Appendix D

Advanced Creations in Nuclear Engineering

Der Welt Erbe gewänne zu eigen,
wer aus dem Rheingold schüfe den Ring,
der maßlose Macht ihm verlieh'.

The whole world can be possessed by one
who from the Rhinegold forges the Ring,
which can bestow immeasurable power.

Richard Wagner. 1854. *Das Rheingold.* Scene I. Wellgunde.

As discussed in Chapter 8, contributions by the German-speaking research world to fundamental nuclear science are very well documented.[1] Wilhelm Röntgen discovered X-rays in 1895, and Ludwig Zehnder was making detailed whole-body X-ray photos of humans by 1896. Hans Geiger and Walther Müller developed accurate radiation meter designs (Geiger counters or Geiger-Müller tubes) during the period 1908–1928 that are still in use today. Nuclear fission reactions were first proposed by Ida Tacke Noddack in 1934, and demonstrated and explained by Otto Hahn, Fritz Strassmann, Lise Meitner, and Otto Frisch in 1938–1939. Nuclear fusion reactions were proposed by Fritz Houtermans and his student Robert Atkinson in 1928–1929, and refined by Carl Friedrich von Weizsäcker and Hans Bethe in 1938. Detailed mathematical models of the nucleus, essential for accurately predicting nuclear decays and reactions, were first developed by von Weizsäcker in 1935 and ultimately finalized by Otto Haxel, Johannes Hans Jensen, Maria Goeppert Mayer, Hans Suess, and Eugene Wigner by 1949.

[1] See for example: Bethe 1991, 1997; Blatt and Weisskopf 1952; Brown and Lee 2006; Otto Hahn 1968; Irving 1967; L'Annunziata 2016; Nachmansohn 1979; Rife 1999; Schweber 2012; Sime 1996; Szanton 1992; Wigner 1967.

In contrast, progress toward nuclear engineering applications within the German-speaking research world is much less well understood by modern scholarship. Much of the relevant archival evidence has only been declassified and rediscovered in recent years, and was not publicly available when earlier historical assessments were made.[2] As presented in this appendix, the evidence that is now available demonstrates that wartime nuclear engineering programs in Germany were considerably larger and more advanced than has previously been generally understood. Some of the evidence even strongly suggests (but does not conclusively prove) that Germany may have developed and successfully tested fission bombs, and that it may have had a megaton-level hydrogen bomb in an advanced stage of development when the war ended.

For a much shorter overview than this appendix, see Section 8.8.

This appendix presents evidence of:

D.1. Flaws in the conventional historical view of the German program.

D.2. The fundamental scientific knowledge and planning of the program.

D.3. Sources of uranium and thorium.

D.4. Enrichment of uranium-235.

D.5. Fission reactors for breeding plutonium-239 and/or uranium-233.

D.6. Electronuclear systems for breeding plutonium-239 and/or uranium-233.

D.7. The production of other potentially nuclear-related materials.

D.8. Fission bomb designs.

D.9. Hydrogen bomb designs.

[2] With access to some of the previously unavailable former Soviet and East German archives and witness testimony, as well as newly discovered and released U.S. and British documents, beginning in the 1990s several authors argued (with varying degrees of success and accuracy—*caveat emptor*) that wartime German work on nuclear weapons was actually much more extensive, involved many more scientists, and progressed much further than had been accepted by the conventional historical narrative. See for example: Brooks 1992, 2002; Frank Döbert in *Walpersberg Geschichts- und Forschungsjournal* 2015, 2016; Eilers 2007, 2015; Fäth 1999, 2000; Fengler 2014; Fengler and Sachse 2012; *Geheimnis Jonastal* 2002–2024; Georg 2009; Henshall 1998, 2000, 2002; Hirschfeld and Brooks 1996; Hydrick 1998, 2016; Karlsch 2005, 2006, 2011; Karlsch and Laufer 2002; Karlsch and Petermann 2007; Karlsch and Zeman 2016; Mayer and Mehner 2001, 2002, 2004a, 2004b, 2009, 2010, 2016, 2019; Mehner 2004; Nagel 2003, 2011, 2012a, 2016; Oleynikov 2000; Petermann 2000; Schmitzberger 2004; Stevens 2007; Sulzer and Brauburger 2015; Matthias Uhl quoted in Schauka 2015; Wilcox 2019; Zeman and Karlsch 2008.

D.10. An October 1944 test explosion on the Baltic coast.

D.11. A circa November 1944 test explosion in Poland.

D.12. March 1945 test explosions in Thuringia.

D.13. Axis belief in the reality of German nuclear weapons.

D.14. Allied belief in the reality of German nuclear weapons.

D.15. Further research that is needed.

These claims may seem controversial. It is possible that the reports of wartime German nuclear weapons tests arose from tests of non-nuclear weapons (such as fuel-air explosives or chemical warfare agents), false wartime propaganda, or other factors. However, it is known that there were extensive and highly secretive nuclear programs in wartime Germany, that numerous military research and production sites were severely bombed by the Allies during the war and/or sanitized by the Germans at the end of the war, that Germans destroyed or hid large amounts of documents and research at the end of the war, and that Soviet, U.S., U.K., and French forces vacuumed up as many scientists and documents and as much equipment as they could find along the way. If the new evidence is indeed correct, one could understand why the Germans involved would have been loath to admit their deeds afterward for fear of being prosecuted as war criminals, or why any Allied forces that found secret evidence of German nuclear accomplishments would have preferred to claim those technologies and achievements exclusively for themselves.

The currently available evidence that is presented in this appendix does not conclusively prove that Germany successfully developed a nuclear weapon during the war. Nonetheless, the available evidence appears to be strongly suggestive of and highly consistent with that conclusion. Therefore, it is vitally important for researchers to thoroughly search all relevant government and personal archives in Russia, the United States, the United Kingdom, France, Germany, Austria, Czechia, Poland, Switzerland, Italy, the Netherlands, Belgium, Norway, Japan, and elsewhere to find additional documents that could fully elucidate the scope, history, and accomplishments of the wartime German nuclear program. Industrial archaeology and chemical analyses at sites where nuclear work may have taken place could also shed a great deal of light on the methods and results of the nuclear program.

D.1 Conventional Historical View of the German Program

[The conventional historical view that has been held since 1945 is that Germany was still trying to complete its first prototype fission reactor when World War II ended in Europe, and that Germany never even made a serious attempt to develop nuclear weapons.[3] This view is based on three categories of evidence, although each category has its own limitations as summarized below:

Evidence	**Limitations**
1. The U.S.-led Alsos Mission searching Germany for evidence of nuclear-weapons-related work at the end of the war found the incomplete fission reactor at Haigerloch, some papers on basic nuclear physics, and apparently not much else, according to the public accounts [Goudsmit 1945, 1947; Groves 1962; Pash 1969].	1. The Alsos Mission failed to properly investigate numerous specific organizations, scientists, and locations that could have revealed a more advanced nuclear program. If any more advanced nuclear work had in fact been discovered, that information would have been automatically classified at the time, and could remain classified or buried in archives and unreleased to this day.
2. Ten German nuclear scientists (Erich Bagge, Kurt Diebner, Walther Gerlach, Otto Hahn, Paul Harteck, Werner Heisenberg, Horst Korsching, Max von Laue, Carl Friedrich von Weizsäcker, and Karl Wirtz) rounded up by the Alsos Mission were kept under house arrest from July 1945 until January 1946 at Farm Hall in the United Kingdom, where their private conversations were recorded without their knowledge. The transcripts, which were not released to the public until 1992, record the scientists' surprise at news of the 6 August 1945 Hiroshima bombing and do not reveal significant apparent knowledge of nuclear weapons design and development [Bernstein 2001; Frank 1993; Hoffmann 2023].	2. A huge number of relevant nuclear scientists were not at Farm Hall. There is evidence that those who were there suspected surveillance and conducted their conversations accordingly. The preserved transcripts document only a small fraction of the discussions that would have occurred among ten people and their British attendants during those six months. Moreover, the transcripts are English translations, which may not accurately reflect the original German conversations. Both the original recordings and the original German transcripts are said to have been permanently lost, a shocking lapse for such an important operation.
3. In their public interviews and writings in the years after the war, German nuclear scientists professed a lack of desire, plans, materials and/or political support to produce nuclear weapons for the Third Reich [Cassidy 1992; Heisenberg 1953, 1971; Irving 1967; Powers 1993; NYT 1948-12-28 p. 10].	3. Only a small number of nuclear scientists went on the public record. It is not clear how much of what they said was factual history versus personal spin meant to avoid postwar criticism; the answer may vary for different scientists in question. Certainly it would have been in their best personal interests to downplay their support for weapons-related work as much as possible.]

[3] E.g., Goudsmit 1947; Hentschel and Hentschel 1996; Hoffmann 2023; Irving 1967; Powers 1993; Rose 1998; Walker 1989, 1995, 2020, 2024a, 2024b.

D.1.1 Alsos Mission

[Popular accounts of the Alsos Mission were written by Samuel Goudsmit, the scientific leader of Alsos, Boris Pash, the military leader, and Leslie Groves, their U.S.-based supervisor. In addition, many Alsos documents, long classified, are now available.

As illustrated by the documents in this section, the Alsos Mission failed to properly pursue a large number of leads that might have revealed that the German nuclear program was much larger and much more advanced than Alsos claimed. Some of the fundamental problems included:

- Whatever evidence Samuel Goudsmit wanted to pursue (or not), and whatever conclusions he drew from that evidence, apparently became the official view of Alsos. Boris Pash and other military men were there to move the Alsos scientists around safely and to retrieve any German scientists/materials that the Alsos scientists wanted, not to express their own opinions in Alsos reports. Likewise, there does not appear to be any documentation of junior Alsos scientists offering different opinions or disagreeing with Goudsmit through official channels.[4] Contemporary documents from U.S. officials show that they realized that Alsos basically was Goudsmit (pp. 3310–3311).

- Goudsmit was trained as a physicist, yet his only significant scientific accomplishment (calculations of electron spin) occurred when he was still a student, and it may have been due much more to his doctoral adviser Paul Ehrenfest and his fellow student George Uhlenbeck than to Goudsmit himself. Goudsmit was selected for Alsos specifically because he did not know or understand the scientific details of the Manhattan Project, in case he was captured by the Germans or the Russians. He spent his postwar career not as a scientifically innovative researcher, but rather as a bureaucratic administrator in scientific organizations who apparently concealed the fact that was a secret CIA asset (pp. 4824–4825).

- In his writings, Goudsmit appeared to show a strong belief in the superiority of his own insight and an equally deep prejudice against Germans, specifically a strong desire to believe that wartime German science and German scientists were inferior and incompetent. Almost certainly Goudsmit's mindset was strongly influenced by his parents having been killed during the war, although perhaps other factors influenced him as well. While his grief would be quite understandable, he did not sound at all like an open-minded and intellectually rigorous investigator for this topic, based on his own words. U.S. officials who worked with Goudsmit openly stated that he had a number of undesirable psychological characteristics (see for example pp. 3278–3279, 3282–3283, 3284–3287, 3292–3293, 3296, 3303–3305, 3306–3307, 3310–3311, 3312–3314, 3339).

- Goudsmit and other investigators incorrectly assumed that any significant details about the German nuclear program would be widely shared among German scientists and freely divulged by those scientists to Alsos investigators. Yet in fact the German program seems to have been highly compartmentalized, with each person knowing only as much as they needed to know to perform their own job in the program. Furthermore, it was in the best personal interests of any German scientists interviewed by Goudsmit to minimize their wartime knowledge, work,

[4] Lt. Col. George R. Eckman's "Final Report on the ALSOS Mission," written in December 1945, seems to be missing from modern archives (p. 3351). If it could be located, it is possible that it might give a different opinion than Goudsmit's public statements.

and accomplishments as much as possible, in order to avoid further interrogations, detention (at Farm Hall, Dustbin, Ashcan, in the United States, etc.), or war crimes trials that could lead to their imprisonment or execution. Thus they told Goudsmit exactly what he wanted to hear—that German science was inferior and had not accomplished much. Goudsmit was apparently very satisfied with that answer. Even if Goudsmit had been more open-minded, he had been trained as a physicist to hold academic discussions and to accept the answers at face value, not to hold strong, probing, skeptical interrogations and to apply as much psychological pressure as possible.

- Goudsmit and the rest of Alsos never investigated work, personnel, equipment, or documents in the large and scientifically very important Soviet-occupied areas of Germany (apart from a token trip to the Kaiser Wilhelm Institute for Physics in Berlin in late July 1945, after the Soviets had already stripped it bare).
- Alsos never investigated other Soviet-occupied territory such as Poland, Czechoslovakia, Hungary, Romania, and Bulgaria, where considerable German work is known to have occurred (pp. 3289–3291).
- Alsos never investigated Norway and Denmark, where important German work had also been conducted.
- Alsos never investigated sites in Thuringia other than Stadtilm and Nordhausen, even though Thuringia was filled with a large number of potentially relevant sites, especially underground.
- Alsos did not seriously investigate Austria (apart from interviewing some scientists from Vienna, after the Soviets had already removed personnel and materials from Austria).
- Alsos dismissed and did not seriously pursue work that had been conducted by the Reichspost, Wilhelm Ohnesorge, Manfred von Ardenne, Fritz Houtermans, Siegfried Flügge, etc.
- Alsos dismissed and did not seriously pursue work that had been conducted by the Army Ordnance Office, Erich Schumann, Walter Trinks, etc.
- Alsos dismissed and did not seriously pursue work that had been conducted under the SS.
- Alsos did not seriously investigate work that had been conducted at I.G. Farben.
- Alsos did not consider the large number of German documents that were destroyed, hidden, or captured by other groups from the United States or from other countries (especially the Soviet Union).
- From the outset, Alsos was highly focused on a few German scientists such as Heisenberg who were already well known before the war. Alsos dismissed and did not seriously pursue other, newer, or previously unknown scientists and engineers that it encountered.
- Alsos stated incorrectly that German scientists had no concept for a bomb, other than a vision of a highly impractical and inefficient out-of-control fission reactor.
- Alsos stated incorrectly that German scientists had not given serious consideration to producing and using plutonium.

- Richard Kuhn was one of the top brains behind Germany's massive, long-running, and highly advanced chemical weapons program that successfully researched, developed, tested, mass-produced, and stockpiled the world's first nerve gases. Despite interrogating Richard Kuhn in April 1945, Goudsmit and the other Alsos investigators were completely oblivious to the existence of the nerve gas program or Kuhn's role in it. Even when they pressed Kuhn for more information in September 1945, all they learned was that he had been involved in the production of plastics and other basic materials (p. 3334). By that time Alsos had spent more than a year searching all of Europe for any evidence of any types of German weapons of mass destruction. This demonstrable and complete failure by Alsos to even discover (let alone properly understand) the massive German chemical weapons program appears to cast grave doubt on the competence of Goudsmit and the other Alsos investigators, as well as the validity of their conclusions about the German nuclear program, which involved many of the same organizations as the nerve gas program (Army Ordnance, SS, I.G. Farben, etc.).

- Before the war even ended, Goudsmit and/or his superiors apparently decided to divert most of the personnel, time, and resources of the Alsos Mission away from weapons of mass destruction (WMD), and instead to analyze other German technological developments such as anti-aircraft missiles and proximity fuses (e.g., pp. 3288, 3303, 3324). That shift is documented by the large number of reports that Alsos personnel wrote on those other subjects in spring and summer 1945. That effort duplicated non-WMD field work that was being carried out by many other teams of Allied investigators (BIOS, CIOS, FIAT, NavTecMisEu, etc.). It also left Alsos even less able to track down leads on German nuclear or other WMD programs. (Or perhaps it got Alsos out of the way so that some much more capable but more secretive Allied team could investigate the German nuclear program?)

- If Goudsmit concluded that there was no advanced German nuclear program, and stated that in official reports and public statements at the time, it would have been in his own best interests to keep saying that, even if he eventually learned otherwise sometime after the war. Goudsmit's ego about his own abilities, his prejudice against German scientists (including his bizarre lifelong personal fixation on Heisenberg), and his desire not to jeopardize his continuing U.S.-government-funded career and his public credibility would have been strong reasons for him to maintain his conclusions, even if sometime after the war he eventually heard some secret evidence that did not fit into his conclusions.

- In May 1945, SHAEF G-2 Generals Thomas J. Betts (p. 5076) and George Bryan Conrad plus AAF General Henry Arnold's advisor Prof. Edward L. Bowles of MIT (pp. 4757, 5381) concluded that Alsos had failed to do its primary job of investigating the German nuclear program (pp. 3303–3305). Robert Furman admitted that there were so many German nuclear sites and documents that his team did not even try to investigate them.

If there was in fact an advanced German nuclear program and the United States learned of that during or after the war, that knowledge does not appear to have flowed through or been shared with the Alsos Mission. Any such knowledge seems to have resided with whatever officials or groups warned Franklin Roosevelt of an advanced German nuclear program; directed advancing U.S. forces straight to Thuringia, Austria, and Czechoslovakia; captured and interrogated Hans Kammler; handled the personnel and materials from the German submarine U-234 and other captured submarines; etc. (see p. 4738).]

[According to Robert Furman, "everything done by Alsos was done by Goudsmit" (p. 3310). Other than the brief mention by Thomas Powers below, why do the many books on the Alsos mission completely omit the fact that in early December 1944, long before Allied forces even reached Germany, Samuel Goudsmit went on such an extreme tirade against German people that he had a nervous breakdown, was relieved of duty, and was sent back to the United States for most of the remainder of the war in Europe? That seems like an important detail in evaluating the history of the Alsos mission and the quality of its work in investigating the German nuclear program.]

Thomas Powers. 1993. *Heisenberg's War: The Secret History of the German Bomb.* New York: Alfred A. Knopf. pp. 371–372, 382, 560.

Robert Furman wasn't quite sure what brought it on—war causes terrible pressures. They'd been out in Strasbourg that day, had suddenly found themselves in a field surrounded by howitzers right at the edge of the war. Back at headquarters they'd seen some victims of shell shock, trembling, weeping men. Goudsmit had been terribly worried about his parents; he'd heard nothing since their final letter of farewell in March 1943, and the news of Eindhoven in September promised no hope.

That night in Strasbourg, when Furman and Goudsmit were alone together, Goudsmit "just went off his rocker—he was furious at the Germans, weeping and thrashing around."[13] It took Furman half an hour to pull Goudsmit together. Goudsmit barely alluded to this episode when he wrote his wife from Paris four or five days later. "The grim part of the venture," he told her, "was that I had to face for the first time a small number of people like myself, but on the other side." He told her he longed for a visit home, and Furman quietly arranged it. Goudsmit had been working closely with Furman for some months on what he had described to Walter Colby as "Major RRF's project for Germany," and Furman had planned to send Goudsmit to Switzerland to lay the groundwork. But the episode in Haagen's apartment in Strasbourg ended all that; it seemed obvious to Furman that Goudsmit was not up to the tension or the delicacy of such an effort. [...]

[O]n November 20, Donovan and Buxton cabled Dulles, "Am told Goudsmit somewhat tactless and possibly should not be included to work with temperamental people. Wardenburg said to be the better informed." But Goudsmit remained a part of the plan until mid-December, when his name abruptly disappeared from operational cables after his strange breakdown under the strain of Strasbourg. [...]

13. Interview with Furman, March 6, 1990.

William Donovan to Allen Dulles. 20 November 1944. Cable Out 23415. [NARA RG 226, Entry A1-134, Box 219, Folder 1371: OUT AZUSA Nov. '43 Sept. '45]

#0857. AZUSA. 110 from 109 and 106. Answering your #0747 and #737 to Paris.

If Furman and Wardenburg are pressing to contact Flute [Paul Scherrer] and others recommend:

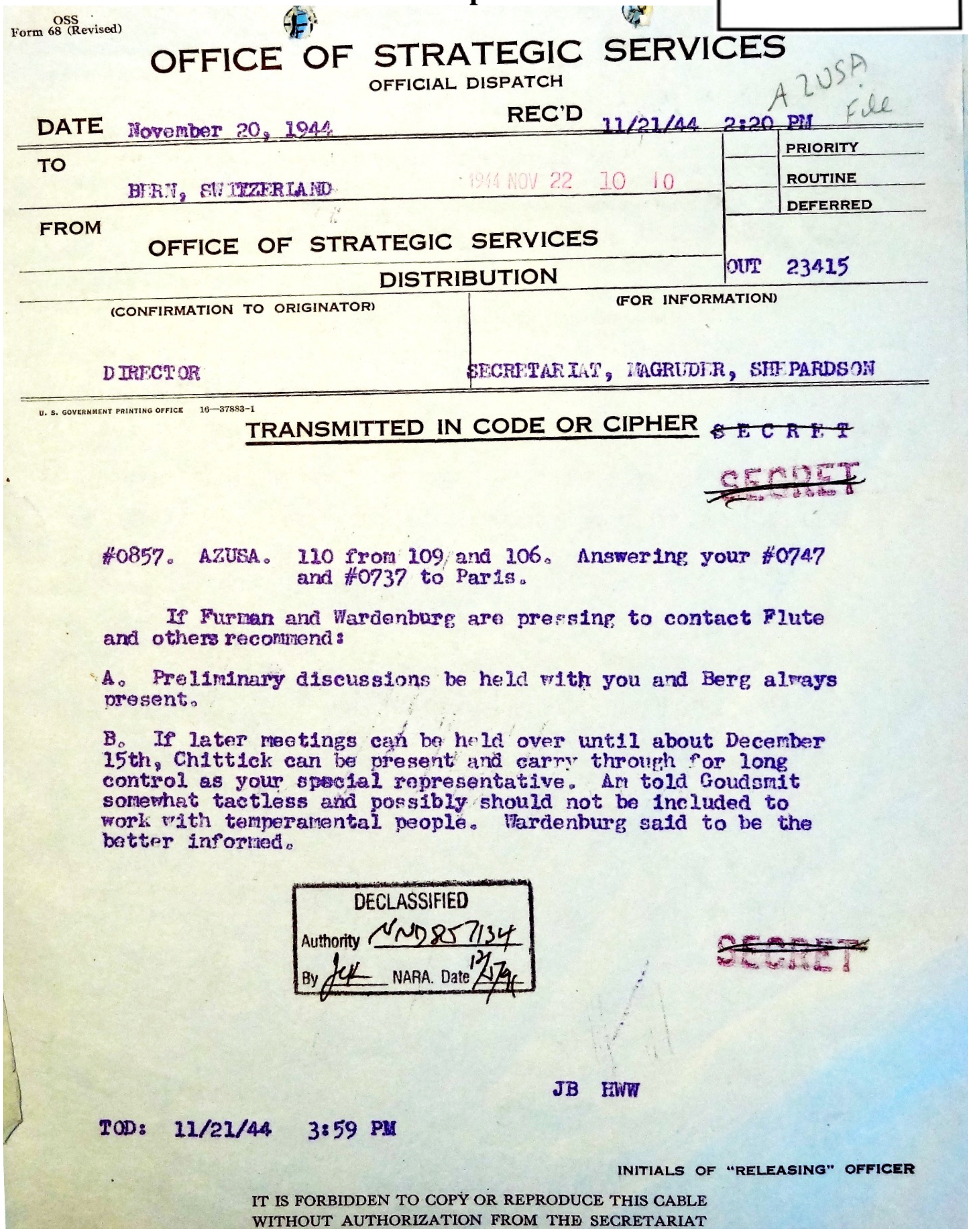
A. Preliminary discussions be held with you and [Moe] Berg always present.

B. If later meetings can be held over until about December 15th, [Martin] Chittick can be present and carry through for long control as your special representative. Am told Goudsmit somewhat tactless and possibly should not be included to work with temperamental people. Wardenburg said to be the better informed.

[See p. 3279. According to OSS Director William Donovan, Samuel Goudsmit was "tactless," not recommended to work with people, and even less "informed" about nuclear weapons physics than Frederic Wardenburg, a junior Alsos member and middle manager from Du Pont whose only scientific education was a bachelor's degree in electrical engineering from two decades earlier (1927).]

NARA RG 226, Entry A1-134, Box 219, Folder 1371: OUT AZUSA Nov. '43 Sept. '45

DECLASSIFIED
Authority NND 917017



OSS Form 68 (Revised)

OFFICE OF STRATEGIC SERVICES
OFFICIAL DISPATCH

A ZUSA File

DATE November 20, 1944 REC'D 11/21/44 2:20 PM

TO BERN, SWITZERLAND 1944 NOV 22 10 10

PRIORITY
ROUTINE
DEFERRED

FROM OFFICE OF STRATEGIC SERVICES

OUT 23415

DISTRIBUTION

(CONFIRMATION TO ORIGINATOR) DIRECTOR

(FOR INFORMATION) SECRETARIAT, MAGRUDER, SHEPARDSON

U. S. GOVERNMENT PRINTING OFFICE 16—37883-1

TRANSMITTED IN CODE OR CIPHER ~~SECRET~~

~~SECRET~~

#0857. AZUSA. 110 from 109 and 106. Answering your #0747 and #0737 to Paris.

If Furman and Wardenburg are pressing to contact Flute and others recommend:

A. Preliminary discussions be held with you and Berg always present.

B. If later meetings can be held over until about December 15th, Chittick can be present and carry through for long control as your special representative. Am told Goudsmit somewhat tactless and possibly should not be included to work with temperamental people. Wardenburg said to be the better informed.

DECLASSIFIED
Authority NND 857134
By JCK NARA. Date 12/2/94

~~SECRET~~

JB HWW

TOD: 11/21/44 3:59 PM

INITIALS OF "RELEASING" OFFICER

IT IS FORBIDDEN TO COPY OR REPRODUCE THIS CABLE WITHOUT AUTHORIZATION FROM THE SECRETARIAT

Figure D.1: OSS Director William Donovan to Allen Dulles. 20 November 1944. Cable Out 23415 [NARA RG 226, Entry A1-134, Box 219, Folder 1371: OUT AZUSA Nov. '43 Sept. '45].

NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002
GERMANY—ALSOS MISSION * Administrative Matters (1940-1945)

DECLASSIFIED
Authority NND 917017

C
o
p
y

SECRET

10 January 1945

Passed to Lansdale

Colonel W. M. Adams
Chief, Foreign Branch
Military Intelligence Service
War Department
Washington, D. C.

Dear Bill:

This letter will cover only one subject, but an important enough subject to justify special consideration. I am writing to you in this informal manner because of a feeling that the subject may be considered outside of my responsibilities, yet it is my feeling that it is not a field that should be a matter of discussion between myself and my immediate chief.

As I have tried to indicate on my last trip to Washington, it is my opinion that our scientific group has not been properly organized and lacks leadership As a result of this, we have had a number of difficulties, not only in the administrative field but also in the fact that some people whose interests we are covering considered it necessary to advise and even direct our technical and administrative personnel on matters pertaining to the Mission. This last phase was always handled satisfactorily in the past and we have not given it too serious consideration. But it does show that proper leadership in the scientific field was necessary.

Upon the departure of Dr. Goudsmit, and lacking a man designated by him to take over the responsibilities, I called a meeting, inviting Dr. Reid, Captain Roop, Captain Cromartie, Mr. Wardenburg and the administrative officers to attend. At this meeting we discussed the various fields of activity and the need for periodical meetings of this nature in order to coordinate the activities of all groups concerned. This idea was concurred in by all and we have since had another meeting.

In the absence of Dr. Goudsmit, Dr. Reid has been asked to serve as the acting chief of the scientific group. This action was taken because no assistant was designated by Dr. Goudsmit.

We see evidence of immediate results, following the above action. Dr. Reid has started organizing the past information and experience of the Mission in order to be able to give a brief but thorough orientation to the newly arrived scientists so that they do not feel lost or neglected when first arriving and are able to coordinate their needs and interests with the general procedure adopted by the Mission. He has also commenced a detailed study of all available information on German targets in order to dovetail such information with operational planning. The few days that he has engaged in this activity have already brought positive reactions and it is my opinion that it has also improved the morale of the scientists.

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By CD/S2 NARS, Date 25 FEB 1976

~~SECRET~~

32.7002

Figure D.2: Boris Pash to W. M. Adams. 10 January 1945. Selection of a replacement chief scientist of Alsos after Samuel Goudsmit's nervous breakdown and removal [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)].

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002
GERMANY—ALSOS MISSION * Administrative Matters (1940-1945)

SECRET

Ltr to Colonel W. M. Adams - continued 10 January 1945

Dr. Reid expects to remain until Dr. Goudsmit's return. I hope that OSRD will be contacted and asked to approve the appointment of Dr. Reid as acting head in Dr. Goudsmit's absence. An official communication informing the War Department of this action has been dispatched with Captain Blake.

In talking over this same matter with Dr. Waterman, I have indicated that in my opinion, Dr. Sherwood would be an excellent man to serve as a scientific coordinator, The man serving in that capacity does not have to have knowledge of the languages, Prime requisites should be administrative and organizational abilities. Dr. Reid has already demonstrated that, and from what I know of Dr. Sherwood, I am sure that he could carry on the work started by Dr. Reid. The only reason I am not considering proposing Dr. Reid is because of his statement that he must return to the States on or about 1 February 1945.

The above in no way is criticism of Dr. Goudsmit's work. As I told Dr. Waterman, the extremely heavy load in connection with the one field of interest of Dr. Goudsmit, has made it practically impossible for him to devote any time to the general organizational work, and what is more important, has created a lack of interest in any other work. At the same time, I do not feel that the man doing the organizational work and general coordinating work of the Mission should be carrying the load and the responsibility as a deputy of a man who will not have any interest in that field. It is therefore my strong recommendation that Dr. Goudsmit be put in charge of all the work in Major Furman's field of interest and another man, preferably Dr. Sherwood or a man with his capabilities be designated as coordinator of the scientific group or chief of the scientific group. I am sure that this would improve our Mission considerably and it is my opinion that such action would be strongly favored by the Navy contingent.

Please accept this informal note as an expression of opinion on my part and it is dispatched only because of my feeling that we are not ready to operate in Germany and that the lack of readiness is not due to our failure to prepare operational plans, but simply because we can lay no plans without information on which to base them. I am now working out plans for operations in Germany and, as I stated above, Dr. Reid has been extremely helpful in getting from the available scientists such information as I need to organize my work.

With best personal wishes,

Sincerely,

BORIS T. PASH,
Lt. Colonel, MI

Figure D.3: Boris Pash to W. M. Adams. 10 January 1945. Selection of a replacement chief scientist of Alsos after Samuel Goudsmit's nervous breakdown and removal [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)].

A. E. Britt to Francis J. Smith. 7 March 1945. SUBJECT: Conversation between Col. Lansdale and Dr. Harold Wilson [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)]

1. Col. Lansdale talked to Dr. Tolman and the latter stated that Dr. Harold Wilson was concerned about the complaints received from Goudsmit. This apparently is the recent letter of which you are cognizant. Col. Lansdale told Dr. Wilson—

a. That we are not concerned with the organization of Alsos in the Theater;

b. This organization [Alsos] is not responsible for TA in the Theater, however that Furman and our organization is and that it is up to us to determine what we want, and how much of what they have obtained that we want and the priority to be established;

c. That it was none of Goudsmit's business as to whether or not the reports were sent to Dr. Tolman. Goudsmit is inclined to want to write reports and direct them to scientists. He was told that it was his responsibility to write reports in a way that non-scientists could understand them inasmuch as this office is the using office.

2. There is some question as to whether or not the above points contradict the basic principles of the Alsos agreement. However in talking to Dr. Wilson, Col. Lansdale pointed out to him that we did not think such as the case.

3. Suggest you talk to Col. Lansdale regarding the above matter.

BRITT

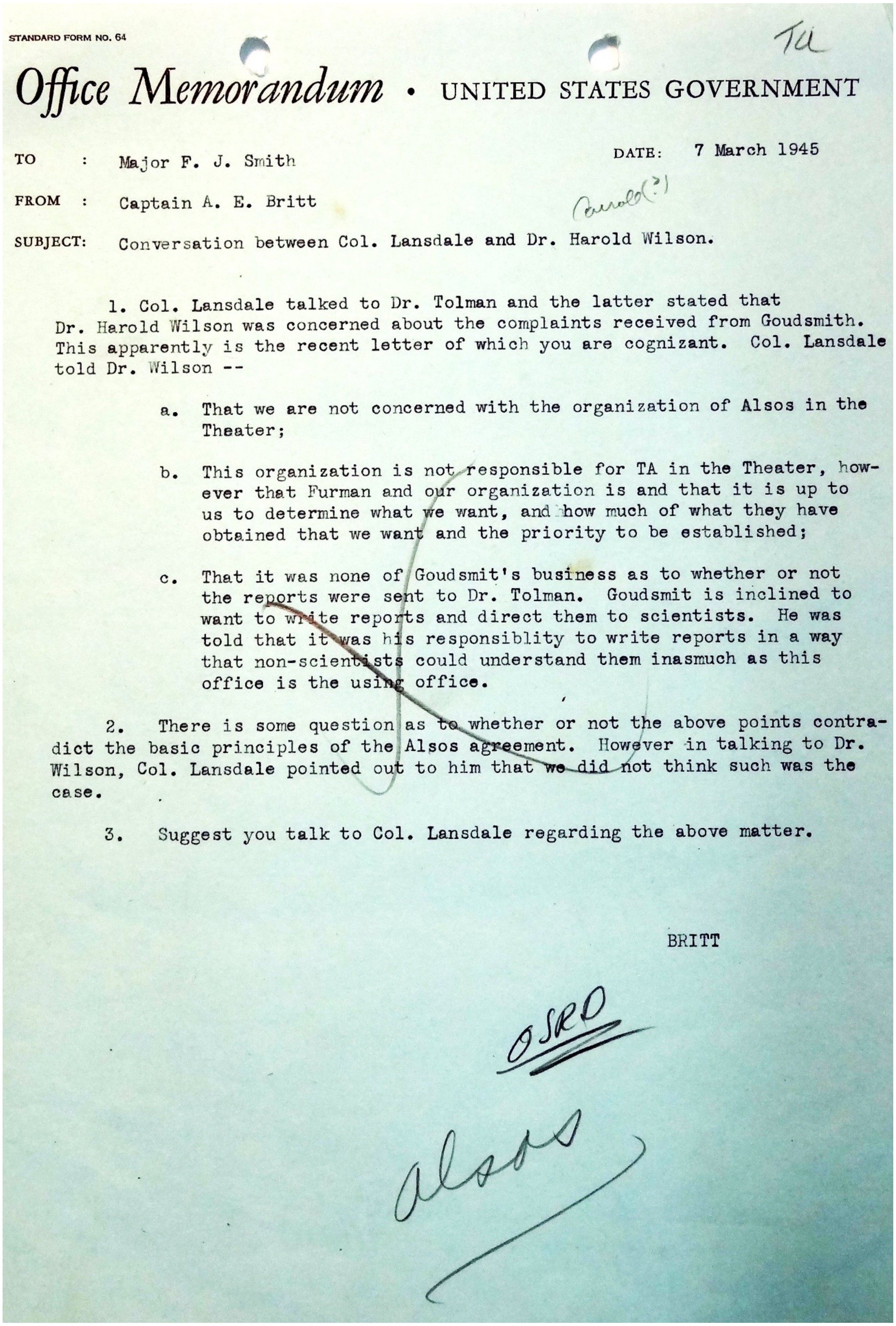
[See document photo on p. 3283.

Goudsmit complained about many other people, and many other people complained about Goudsmit's behavior and performance.

For some other examples, see pp. 3278–3279, 3284–3287, 3292–3293, 3296, 3303–3305, 3306–3307, 3310–3311, 3312–3314, 3339.

Quarrelsome behavior so severe as to leave such a paper trail was quite unusual for a senior scientific "professional," and certainly would have been detrimental to the proper functioning and the quality of the results of a high-priority intelligence mission being conducted in the midst of a world war.]

DECLASSIFIED
Authority NND 917017



STANDARD FORM NO. 64

TA

Office Memorandum • UNITED STATES GOVERNMENT

TO : Major F. J. Smith DATE: 7 March 1945

FROM : Captain A. E. Britt

Carroll(?)

SUBJECT: Conversation between Col. Lansdale and Dr. Harold Wilson.

1. Col. Lansdale talked to Dr. Tolman and the latter stated that Dr. Harold Wilson was concerned about the complaints received from Goudsmith. This apparently is the recent letter of which you are cognizant. Col. Lansdale told Dr. Wilson --

a. That we are not concerned with the organization of Alsos in the Theater;

b. This organization is not responsible for TA in the Theater, however that Furman and our organization is and that it is up to us to determine what we want, and how much of what they have obtained that we want and the priority to be established;

c. That it was none of Goudsmit's business as to whether or not the reports were sent to Dr. Tolman. Goudsmit is inclined to want to write reports and direct them to scientists. He was told that it was his responsiblity to write reports in a way that non-scientists could understand them inasmuch as this office is the using office.

2. There is some question as to whether or not the above points contradict the basic principles of the Alsos agreement. However in talking to Dr. Wilson, Col. Lansdale pointed out to him that we did not think such was the case.

3. Suggest you talk to Col. Lansdale regarding the above matter.

BRITT

OSRD

alsos

NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002
GERMANY—ALSOS MISSION * Administrative Matters (1940-1945)

Figure D.4: A. E. Britt to Francis J. Smith. 7 March 1945. SUBJECT: Conversation between Col. Lansdale and Dr. Harold Wilson [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION $*$ Administrative Matters (1940–1945)]. Goudsmit complained about many other people, and many other people complained about Goudsmit's behavior and performance.

Vannevar Bush to Samuel A. Goudsmit. 15 March 1945. [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)]

There were several matters which you discussed with Dr. Waterman and Mr. Wilson, prior to your return to the ETO, relating to the activities of the ALSOS Mission on behalf of the Special Project. Subsequent discussion of these matters with Dr. Tolman and Lt. Col. Lansdale have, I believe, clarified the points which were on your mind and resulted in bringing these matters into satisfactory form. Undoubtedly since you have now returned, you will be conferring with Major Furman and Major Calvert and the scientific members of ALSOS who are concerned with this subject and will presently have a full picture of the situation as it now stands in the ETO.

One point which I believe you felt needed clarification concerned the action which you and your colleagues should take in regard to the execution of plans for gathering intelligence in this area, which might be requested from Washington and alter materially the priorities and plans already agreed upon by the military and scientific group in the ETO. I do not anticipate that such situations are likely to arise, but if this were to occur, I understand it was your feeling that you would be satisfied if you were assured that any major changes were reviewed by and concurred in by Dr. Tolman. I am assured by Dr. Tolman and Colonel Lansdale that such will be the case. I expect that you will find upon your return that plans for targets and priorities are fairly well agreed upon and details have been worked out to the extent possible with available data. I understand that these plans have been closely coordinated with the requirements and information available in Washington. I expect that these plans are now clear enough so that there is little likelihood of important differences of opinion.

Another matter which has been discussed with Dr. Tolman and Colonel Lansdale concerns the nature of the intelligence reports which you prepare relating to the Special Project. We can give you full assurance that all of these reports are available to Dr. Tolman and reach him. As to the matter of writing them in "lay language," this writing must be done either in the ETO or here. If your reports are not received in such form someone here, namely Dr. Tolman, would have to re-write them in a form understandable to the non-scientific group. This is a burden which Dr. Tolman cannot take on nor can his staff. Hence we feel that it is reasonable to ask that your group prepare these reports in a form directly useable by the military group. Moreover, such reports can best be prepared with the full information available in the ETO rather than attempt to expand abbreviated scientific reports.

On the matter of interviewing German scientists taken into custody and sent to this country, this comes under two headings; firstly, interviewing for information on the Special Project; and secondly, interviewing for information in other fields. As to the first, it is Colonel Lansdale's group which can arrange the interviews. As to the second, it is a matter for Colonel Adams to arrange, for it is a G-2 function, and I understand that Dr. Waterman is taking this up with Colonel Adams. As to the PW's described in your memorandum, it is the conclusion of Colonel Lansdale's group, with which Dr. Tolman concurs, that the marginal material on the Special Project which might be obtained from these men, in addition to that already obtained by you and your colleagues in the interviews in the ETO, is not sufficiently promising to warrant the risks involved in giving them more information which might result from further interviews on this subject. Dr. Waterman will advise you of the results of his discussion with Colonel Adams regarding interviews for the purpose of obtaining information on other subjects.

I believe that you have found upon your return that the organization of intelligence on the Special Project from the military side has been clarified since your departure in December, and I trust that matters will progress smoothly during the remainder of this important and interesting assignment. I also hope that the targets will soon be available and that the circumstances, planning and execution of the missions will permit achieving results which are up to the Strasbourg standard. I am sure that all groups concerned will exert their best efforts to bring about this result.

Very sincerely yours,

V. Bush, Director

cc: General Groves
Dr. Tolman
Dr. Waterman

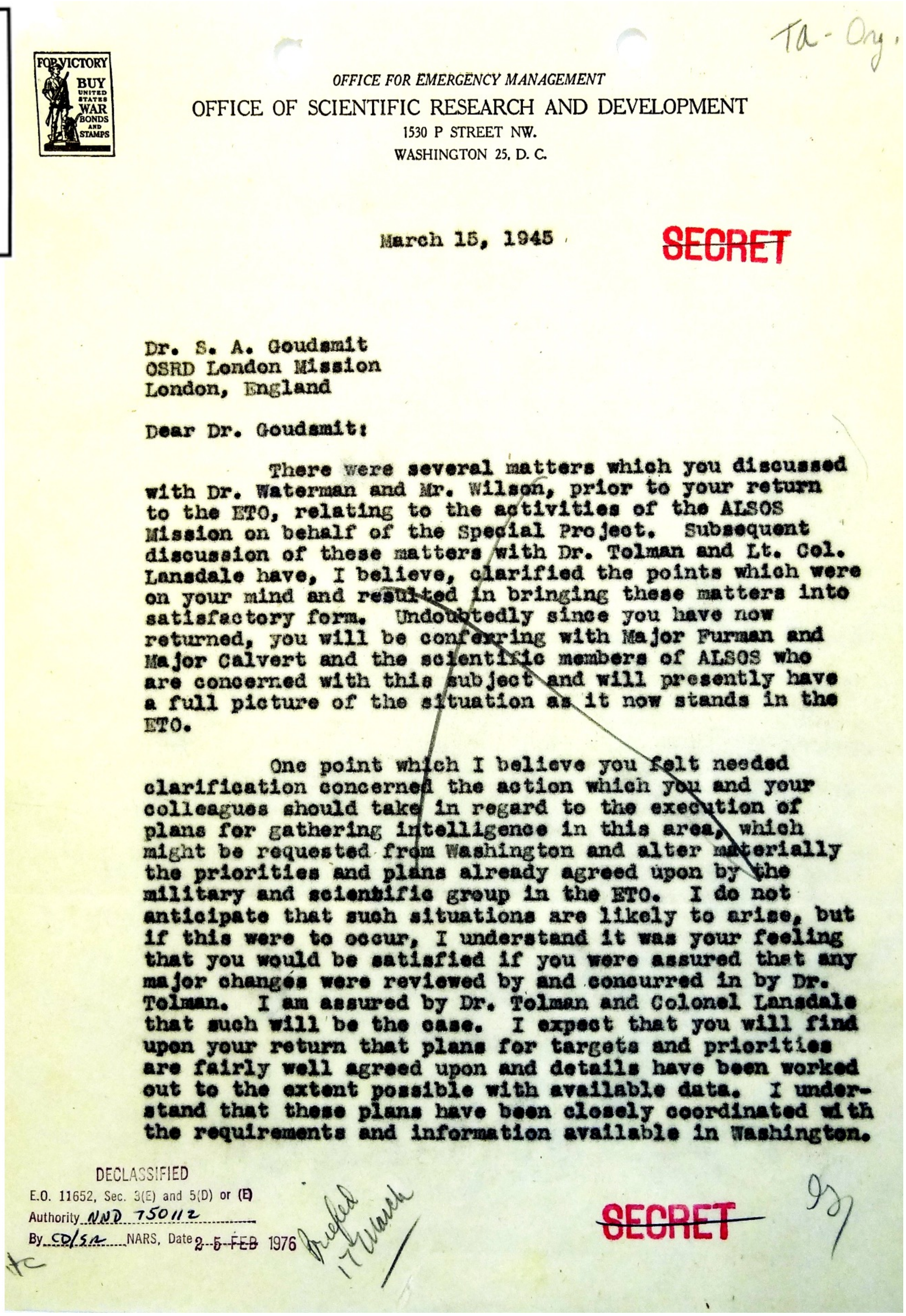
[See document photos on pp. 3286–3287.

Vannevar Bush, who ran all wartime U.S. R&D, apparently agreed with all of the concerns about Goudsmit. Bush's letter to Goudsmit was diplomatically phrased but undoubtedly severe.

Goudsmit had been ordered out of Europe from December 1944 until sometime in March 1945, and Alsos wrapped up most of its duties by early May 1945. Thus Goudsmit spent very little time in Europe during the critical final six months of the war.]

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002
GERMANY—ALSOS MISSION * Administrative Matters (1940-1945)



Ta - Org.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

OFFICE FOR EMERGENCY MANAGEMENT
OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT
1530 P STREET NW.
WASHINGTON 25, D. C.

March 15, 1945 SECRET

Dr. S. A. Goudsmit
OSRD London Mission
London, England

Dear Dr. Goudsmit:

There were several matters which you discussed with Dr. Waterman and Mr. Wilson, prior to your return to the ETO, relating to the activities of the ALSOS Mission on behalf of the Special Project. Subsequent discussion of these matters with Dr. Tolman and Lt. Col. Lansdale have, I believe, clarified the points which were on your mind and resulted in bringing these matters into satisfactory form. Undoubtedly since you have now returned, you will be conferring with Major Furman and Major Calvert and the scientific members of ALSOS who are concerned with this subject and will presently have a full picture of the situation as it now stands in the ETO.

One point which I believe you felt needed clarification concerned the action which you and your colleagues should take in regard to the execution of plans for gathering intelligence in this area, which might be requested from Washington and alter materially the priorities and plans already agreed upon by the military and scientific group in the ETO. I do not anticipate that such situations are likely to arise, but if this were to occur, I understand it was your feeling that you would be satisfied if you were assured that any major changes were reviewed by and concurred in by Dr. Tolman. I am assured by Dr. Tolman and Colonel Lansdale that such will be the case. I expect that you will find upon your return that plans for targets and priorities are fairly well agreed upon and details have been worked out to the extent possible with available data. I understand that these plans have been closely coordinated with the requirements and information available in Washington.

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By CD/SR NARS, Date 2-5-FEB 1976

Briefed 17 March

~~SECRET~~

Figure D.5: Vannevar Bush to Samuel A. Goudsmit. 15 March 1945 [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)].

NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002
GERMANY—ALSOS MISSION * Administrative Matters (1940-1945)

- 2 - SECRET

I expect that these plans are now clear enough so that there is little likelihood of important differences of opinion.

Another matter which has been discussed with Dr. Tolman and Colonel Lansdale concerns the nature of the intelligence reports which you prepare relating to the Special Project. We can give you full assurance that all of these reports are available to Dr. Tolman and reach him. As to the matter of writing them in "lay language," this writing must be done either in the ETO or here. If your reports are not received in such form someone here, namely Dr. Tolman, would have to re-write them in a form understandable to the non-scientific group. This is a burden which Dr. Tolman cannot take on nor can his staff. Hence we feel that it is reasonable to ask that your group prepare these reports in a form directly useable by the military group. Moreover, such reports can best be prepared with the full information available in the ETO rather than attempt to expand abbreviated scientific reports.

On the matter of interviewing German scientists taken into custody and sent to this country, this comes under two headings; firstly, interviewing for information on the Special Project; and secondly, interviewing for information in other fields. As to the first, it is Colonel Lansdale's group which can arrange the interviews. As to the second, it is a matter for Colonel Adams to arrange, for it is a G-2 function, and I understand that Dr. Waterman is taking this up with Colonel Adams. As to the PW's described in your memorandum, it is the conclusion of Colonel Lansdale's group, with which Dr. Tolman concurs, that the marginal material on the Special Project which might be obtained from these men, in addition to that already obtained by you and your colleagues in the interviews in the ETO, is not sufficiently promising to warrant the risks involved in giving them more information which might result from further interviews on this subject. Dr. Waterman will advise you of the results of his discussion with Colonel Adams regarding interviews for the purpose of obtaining information on other subjects.

I believe that you have found upon your return that the organization of intelligence on the Special Project from the military side has been clarified since your departure in December, and I trust that matters will

- 3 - SECRET

progress smoothly during the remainder of this important and interesting assignment. I also hope that the targets will soon be available and that the circumstances, planning and execution of the missions will permit achieving results which are up to the Strasbourg standard. I am sure that all groups concerned will exert their best efforts to bring about this result.

Very sincerely yours,

V. Bush, Director

cc: General Groves
Dr. Tolman
Dr. Waterman

Figure D.6: Vannevar Bush to Samuel A. Goudsmit. 15 March 1945 [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)].

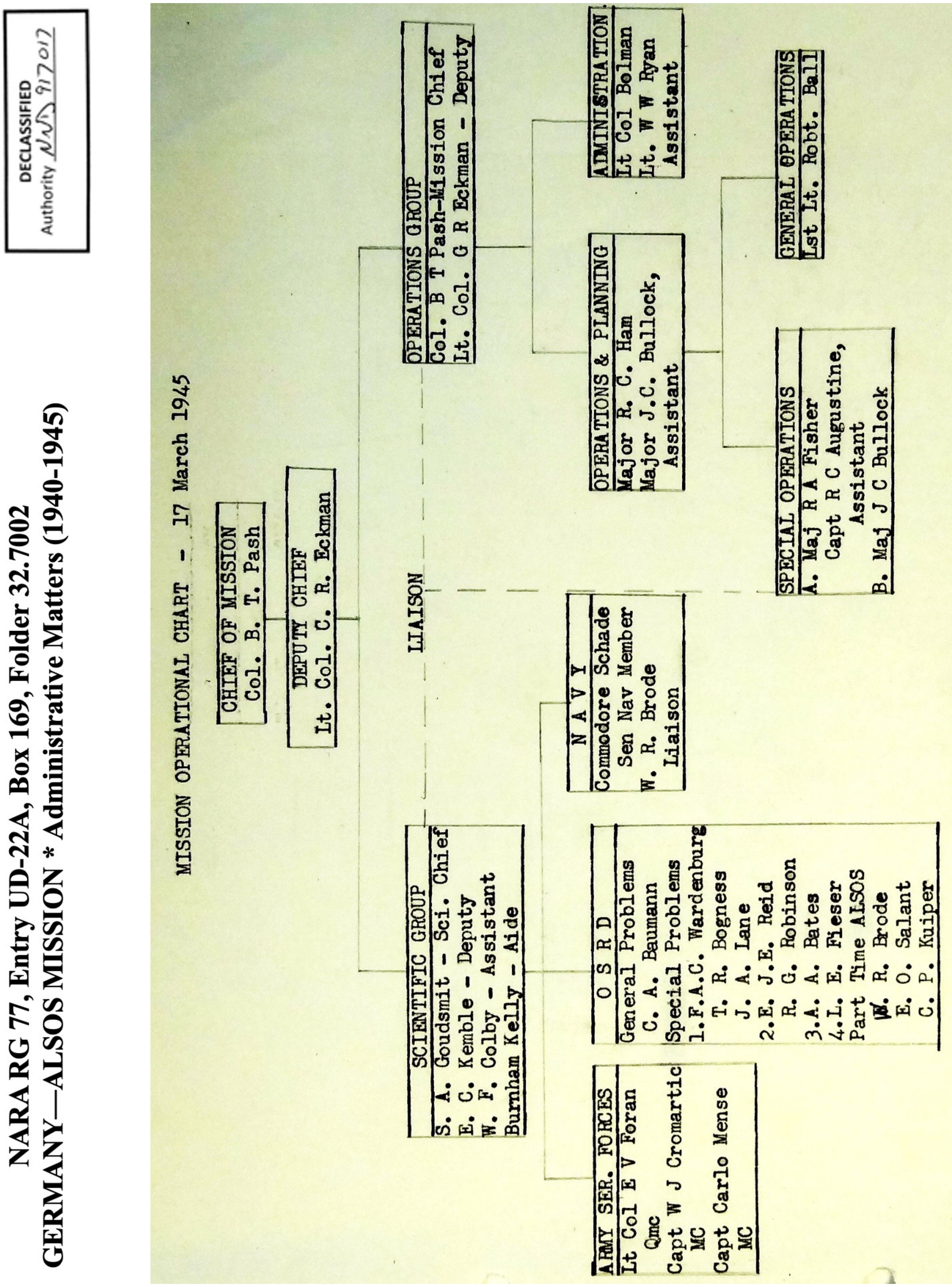
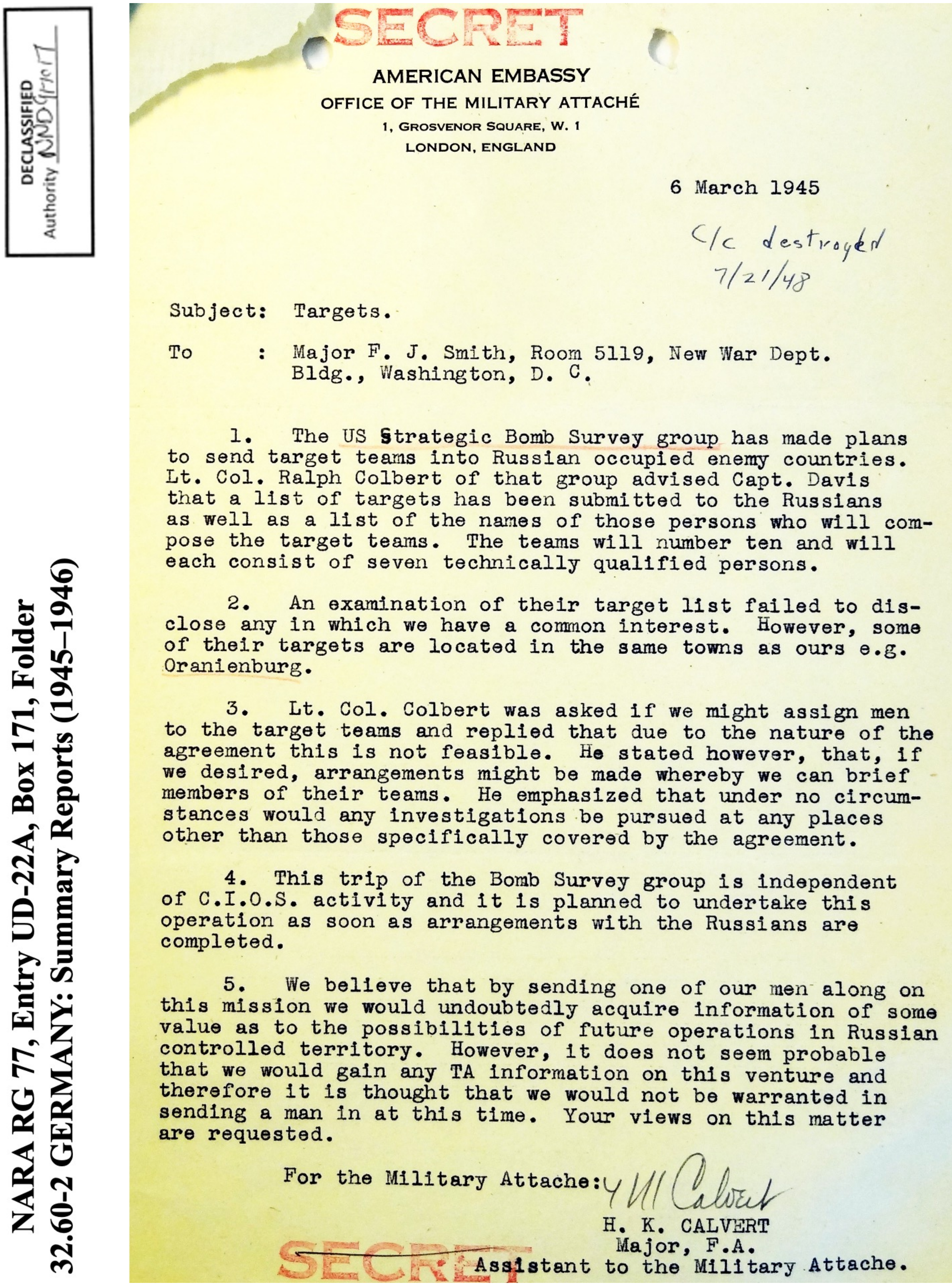


Figure D.7: Alsos Mission Operational Chart. 17 March 1945 [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)]. "Special Problems 1" was the German nuclear program; Alsos also investigated many other unrelated topics. Even at its brief peak in the final two months of the war in Europe, Alsos was far too understaffed and overstretched to conduct a proper investigation of the nuclear program.



DECLASSIFIED
Authority NND 917017

SECRET

AMERICAN EMBASSY
OFFICE OF THE MILITARY ATTACHÉ
1, GROSVENOR SQUARE, W. 1
LONDON, ENGLAND

6 March 1945

C/c destroyed
7/21/48

Subject: Targets.

To : Major F. J. Smith, Room 5119, New War Dept. Bldg., Washington, D. C.

1. The US Strategic Bomb Survey group has made plans to send target teams into Russian occupied enemy countries. Lt. Col. Ralph Colbert of that group advised Capt. Davis that a list of targets has been submitted to the Russians as well as a list of the names of those persons who will compose the target teams. The teams will number ten and will each consist of seven technically qualified persons.

2. An examination of their target list failed to disclose any in which we have a common interest. However, some of their targets are located in the same towns as ours e.g. Oranienburg.

3. Lt. Col. Colbert was asked if we might assign men to the target teams and replied that due to the nature of the agreement this is not feasible. He stated however, that, if we desired, arrangements might be made whereby we can brief members of their teams. He emphasized that under no circumstances would any investigations be pursued at any places other than those specifically covered by the agreement.

4. This trip of the Bomb Survey group is independent of C.I.O.S. activity and it is planned to undertake this operation as soon as arrangements with the Russians are completed.

5. We believe that by sending one of our men along on this mission we would undoubtedly acquire information of some value as to the possibilities of future operations in Russian controlled territory. However, it does not seem probable that we would gain any TA information on this venture and therefore it is thought that we would not be warranted in sending a man in at this time. Your views on this matter are requested.

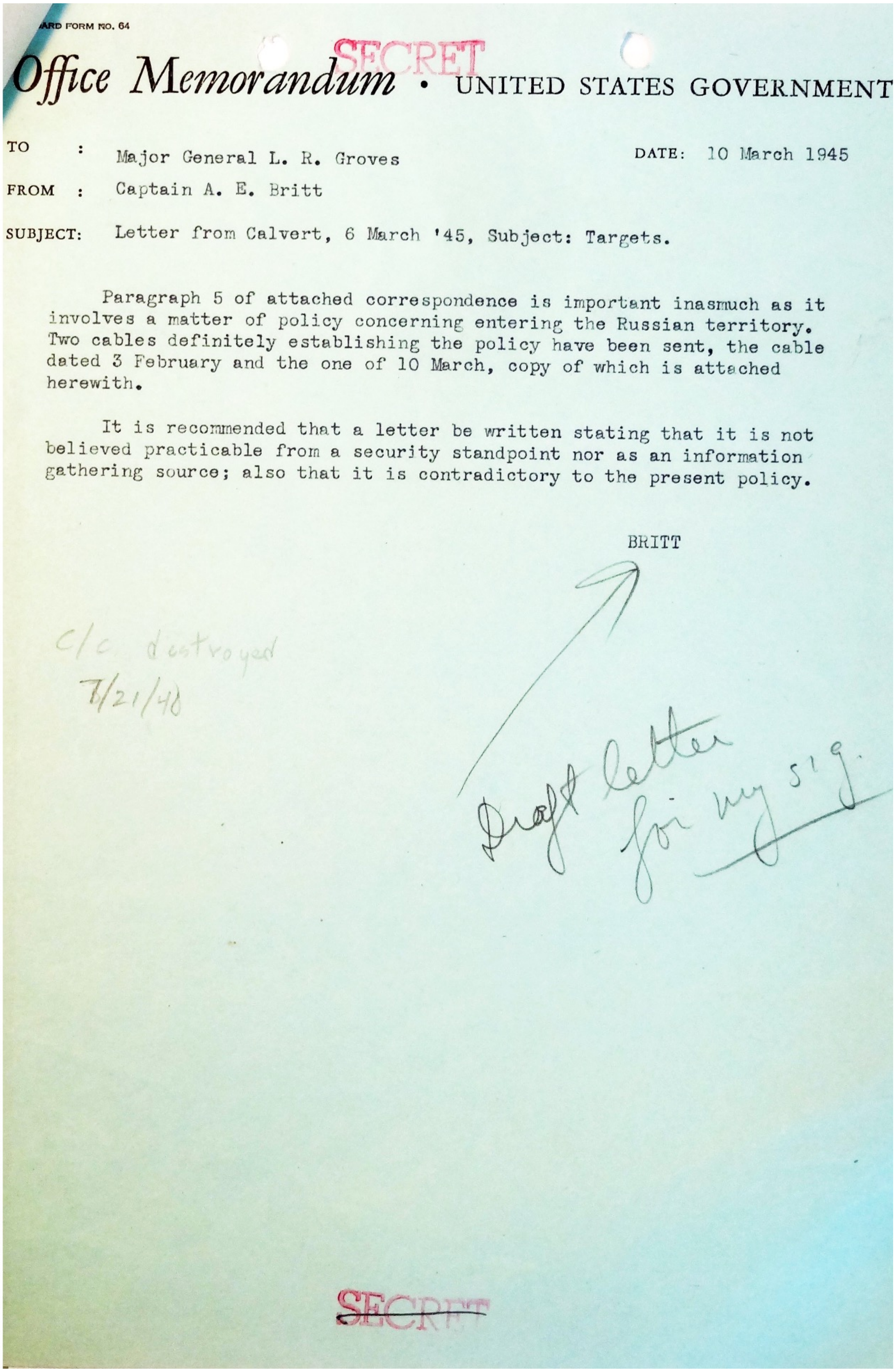
For the Military Attache: H K Calvert

H. K. CALVERT
Major, F.A.
Assistant to the Military Attache.

SECRET

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.8: Leslie Groves issued an order for Alsos not to investigate any nuclear sites or people in the vast amount of formerly German-controlled territory that became occupied by Soviet forces, thereby making most of the German nuclear program off-limits to Alsos [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].



STANDARD FORM NO. 64

SECRET

Office Memorandum • UNITED STATES GOVERNMENT

TO : Major General L. R. Groves DATE: 10 March 1945

FROM : Captain A. E. Britt

SUBJECT: Letter from Calvert, 6 March '45, Subject: Targets.

Paragraph 5 of attached correspondence is important inasmuch as it involves a matter of policy concerning entering the Russian territory. Two cables definitely establishing the policy have been sent, the cable dated 3 February and the one of 10 March, copy of which is attached herewith.

It is recommended that a letter be written stating that it is not believed practicable from a security standpoint nor as an information gathering source; also that it is contradictory to the present policy.

BRITT

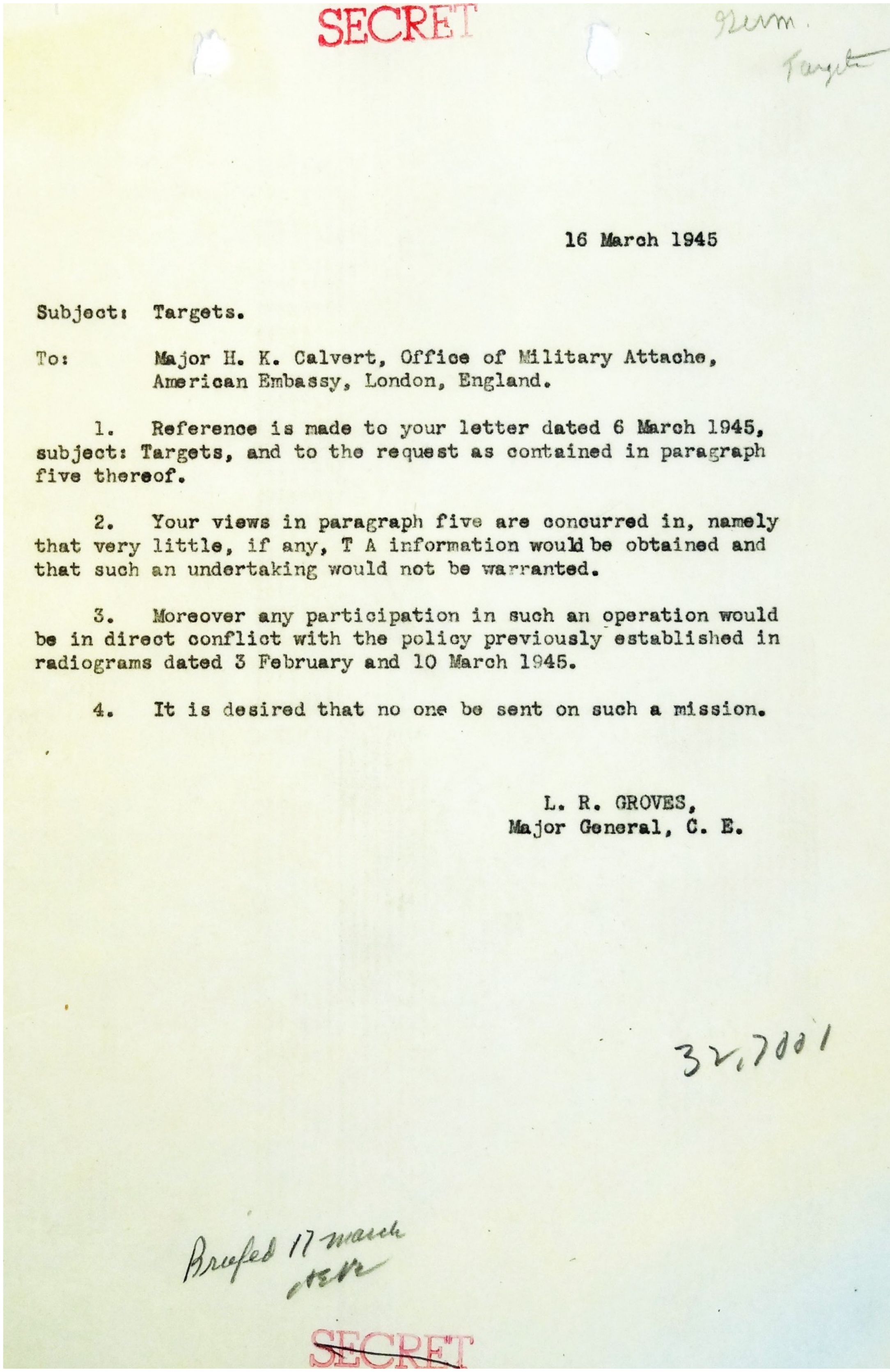
C/c destroyed
7/21/48

Draft letter for my sig.

~~SECRET~~

Figure D.9: Leslie Groves issued an order for Alsos not to investigate any nuclear sites or people in the vast amount of formerly German-controlled territory that became occupied by Soviet forces, thereby making most of the German nuclear program off-limits to Alsos [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].

DECLASSIFIED
Authority NND947017



SECRET

Germ.
Targets

16 March 1945

Subject: Targets.

To: Major H. K. Calvert, Office of Military Attache, American Embassy, London, England.

1. Reference is made to your letter dated 6 March 1945, subject: Targets, and to the request as contained in paragraph five thereof.

2. Your views in paragraph five are concurred in, namely that very little, if any, T A information would be obtained and that such an undertaking would not be warranted.

3. Moreover any participation in such an operation would be in direct conflict with the policy previously established in radiograms dated 3 February and 10 March 1945.

4. It is desired that no one be sent on such a mission.

L. R. GROVES,
Major General, C. E.

32.7001

Briefed 17 March

SECRET

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.10: Leslie Groves issued an order for Alsos not to investigate any nuclear sites or people in the vast amount of formerly German-controlled territory that became occupied by Soviet forces, thereby making most of the German nuclear program off-limits to Alsos [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].

Samuel Goudsmit. 18 April 1945. SUBJECT: Preliminary Report on TA Information Obtained at Stadtilm. [NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-3 GERMANY: US Wartime Positive Int. (Nov. 44–June 45)]

[...] 2. Targets to be removed from TA list.

a. Freiburg.

b. Posthalde bei Hinterzarten in the Black Forest.

c. Miersdorf bei Zeuthen, where the Reichspost worked.

d. Gottow

e. Berlin

f. Oranienburg, Auer.

All of the above places have been evacuated as far as TA targets are concerned.

[...] 6. Evaluation.

We are more convinced that the German TA effort is small. [...]

Note attached to Samuel Goudsmit's 18 April 1945 memo. [NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-3 GERMANY: US Wartime Positive Int. (Nov. 44–June 45)]

Capt BRITT

This report seems a bit "fuzzy" to me—the arrangement (indentation, e. g.,) doesn't clarify the meaning for me.

R.

I imagine Goudsmit's talking thru 'is 'at when he says certain Targets are to be REMOVED from TA list—on what ground? Freiburg, e. g., he hasn't been there that I know of.

[Handwritten:] Major Smith has read.

[See document photos on p. 3293.

Even officers who were supporting Goudsmit's activities were exasperated by his penchant for declaring that no significant nuclear (TA) evidence could exist at certain places without even bothering to visit or investigate them. According to them, Goudsmit was known for "talking through his hat," a colloquial British phrase for talking about something without understanding it at all.]

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-3
GERMANY: US Wartime Positive Int. (Nov. 44–June 45)

SECRET

HEADQUARTERS
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
ALSOS MISSION
APO 887

Copy No. 1 of 5 Copies

18 April 1945

SUBJECT: Preliminary Report on TA Information Obtained at Stadtilm

1. General:

a. Though all secret files were removed from Stadtilm, there remain about seventy German file folders with very revealing correspondence and new target information.

b. We have examined much of this on the spot for information affecting our immediate operations.

c. Although the material will be subjected to further study at our headquarters it will obviously be impossible to deal adequately with all of it.

2. Targets to be removed from TA list.

a. Freiburg.

b. Posthalde bei Hinterzarten in the Black Forest.

c. Miersdorf bei Zeuthen, where the Reichspost worked.

d. Gottow

e. Berlin

f. Oranienburg, Auer.

All the above places have been evacuated as far as TA Targets are concerned.

3. Targets to be added.

a. Haigerloch, about 10 miles west of Hechingen. The pile is in the rockcellar of the Inn Zum Schwanen, also described as under the church and as "Schwanenkeller". Also at Haigerloch is the group under Philipp, which used to be in the Black Forest (Posthalde-Hinterzarten).

b. Celle, north of Hannover, in the "Mitteldeutsche Spinnhütte A.G." (Spinning Mill) where Groth has set up the centrifuge from Freiburg since November.

- 1 -

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750122
By C.S.R. NARS, Date 25 FEB 1976

SECRET

SECRET

c. Hamburg, Harteck is back at the University there.

4. Active TA Groups

a. As of 26 February 1945 (five) only of the following groups were importantly engaged on the project for the "derivation of energy from nuclear processes":

Arbeitsgruppen KWI (Physik und Chemie) (Berlin, Heidelberg, Hechingen, Tailfingen) des Bevollmächtigten in Stadtilm, Haigerloch, München

Prof. Harteck (Inst. Phys. Chem. Hamburg, Celle and Anschutz und Co)

Prof. Kirchner - Prof. Riezler (Phys. Inst. Köln, Zwstelle Garmisch-Partenkirchen)

Phys. Inst. Wien (Prof. Stetter)

Strahlenschutz und Dosimetrie (PTR und KWI Berlin-Buch)

Vorhaben SH200 (besonders I.G. and Bamag-Meguin)

Spezialmetallfertigung (Auer, Degussa)

Zyklotron (KWI Heidelberg, Siemens-Halske)

Elektronenschleuder (Betatron) gemeinsam mit RuK

These are in the highest priority group, "Fuhrernotprogramm" copied from a letter from Gerlach to the Kriegswirtschaftsstelle RFR.

5. Interrogation of Berkei (additional).

a. Dällenbach works on a "betatron" in Bisingen. (SAG is not sure that Berkei is correct, though correspondence files show that Berkei held a responsible position in Gerlach's organization).

b. Gerlach is most likely in München.

c. Schüler is in Hechingen.

d. The place to which Diebner and most of his personnel were taken is not known. That it was Hechingen is merely a guess.

e. The party leader who watches over nuclear physics according to rumors, and who is blamed for the kidnapping of Diebner et al. is called Standartenführer Sievers. No details, only rumors.

f. The SS has its own research department (Waffenamt) under a General Professor Schwab.

- 2 -

SECRET

SECRET

g. Information from enemy countries was insufficient because German intelligence did not use technically qualified people. In charge was, for this field, a Dr. Fischer, Referent Für Wiss. Erkundungen. One time address Prinz Heinrichstrasse, Berlin. They were told that the U.S.A. made its own heavy water. (Their code name is SH200) and that we were successful at separating 235 in kilograms.

6. Evaluation.

We are more convinced that the German TA effort is small.

However, nowhere have we found the real secret progress reports. Nor have we found copies of an existing secret magazine, called "Geheime Berichte" or "Kernphysikalische Berichte". These can only be found in a rapid surprise move.

S. A. GOUDSMIT
Scientific Chief

Capt BRITT

This report seems a bit "fuzzy" to me - the arrangement (indentation, e. g.,) doesn't clarify the meaning for me.

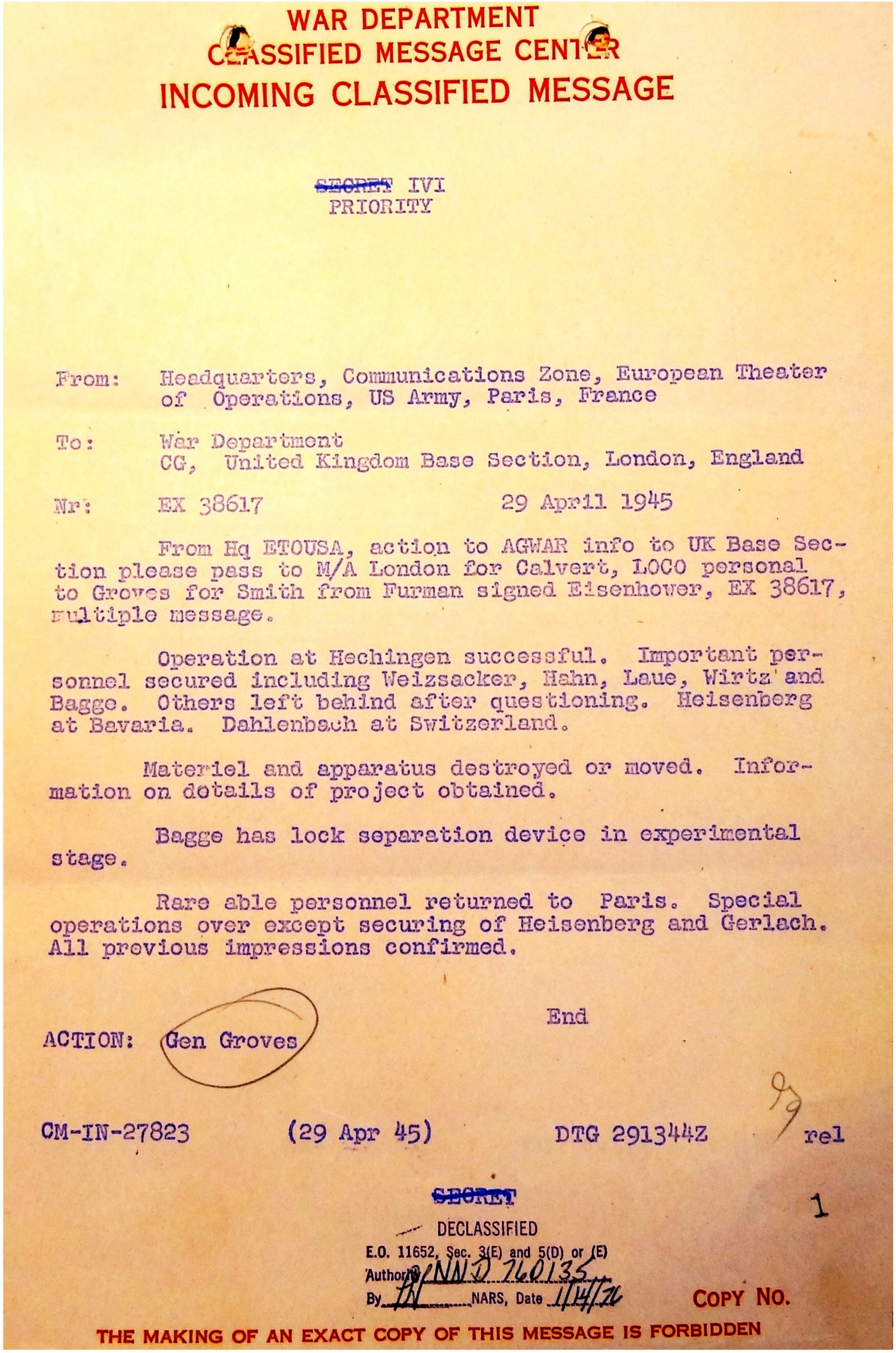
R.

I imagine Goudsmit's talking thru 'is 'at when he says certain Targets are to be REMOVED from TA list - on what ground? Freiburg, e. g., he hasn't been there that Iknow of.

Major Smith has read.

Figure D.11: Samuel Goudsmit. 18 April 1945. SUBJECT: Preliminary Report on TA Information Obtained at Stadtilm. [NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-3 GERMANY: US Wartime Positive Int. (Nov. 44–June 45)]

DECLASSIFIED
Authority NND 917017


WAR DEPARTMENT
CLASSIFIED MESSAGE CENTER
INCOMING CLASSIFIED MESSAGE

~~SECRET~~ IVI
PRIORITY

From: Headquarters, Communications Zone, European Theater of Operations, US Army, Paris, France

To: War Department
CG, United Kingdom Base Section, London, England

Nr: EX 38617 29 April 1945

From Hq ETOUSA, action to AGWAR info to UK Base Section please pass to M/A London for Calvert, LOCO personal to Groves for Smith from Furman signed Eisenhower, EX 38617, multiple message.

Operation at Hechingen successful. Important personnel secured including Weizsacker, Hahn, Laue, Wirtz and Bagge. Others left behind after questioning. Heisenberg at Bavaria. Dahlenbach at Switzerland.

Materiel and apparatus destroyed or moved. Information on details of project obtained.

Bagge has lock separation device in experimental stage.

Rare able personnel returned to Paris. Special operations over except securing of Heisenberg and Gerlach. All previous impressions confirmed.

End

ACTION: Gen Groves

CM-IN-27823 (29 Apr 45) DTG 291344Z 99 rel

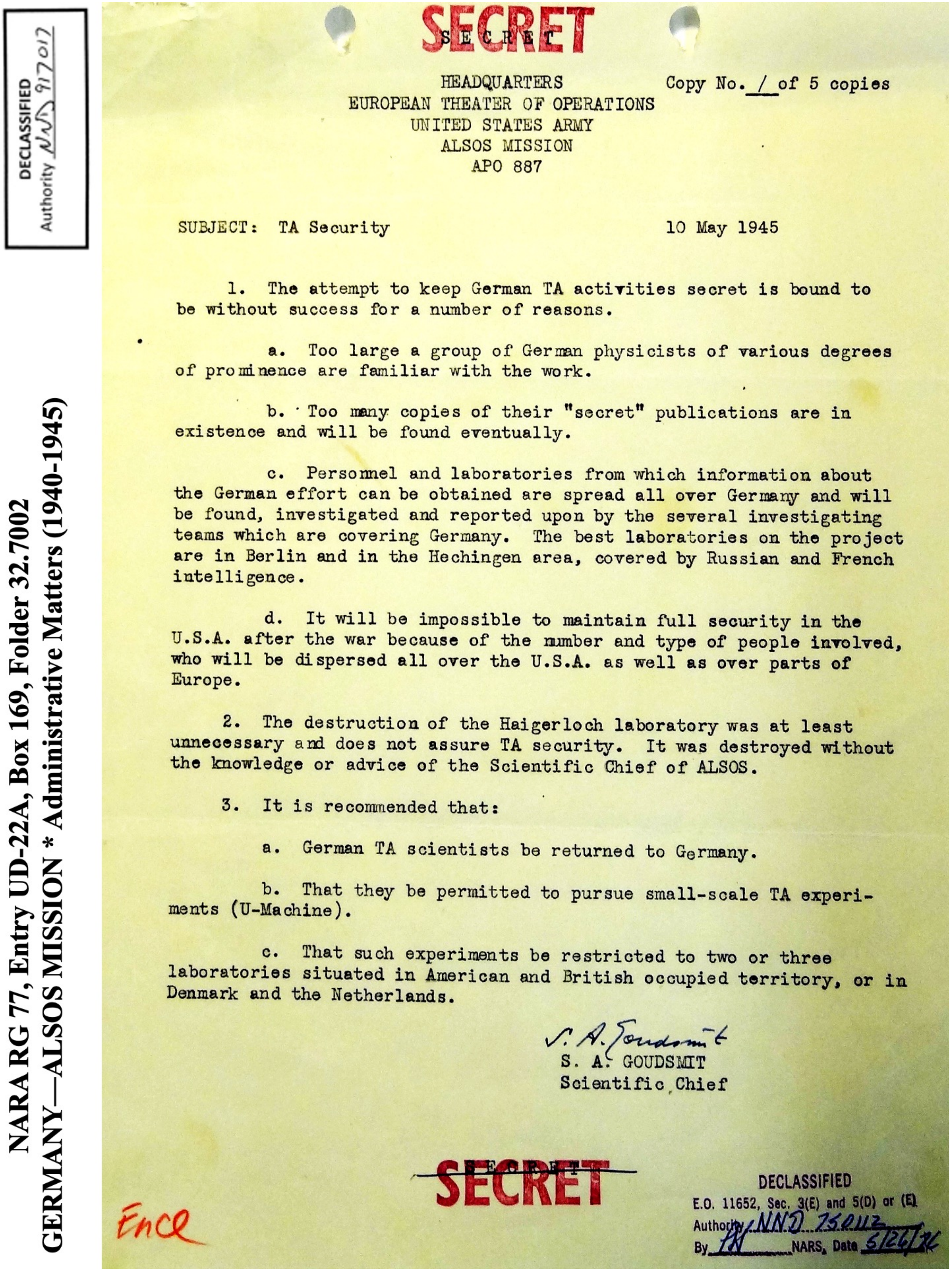
~~SECRET~~ 1

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 760135
By TN NARS, Date 1/14/76 COPY NO.

THE MAKING OF AN EXACT COPY OF THIS MESSAGE IS FORBIDDEN

NARA RG 77, Entry UD-22A, Box 160, Folder APR 45–Dec. '45

Figure D.12: 29 April 1945 [NARA RG 77, Entry UD-22A, Box 160, Folder APR–Dec. '45]. "Rare able personnel returned to Paris. Special operations over except securing of Heisenberg and Gerlach. All previous impressions confirmed."



DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002
GERMANY—ALSOS MISSION * Administrative Matters (1940-1945)

SECRET

S E C R E T

HEADQUARTERS
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
ALSOS MISSION
APO 887

Copy No. / of 5 copies

SUBJECT: TA Security

10 May 1945

1. The attempt to keep German TA activities secret is bound to be without success for a number of reasons.

a. Too large a group of German physicists of various degrees of prominence are familiar with the work.

b. Too many copies of their "secret" publications are in existence and will be found eventually.

c. Personnel and laboratories from which information about the German effort can be obtained are spread all over Germany and will be found, investigated and reported upon by the several investigating teams which are covering Germany. The best laboratories on the project are in Berlin and in the Hechingen area, covered by Russian and French intelligence.

d. It will be impossible to maintain full security in the U.S.A. after the war because of the number and type of people involved, who will be dispersed all over the U.S.A. as well as over parts of Europe.

2. The destruction of the Haigerloch laboratory was at least unnecessary and does not assure TA security. It was destroyed without the knowledge or advice of the Scientific Chief of ALSOS.

3. It is recommended that:

a. German TA scientists be returned to Germany.

b. That they be permitted to pursue small-scale TA experiments (U-Machine).

c. That such experiments be restricted to two or three laboratories situated in American and British occupied territory, or in Denmark and the Netherlands.

S. A. Goudsmit
S. A. GOUDSMIT
Scientific Chief

~~SECRET~~

~~S E C R E T~~

Encl

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By PH NARS, Date 5/26/76

Figure D.13: Samuel Goudsmit. 10 May 1945. SUBJECT: TA Security [NARA RG 77, Entry UD-22A, Box 169, Folder 32.7002 GERMANY—ALSOS MISSION ∗ Administrative Matters (1940–1945)]. Even Goudsmit said that Alsos was far too small compared to the number of other Allied investigators and the size of the German nuclear program to conduct a proper investigation. Note that Goudsmit missed out on the Haigerloch site, the greatest “success” of Alsos.

Sean Longden. 2009. *T-Force.* p. 193, citing TNA FO800/565 or some other TNA document???

Among the 106 targets investigated by T-Force in the ruins of Hamburg were some that related to nuclear research. They included the laboratory of the nuclear physicist Dr Paul Harteck, an associate of Dr Groth. In May 1945, his detention caused some controversy, since he was picked up by a specialist team with an interest in nuclear research [Alsos] that was working within the 21st Army Group's area. This team had been operating without notifying T-Force HQ or coordinating their activities with T-Force teams in the field. As a result, the atomic research team's work within the British zone was temporarily suspended and similar teams were withdrawn from the area. The issue was rectified when the team in question agreed to abide by existing operational orders. [...]

Upon arriving back in Germany, Dr. Groth discovered that the centrifuge needed for his work was missing. Investigations carried out by T-Force HQ revealed that the centrifuge had been disassembled and sent to SHAEF for the attention of the Operation Alsos mission. It was one of the few examples of evacuations that had been unsuccessful. The hurried nature of the work and the involvement of outsiders, added to the importance of the research equipment, meant that the standard procedures had not been followed. Due to an administrative oversight, no serial number had been issued and the shipment was untraceable. Dr. Harteck was later informed that the centrifuge was unlikely to be located...

[The Alsos Mission was officially reprimanded and removed from the field for behaving improperly and/or finding things they should not have. Apparently they also carelessly lost (or perhaps confiscated and deliberately concealed?) a highly important advanced uranium gas centrifuge prototype.]

SECRET

Ger. Targets
Ger. Sum. Rpts
TA

AMERICAN EMBASSY
OFFICE OF THE MILITARY ATTACHÉ
1, GROSVENOR SQUARE, W. 1
LONDON, ENGLAND

4 May 1945

Subject: List of targets not exploited.

To: Maj. Gen. L. R. Groves
Room 5120, New War Dept. Bldg., Washington, D. C.

Attention: Lt. Col. John Lansdale, Jr.
Major Francis J. Smith

1. Attached is a list of targets not exploited by the Alsos Mission. Their relative importance is indicated by the letterings A through D.

2. It is recommended that at a later date these targets be investigated quietly through channels which you are probably establishing now to accomplish investigating during the post-war period.

R. R. Furman
R. R. FURMAN,
Major, C.E.

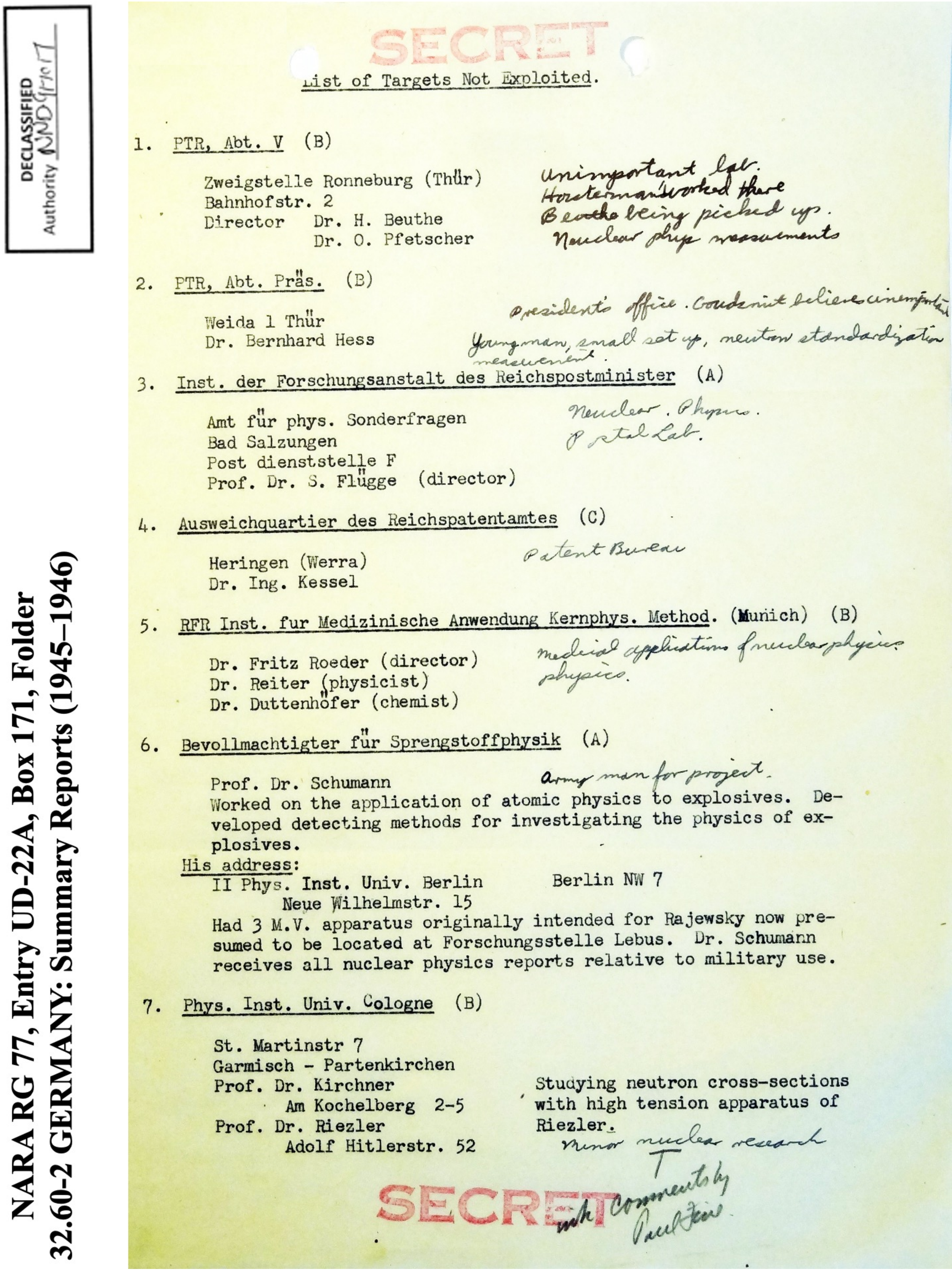
Attachment - 1

P/

SECRET

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.14: On 4 May 1945, Alsos sent Leslie Groves a long (yet still highly incomplete) list of nuclear sites and people that they never bothered to visit, did not plan to visit, and even discouraged other investigators from visiting (e.g., grades C and D) [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].



SECRET

List of Targets Not Exploited.

1. PTR, Abt. V (B)

Zweigstelle Ronneburg (Thür)
Bahnhofstr. 2
Director Dr. H. Beuthe
Dr. O. Pfetscher

unimportant lab.
Horstermann worked there
Beuthe being picked up.
Nuclear phys measurements

2. PTR, Abt. Präs. (B)

Weida 1 Thür
Dr. Bernhard Hess

President's office. Couldn't believe unimportant
Young man, small set up, neutron standardization measurement.

3. Inst. der Forschungsanstalt des Reichspostminister (A)

Amt für phys. Sonderfragen
Bad Salzungen
Post dienststelle F
Prof. Dr. S. Flügge (director)

Nuclear. Physics.
Postal Lab.

4. Ausweichquartier des Reichspatentamtes (C)

Heringen (Werra)
Dr. Ing. Kessel

Patent Bureau

5. RFR Inst. fur Medizinische Anwendung Kernphys. Method. (Munich) (B)

Dr. Fritz Roeder (director)
Dr. Reiter (physicist)
Dr. Duttenhöfer (chemist)

medical applications of nuclear physics physics.

6. Bevollmachtigter für Sprengstoffphysik (A)

Prof. Dr. Schumann army man for project.
Worked on the application of atomic physics to explosives. Developed detecting methods for investigating the physics of explosives.
His address:
II Phys. Inst. Univ. Berlin Berlin NW 7
Neue Wilhelmstr. 15
Had 3 M.V. apparatus originally intended for Rajewsky now presumed to be located at Forschungsstelle Lebus. Dr. Schumann receives all nuclear physics reports relative to military use.

7. Phys. Inst. Univ. Cologne (B)

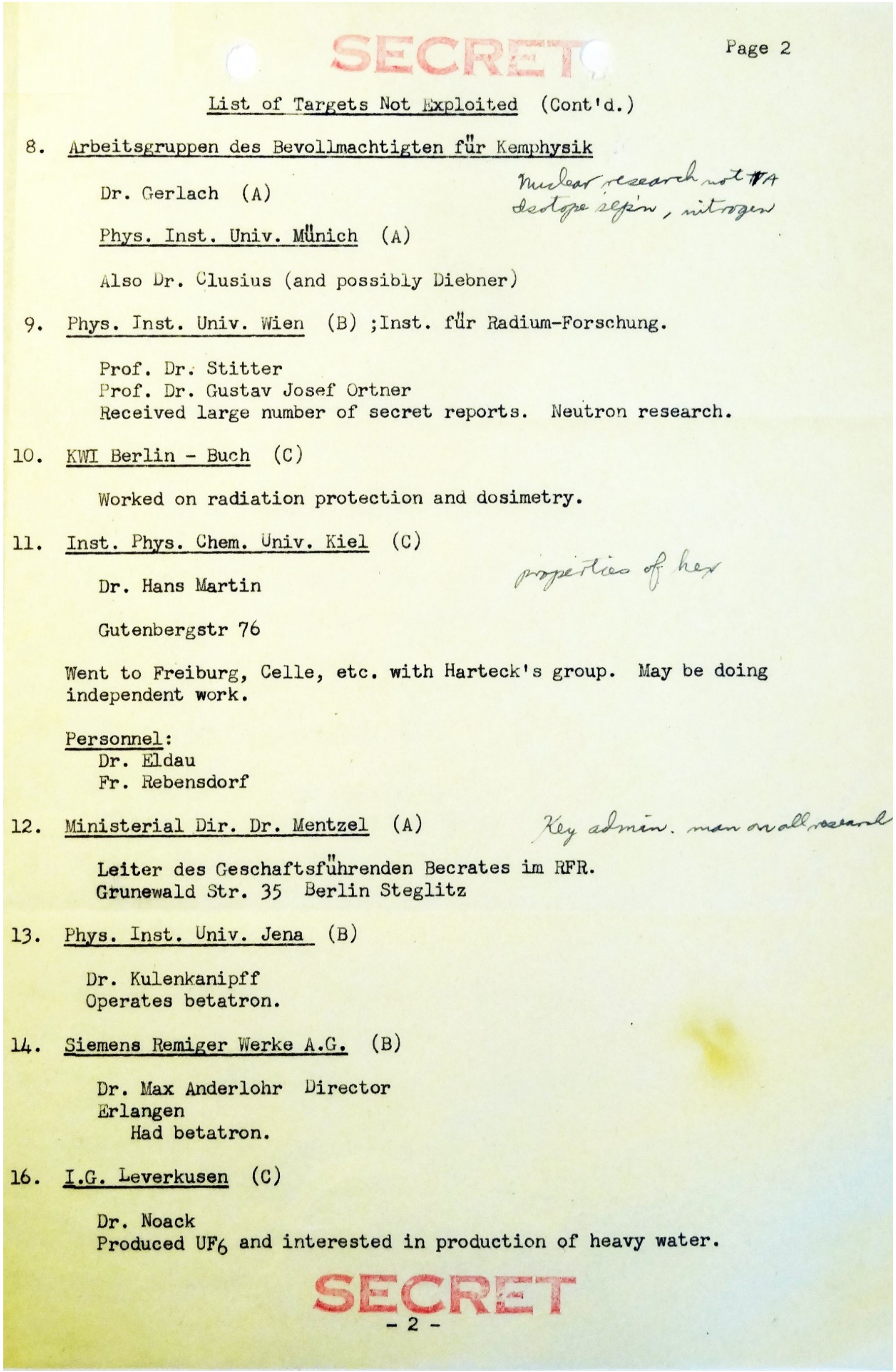
St. Martinstr 7
Garmisch - Partenkirchen
Prof. Dr. Kirchner
Am Kochelberg 2-5
Prof. Dr. Riezler
Adolf Hitlerstr. 52

Studying neutron cross-sections with high tension apparatus of Riezler.
minor nuclear research

SECRET

ink comments by Paul Fine

Figure D.15: On 4 May 1945, Alsos sent Leslie Groves a long (yet still highly incomplete) list of nuclear sites and people that they never bothered to visit, did not plan to visit, and even discouraged other investigators from visiting (e.g., grades C and D) [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].



SECRET

Page 2

List of Targets Not Exploited (Cont'd.)

8. Arbeitsgruppen des Bevollmachtigten für Kemphysik

Dr. Gerlach (A)

nuclear research not #A
isotope sep'n, nitrogen

Phys. Inst. Univ. München (A)

Also Dr. Clusius (and possibly Diebner)

9. Phys. Inst. Univ. Wien (B) ;Inst. für Radium-Forschung.

Prof. Dr. Stitter
Prof. Dr. Gustav Josef Ortner
Received large number of secret reports. Neutron research.

10. KWI Berlin - Buch (C)

Worked on radiation protection and dosimetry.

11. Inst. Phys. Chem. Univ. Kiel (C)

Dr. Hans Martin

properties of hex

Gutenbergstr 76

Went to Freiburg, Celle, etc. with Harteck's group. May be doing independent work.

Personnel:
Dr. Eldau
Fr. Rebensdorf

12. Ministerial Dir. Dr. Mentzel (A)

Key admin. man on all research

Leiter des Geschaftsführenden Becrates im RFR.
Grunewald Str. 35 Berlin Steglitz

13. Phys. Inst. Univ. Jena (B)

Dr. Kulenkanipff
Operates betatron.

14. Siemens Remiger Werke A.G. (B)

Dr. Max Anderlohr Director
Erlangen
Had betatron.

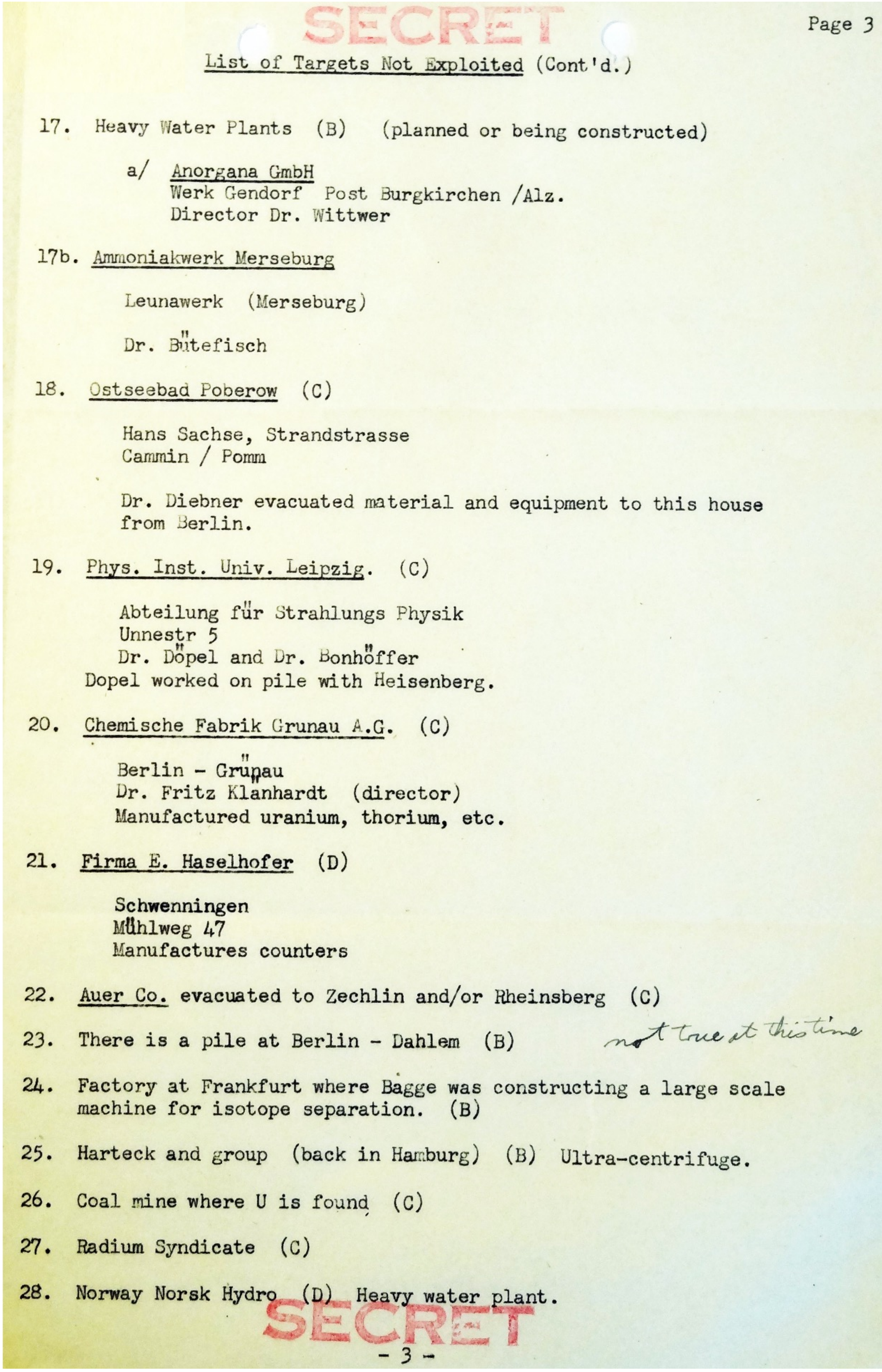
16. I.G. Leverkusen (C)

Dr. Noack
Produced UF_6 and interested in production of heavy water.

SECRET
- 2 -

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.16: On 4 May 1945, Alsos sent Leslie Groves a long (yet still highly incomplete) list of nuclear sites and people that they never bothered to visit, did not plan to visit, and even discouraged other investigators from visiting (e.g., grades C and D) [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].



SECRET

Page 3

List of Targets Not Exploited (Cont'd.)

17. Heavy Water Plants (B) (planned or being constructed)

  a/ Anorgana GmbH
  Werk Gendorf Post Burgkirchen /Alz.
  Director Dr. Wittwer

17b. Ammoniakwerk Merseburg

  Leunawerk (Merseburg)

  Dr. Bütefisch

18. Ostseebad Poberow (C)

  Hans Sachse, Strandstrasse
  Cammin / Pomm

  Dr. Diebner evacuated material and equipment to this house from Berlin.

19. Phys. Inst. Univ. Leipzig. (C)

  Abteilung für Strahlungs Physik
  Unnestr 5
  Dr. Döpel and Dr. Bonhöffer
  Dopel worked on pile with Heisenberg.

20. Chemische Fabrik Grunau A.G. (C)

  Berlin - Grünau
  Dr. Fritz Klanhardt (director)
  Manufactured uranium, thorium, etc.

21. Firma E. Haselhofer (D)

  Schwenningen
  Mühlweg 47
  Manufactures counters

22. Auer Co. evacuated to Zechlin and/or Rheinsberg (C)

23. There is a pile at Berlin - Dahlem (B) not true at this time

24. Factory at Frankfurt where Bagge was constructing a large scale machine for isotope separation. (B)

25. Harteck and group (back in Hamburg) (B) Ultra-centrifuge.

26. Coal mine where U is found (C)

27. Radium Syndicate (C)

28. Norway Norsk Hydro (D) Heavy water plant.

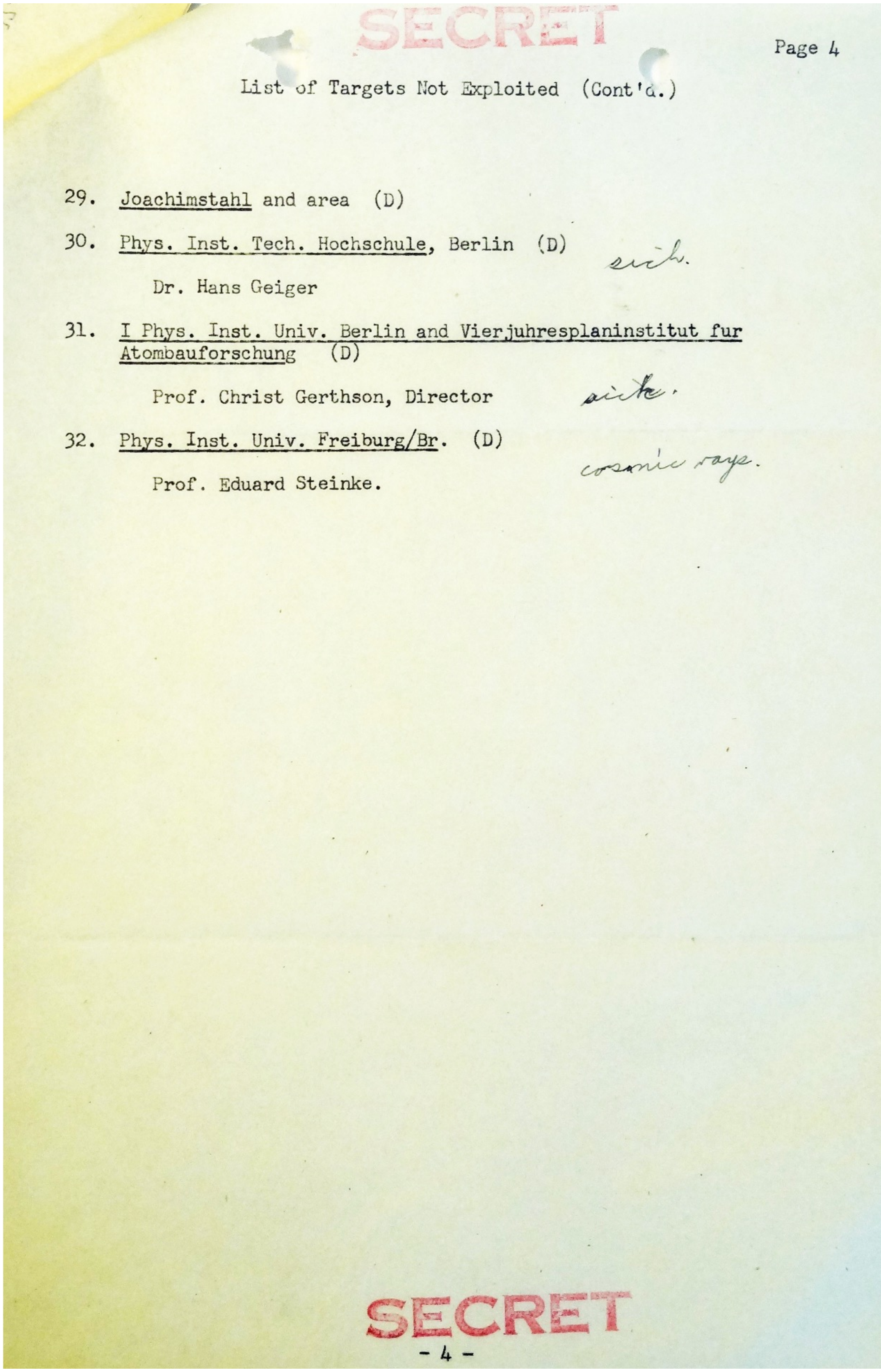
SECRET

- 3 -

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.17: On 4 May 1945, Alsos sent Leslie Groves a long (yet still highly incomplete) list of nuclear sites and people that they never bothered to visit, did not plan to visit, and even discouraged other investigators from visiting (e.g., grades C and D) [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].

DECLASSIFIED
Authority NND 979017


SECRET

Page 4

List of Targets Not Exploited (Cont'd.)

29. Joachimstahl and area (D)

30. Phys. Inst. Tech. Hochschule, Berlin (D) sick.

Dr. Hans Geiger

31. I Phys. Inst. Univ. Berlin and Vierjuhresplaninstitut fur Atombauforschung (D)

Prof. Christ Gerthson, Director sicke.

32. Phys. Inst. Univ. Freiburg/Br. (D) cosmic rays.

Prof. Eduard Steinke.

SECRET

- 4 -

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.18: On 4 May 1945, Alsos sent Leslie Groves a long (yet still highly incomplete) list of nuclear sites and people that they never bothered to visit, did not plan to visit, and even discouraged other investigators from visiting (e.g., grades C and D) [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1
GERMANY—Research—TA—(1943--June 1946)

Germ. Res

SECRET

PRELIMINARY !!

THIS DOCUMENT CONSISTS OF..1...PAGE(S)
NO..1.....OF...3.. COPIES, SERIES A.....

19 May 1945

Copies #2 & 3 destr. 7/28/48

Subject: Information on German TA Project which is still Missing.

JJ Ruberg

MEMORANDUM to Major Francis J. Smith.

1. Reports on D_2O ice pile (1944).

2. Heisenberg report on 1944 Gattow layer experiments.

3. Heisenberg reports on semi-technical pile ($1\frac{1}{2}$ ton D_2O plus 3 tons U.)

4. Detailed reports on work in industrial laboratories, to wit: Hex preparation methods used by I. G., catalyst preparation for heavy water exchange by Leuna, and details of Uranium metal by Degussa and Auer.

5. Riehl of the Auer Company has not been recorded as captured. It is possible that the Auer Company carried on work on separation which was not reported on by Clusius.

6. Interview with Heisenberg most unsatisfactory. Heisenberg's stock of reports should be uncovered if at all possible. Questioning of Heisenberg should endeavor to find out whether any work was begun on fast chains to implement Flugge's 1942 research plan.

7. Investigation of German intelligence files on -

   a. State of their knowledge of our project.

   b. State of their knowledge of Russian project.

Karl Cohen

KARL COHEN

Figure D.19: Karl Cohen to Francis J. Smith. 19 May 1945. Subject: Information on German TA Project which is still Missing [NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1 GERMANY—Research—TA—(1943–June 1946)]. As this document demonstrates, even for the fairly small number of people and sites that Alsos focused on, they failed to collect a great deal of important information.

Robert Furman to John Lansdale. 22 May 1945. [NARA RG 77, Entry UD-22A, Box 168, Folder 202.2 LONDON OFFICE: Combined Intell Disc.]

Boris [Pash] left here for home to try to convince authorities that the Alsos job is over. But in this theater, [General Thomas J.] Betts, [General George Bryan] Conrad and [MIT Professor Edward L.] Bowles are not agreeing that the job for which Alsos was set up to do is in any way completed. More scientists have now arrived. Proximity fuzes, BW [biological warfare] and NACA [aerospace] investigations are now absorbing the energies of Tarryton equipment and personnel.

A great many TA [tube alloy = nuclear] reports still remain in Germany, as you know. Therefore, reports on installations are received weekly about which we do very little. We always try to pick up papers that are reported to exist, to remove them from circulation but it is impossible to keep other agencies from finding out about the German effort. For instance, in Osenberg's files, was found some of the essential reports which you had taken back to the States.

[See document photos on pp. 3304–3305.

According to Robert Furman, in May 1945, three very senior and extremely well-informed U.S. intelligence officials concluded that Alsos had failed to do its primary job of investigating the German nuclear program:

- SHAEF intelligence (G-2) General Thomas J. Betts (see pp. 5074–5076).
- SHAEF intelligence (G-2) General George Bryan Conrad.
- AAF General Henry Arnold's advisor Prof. Edward L. Bowles of MIT (see pp. 4757, 5381).

Robert Furman admitted that there were so many German nuclear sites and documents that his team did not even try to investigate them.]

NARA RG 77, Entry UD-22A, Box 168, Folder 202.2 LONDON OFFICE: Combined Intell Disc.

SECRET

AMERICAN EMBASSY
Office of the Military Attache
London, England

DECLASSIFIED
Authority NND 911017

Paris Office
22 May 1945

dupey destroyed 30 dec 1946 FSt

Dear Jack: Lansdale

Stanport material

This letter will help bring you up to date on happenings here.

The Hildesheim operation is virtually complete. Materials on this day should be on board boat headed for a port in the London area.

by airfield.

Lt. Warner left for LeHavre today with the materials we have collected in Germany. He will escort these materials to America the latter part of this week. He will call General Groves upon his arrival in the states. The materials are marked for shipment to Major Kelley at his New York address, as directed. You will be advised by wire what date Lt. Warner can be expected in the states.

Nearly all TA documents in the hands of Alsos have been shipped to London and I anticipate closing this TA Alsos office about 1 June. Harteck's files were shipped by Major Bullock to Washington.

Diesheim is returning with Major Bullock. We found it best to release him if we can get Toepel.

Major Calvert has released Sgt. Connerton for a job at Oak Ridge providing a replacement is forthcoming. Can you wire about the replacement so we can get Connie started home.

to Le Havre, presumably & to Kelley – 39 bbls {4 light, 35 low} "HART & ACID"

One shipment, the heavy water from the Hartz mountain region, will follow Lt. Warner separately. I have an escort available.

After you left, Harteck was found and Dr. Goudsmit considers him one of the most interesting and certainly the most able technically of the group.

Albers will be located and questioned. A report will be rendered on him possibly next week. He will be detained with the others if his part in the program seems interesting or important enough.

The casual search made through Harteck's records here has shown that there is certain to be counter-intelligence information of value in the records you already have in Washington. For instance, Albers evidently received some fragmentary news of the effort being made in the United States. A report on this will be obtained from him. While I haven't heard of what you are doing with those records, I assume you have Lane, Fine, Sherwood and others busy analyzing the files. Let us know what is being done with these records so that we can tell Perrin progress.

important

The guests have been a problem since your departure because of the severe criticism the theater has received on the handling of prisoners and detained personnel. I have tried not to make any arrangements that can later be questioned. This appears to be done now since General Groves dropped his interest in comforts for these people. I am trying to do these people as well

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By CD/SR NARS, Date 2 4 FEB 1976

-1-

SECRET

Figure D.20: Robert Furman to John Lansdale. 22 May 1945. SHAEF G-2 Generals Thomas J. Betts (p. 5076) and George Bryan Conrad plus AAF General Henry Arnold's advisor Prof. Edward L. Bowles of MIT (pp. 4757, 5381) concluded that Alsos had failed to do its job. Furman admitted that there were so many German nuclear sites and documents that his team did not even try to investigate them [NARA RG 77, Entry UD-22A, Box 168, Folder 202.2 LONDON OFFICE: Combined Intell Disc.].

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 168, Folder 202.2 LONDON OFFICE: Combined Intell Disc.

as I can while still remaining well within the covering directives. I expect to take up with Perrin, in London when I see him this week, plans for keeping these Germans busy. Plenty of reading material will be given them. Plenty of paper and pencils will be made available. Ideas from Washington are invited.

Believe we should be getting out of Alsos with an open door policy set up so that Calvert can call upon them to assign Tarryton personnel and equipment if necessary on affairs he directs. Calvert intends to use other means in every possible instance, I am sure, but you can understand how difficult it sometimes is to get the facilities needed to do a job quickly and discreetly and for this reason Alsos facilities should be available. Lt. Colonel Eckman was ordered not to give personnel and I would suggest immediate clearance by wire after conversation with Adams and Pash.

We have asked for Lt. Toepel. Please wire me immediately on him as I need him now. Oates is covering for Toepel until you get Boris to release him. Due to Pash's interpretations on our completed target work, Eckman won't even lend him to me. If you wish, we will look for someone else to avoid difficulties but we know Toepel is briefed and able. I believe his is the best solution.

What is the answer on the request by cable for a set up in the American Embassy, Paris? Calvert prefers the Embassy to Com Z.

Dr. Goudsmit has great interest in and by now a very complete knowledge of the German effort. He has asked me if somehow he can continue to work with us. Both Calvert and I believe Sam has done a fine job and should be used. I believe Sam could be a part of Calvert's staff on duty in Paris and by continuing his contacts and memberships in all the various intelligence organizations here, he could continue a very essential service toward security and counter-intelligence.

Alsos position here now is complex. I might write you what I see happening, but it all results in confirming our present policy of hands off and no participation in their re-organization. Boris left here for home to try to convince authorities that the Alsos job is over. But in this theater, Betts, Conrad and Bowles are not agreeing that the job for which Alsos was set up to do is in any way completed. More scientists have now arrived. ~~Precision~~ PROXIMITY fuzes, BW and NACA investigations are now absorbing the energies of Tarryton equipment and personnel.

A great many TA reports still remain in Germany, as you know. Therefore, reports on installations are received weekly about which we do very little. We always try to pick up papers that are reported to exist, to remove them from circulation but it is impossible to keep other agencies from finding out about the German effort. For instance, in Osenberg's files, was found some of the essential reports which you had taken back to the states.

Jay is bound to get word of the American detention of Heisenberg, etc. soon. Can you answer our cable on this point?

I had no difficulty in arranging the Joachimstahl trip.

Please save any boxes I send to you for me, against the forces of the office counter-scroungers.

My plans will be to return to the states between 1 June and 5 June unless I hear from you that a change in my plans would be desirable. I would like to

know if any reports will be required, so that I can prepare them here from files with which I am acquainted. This might make it possible for me to get some leave upon my return.

Bob Furman

Figure D.21: Robert Furman to John Lansdale. 22 May 1945. SHAEF G-2 Generals Thomas J. Betts (pp. 5074–5076) and George Bryan Conrad plus AAF General Henry Arnold's advisor Prof. Edward L. Bowles of MIT (pp. 4757, 5381) concluded that Alsos had failed to do its job. Furman admitted that there were so many German nuclear sites and documents that his team did not even try to investigate them [NARA RG 77, Entry UD-22A, Box 168, Folder 202.2 LONDON OFFICE: Combined Intell Disc.].

Samuel Goudsmit to George Eckman. 7 June 1945. [NARA RG 77, Entry UD-22A, Box 166, Folder 32.24-2 GERMANY: Research—Res. Inst. & other Facilities (May 45–Dec 46)]

1. I request that this document and all attachments [from Hans Martin on uranium gas centrifuges] be handed over to Major Furman at once. They are an excellent example of the type of TA information which is picked up by other agencies and finally arrives in our hands.

2. At the end of the report, the conceited German makes certain demands which may impress the Military Government. I request that you send through the proper channels the following information:

> a. The intelligence in connection with the scientific work of Professor Martin of Kiel has been completely covered by information and documents obtained elsewhere.
>
> b. His own activities are considered relatively insignificant and do not warrant any special action or privileges.

3. I think this information should reach the hands of all those who had anything to do with this case.

[See document photo on p. 3307. Hans Martin developed advanced uranium gas centrifuges (pp. 3535–3546). Alsos never visited Martin and discouraged other investigators from doing so (p. 3299, grade C). When Martin gave documents to other investigators, Goudsmit confiscated them and strongly discouraged further examination of Martin or his centrifuges.

Without ever even meeting Hans Martin or seeing his uranium gas centrifuges, Goudsmit labelled Martin just another example of "the conceited German," declared the uranium gas centrifuges "relatively insignificant," and broadcast those conclusions to other agencies to try to prevent any further discussions of the topic. Thus this letter illustrates three aspects of Goudsmit's personality that shine through in many of his writings:

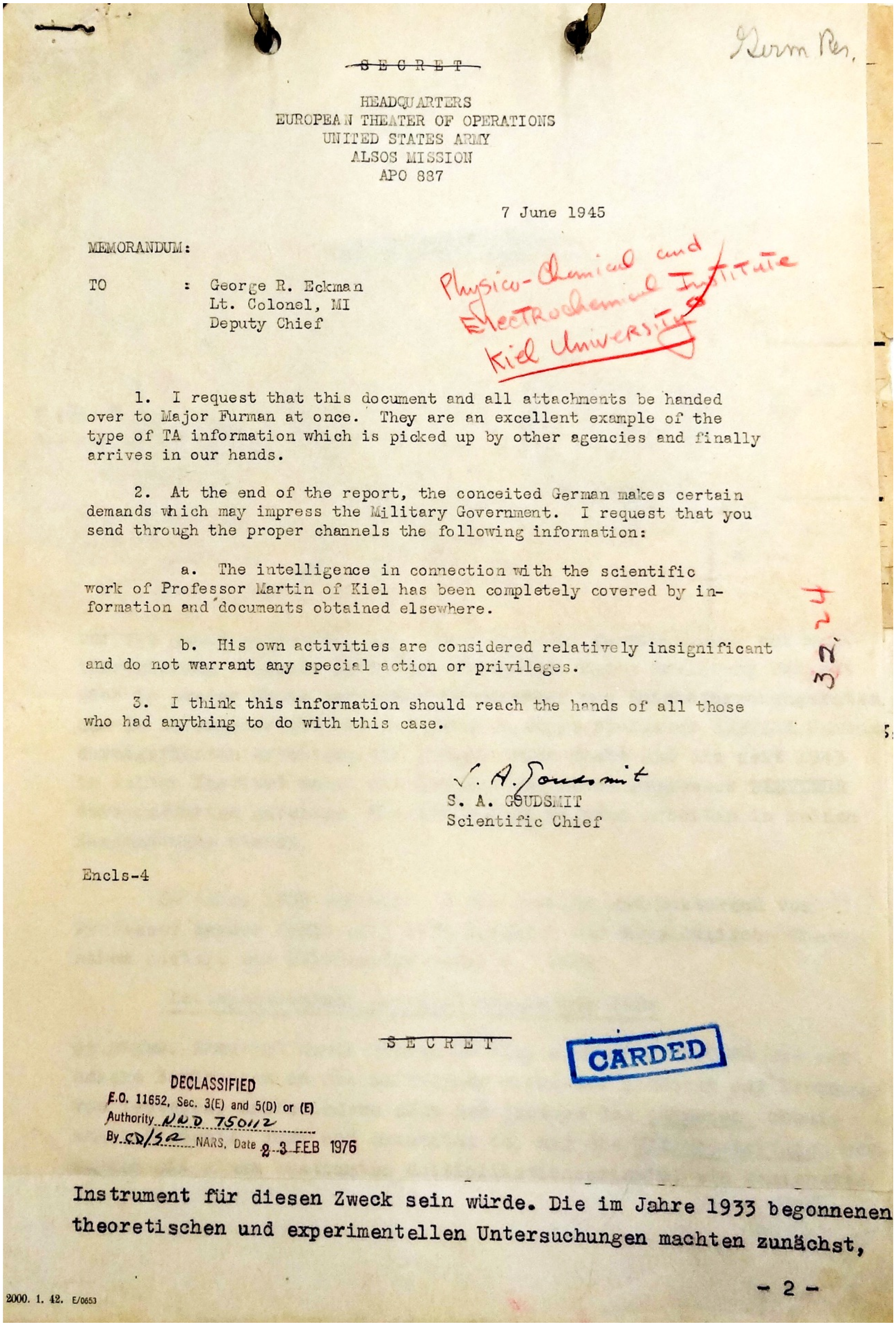
1. A raging prejudice against all Germans, including those he had never even met.
2. An obsessive need to keep claiming his own intellectual superiority over other people (especially career scientists such as Hans Martin, Werner Heisenberg, and many others who made much more important scientific discoveries and inventions than Goudsmit did in his lifelong career as a government bureaucrat).
3. Abuse of the power of his U.S.-government-granted position to harm other people, even people he had never met or interacted with, simply to gratify his own impulses.

Goudsmit's behavior had already led to a four-month removal from duty as well as meetings and letters of reprimand (e.g., pp. 3278–3287, 3339), yet as shown in this letter, he persisted in that behavior even after he was reinstated.

Goudsmit's behavior was highly counterproductive for the work that he was expected to perform: conducting a detailed investigation of the German nuclear program. In this particular case, Goudsmit, who had no expertise with any uranium enrichment methods whatsoever, succeeded in suffocating the U.S. government's interest in German uranium gas centrifuges. Ultimately those centrifuges proved to be so much more efficient than the U.S.'s own methods of uranium enrichment that they dominated the global market and drove the U.S. enrichment facilities out of business (pp. 3567–3587).]

DECLASSIFIED
Authority NND 917012

NARA RG 77, Entry UD-22A, Box 166, Folder 32.24-2
GERMANY: Research—Res. Inst. & other Facilities (May 45–Dec 46)



Germ Res.

~~S E C R E T~~

HEADQUARTERS
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
ALSOS MISSION
APO 887

7 June 1945

MEMORANDUM:

TO : George R. Eckman
Lt. Colonel, MI
Deputy Chief

Physico-Chemical and Electrochemical Institute
Kiel University

1. I request that this document and all attachments be handed over to Major Furman at once. They are an excellent example of the type of TA information which is picked up by other agencies and finally arrives in our hands.

2. At the end of the report, the conceited German makes certain demands which may impress the Military Government. I request that you send through the proper channels the following information:

a. The intelligence in connection with the scientific work of Professor Martin of Kiel has been completely covered by information and documents obtained elsewhere.

b. His own activities are considered relatively insignificant and do not warrant any special action or privileges.

3. I think this information should reach the hands of all those who had anything to do with this case.

32.24

S. A. Goudsmit
S. A. GOUDSMIT
Scientific Chief

Encls-4

~~S E C R E T~~

CARDED

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By CD/SR NARS, Date 23 FEB 1976

Instrument für diesen Zweck sein würde. Die im Jahre 1933 begonnenen theoretischen und experimentellen Untersuchungen machten zunächst,

- 2 -

2000. 1. 42. E/0653

Figure D.22: Samuel Goudsmit to George Eckman. 7 June 1945 [NARA RG 77, Entry UD-22A, Box 166, Folder 32.24-2 GERMANY: Research—Res. Inst. & other Facilities (May 45–Dec 46)]. Hans Martin developed advanced uranium gas centrifuges (pp. 3535–3546). Alsos never visited Martin and discouraged other investigators from doing so (p. 3299, grade C). When Martin gave documents to other investigators, Goudsmit confiscated them and strongly discouraged further investigations.

James A. Lane to Francis J. Smith. 16 June 1945. [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)]

Attached is presented an overall summary of the German nuclear physics work obtained from an analysis of the captured technical and correspondence files. The previous indication given by the Strassburg report that the German nuclear physics project was only a “Class B” enterprise is verified in all respects by this more complete set of documents. It is apparent that the German scientists and military leaders early in the war abandoned hope for a military application of nuclear physics, but at the same time realized that it would be a mistake for Germany to fall behind other countries in the field. Their project was therefore developed on a scale approximately comparable to a normal peace time enterprise. According to Berkei the nuclear physics project cost a total of 15,000,000 marks ($1,500,000) in the period 1940–1945. A rough estimate gives the following distribution of costs:

Cost of uranium metal	$200,000
Cost of heavy water	100,000
High voltage apparatus and cyclotrons	500,000
Experimental work and salaries 1940–42	150,000
” 1943	200,000
” 1944	300,000
” to May 1945	50,000
	$1,500,000

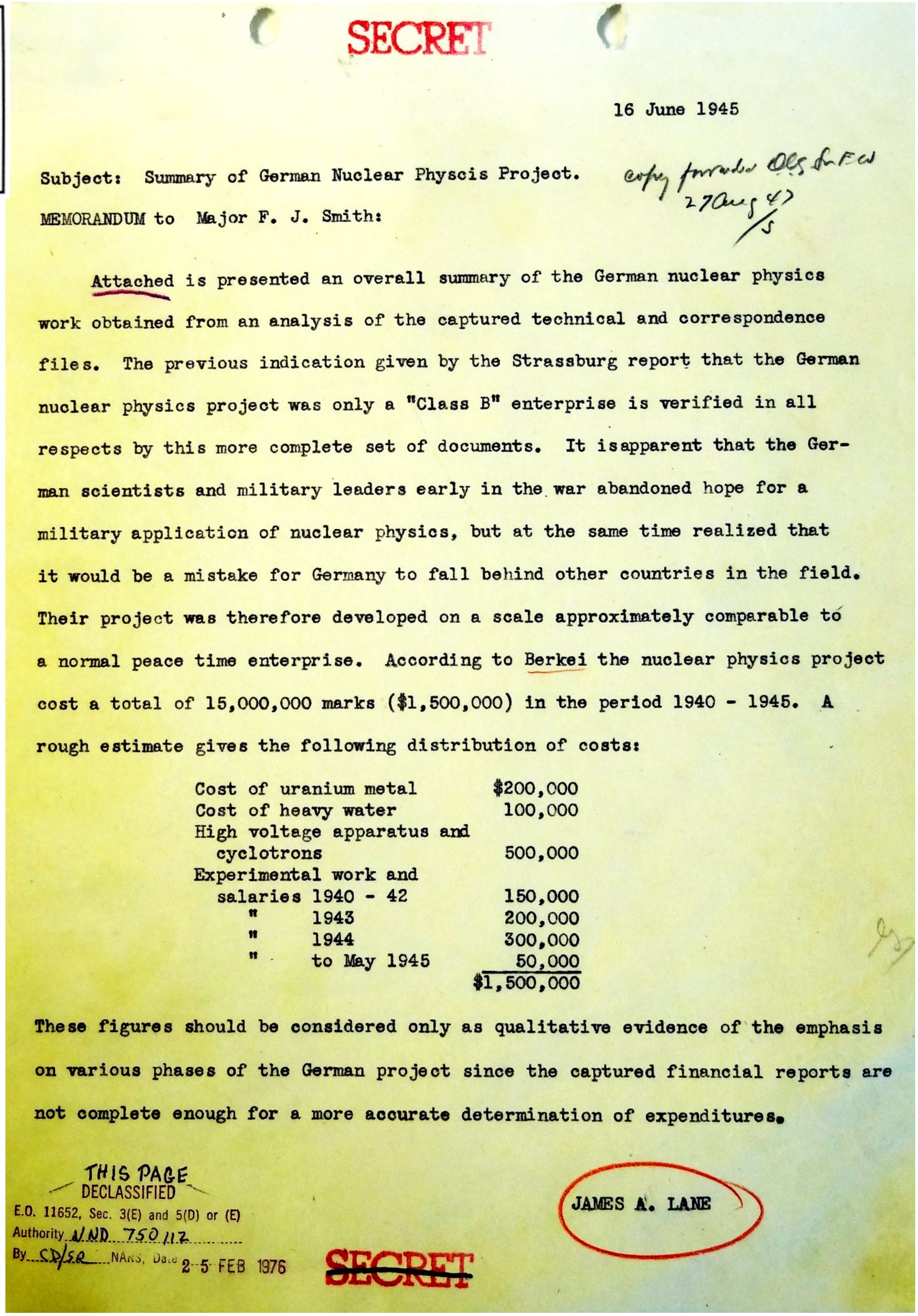
These figures should be considered only as qualitative evidence of the emphasis on various phases of the German project since the captured financial reports are not complete enough for a more accurate determination of expenditures.

[See document photo on p. 3309. Friedrich Berkei, a junior scientist working on small fission pile experiments, gave his personal rough estimate of the total cost of those experiments that he knew about (or was willing to admit to Allied investigators that he knew about): 15 million marks.

Authors from Samuel Goudsmit (p. 3316) onward have falsely represented that as the total cost of the entire wartime German nuclear program.

The true total cost of the program would have to include work at a large number of organizations (p. 5155) and sites all over Europe (from Norway to East Prussia to Bulgaria to Portugal), as demonstrated by the documents in the rest of this appendix.

An analogous situation would be asking a junior scientist helping with Enrico Fermi’s Chicago pile experiments to give a personal rough estimate of the cost of those experiments, then claiming that that estimate was the total cost of the entire Manhattan Project. No credible scholar would do that. Likewise no credible scholar should claim that Berkei’s estimate is the true total cost of the entire wartime German nuclear program. (This criticism is not directed at James Lane, who was merely filing a field report recounting what Berkei had told him.)]



SECRET

16 June 1945

Subject: Summary of German Nuclear Physcis Project.

copy forwarded OCS for FCW 27 Aug 47 /S

MEMORANDUM to Major F. J. Smith:

Attached is presented an overall summary of the German nuclear physics work obtained from an analysis of the captured technical and correspondence files. The previous indication given by the Strassburg report that the German nuclear physics project was only a "Class B" enterprise is verified in all respects by this more complete set of documents. It isapparent that the German scientists and military leaders early in the war abandoned hope for a military application of nuclear physics, but at the same time realized that it would be a mistake for Germany to fall behind other countries in the field. Their project was therefore developed on a scale approximately comparable to a normal peace time enterprise. According to Berkei the nuclear physics project cost a total of 15,000,000 marks ($1,500,000) in the period 1940 - 1945. A rough estimate gives the following distribution of costs:

Cost of uranium metal	$200,000
Cost of heavy water	100,000
High voltage apparatus and cyclotrons	500,000
Experimental work and salaries 1940 - 42	150,000
" 1943	200,000
" 1944	300,000
" to May 1945	50,000
	$1,500,000

These figures should be considered only as qualitative evidence of the emphasis on various phases of the German project since the captured financial reports are not complete enough for a more accurate determination of expenditures.

JAMES A. LANE

THIS PAGE DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750117
By CD/SR NARS, Date 2 5 FEB 1976

SECRET

NARA RG 77, Entry UD-22A, Box 171, Folder
32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.23: James A. Lane to Francis J. Smith. 16 June 1945 [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)]. Friedrich Berkei, a junior scientist working on small fission pile experiments, estimated the total cost of those experiments that he knew about (or admitted knowing about): 15 million marks. Authors from Samuel Goudsmit onward have falsely represented that as the total cost of the wartime German nuclear program, which actually included a large number of organizations and sites all over Europe.

W. A. Consodine to Leslie Groves. 12 July 1945. Intelligence Setup in Europe. [NARA RG 77, Entry UD-22A, Box 168, Folder British–U.S. Relations on Atomic Energy Intelligence (War Period) to 8 Oct 1945]

1. In a discussion with Major Furman I learned his ideas as to the Intelligence setup in Europe as you requested me. He thinks there should be a study of German research in Tube Alloys and industrial research and also of personnel. He thinks that now is the time to do it in Germany. He also believes that all reports of all other U.S. and U.K. agencies should be correlated as quickly as possible.

2. He says that there is no one in Paris now and someone should be there who reads and speaks German, who has a knowledge of the project, who is field grade in rank, preferably Lieut. Colonel, who can work with Spears, Oaks and Davis, etc.

3. He commented that there are a lot of T.A. reports in various American channels now. He thinks that Goudsmit is the ideal man to do the German job in Paris. He mentioned that he has a personality difficulty. He, however, said that Goudsmit is the one who did the job for Alsos and that everything done by Alsos was done by Goudsmit. He said the British respect Goudsmit.

4. He mentioned that Welsh was insecure and a braggart. He substantiated previous statements that he is anti-American. He said that Gattiger is hard to control but all right. He stressed that we must start right away, that if we do not we will lose the advantages we can get out of the transition period.

5. He concluded that the man or men you use must have the following qualifications: (1) knowledge of American and British scientific war groups (2) rank (3) know the project (4) be able to handle prima donna scientists and prima donna military officers.

[See document photo on p. 3311.

If the German nuclear program was as small and accomplished as little as Alsos reported, why did Robert Furman recommend that a detailed study of the German nuclear program's research, industry, and personnel be conducted in July 1945, after Alsos had basically already wrapped up its mission and (officially at least) already learned everything important about the German program?

Recall that in a 22 May 1945 letter, Furman had privately admitted that there were so many German nuclear sites and documents that his team did not even try to investigate them (p. 3305).

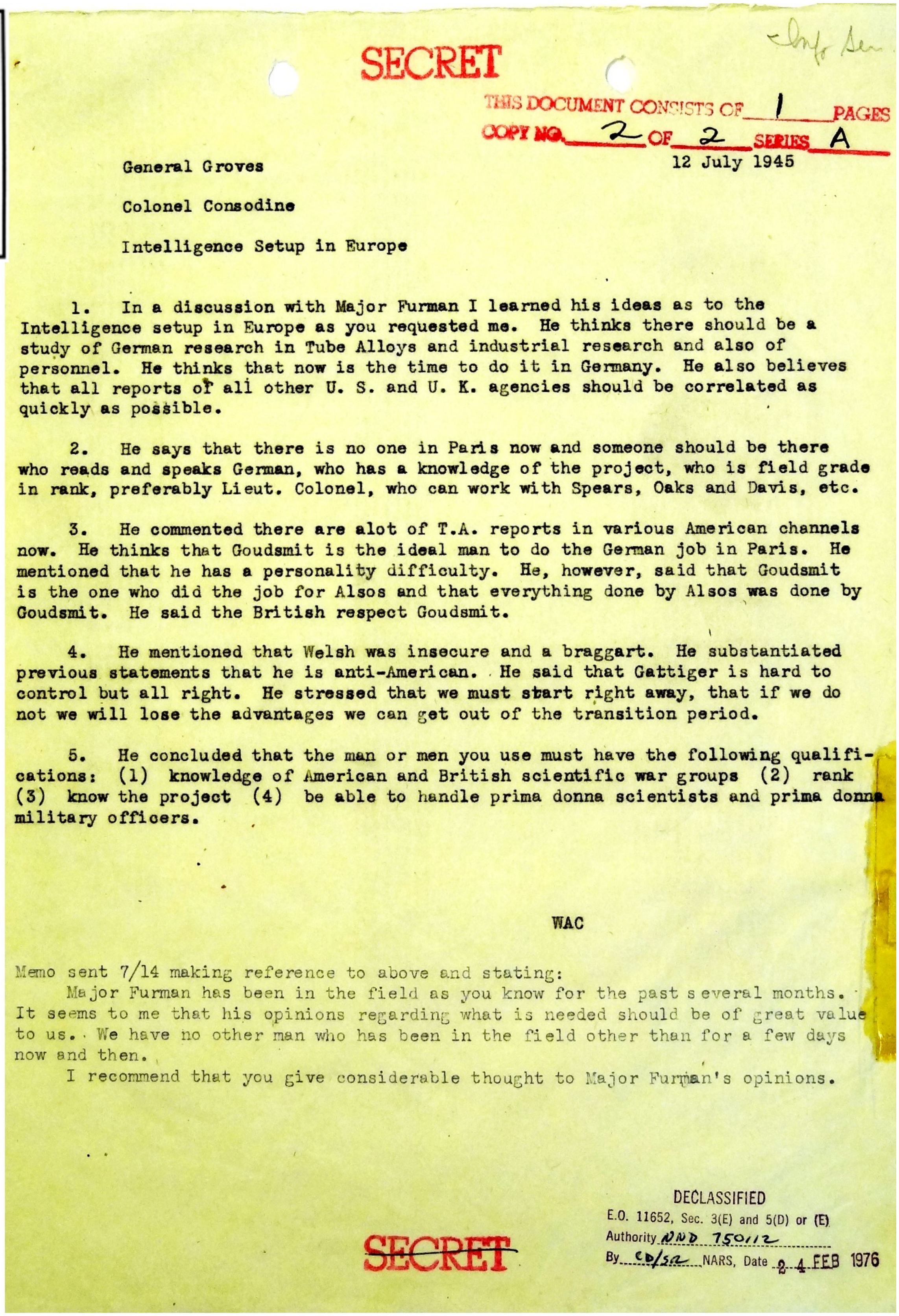
In addition to the reports written by Alsos, there were "a lot of T.A. reports in various American channels" as of July 1945. Furman also referred to "all reports of all other U.S. and U.K. agencies" on the subject. Who wrote all of those other reports, and where are the reports now?

Similarly, in his 22 May 1945 letter, Furman had written that there were so many German nuclear sites and documents that "it is impossible to keep other agencies from finding out about the German effort" (p. 3305).

According to the document above, Furman explicitly stated that Samuel Goudsmit had "a personality difficulty" and that "everything done by Alsos was done by Goudsmit."]

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 168, Folder British-U.S. Relations on Atomic Energy Intelligence (War Period) to 8 Oct 1945



SECRET

Info Sec

THIS DOCUMENT CONSISTS OF 1 PAGES
COPY NO. 2 OF 2 SERIES A

12 July 1945

General Groves

Colonel Consodine

Intelligence Setup in Europe

1. In a discussion with Major Furman I learned his ideas as to the Intelligence setup in Europe as you requested me. He thinks there should be a study of German research in Tube Alloys and industrial research and also of personnel. He thinks that now is the time to do it in Germany. He also believes that all reports of all other U. S. and U. K. agencies should be correlated as quickly as possible.

2. He says that there is no one in Paris now and someone should be there who reads and speaks German, who has a knowledge of the project, who is field grade in rank, preferably Lieut. Colonel, who can work with Spears, Oaks and Davis, etc.

3. He commented there are alot of T.A. reports in various American channels now. He thinks that Goudsmit is the ideal man to do the German job in Paris. He mentioned that he has a personality difficulty. He, however, said that Goudsmit is the one who did the job for Alsos and that everything done by Alsos was done by Goudsmit. He said the British respect Goudsmit.

4. He mentioned that Welsh was insecure and a braggart. He substantiated previous statements that he is anti-American. He said that Gattiger is hard to control but all right. He stressed that we must start right away, that if we do not we will lose the advantages we can get out of the transition period.

5. He concluded that the man or men you use must have the following qualifications: (1) knowledge of American and British scientific war groups (2) rank (3) know the project (4) be able to handle prima donna scientists and prima donna military officers.

WAC

Memo sent 7/14 making reference to above and stating:

Major Furman has been in the field as you know for the past several months. It seems to me that his opinions regarding what is needed should be of great value to us. We have no other man who has been in the field other than for a few days now and then.

I recommend that you give considerable thought to Major Furman's opinions.

SECRET

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By CD/SR NARS, Date 24 FEB 1976

Figure D.24: W. A. Consodine to Leslie Groves. 12 July 1945. Intelligence Setup in Europe [NARA RG 77, Entry UD-22A, Box 168, Folder British–U.S. Relations on Atomic Energy Intelligence (War Period) to 8 Oct 1945]. Robert Furman explicitly stated that Samuel Goudsmit had "a personality difficulty" and that "everything done by Alsos was done by Goudsmit."

Samuel Goudsmit to Reginald C. Augustine, 18 September 1945. [NARA RG GOUDS, Entry UD-7420, Box 6, Folder Rosbaud]

1. It is still of primary importance to Alsos and to other intelligence agencies to locate Professor (or General) Erich Schumann about whom I have written you before. Recently, a new lead on this man was discovered in Berlin by Major Clark. I believe it is definitely worthwhile to follow it up. The contact in Berlin may actually know where Schumann is. I propose that Rosenberger go to Berlin to squeeze the information out of him, or at least as much as can be obtained. Schumann is supposed to be in Bavaria somewhere. At one time, we sent Previti down to find some of Schumann's disciples. He returned without any information about Schumann. I think this angle should be pushed a little harder after Rosenberger returns from Berlin.

2. Here follow the details: The man in Berlin in Professor Erhard Landt, born 22 June 1900. He was Dozentenbundsführer and Dozentenschaftsleiter of Berlin University where he was a professor of physical and chemical technology and an honorary professor of physics. His present address is Berlin-Schmargendorf, Königsallee 67, British Zone. Landt was interrogated by Major Clark and Pfc. Strauss. Major Clark was interested in finding a man by the name of Rudi Schall who, at one time, worked with Schumann. Major Clark made it appear that Schall might be useful on a job in the U.S.A. At that suggestion, Landt intimated that he knew that Schall was in Bavaria, that Schumann was there also, that Schumann was the better man and that he (Landt) might be able to contact him.

3. I wish that Rosenberger would pick up this lead as if he came from Major Clark [i.e., lie] and, in that way, obtain Schumann's location.

4. I should like to point out again that Schumann, though he had a very high position, is regarded by all scientists, including old and competent German scientists, as definitely a second-rater. We even possess a Gestapo evaluation of him, mentioning that he was incompetent and not possessing the right character for the job he was holding. The fact that Landt praises him very much proves that he is also an incompetent charlatan. Landt was very much surprised that Clark had found him. He is a cagey, unreliable man who asks more questions than he gives out information. If everything fails, there may be enough reasons to have him detained. I have a feeling that he was an ardent supporter of the party. If Rosenberger needs any assistance in Berlin, he might contact Dr. P. Rosbaud who has been exceedingly helpful to us so far. Rosenberger can tell him what he is after—he knows about it. He has also helped Major Clark. His last known address was Boltzmannstrasse 1. He is keeping in contact with G-2 of Group CC whose office is at Boltzmannstrasse 20. If Rosenberger is successful in Berlin, the information obtained should be followed up immediately by a trip to Bavaria. Even if it is not successful, someone should once more go back on the trail which Marti Previti tried to follow and use some forceful inducements on those fellows to find their boss. I return herewith one copy of Previti's report.

[See document photo on p. 3314.

To the modern reader, Samuel Goudsmit's tone and message throughout this letter are truly shocking. This does not sound like a professional business letter written by a well-known theoretical physicist or a diligent government investigator. It sounds more like an organized crime boss ranting about someone he hates and then ordering all of his goons to use extreme measures to track down that person and deal with him.

Erich Schumann designed and apparently built fission implosion bombs during the war (pp. 4223–4315, 4686–4710, 4295–4297).

When Alsos finished its major operations in May 1945, it had not located Schumann, but it strongly recommended that other investigators do so (p. 3298, grade A). In this letter, Goudsmit sounded willing to go to any lengths to find Schumann. This letter also mentioned past and planned future attempts to locate Schumann.

Schumann appears to have hidden with various friends in Germany until summer 1947, when he was given official sanctuary in the British-controlled zone of Germany in exchange for information and/or work that U.K. officials considered sufficiently valuable to shield Schumann from the United States and from the ongoing war crimes trials. See pp. 4956–4957.

Despite all of this evidence about Schumann's wartime work on sophisticated nuclear weapon designs and despite Goudsmit's months-long frantic searches for Schumann, Goudsmit knowingly gave false testimony to the United States Senate by claiming that Schumann's "main interest was the physics of piano strings" (p. 3315). Goudsmit repeated this deliberate falsehood in his 1947 book, *Alsos* (p. 3335).

Goudsmit even included some gratuitous slander in this letter, seemingly oblivious to the fact that it was clearly disproven by the very request he was so urgently making in the letter.

Without providing any evidence, Goudsmit claimed that any person who "praises" Schumann's work "proves that he is also an incompetent charlatan." By Goudsmit's definition, such incompetent charlatans must then include the Allied investigator Major J. C. Clark mentioned in Goudsmit's letter (p. 4228), the U.S. Army Ordnance Department (p. 4225), the British government (pp. 4956–4957), the Soviet government (p. 4688), Max Planck (p. 4956), Wernher von Braun after the Apollo 11 moon landing (1996), and even Alsos itself (p. 3298, grade A).

Goudsmit claimed that a Gestapo evaluation proved that Schumann was incompetent. Actually Schumann was one of Heinrich Himmler's top scientific advisors, and the United States was well aware of that fact after the war (p. 3411).

What were the "other intelligence agencies" to whom it was of "primary importance... to locate... Schumann"? CIC, OSS, or otherwise? Even without explicitly identifying them, this is a written admission by Samuel Goudsmit that U.S. government organizations that were not Alsos were also doing an official (and probably more thorough) investigation of the wartime German nuclear program.]

DECLASSIFIED
Authority NND 933079

C O N F I D E N T I A L

HEADQUARTERS
U. S. FORCES, EUROPEAN THEATER
ALSOS MISSION, G-2

APO 887 - Rear

18 September 1945

MEMORANDUM:

TO : Captain Reginald C. Augustine
Alsos Mission
Heidelberg

1. It is still of primary importance to Alsos and to other intelligence agencies to locate Professor (or General) Erich Schumann about whom I have written you before. Recently, a new lead on this man was discovered in Berlin by Major Clark. I believe it is definitely worthwhile to follow it up. The contact in Berlin may actually know where Schumann is. I propose that Rosenberger go to Berlin to squeeze the information out of him, or at least as much as can be obtained. Schumann is supposed to be in Bavaria somewhere. At one time, we sent Previti down to find some of Schumann's deciples. He returned without any information about Schumann. I think this angle should be pushed a little harder after Rosenberger returns from Berlin.

2. Here follow the details: The man in Berlin is Professor Erhard Landt, born 22 June 1900. He was Dozentenbundsführer and Dozentenschaftsleiter of Berlin University where he was a professor of physical and chemical technology and an honorary professor of physics. His present address is Berlin-Schmargendorf, Königsallee 67, British Zone. Landt was interrogated by Major Clark and Pfc. Strauss. Major Clark was interested in finding a man by the name of Rudi Scholl who, at one time, worked with Schumann. Major Clark made it appear that Scholl might be useful on a job in the U.S.A. At that suggestion, Landt intimated that he knew that Scholl was in Bavaria, that Schumann was there also, that Schumann was the better man and that he (Landt) might be able to contact him.

3. I wish that Rosenberger would pick up this lead as if he came from Major Clark and, in that way, obtain Schumann's location.

4. I should like to point out again that Schumann, though he had a very high position, is regarded by all scientists, including old and competent German scientists, as definitely a second-rater. We even possess a Gestapo evaluation of him, mentioning that he was incompetent and not possessing the right character for the job he was holding. The fact that Landt praises him very much proves that he is also an incompetent charlatan. Landt was very much surprised that Clark had found him. He is a cagey, unreliable man who asks more questions than he gives out information. If everything fails, there may be enough reasons to have him detained. I have a feeling that he was an ardent supporter of the party. If Rosenberger needs any assistance in Berlin, he might contact Dr. P. Rosbaud who has been exceedingly helpful to us so far.

NO DEPT. OF ENERGY CLASSIFIED INFORMATION (NO RD/FRD/~~DOE-NSI~~)
COORDINATE WITH: DOD
BEFORE DECLASSIFICATION/RELEASE
AUTHORITY: DOE DPC 3/3/12
BY R. HAMBURGER DATE:

Rosenberger can tell him what he is after - he knows about it. He has also helped Major Clark. His last known address was Boltzmannstrasse 1. He is keeping in contact with G-2 of Group CC whose office is at Boltzmannstrasse 20. If Rosenberger is successful in Berlin, the information obtained should be followed up immediately by a trip to Bavaria. Even if it is not successful, someone should once more go back on the trail which Marti Previti tried to follow and use some forceful inducements on those fellows to find their boss. I return herewith one copy of Previti's report.

S. A. GOUDSMIT
Scientific Chief

NARA RG GOUDS, Entry UD-7420, Box 6, Folder Rosbaud

Figure D.25: Samuel Goudsmit to Reginald C. Augustine, 18 September 1945: "It is still of primary importance to Alsos and to other intelligence agencies to locate Professor (or General) Erich Schumann about whom I have written you before" [NARA RG GOUDS, Entry UD-7420, Box 6, Folder Rosbaud]. Schumann designed and apparently built fission implosion bombs during the war (pp. 4223–4315, 4686–4710, 4295–4297). When Alsos finished its major operations in May 1945, it had not located Schumann but recommended that other investigators do so (p. 3298, grade A). See p. 4228 for Major Clark.

Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate. *Hearings Before the Special Committee on Atomic Energy, United States Senate, Seventy-Ninth Congress, First Session, Pursuant to S. Res. 179, a Resolution Creating a Special Committee to Investigate Problems Relating to the Development, Use, and Control of Atomic Energy, Part 2, December 5, 6, 10, and 12, 1945.* Washington, D.C.: U.S. Government Printing Office, 1946. [Goudsmit 1945]

In spite of certain preliminary newspaper reports, we can say that the Germans did not have anything at all. They were way behind. They just did not have the vision which the Allied scientists had, I believe.

[...] For instance, as I mentioned before, the German scientists seem to have lacked the vision. They did not believe in its success from the very beginning. They knew its importance, and were convinced that the project was important; but they did not believe that it could be done within a reasonable time, 50 to 100 years. [...]

Himmler's SS men went around and spread the rumor that very soon the Germans were going to use a uranium bomb, scaring the scientists who knew they were 50 or a hundred years away from such a goal.

Other reasons why the Germans did not make any real progress were probably, as I mentioned before, that the key men in administrative positions were utterly incompetent. For instance, Army Ordnance had as its chief advisor on military matters a second-rate physicist named Schumann, like the musician Schumann. In fact, his main interest was the physics of piano strings. [...]

That man had a small project going on in one of the Army proving grounds near Berlin, and the scientists he had working with him were definitely inferior compared with the scientists which were available in Germany for such a project; so there was one group working.

There was another group working in the so-called Kaiser-Wilhelm Institute for physics. [...]

A private scientist, Baron von Ardenne, a clever technician and businessman, got the Minister of Post and Telegraph, Ohnesorge, interested in his research. Ohnesorge was near to Hitler and kept the Fuehrer informed about the importance of the project. For awhile, Von Ardenne was considered by the German authorities to be the expert on the uranium problem, much to the dismay of the really competent scientists. [...]

At the beginning of 1945, most of the research was still in practically the same state as it had been in 1943. Isotope separation had been tried on a very small scale only by means of a centrifuge. [...]

Some of the key scientists worked only part time on this important research and the rest of the time did routine teaching or administrative work. The lack of proper large-scale facilities necessary for this kind of work was, of course, another reason for the lack of success.

At the slow pace at which they were progressing, it is obvious that German scientists did not believe a bomb would be constructed within the course of the war. They were confident that perhaps a uranium machine, or at least its basic principles, could be obtained within a reasonable length of time. It is remarkable, however, how incomplete their knowledge was. They were, according to their research reports, scarcely aware of some of the basic difficulties which they were likely to encounter in their efforts. Most surprising is the fact that not even their best scientists had given any thought to the use of plutonium.

Attempts were made to have German chemical industry produce heavy water because the Norwegian plant had been destroyed. However, not much progress was made with this plan either. [...]

The effort was small, though it had the highest priority among all scientific research projects in Germany. The total expenditure was about 15,000,000 marks, which is perhaps equivalent to some $10,000,000. The appropriation for 1944–45 was 3 ¼ million marks with a subsequent supplement of 1,000,000.

It is estimated that approximately 100 scientists were active on this project. They were divided into several rather small groups working on different phases of the problem and were spread all over Germany. [...]

Toward the end of the war, the German experiments had indicated that it was possible to obtain an increase in the number of neutrons, but no self-sustaining neutron source had been constructed as yet. [...] Gerlach was quite upset when, shortly afterward, the S. S. spread rumors that the Germans were soon going to use a uranium bomb. The scientists knew that they were still a hundred years away from that goal.

Himmler's S. S. had begun to take an active interest in research and especially in the uranium project. This organization had threatened to evacuate key scientists and their equipment to the Bavarian redoubt where they would be forced to complete the work under pressure. To the relief of the frightened German scientists, this plan failed, probably because of the rapidity of the German collapse. Only one group was actually kidnapped by the S. S. and let loose in Bavaria.

But, the German scientists believed in their superiority. They attempted to hide their research reports and all information about their work from Allied investigators—of course, in vain.

Not until they learned about the use of the atomic bomb by the Allies did they realize how far behind they were. They had lost not only the military war, but also the war of science.

[Samuel Goudsmit knowingly and repeatedly gave completely false testimony to the United States Senate, as shown by many documents from Alsos's own files, including but not limited to those on:

- Erich Schumann and his implosion bomb experiments (e.g., pp. 3298, 3314, 4228).
- Manfred von Ardenne's calutron (all of Section D.4.3, especially p. 3596).
- Reports on plutonium from Ida Tacke Noddack (pp. 3829–3828), Carl Friedrich von Weizsäcker (pp. 3834–3841), Fritz Houtermans (pp. 3848–3857), Otto Hahn (p. 3859) and Josef Schintlemeister (pp. 3828, 3861–3864).
- The fact that the 15,000,000 marks only covered a small set of fission pile experiments and was not at all the total cost of the wartime German nuclear program, which included a large number of organizations and sites all over Europe (p. 3309).
- The German nuclear program being too large for Alsos to even investigate more than a small fraction of it (e.g., pp. 3289–3291, 3297–3301, 3303–3305, 3310–3311).
- SHAEF G-2 Generals Thomas J. Betts (p. 5076) and George Bryan Conrad plus AAF General Henry Arnold's advisor Prof. Edward L. Bowles of MIT (pp. 4757, 5381) concluding that Alsos had failed to do its primary job of investigating the German nuclear program (pp. 3303–3305).
- Statements by knowledgeable participants that German nuclear weapons were ready or nearly ready by the end of the war and that would have been known to Alsos (e.g., pp. 4224–4228, 4313–4315, 4434–4459, plus many documents in Sections D.13 and D.14).

Goudsmit repeated most of these false claims in his 1947 book and other writings.

In view of this overwhelming evidence that Samuel Goudsmit was a serial fabulist, scholars and journalists must treat Goudsmit and any information derived from him accordingly.]

Questions from Senator Edwin Johnson during Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate. *Hearings Before the Special Committee on Atomic Energy, United States Senate, Seventy-Ninth Congress, First Session, Pursuant to S. Res. 179, a Resolution Creating a Special Committee to Investigate Problems Relating to the Development, Use, and Control of Atomic Energy, Part 2, December 5, 6, 10, and 12, 1945.* Washington, D.C.: U.S. Government Printing Office, 1946, p. 254. [Goudsmit 1945]

Dr. GOUDSMIT. [...] The total effort expended by the Germans on the project was rather small, but it was among the scientific projects the one of the highest priority; still it was very small compared to our effort.

Senator JOHNSON. In your investigation of the German effort, did you have access to all of the efforts of Germany? Press reports have inferred, or at least I have understood from them, that certain German efforts had been taken over by the Russians, and that such plants as they took over were not open to inspection.

Now, did you have access to all the plants in Germany, and when you speak of what the Germans did, are you speaking of everything that the Germans did in the Russian-occupied zone as well as in the American-occupied zone?

Dr. GOUDSMIT. I speak with confidence of everything the Germans did on the atomic bomb project. I am certain that I have inspected all the papers and have talked to all the key men on the project, and have seen all the documents and most of the laboratories have been visited by me or by men who worked in connection with me.

Senator JOHNSON. In the Russian-occupied as well as in the American- and British-occupied zones? Have you visited any Russian-occupied laboratories?

Dr. GOUDSMIT. I think that is classified information.

Senator JOHNSON. You cannot testify on that?

Dr. GOUDSMIT. I cannot testify in open session as to that.

[From this exchange, it appears that Goudsmit had additional information about the German nuclear program that he was unwilling to share with the U.S. Senate. What exactly was that information?

Alternatively, was Goudsmit simply bluffing the U.S. Senate? If providing honest answers to Senator Johnson's questions would have revealed that Goudsmit had failed to pursue many important leads, did Goudsmit evade Johnson's questions by falsely claiming that the answers were "classified information" that he could not discuss?]

ATOMIC ENERGY

HEARINGS

BEFORE THE

SPECIAL COMMITTEE ON ATOMIC ENERGY

UNITED STATES SENATE

SEVENTY-NINTH CONGRESS

FIRST SESSION

PURSUANT TO

S. Res. 179

A RESOLUTION CREATING A SPECIAL COMMITTEE TO INVESTIGATE PROBLEMS RELATING TO THE DEVELOPMENT, USE, AND CONTROL OF ATOMIC ENERGY

PART 2

DECEMBER 5, 6, 10, AND 12, 1945

Printed for the use of the Special Committee on Atomic Energy

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1946

79879

CONTENTS

STATEMENT OF DR. S. A. GOUDSMIT, PROFESSOR OF PHYSICS, UNIVERSITY OF MICHIGAN

The CHAIRMAN. Dr. Goudsmit, have you a prepared statement?

Dr. GOUDSMIT. I have no prepared statement with me, but I may have one later.

I wish to point out first of all that my connection with the atomic bomb is quite different from that of the previous witnesses. I have not worked on the project at all, except in intelligence functions.

I was connected with the War Department mission which was sent overseas in order to find out what the German progress was along the project of the atomic bomb, and that was what we have done, and that is the information which I can give you.

Also, because of that function, I may have a few suggestions which might be useful, even though they are one-sided suggestions, as to control and supervision.

In spite of certain preliminary newspaper reports, we can say that the Germans did not have anything at all. They were way behind. They just did not have the vision which the Allied scientists had, I believe.

I have put down a few points about the German progress.

The German scientists had abandoned the hope of making a bomb during this war, entirely. They used the idea of the bomb to sell it to the Government and to the military officials.

Another point is that as a result they concentrated their efforts on the production of atomic energy, and all the work done was nothing else but trying to build what is called over here a pile, a uranium machine. That is all they worked on, and they had not even succeeded in constructing a pile. They had not a working uranium machine.

At the end of the war they had done just enough experimentation so that they were certain that it could be done, but they had not done it. They had not produced a chain reaction. They had not a uranium machine which they had hoped for.

The total effort expended by the Germans on the project was rather small, but it was among the scientific projects the one of the highest priority; still it was very small compared to our effort.

Senator JOHNSON. In your investigation of the German effort, did you have access to all of the efforts of Germany? Press reports have inferred, or at least I have understood from them, that certain German efforts had been taken over by the Russians, and that such plants as they took over were not open to inspection.

Now, did you have access to all the plants in Germany, and when you speak of what the Germans did, are you speaking of everything that the Germans did in the Russian-occupied zone as well as in the American-occupied zone?

Dr. GOUDSMIT. I speak with confidence of everything the Germans did on the atomic bomb project. I am certain that I have inspected all the papers and have talked to all the key men on the project, and have seen all the documents and most of the laboratories have been visited by me or by men who worked in connection with me.

Senator JOHNSON. In the Russian-occupied as well as in the American- and British-occupied zones? Have you visited any Russian-occupied laboratories?

Dr. GOUDSMIT. I think that is classified information.

Senator JOHNSON. You cannot testify on that?

Dr. GOUDSMIT. I cannot testify in open session as to that.

The remarkable thing about the Germans is that all the time they believed that they were ahead of our effort along those lines. Not until the news broke that the atomic bomb had been dropped did they realize that they were not ahead, but that they were behind. They were absolutely convinced that their work was ahead of ours.

They had no knowledge of our project, none whatsoever, except a few incorrect statements from their intelligence department, and some rumors which they did not take seriously. There was, in 1943, a rumor that in America scientists were working on an atomic bomb, but all details were lacking, and so it was not taken seriously. It was merely used as a means to have the authorities give more help, more men, more space for the laboratories. That was all they used it for.

Senator RUSSELL. You state that their work was very narrow in scope. Do you gather from this that it had not gotten beyond the laboratory stage?

Dr. GOUDSMIT. It had not gotten beyond the laboratory stage.

Senator MILLIKIN. They did not even have a pilot plant?

Dr. GOUDSMIT. They did not have even a pilot plant. The reason for the lack of progress in Germany, as I see it, can be again put down in a number of points.

Figure D.26: Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate [Goudsmit 1945].

For instance, as I mentioned before, the German scientists seem to have lacked the vision. They did not believe in its success from the very beginning. They knew its importance, and were convinced that the project was important; but they did not believe that it could be done within a reasonable time, 50 to 100 years.

The CHAIRMAN. Goebbels was talking all the time about a secret weapon. Do you think he had in mind, when he said that, the possibility of the development in German laboratories of this thing?

Dr. GOUDSMIT. He had knowledge of that, and some of the higher officials in Germany, who were utterly incompetent, may have believed that an atomic bomb was possible within a short time.

Senator JOHNSON. Hitler made many statements that he was going to bring the whole world down with him if he fell; in the light of the atomic bomb, it might seem that he had that in mind. Do you think he had that in mind, or was that pure bluff?

Dr. GOUDSMIT. It was pure bluff. They had it in mind, however. For instance, near the end of the war, when the Germans had made a preliminary success, they had really discovered by their experimentation that it might be possible to make a uranium machine.

Himmler's SS men went around and spread the rumor that very soon the Germans were going to use a uranium bomb, scaring the scientists who knew they were 50 or a hundred years away from such a goal.

Other reasons why the Germans did not make any real progress were probably, as I mentioned before, that the key men in administrative positions were utterly incompetent. For instance, Army Ordnance had as its chief adviser on military matters a second-rate physicist named Schumann, like the musician Schumann. In fact, his main interest was the physics of piano strings. He even rose to be the chief adviser of all the German armed forces after a while. That man was the first one who started the project for the German Army. He was the first one who went to France and tried to get the French development out of the hands of the French, and tried to move the French cyclotron, later deciding not to destroy it but to make it work, and sent some Germans down to put it in order and make it work.

That man had a small project going on in one of the Army proving grounds near Berlin, and the scientists he had working with him were definitely inferior compared with the scientists which were available in Germany for such a project; so there was one group working.

There was another group working in the so-called Kaiser-Wilhelm Institute for Physics, where a group of competent scientists by themselves had been working on this project trying to make a pile. Those two groups were always in competition with each other, instead of trying to cooperate with each other.

There were other men who had heard that nuclear physics was important. They tried to convince some other branch of the Government to give them money. They preferred the Air Forces, because in Germany the Air Forces had a lot of money. It was the only organization which was able to support research on a large and lavish scale, so some of them succeeded in talking the Air Forces into the fact that nuclear physics is important, that they should be given money for high tension apparatus, for laboratory equipment, and so on.

Again another man, a great technician and a good businessman, talked the Minister of Post and Telegraph into supporting him. He

had discovered that the Research Department of the Post and Telegraph Services in Germany had a lot of money which was not being used, and that they had research facilities; so he talked him into supporting a project along those lines.

It is clearly understandable that in such a way they could not go very far. It was only later in the history, after the war went badly, that the thing was better coordinated and that one man was put at the head of the whole organization, a competent scientist. He tried to bring some sense into the organization and diminish the competition and make it into cooperation, but that was too late. That was around 1943. I don't know exactly which month it was, but it is in the record somewhere.

Senator RUSSELL. Doctor Goudsmit, you of course are familiar with the Smyth report?

Dr. GOUDSMIT. Yes, sir.

Senator RUSSELL. From your investigations in Germany, do you think that they had knowledge of practically all or all of the facts that are set forth in that report?

Dr. GOUDSMIT. No; definitely not.

Senator RUSSELL. You don't think they knew as much as was contained in the Smyth report?

Dr. GOUDSMIT. They did not know as much as was contained in the Smyth report.

I must modify that statement a little bit. They might have known it, but they did not give the proper importance to the various pieces of knowledge they had. They could have known certain things, and could have thought of the use of plutonium, but it simply did not enter their minds.

One man mentioned it at one time in a short report of his, but it was not taken seriously. I should say the knowledge was there, they could have known it, but they did not grasp the right points in order to further the development.

Senator RUSSELL. Other witnesses have indicated that scientists in Germany, as well in other countries, have for some time had knowledge of the matters and statements in the Smyth report.

Dr. GOUDSMIT. There is indeed, as I say, the possibility that the facts were known; but knowing the facts is not sufficient, definitely not. Knowing that one can make plutonium, which is obvious to any scientist and was in 1939, would not be important; but the German scientists did not go further than that and see in it a realizable possibility of making an atomic bomb, which is something quite different.

Senator MILLIKIN. Did you find any evidence that the Germans had coordinated their individual knowledge and their group knowledge of the subject?

Dr. GOUDSMIT. Yes. They had free exchange of information in the form of reports among the various groups which worked on it. There was no compartmentalization.

Senator MILLIKIN. Then did any group or any top coordinating agency pull this altogether into some sort of definitive statement?

Dr. GOUDSMIT. No.

Senator MILLIKIN. That was not done?

Dr. GOUDSMIT. No; it was simply done in the form of secret publications.

Figure D.27: Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate [Goudsmit 1945].

ATOMIC ENERGY 257

Senator MILLIKIN. In other words, a number of groups of scientists were sort of going along, each one on its own route?

Dr. GOUDSMIT. Yes, sir.

Senator MILLIKIN. They were not working under over-all direction?

Dr. GOUDSMIT. Not until the very end, which was much too late, was there a little bit of coordination, and only a very little.

The CHAIRMAN. Doctor, you tell us that work had not gotten along very far. Now, we didn't know that until after the war, until you could get in there and make an evaluation.

You say that the Germans didn't know much about our situation, and had not learned it. Our information about them was just as poor as theirs about us?

Dr. GOUDSMIT. Yes.

The CHAIRMAN. I can recollect that General Marshall stated that they were in a race with us. That must have been based upon the G-2 reports before the end of the war.

General Eisenhower said, I believe in April, as I recollect it, that barring the bringing into effect of a new weapon, he felt that the war would be over in the spring.

I don't know whether you remember that declaration or not. The fact of the matter is that our intelligence overestimated what they were doing entirely, didn't they?

Dr. GOUDSMIT. It was known. This mission did not wait until the war was over. We have been overseas for quite awhile, and followed the armies.

The first concrete information which was turned over to the War Department, and which definitely indicated that there was no German effort along those lines, complete proof, in fact, occurred in the late winter of '44, around December of '44.

We were absolutely certain that the Germans did not have anything like an atomic bomb.

The CHAIRMAN. So when General Marshall talked about a race, it was the turtle and the hare.

Senator JOHNSON. Were the German scientists and the German efforts handicapped by Hitler's policy of persecution, which included top-notch physicists and scientists as well as other persons?

Dr. GOUDSMIT. They were seriously handicapped by the lack of prestige which science has in Germany. The scientists themselves had gotten together in an informal society, the Uranium Society, just before the war. They had taken it seriously, and had even sent over two of the top scientists to this country to find out what we were doing just before the war started in the summer of 1939.

When the war broke out, all German scientists were drafted. One of the top scientists was a corporal for a while, and stated that his Army experience was like the usual mountaineering, only made difficult by the presence of sergeants. That was the only thing, but the rest was just a mountaineering trip in the Alps.

But pretty soon the key scientists were taken out of the Army and put back in the laboratories; but the bulk of the German scientists remained in the Army for several years, 2 to 3 years. Several were killed in action as soldiers.

Only when the war went bad, especially after the U-boat war went bad, where scientists released from the armed forces and put back

258 ATOMIC ENERGY

on war work, which on the whole was not very successful, as I said, except for the Air Force.

Senator MILLIKIN. Prior to the war, were the German scientists regimented or were they free to pursue their own work in their own way?

Dr. GOUDSMIT. Also then did they suffer from the lack of prestige, and it was pointed out during the war by one of the key German scientists how German science had declined compared with science in America. He went around the country lecturing for various officials for the Air Forces, using statistics—some of the statistics he had obtained from American journals—to point out that Germany was rapidly declining in the fundamental sciences.

Senator MILLIKIN. What reasons did he attribute to that?

Dr. GOUDSMIT. He attributed it primarily to lack of support for science, to some extent to the loss of scientists because of persecution, and to a greater extent to the replacement of those scientists by incompetent party members instead of good scientists.

Senator JOHNSON. Did Hitler's policy of persecution reach into the scientific groups?

Dr. GOUDSMIT. Not directly, except insofar as several scientists had to leave the country, of course long before the war was started; but the replacement of those men by incompetent scientists was the greatest handicap.

Senator RUSSELL. Doctor Goudsmit, did your investigation indicate whether the rocket bombs or buzz bombs were developed by the Ordnance Corps of the German Army or by civilian scientists, or scientists who were not inducted into the Army?

Dr. GOUDSMIT. The rockets were mainly developed by excellent aeronautical engineers, who worked primarily for Army Ordnance.

Senator MILLIKIN. I thought you made a very interesting statement in recapitulating the reasons for the decline in German science when you said, in effect, that one of the reasons was that they were putting party hacks into positions of authority in science.

Is that not a danger that we must avoid as far as we can avoid it in any governmental agencies of that kind that we may set up in this country?

Dr. GOUDSMIT. Definitely.

Senator MILLIKIN. I will put it this way, that danger cannot be entirely avoided in any kind of a governmental set-up having to do with science. Would you go along with me on that?

Dr. GOUDSMIT. Certainly. We have, for instance, noticed that on this intelligence work, the reason it succeeded at all was I think due to the perfect cooperation between the Army organization and the scientists on these teams. It was really an ideal example of how such a thing can be set up.

The chief of the mission was Col. B. T. Pash, and he understood completely his responsibilities. He never questioned, for instance, the judgment of the scientists about any scientific matter. It was up to the scientists to decide which village in Germany was important; it was up to the scientists to investigate the papers to get all that information; it was up to the scientists to decide who was really an important scientist and who was just a man who had gotten his name in the newspapers.

Figure D.28: Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate [Goudsmit 1945].

The military never failed to get us to the places we wanted to go to, to find the man we wanted to find, to get the papers we wanted to read. They never questioned the judgment of the scientists on scientific matters, and that was an ideal cooperation. I think it should be made an example for cooperation not only in wartime, but also in peacetime.

I have been connected with other organizations where civilians and Army people have worked together, and I have been very fortunate that in all cases there was such ideal cooperation.

I was previously overseas for radar work, and there the mingling of the civilians with the Air Forces officials on radar was also really an ideal example of perfect cooperation. That should continue in peacetime.

Senator JOHNSON. I would like to ask Doctor Goudsmit to put something in the record of his personal and professional background.

I understand you are a native of Holland.

Dr. GOUDSMIT. Yes; I am.

Senator JOHNSON. And you are now a professor of physics at the University of Michigan.

Dr. GOUDSMIT. I have been there since 1927.

Senator JOHNSON. Are you a citizen of the United States?

Dr. GOUDSMIT. Yes, I am.

Senator JOHNSON. How long have you been in the United States?

Dr. GOUDSMIT. Since 1927, and I have been at the University of Michigan all that time, except that since the beginning of 1941 I have been on leave for war work.

Senator JOHNSON. How much experience in your profession did you have prior to coming to the United States?

Dr. GOUDSMIT. I had done research work in Holland and Germany and other countries of Europe, and when I came to the United States I was appointed on the faculty of the University of Michigan in 1927.

Senator JOHNSON. How much experience had you had in Europe prior to coming to the United States?

Dr. GOUDSMIT. I don't know how to measure it. I had already published several papers in physics.

Senator JOHNSON. Had you taught in any university?

Dr. GOUDSMIT. Only as an assistant at the University of Amsterdam, and I had a Rockefeller fellowship in Germany and Denmark. I had mainly done research work, and very little teaching.

Senator MILLIKIN. What schools did you graduate from?

Dr. GOUDSMIT. I got my Ph. D. from the University of Leiden in Holland.

I would like to add a few words about the possibilities of control.

The experience we had in Germany shows clearly that some type of supervision or control is possible. I mentioned before that no knowledge of German development was available here. I can add to that by saying that the security of the Germans was inadequate. They used letterheads and envelopes which clearly stated "Nuclear Physics" on the outside. Nevertheless, we had no knowledge of the work at all over there. The allies did not know what was going on.

As soon as our mission got in touch with the first physicists, the first physics laboratory, the first correspondence and documents on physics which were available on the Continent, we obtained the com-

plete story. From that you see that if there could be free interchange of ideas among the scientists, if they could travel freely, if they were allowed to visit each other's laboratories, if that were possible, then as long as scientists are working or have to be used in work on an atomic bomb or anything of that nature, I don't believe that it can be kept secret. It would be known immediately to their colleagues all over the world without any doubt.

If, however, the art of making atomic bombs will progress so far that they do not need scientists any more, and it can be done by slave labor or prisoners, then of course control will be more difficult. But as long as scientists are needed in the building, construction, or research work on atomic bombs, it cannot be kept a secret from other scientists if they have free access to each other's papers, can talk with each other, can travel and go to meetings together.

Senator RUSSELL. I would like to ask one or two questions, Mr. Chairman.

Dr. Goudsmit, from your investigations in Germany as to the progress which has been made in their research, would you care to venture any opinion as to how long it would take any other country of the world to complete an atomic bomb or to advance to the stake where we are today?

Dr. GOUDSMIT. I can say that the Germans, at the rate at which they were going before they knew about the atomic bomb——

Senator RUSSELL. Of course that made a difference.

Dr. GOUDSMIT. That made an enormous difference, and it makes my estimate valueless. At that time it would have taken them a hundred years, they were going so slowly. You can see the progress in the research reports.

Senator RUSSELL. But you stated they didn't have any faith.

Dr. GOUDSMIT. Now they have.

Senator RUSSELL. But it is an entirely different situation today. The whole world knows the bomb can and has been created and used.

Dr. GOUDSMIT. Yes. Then my estimate must be the same as that of other scientists, and it just depends on getting the men together, getting the industry developed and organized, and I do not see why it should take them any longer than it took us.

Senator RUSSELL. We talked a great deal about rockets during the course of these hearings. Did you make any investigation into the development of the rocket in Germany?

Dr. GOUDSMIT. I did not make any investigation.

Senator RUSSELL. You dealt entirely with atomic energy?

Dr. GOUDSMIT. No; we had some other responsibilities on that mission.

Senator RUSSELL. In other words, you did not have any connection whatever with the investigation on rockets. What member of your group was dealing with the question of rockets?

Dr. GOUDSMIT. We left that entirely to the technical teams of the Army and Navy. There were so many teams over there picking up V-1's and V-2's that we thought our small group could safely stay away from it and leave it to technical teams.

Senator RUSSELL. I gather from that that you would prefer not to express any opinion as to the relative progress which has been made by the Germans and by this country in the development of the rocket as a weapon of war?

Figure D.29: Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate [Goudsmit 1945].

Dr. GOUDSMIT. As far as the large rockets are concerned, I do not think that our development went very far because we were not interested in those. As far as the smaller rockets are concerned, I was told by experts that we could not learn much from the German developments.

Senator RUSSELL. I happened to be in the Hague this summer where the Germans launched a great many of these rockets against England, and if they didn't have better luck with them with atomic war-heads than with the bombs they used, it would be bad, because about every other one flew back. They had absolutely no sure sense of direction. About half of them landed in the surrounding countryside, and half over in England.

Unless progress is made in the rocket, it will be some time before any one tries to use rockets extensively with atomic war heads.

Senator JOHNSON. There is room for only one mistake with an atomic bomb.

The CHAIRMAN. Doctor, there has been some comment in the press about the fact that German scientists are finding employment in Russia. Would you care to comment on that?

Dr. GOUDSMIT. I think it is well known that certain German scientists are finding employment in Russia.

The CHAIRMAN. The obvious conclusion is that it will enhance their available resources of scientific development.

Dr. GOUDSMIT. Yes. I think similar German scientists in the French zone are working for the benefit of France, and in the British zone certain factories and laboratories may have been put back to work for British interests.

Senator JOHNSON. Is that true of America also?

Dr. GOUDSMIT. When I left, it was not well coordinated; but let us hope that it will be better coordinated by now.

The CHAIRMAN. Who is Dr. Otto Hahn?

Dr. GOUDSMIT. He is a German chemist who discovered fission, which is the basic process.

The CHAIRMAN. He has just been awarded the Nobel prize.

Dr. GOUDSMIT. Yes.

The CHAIRMAN. Where is he?

Dr. GOUDSMIT. I don't know where he is at the moment.

The CHAIRMAN. You don't think he will be at the Astor Hotel on Monday night when the Nobel prize dinner is held?

Dr. GOUDSMIT. No; I don't think so.

The CHAIRMAN. I am interested, for I am speaking there Monday night.

Are there any further questions?

Thank you very much indeed, Doctor. We appreciate your statement.

(The prepared statement submitted by Dr. Goudsmit reads as follows:)

FOREWORD

The opinions expressed in the following are entirely my own. These opinions represent my subjective reaction to information obtained abroad.

The facts quoted in the following account are derived from evidence collected in the European theater of operations in my function as scientific chief of the Alsos mission. This evidence consists primarily of documents, such as captured

German secret research reports and administrative scientific correspondence. In addition, laboratories were inspected and several scientists interviewed.

State of atomic bomb research in Germany

The progress made by German scientists towards the construction of an atomic bomb was negligibly small. The state of affairs near the end of the war can be summarized as follows:

1. German scientists had abandoned hope of making a bomb for this war.
2. They concentrated their efforts on atomic energy production rather than on an explosive.
3. They had no yet succeeded in constructing a "pile" or self-supporting chain reaction.
4. The total effort expended on the atomic energy project was small, even though it had the highest priority.
5. German scientists had no knowledge of our work.
6. They believed that they were ahead of our developments in atomic energy.

REASONS FOR FAILURE

A careful study of the documents may reveal the causes of the complete German failure in this field. My opinion in this connection can be summarized in the following statements:

1. German scientists lacked the vision which the Allied scientists possess.
2. The Nazi Party and the German military placed incompetent scientists in key administrative positions.
3. Lack of coordination caused competition instead of cooperation among the various groups.
4. German scientists put into this field scarcely more effort than they would have into a peacetime research project, because they felt certain of their superiority.
5. German pure science had no support from nor contact with the military.
6. Allied bombing interfered with German progress.

HISTORY OF GERMAN ATOM BOMB RESEARCH

Early in 1939, as was done everywhere else, several German physicists called to the attention of the military and of other authorities the possibility of making a superexplosive as a result of the discovery of uranium fission. A group of physicists met and formed the Uranium Society (Uran Verein). This was originally an informal group, exchanging information among each other, but keeping such information from outsiders.

German nuclear physicists proceeded with their reseach independently. Army Ordnance had a scientific group under a second-rate physicist, Schumann, which started work on this problem. The best-qualified groups were the Kaiser-Wilhelm Institute for Physics in Berlin, under Heisenberg, and the physics section of the KWI for Medical Research in Heidelberg, under Bothe. Bothe, as well as Heisenberg, made a survey trip through the United States of America in the summer of 1939, just before the war started, obviously to find out what our plans were for the uranium bomb.

When the war broke out, scientists in Germany were immediately drafted into the Army, but a short while later the key men were deferred and returned to their laboratories. However, the bulk of the lesser academic scientists remained in the field (where several were killed in action), until about two or three years later when the military authorities finally agreed to release them for war work.

At the beginning of the war, each academic research group had to find its own sponsor. The German Air Forces had the best and most liberal set-up for research, and some nuclear physicists were fortunate enough to get support from them. A private scientist, Baron von Ardenne, a clever technician and businessman, got the Minister of Post and Telegraph, Ohnesorge, interested in his research. Ohnesorge was near to Hitler and kept the Fuehrer informed about the importance of the project. For awhile, Von Ardenne was considered by the German authorities to be the expert on the uranium problem, much to the dismay of the really competent scientists.

The various groups worked in competition with each other. The sabotage and bombing of the Norwegian heavy water plant had cut their supply so that it was barely enough for one group to make important experiments. As a result, disagreements arose concerning its use.

Figure D.30: Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate [Goudsmit 1945].

ATOMIC ENERGY 263

The bulk of German scientific research was under the Ministry of Education (Minister Rust). It was governed by a Research Council under an incompetent administrator and second-rate chemist named Rudolph Mentzel, a brigadier in Himmler's SS.

Early in 1942 the members of the Uranium Society thought it necessary to call the project to the attention of the highest members of Government and military organizations. A special secret meeting was called by Minister Rust and General Leeb, Chief of Army Ordnance, to which all top-ranking officials were invited. However, most of them declined or sent minor representatives. The program consisted of a number of talks and a scientific luncheon prepared with synthetic fats. The introductory talk was by Professor Schumann about Nuclear Physics as a Weapon. Then followed popular technical lectures by Hahn, Heisenberg, Bothe, and a few others, and finally a lecture by Professor Esau, Director of the German Bureau of Standards, on the Expansion of Nuclear Physics Research Through the Participation of Other Government and Industrial Departments. It is doubtful whether this meeting had any success.

A few months later, the Research Council was taken out of the Ministry of Education and, by "Hitler decree," placed under Goering. It was hoped that this change would bring research on other subjects up to the same high level as that of the air forces, but matters did not turn out that way. The incompetent Professor Mentzel remained the active head of the Research Council.

Professor Esau, of the Bureau of Standards, was put in charge of uranium research. Later, sometime in 1943, he was replaced by physicist Walther Gerlach, of the University of Munich, a really first-class experimental scientist and organizer. At the same time, Army Ordnance seemed to have gotten tired of this apparently hopeless research and turned the facilities and men over to the Research Council. Upon Gerlach's shoulders fell the difficult task of reconciling the two principal groups working on uranium—the Kaiser-Wilhelm Institutes and the former Ordnance Group.

In the meantime, Allied bombing had forced the scientists to evacuate their well-equipped laboratories in the cities and to seek shelter in rather primitive quarters in various small villages spread all over Germany.

In studying the Research Reports, one is, first of all, impressed with the slowness of the progress. At the beginning of 1945, most of the research was still in practically the same state as it had been in 1943. Isotope separation had been tried on a very small scale only by means of a centrifuge. It had been discovered that the Clusius method did not work. Research on several other methods had been dragging on for a few years without much progress.

Some of the key scientists worked only part time on this important research and the rest of the time did routine teaching or administrative work. The lack of proper large-scale facilities necessary for this kind of work was, of course, another reason for the lack of success.

At the slow pace at which they were progressing, it is obvious that German scientists did not believe a bomb would be constructed within the course of the war. They were confident that perhaps a uranium machine, or at least its basic principles, could be obtained within a reasonable length of time. It is remarkable, however, how incomplete their knowledge was. They were, according to their research reports, scarcely aware of some of the basic difficulties which they were likely to encounter in their efforts. Most surprising is the fact that not even their best scientists had given any thought to the use of plutonium.

Attempts were made to have German chemical industry produce heavy water because the Norwegian plant had been destroyed. However, not much progress was made with this plan either. Uranium metal was produced in quantities sufficient for small-scale experiments, and the stock of heavy water seemed to be just enough for that.

The effort was small, though it had the highest priority among all scientific research projects in Germany. The total expenditure was about 15,000,000 marks, which is perhaps equivalent to some $10,000,000. The appropriation for 1944–45 was 3¼ million marks with a subsequent supplement of 1,000,000.

It is estimated that approximately 100 scientists were active on this project. They were divided into several rather small groups working on different phases of the problem and were spread all over Germany.

Security

Almost nothing was known about the German project before the invasion of continental Europe in spite of the fact that the security was not of a very high standard. Letterheads and envelopes were used which clearly indicated the

264 ATOMIC ENERGY

prominence given to nuclear physics, reading "The Marshal of the German Reich, President of the State Research Council, the Plenipotentiary for Nuclear Physics," or "The Plenipotentiary of the Reichsmarshal for Nuclear Physics," which gave Gerlach the nickname of "Reichsmarshal for Nuclear Physics." In draft deferment requests, the reason was clearly stated as "Working on Energy Production from Uranium." There were some weak protests against this lack of security but to no avail. However, this stationery was never used for correspondence with neutral countries. The locations to which the laboratories had been evacuated were kept very secret.

German scientists knew practically nothing about Allied developments, aside from what they picked up the summer of 1939. They received some utterly wrong and useless information from the German intelligence, information largely obtained from travelers or other unreliable sources. There was a rumor in 1943 that the German intelligence had information about atomic bomb-work being performed in the United States. This apparently was not taken seriously, as further details were lacking.

Results

Toward the end of the war, the German experiments had indicated that it was possible to obtain an increase in the number of neutrons, but no self-sustaining neutron source had been constructed as yet. The German scientists considered this achievement of great importance. They were convinced that they were far ahead of the Allies. They believed that this success might play an important role in the settlement of the peace terms, for they understood correctly the immense implications of the uranium-energy project. Even if the peace terms might not be influenced by them, this achievement would at least insure for German science a leading role in the world and save Germany in that way. These thoughts were, indeed, the driving force behind the German scientific efforts. Gerlach was greatly excited when he learned about the favorable result of the preliminary experiment. He immediately informed Bormann, the head of the Nazi Party, reassuring him of German supremacy in this field. Gerlach was quite upset when, shortly afterward, the S. S. spread rumors that the Germans were soon going to use a uranium bomb. The scientists knew that they were still a hundred years away from that goal.

Himmler's S. S. had begun to take an active interest in research and especially in the uranium project. This organization had threatened to evacuate key scientists and their equipment to the Bavarian redoubt where they would be forced to complete the work under pressure. To the relief of the frightened German scientists, this plan failed, probably because of the rapidity of the German collapse. Only one group was actually kidnaped by the S. S. and let loose in Bavaria.

But, the German scientists believed in their superiority. They attempted to hide their research reports and all information about their work from Allied investigators—of course, in vain.

Not until they learned about the use of the atomic bomb by the Allies did they realize how far behind they were. They had lost not only the military war, but also the war of science.

Control

In my opinion, a survey of the German work on uranium energy leads to certain recommendations for eventual control of uranium research.

It has become evident that such supervision can only be had with the help of qualified scientists. The present military methods of intelligence or of occupation are totally inadequate for the control of scientific research. These merely lead to such utterly useless extremes as the destruction of the cyclotrons in Japan.

It is not only the destruction itself which is objectionable. So much has been ruined in this war that a few expensive scientific instruments are insignificant by comparison. The destruction of the cyclotrons is bad because it indicates that those who are responsible for this deed are totally unfamiliar with the real significance of these instruments in the atomic-energy problem. Blowing up cyclotrons is almost equivalent to the attempted cutting down of the Japanese cherry trees here in Washington shortly after Pearl Harbor.

It shows that sound and competent scientific advice is essential in dealing with this matter and those related to it. In this war, there have been several examples of very close and successful cooperation in the field between the military and scientists. I am fortunate to know this from personal experience. Such coordination and supplementation should exist not merely in the laboratory but in all phases of the atomic-energy problem.

ATOMIC ENERGY 265

The War Department mission, which, among other functions, collected the material mentioned before, can be taken as an ideal example of such cooperation. The chief of mission, Col. B. T. Pash, never failed to execute the operations, often difficult ones, requested by the scientific chief and his staff of scientists. The military were in charge of and took full responsibility for security and for other purely military matters. The scientists were responsible for judging matters concerning enemy scientists, instruments, laboratories, and documents.

Finally, I wish to point out the scientific cooperation which exists among scientists all over the world. This cooperation overcomes the barriers of war and differences of political opinion. I feel certain that, if all countries grant complete scientific freedom to their research workers, no dangerous activity will, or can, be kept secret as long as scientists are involved. By "scientific freedom" I mean the scientists' free choice of research problems and freedom of publication.

The Chairman. The hearing is adjourned.

(Whereupon at 12:05 p. m., the committee recessed until Monday, December 10, at 10 a. m.)

Figure D.31: Samuel Goudsmit's 6 December 1945 testimony to the U.S. Senate [Goudsmit 1945].

Samuel A. Goudsmit. 7 December 1945. Report by the Scientific Chief of the Alsos Mission, pp. 15–16 [NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Mission].

Limitations of Fields of Interest

Experience has shown that it was impossible to cover efficiently the whole field of scientific research in Germany. The amount of material, such as documents, personnel and laboratories, encountered during operations was so overwhelming that no intelligence agency of reasonable size could handle it all. A very thorough job could be done, however, on such scientific subjects for which there existed at home or in the field a definite demand for intelligence information. For this reason, the Alsos Mission, more or less automatically, restricted its investigations to the following subjects:

a. The Uranium Problem

b. Bacteriological Warfare

c. Organization of Enemy Scientific Research

d. Aeronautical Research

e. Proximity Fuzes

f. German Research Facilities for Guided Missiles

g. The Speer Ministry's Interest in Research

h. Chemical Research

i. Metallurgical Research

j. Shale Oil Development

k. Miscellaneous Intelligence [...]

Scientific Results Obtained by the Alsos Mission

a. The Uranium Project.

The Alsos Mission was the only intelligence team authorized to investigate for United States and British interests the German progress on the Atom Bomb. Documents found at Strasbourg indicated that the enemy had made practically no progress in this field, though it had the highest priority of all scientific research projects. The Alsos Mission located all the centers of Uranium research in Germany. The laboratories were investigated and key personnel detained and questioned. The enemy tried in vain to hide essential materials and research reports. They were all recovered by the Alsos Mission. It is certain that complete research data and all key scientists fell into the hands of the Alsos Mission.

The evaluation of the intelligence indicated that the Germans believed that they were far ahead of American development in this field. In reality, the Germans, though they had started sooner, were far behind. They had given up altogether the idea of making a bomb and were concentrating their efforts on constructing an energy producing machine, which they called a "Uranium Burner". At the end of the war, they had not even succeeded in constructing a self-sustaining chain reaction or "pile". Nevertheless, they believed their progress to be so important that they offered to assist United States scientists in their efforts to harness atomic energy. They were convinced that their work would help Germany to dominate the world of science even though the military struggle had been lost. Not until the news of the Atomic Bomb reached them on August 7, 1945, did German scientists realize that they had also lost the war of physics. [...]

Conclusion

It is the opinion of the Scientific Chief that the Mission has been highly successful. It has taught us lessons in intelligence procedure which may be of great value in peacetime, too. This fact is of greater importance than the actual scientific information which was collected, the bulk of which was negative.

Only the method used by the Alsos Mission could have revealed, immediately after the fall of Strasbourg, that no threat of a German Atom Bomb existed. From a military point of view, this was the most important result obtained by the Mission.

The Alsos method, it must be emphasized, succeeded only because of the close cooperation and mutual trust of the military and the scientists. For all members, this Mission has been a unique undertaking, giving the inner satisfaction of having actively contributed to the success of the Allied cause.

[Samuel Goudsmit's final report for the Alsos mission was 25 pages long, yet devoted only approximately one page to the German nuclear program, giving little detail. Goudsmit spent far more pages of the report on extreme self-promotion and a long series of petty complaints, such as that the U.S. government had declined his requests to give him his own private plane.

Goudsmit was especially proud of his own unique method that "revealed... no threat of a German Atom Bomb existed" before he had ever even visited any sites in Germany or its eastern occupied territories, read any documents from those sites, seen any equipment from those sites, or interrogated any personnel from those sites. Undoubtedly that was indeed a unique method.

Alsos's own files prove that Goudsmit was knowingly making false statements when he wrote claims such as: "The Alsos Mission located all the centers of Uranium research in Germany. The laboratories were investigated... It is certain that complete research data and all key scientists fell into the hands of the Alsos Mission." (See for example pp. 3289–3291, 3297–3301, 3303–3305, 3312–3314, 3306–3307, 3310–3311.)

Note the long list of German fields of research (each quite vast, as shown by other sections of this book) for which Goudsmit, with only a small number of assistants for a few months, claims to have done "a very thorough job."

In stark contrast to Goudsmit's glowing evaluation of himself, the archival record shows that he:

- Had a nervous breakdown long before Allied forces even entered Germany and spent most of the final months of the war in the United States (e.g., pp. 3278–3287).
- Quarreled with and was criticized by a long list of people (e.g., pp. 3278–3279, 3282–3283, 3284–3287, 3292–3293, 3296, 3303–3305, 3306–3307, 3310–3311, 3312–3314, 3339).
- Failed to investigate a huge number of nuclear sites and personnel (e.g., pp. 3297–3301).
- Was ultimately judged to have failed in his mission by SHAEF G-2 Generals Thomas J. Betts and George Bryan Conrad plus AAF General Henry Arnold's advisor Prof. Edward L. Bowles of MIT (pp. 3303–3305).
- Knowingly and repeatedly gave false testimony to the United States Senate (pp. 3315–3323).]

REPORT BY THE SCIENTIFIC CHIEF OF THE ALSOS MISSION

Purpose of the Alsos Mission

Investigation of the state of Uranium Bomb research in Germany was the primary aim of the original Alsos Mission in Italy. When the present Scientific Chief joined the Mission, its scope had been widened considerably.

The directive of the Mission instructed it to collect intelligence on the scientific war effort of the enemy. The term, "scientific", limited the interest of the Mission to problems of research and early development. It was intended that weapons or technical apparatus in use or ready for production be covered by technical intelligence teams of the Army Service Forces, of the Navy and of the Air Forces. These teams investigated captured enemy equipment and military technical personnel, whereas the Alsos Mission was primarily interested in research laboratories and academic scientists. It is obvious that a clear distinction between "research" and "development" could not be made, but the limitation to "scientific" intelligence could be used as a guiding principle and successfully prevented overlapping with other intelligence agencies.

Limitations of Fields of Interest

Experience has shown that it was impossible to cover efficiently the whole field of scientific research in Germany. The amount of material, such as documents, personnel and laboratories, encountered during operations was so overwhelming that no intelligence agency of reasonable size could handle it all. A very thorough job could be done, however, on such scientific subjects for which there existed at home or in the field a definite demand for intelligence information. For this reason, the Alsos Mission, more or less automatically, restricted its investigations to the following subjects:

a. The Uranium Problem
b. Bacteriological Warfare
c. Organization of Enemy Scientific Research
d. Aeronautical Research
e. Proximity Fuzes
f. German Research Facilities for Guided Missiles
g. The Speer Ministry's Interest in Research
h. Chemical Research
i. Metallurgical Research
j. Shale Oil Development
k. Miscellaneous Intelligence

The Policy on Scientific Personnel

At the time the Alsos Mission was being organized, it seemed impossible to predict the problems which such a mission would encounter in its field operations. Not until the fall of Strasbourg in November 1944 did one get an insight into the work which had to be done when entering Germany. This general uncertainty explains the changes which were necessary in the choice of scientific personnel for the Mission.

The original recommendation was that the Scientific Chief would be the only permanent civilian member of the Mission. Whenever important targets were uncovered, the Office of Field Service of the Office of Scientific Research and Development would send expert scientists to the Mission for exploitation of the target. For this purpose, the Office of Field Service alerted about forty key scientists.

It soon developed that the original scheme could not be followed. Experience in France showed that the key scientists attached to the Mission

-2-

NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Mission,
Samuel A. Goudsmit, 7 December 1945,
Report by the Scientific Chief of the Alsos Mission

could seldom be made available at the right instant, especially during rapid advances of the Allied forces. Those key scientists who did join the Mission could not be spared long enough from their research projects at home to insure continuity of action. Moreover, several of the research project leaders were convinced that so little could be learned from a study of German war research that they were unwilling permanently to divert their experts to such investigations. As a result of this policy, only the Scientific Chief and one expert on the Uranium problem (Wardenburg) were on hand at the fall of Strasbourg. They were followed shortly by two military experts on Bacteriological Warfare (Capts. Cromartie and Henze). The exhaustive information on these two subjects, which was collected there, indicated that, if more scientists had been present, a multitude of significant scientific intelligence in other fields would have been found.

After this, at the urgent request of the Scientific Chief, a few scientists were attached to the Mission permanently (Colby, Baumann, Smyth, Kuiper). These men were responsible to the Mission only and to no other war research project at home. They were selected for their ability as all-round scientists capable of judging the importance of research work even when it did not pertain to their own fields of specialization. Of great importance in their selection was their thorough knowledge of the German language and German scientific institutions.

Those special war research projects, which considered the work of sufficient value to support it by continuous representation on the Mission, were also accommodated, the principal examples being the Bacteriological Warfare Division (Capt. Cromartie et al), the Uranium Project (Wardenburg et al), the National Advisory Council on Aeronautics (Reid et al) and the Petroleum Division of the Quarter Master General (Lt. Col. Foran).

-3-

Experts attached to the Mission for a short term were accepted only when there was a very definite need for them and when their activities did not interfere with the Mission's sufficient, but not inexhaustible, means of transportation. In addition, the War Department attached to the Mission a few teams whose interests were somewhat outside the field of scientific intelligence.

The Office of Field Service, in March 1945, assigned a Deputy Scientific Chief (Kemble) and a Technical Aide (Kelly) to the Mission. The task of the former was to represent the Scientific Chief whenever he was away on field investigations.

At the request of the Scientific Chief, a few more scientists were sent over in the summer of 1945 to assist in the reading and evaluation of numerous captured German documents (Van Klooster, Beth, Helmkamp, Wannier, Van de Kamp).

A highly valuable and unique position in the Alsos Mission was held by Major R. A. Fisher. He was both a scientist and a member of the military administrative staff of Alsos. This combination proved to be extremely useful.

Whenever expedient, members of other intelligence organizations were temporarily attached to the Alsos Mission. Most of the investigation on the enemy's proximity fuse development was performed with such temporary personnel under the leadership of Dr. E. O. Salant.

The fact that the Mission had but one civilian secretary (except for the last two months when there were two) proved to be a serious handicap. It is no wonder, therefore, that the Technical Aide and the Deputy Scientific Chief complained that much of the work they were obliged to do could have been performed by an additional competent secretary.

-4-

DECLASSIFIED
Authority NND 933079

Figure D.32: Samuel A. Goudsmit. 7 December 1945. Report by the Scientific Chief of the Alsos Mission [NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Mission].

NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Mission,
Samuel A. Goudsmit, 7 December 1945,
Report by the Scientific Chief of the Alsos Mission

The War Department attached several clerks to the Mission who performed a splendid job in typing reports and memoranda. Those who were well-qualified as secretaries were not available to the scientific staff, as they were needed for the large amount of military administration necessitated by the Mission's extensive activities. The few who might have been useful as secretaries, because they knew German, were sent into the field to drive vehicles and to act as interpreters for those members of the Mission who lacked knowledge of the German language.

Toward the end of activities in Europe, two competent German translators were finally sent to the Mission from the War Department.

Major Scientific Personnel

The scientific personnel of the Alsos Mission changed frequently. Some members were attached only for short periods for special investigations. The following list includes, therefore, only those whose major activities in the ETO were for Alsos:

GOUDSMIT	Scientific Chief of Mission. Field Work on Uranium Project, Organization of German Science, Speer Ministry.
FISHER, Maj.	Field Work on Uranium Project, Organization of German Science, Liaison with F.I.A.T.
KEMBLE	Deputy Scientific Chief of Mission. Evaluation of German Documents.
COLBY	Field Work on Uranium Project, Organization of German Science, Speer Ministry and other subjects.
BAUMANN	Field Work on Chemistry and other subjects.
SMITH	Field Work on Physics, Chemistry and other subjects.
WARDENBURG	Field Work on Uranium Project and other subjects.
LANE	Field Work on Uranium Project

-5-

HOGNESS	Field Work on Uranium Project
CROMARTIE, Capt. HENZE, Capt. BARNES, Major (Br) ADAM, Major (Br) HOFER, Lt., USN	Field Work on Bacteriological Warfare
REID ROBINSON KEMPER EBERT BOGERT, Col.	Field Work on Aeronautical Research
KLEMPERER	Field Work on Guided Missile Research
SALANT TOLLES	Field Work on Proximity Fuzes
FORAN, Lt. Col.	Field Work on Shale Oil Development
KUIPER	Field Work on Physics, Electronics & Astronomy
VAN KLOOSTER VAN DE KAMP BETH WANNIER SENIOR	Evaluation of German Documents & Some Field Work
NOYES SHERWOOD FIESER HELMKAMP CHITTICK, Col.	Field Work on Chemistry & Chemical Engineering
RICHTER PIERCE SHAW, Col.	Field Work on Secret Communication Devices
HICKMAN	Field Work on V-1 Launching
BATES HOYT	Field Work on Metallurgy
RANGER, Lt. Col. CUTTING OMBERG	Field Work in France on Subjects of Interest to the Signal Corps

-6-

BRODE	Field Work on Chemistry & Infrared Devices
JOHNSON BLEAKNEY CLARK, Major	Field Work on Ballistics Research
MAY REESE	Field Work on P.W. Psychology
KELLY	Technical Aide
CUNNINGHAM, Mrs. BOHAN, Miss MILNE, Miss	Secretaries

Relations Between the Scientific and Military Groups

Almost from the very beginning of operations in France, a clear understanding was reached concerning the division of responsibility between the military and the scientific groups of the Alsos Mission.

The task of the scientists was to analyze and evaluate all available material which led to personalities and locations of interest to scientific intelligence. The task of the military was to plan and execute operations, to secure the personalities and locations indicated by the scientific staff and to enable the scientists to investigate these targets.

This arrangement worked out perfectly. Never did the military group question the judgment of the scientific group as to the importance of a target, and never did they fail to execute the operations as needed and planned. It was essential, however, that the Military Chief (Col. B. T. Pash) be given, before each operation, as complete a picture of the scientific interests as possible. A mere description and enumeration of the targets would have been insufficient. On the other hand, the scientists were sometimes handicapped by not always being fully informed of military advances, as the relative importance of targets often depended upon the order in which they might be captured.

-7-

Through the use of an adequate number of vehicles which were kept in excellent running condition, the Mission was absolutely mobile at all times. The Mission requisitioned its own field bases with billeting and messing facilities in Strasbourg, Aachen, Heidelberg, Göttingen and Munich. This independence greatly facilitated the operations of the Mission. It gave its members a freedom of movement which would have been impossible otherwise. It eliminated numerous administrative formalities, which would have caused damaging delays in various field investigations. That the field facilities selected for the Alsos Mission were always the best available is obvious, since Col. Pash and his men were always the first on the scene.

Communications and Direction of the Mission

One of the most serious handicaps and disappointments was the lack of adequate and rapid communication between field teams, bases and headquarters of the Alsos Mission. Telephone communications could not be relied upon, especially during the rapid advances of the Allied forces. Radio or telegraph communications were often ineffective. Not until the situation in a region had become stationary did communication facilities improve. At that time, their urgency in connection with Alsos operations was no longer existent. Often a field team would be without contact with Alsos Headquarters for a week or more.

Under these circumstances, it was impossible for the Scientific Chief to direct the field teams in the details of their operations. Only the planning of a trip could be directed and supervised, but in the investigations themselves, the scientific members often had to make their own independent decisions. Nearly all of the members of the

-8-

DECLASSIFIED
Authority NND 933079

Figure D.33: Samuel A. Goudsmit. 7 December 1945. Report by the Scientific Chief of the Alsos Mission [NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Mission].

Mission were highly competent to take such responsibility.

The difficulties in communications were relieved partially by the fact that the Mission had enough vehicles to establish its own courier service between Headquarters and advance bases. Moreover, field trips during the period of actual combat were planned by the military to include enough vehicles to make courier service possible. In several cases, this was the only certain way of conveying an urgent message.

The communications difficulties of the Alsos Mission could have been overcome almost completely if the Mission had had at its disposal one airplane with crew. This would have permitted almost daily contact with the advance bases and would have considerably improved the all-over coordination of Alsos activities. The flying time between Paris and Heidelberg or between Paris and Göttingen is about two hours - between Heidelberg and Göttingen about one hour. By jeep, at the time of heavy troop movements and difficult bridge crossings, these same trajects took about eleven hours and five hours, respectively.

On a few emergency occasions, members of the Alsos Mission were able to obtain unscheduled air transportation as a result of personal and informal relations with members of USSTAF. At times, it was possible to fly on courier or hospital planes. Later on, when the urgency had long subsided, Alsos members made frequent use of the various ATC shuttle services.

Communications with Washington were also often inadequate, but for different reasons. The situations encountered in the operations varied so often and were frequently so unexpected that it was impossible to convey by means of simple radiograms the problems encountered. Occasional

-9-

instructions received from the Office of Scientific Research and Development or from the War Department in connection with the activities of the Mission were often entirely unrealistic and could not be followed up without seriously hampering the planned operations. This difficulty could have been mitigated considerably if a short, weekly, teletype conference between Paris and Frankfurt and Washington could have been arranged. In spite of urgent requests from the Scientific Chief, such facilities were not made available. Several misunderstandings could have been avoided if this plan had succeeded.

In addition to the Chief of Mission (Colonel B. T. Pash), the administrative details of the Mission were admirably handled by Lt. Colonel G. E. Eckman and by Lt. Colonel R. C. Ham. They were successful in reducing "red tape" to a bare minimum and in otherwise facilitating the work of the scientists.

<u>Relations between Alsos Scientists and Other Intelligence Groups</u>

The report of the Chief of Mission relates the official connections between the Alsos Mission and other intelligence agencies. As far as scientific activities were concerned, informal relations between Alsos scientists and those of other organizations were of primary importance.

Originally, the Alsos Mission included several representatives of the U. S. Navy, who later were absorbed by the Naval Technical Mission in Europe. For about six months, the Paris office of the Alsos Mission was at the U. S. Naval Headquarters in Paris. Whenever they were in Paris, all civilian members and most of the officers of the Alsos Mission were billeted at the Navy hotel. It is obvious that very cordial relations existed, therefore, between scientific and technical investigators of the Navy and of Alsos and that there was an informal and complete

-10-

<u>Scientific Results Obtained by the Alsos Mission</u>

a. <u>The Uranium Project</u>.

The Alsos Mission was the only intelligence team authorized to investigate for United States and British interests the German progress

-15-

on the Atom Bomb. Documents found at Strasbourg indicated that the enemy had made practically no progress in this field, though it had the highest priority of all scientific research projects. The Alsos Mission located all the centers of Uranium research in Germany. The laboratories were investigated and key personnel detained and questioned. The enemy tried in vain to hide essential materials and research reports. They were all recovered by the Alsos Mission. It is certain that complete research data and all key scientists fell into the hands of the Alsos Mission.

The evaluation of the intelligence indicated that the Germans believed that they were far ahead of American development in this field. In reality, the Germans, though they had started sooner, were far behind. They had given up altogether the idea of making a bomb and were concentrating their efforts on constructing an energy producing machine, which they called a "Uranium Burner". At the end of the war, they had not even succeeded in constructing a self-sustaining chain reaction or "pile". Nevertheless, they believed their progress to be so important that they offered to assist United States scientists in their efforts to harness atomic energy. They were convinced that their work would help Germany to dominate the world of science even though the military struggle had been lost. Not until the news of the Atomic Bomb reached them on August 7, 1945, did German scientists realize that they had also lost the war of physics.

the political attitude of several German scientists has also come into the hands of Alsos.

<u>Conclusion</u>

It is the opinion of the Scientific Chief that the Mission has been highly successful. It has taught us lessons in intelligence procedure which may be of great value in peacetime, too. This fact is of greater importance than the actual scientific information which was collected, the bulk of which was negative.

Only the method used by the Alsos Mission could have revealed, immediately after the fall of Strasbourg, that no threat of a German Atom Bomb existed. From a military point of view, this was the most important result obtained by the Mission.

The Alsos method, it must be emphasized, succeeded only because of the close cooperation and mutual trust of the military and the scientists. For all members, this Mission has been a unique undertaking, giving the inner satisfaction of having actively contributed to the success of the Allied cause.

Washington, D.C.
7 December 1945

S. A. GOUDSMIT
Scientific Chief
Alsos Mission

-25-

DECLASSIFIED
Authority NND 933079

NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Mission,
Samuel A. Goudsmit, 7 December 1945,
Report by the Scientific Chief of the Alsos Mission

Figure D.34: Samuel A. Goudsmit. 7 December 1945. Report by the Scientific Chief of the Alsos Mission [NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Mission].

NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1
GERMANY—Research—TA—(1943--June 1946)

W. D., A. G. O. 1 October 19..

...ADQUARTERS, AR... SERVICE FORCES

MEMO ROU...NG SLIP

...ING IN ORDER INDICATED:

...R TITLE	ORGANIZATION	BUILDING AND ROOM	INITIALS / DATE
Major Mattina			DATE 5/11
2			
3			

I have read the accompanying articles and comments. A reading of Dr. Goudsmits Senate Testimon showed me that he kept within his testimony on all points in his articles. It is unfortunate, but unpreventable, that the newspaper article threw the wrong emphasis on Himlers plans for continuing atomic energy in the Bavarian Redoubt. Nevertheless it is true.

I feel Goudsmit is doing us a service by showing the value of our MED organization. It would be utter stupidity to alienate one of the few friends we have among the Atomic Scientists by calling him to task for this.

Lowenhaupt

R

FROM:	NAME	ORGANIZATION	BUILDING AND ROOM	DATE
				TELEPHONE

W. D., A. G. O. Form 0115
1 October 1944

This Form supersedes W. D., A. G. O. Form 0115, 23 March 1944, which may be used until existing stocks are exhausted.

16—31046-2 GPO

Figure D.35: After the war, Goudsmit lived under the threat of government action against him if he made any public statements that deviated significantly from his initial story about the wartime German nuclear program. This memo appears to acknowledge that the real German nuclear program was headed by Heinrich Himmler's SS and was deemed a high priority to the very end of the war. Henry Lowenhaupt to Major Mattina. 11 May 1946. [NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1 GERMANY—Research—TA—(1943–June 1946)].

ADQUARTERS, ARMY SERVICE FORCES

MEMO ROUTI SLIP

NG IN ORDER INDICATED:

TITLE	ORGANIZATION	BUILDING AND ROOM	INITIALS / DATE
Major Mattina			
2 Hawk			HSC
3 Earl Gillitter	DC 44 19/6/46		e VCG

This is a healthy sort of article to have published — showing our superior administrative organization in the U.S.

There is no classified technical info. involved.

Re — "Failure of German Uranium Research — A Documentary Story of the Decline of German Science During the War" — by Dr. S. A. Goudsmit. Told Goudsmit OK

RT

NAME	ORGANIZATION	BUILDING AND ROOM	DATE
FROM: Campbell			TELEPHONE

W.D., A.G.O. Form 0115 1 October 1944 — This Form supersedes W. D., A. G. O. Form 0115, 23 March 1944, which may be used until existing stocks are exhausted. 16—31046-2 GPO

FAILURE OF GERMAN URANIUM RESEARCH - A DOCUMENTARY STORY ON THE DECLINE OF GERMAN SCIENCE DURING THE WAR

by S. A. Goudsmit

If the Germans, before their surrender, had written a "Smyth Report" of their own, it would have been most instructive to compare the German handling of atomic bomb research with the American. Such a report would have brought out the mistakes that doomed the German effort to failure, mistakes which we might have made ourselves and may still make in the future.

There is no German equivalent of our "Smyth Report". But, we can, from the documents and authentic information at our disposal, construct one, though it will lack the tone of optimism and confidence the Germans would have given it. For, Germany's scientists were certain they had left the Allies far behind in the race. Her physicists seriously believed that their results were so important that they could be used to buy a soft peace. The Germans attempted to keep their nuclear research secret and their documents hidden from the Allied experts. As for Allied research, they had not the faintest notion of either its nature or its extent. The news of Hiroshima took the German scientists completely by surprise. It was a greater blow to them than the military defeat.

The most fatal mistake the Germans made was to appoint to key administrative positions in the scientific organization men utterly inadequate to the tasks involved. Active creative scientists are not essential for administrative tasks, but those responsible for policymaking must possess vision and sound judgment. Judgment especially is necessary in choosing advisors and in delegating power. The United States might fall into the same

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

-2-

error by having science controlled by a committee selected solely on the basis of its political or military affiliations. ~~In a letter to a colleague about the original Kilgore Bill of 1942, which proposed government control of science, a German physicist declared that the bill "would kill science in America just as it had been in Germany."~~

Another mistake, one especially typical of one phase of the German Atom Bomb Project, was that of making it a "one-man show". The principal work on the project was dominated by one man, Heisenberg, whose ideas determined what course the uranium research should take. Heisenberg is truly one of the world's greatest physicists and a foremost expert on atomic problems, but a uranium project is beyond the capacities of any single scientist, no matter how eminent. One gathers the impression, however, that the scientists cooperating with Heisenberg never doubted his judgment. In the Allied project, on the contrary, the clashes of opinion among the key scientists were essential to its ultimate success; Oppenheimer was not surrounded by a group of "yes-men".

-3-

To understand the extent of the German failure, we must know something about the organization of scientific research in Germany. During the first half of the war, research in pure science was supervised by a Research Council sponsored by the Department of Education under Minister Rust. The council members were usually competent representatives of the various fields of science. The chairman of the council, Dr. Rudolf Mentzel, was, however, a second-rate chemist whose administrative ability was as totally inadequate as his scientific skill for such a comprehensive task. He was favored by being made? a brigadier general in Himmler's SS.

Practically no war research was done in the early days. Most scientists were drafted into the Army, as they were not considered essential to the war effort. It was thought that the war would last such a short time that new developments were unnecessary.

In 1943, when it became evident that the war would last longer than the Germans had originally anticipated, the Research Council was taken out of the Department of Education and placed directly under Reichsmarshal Göring. The incompetent Mentzel stayed on as Chief Administrator, however, and the reorganization did not improve the quality of research in its relation to the war effort.

A new figure appeared on the horizon of scientific organization. He was likewise a second-rater, an engineer from Hannover named Osenberg. He had an almost psychopathic mania for organization charts and card files. German scientists had expressed in

Figure D.36: Samuel Goudsmit. Failure of German Uranium Research—A Documentary Story of the Decline of German Science During the War. June 1946 draft article for publication [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].

-4-

talks and in writing a great admiration for the United States' Roster of Scientific Personnel and believed that the appointment of Osenberg as chief of a newly created personnel office would solve all their problems. He did, indeed, succeed in convincing the authorities that scientific personnel were more valuable in the laboratory than in the armed forces, and, as a result, a few thousand scientists were released in 1944. At the end of 1944, Göring ordered him to create a unified research organization, comprising all the research facilities of the armed forces, of industry, and of academic institutions. Osenberg gave himself the two? most powerful positions in this "War Research Association", which existed on paper only. Neither industry nor the armed forces cooperated. When Osenberg and his files were captured and removed to Paris for investigation, he was convinced that the Allies would continue to use his services and merely changed his business letterhead to read "z. Zt. Paris" (temporarily in Paris).

Not all research was centralized in the Research Council. More successful in their organization from the very start was the Research Department of the German Air Force. Here, men of vision were in charge, and Nazi party affiliation was not essential. To the very end, they remained totally independent of the other research organizations.

The German Navy had an independent research department which limited its efforts to Navy interests and, towards the end of the war, did excellent work on U-boat problems.

-5-

Chief of Army Research was a certain Professor Erich Schumann. He was Director of the Second Physics Institute of Berlin University, where secret war work had already been in progress for several years before the war. He held the chair for "Military Physics", though his few publications dealt with the physics of musical instruments. His colleagues dubbed him "Professor of Military Music". In 1944, General Keitel, the Chief of Staff, appointed Schumann head of all war research for the armed forces.

Of other research organizations, the only one of interest for this article was the Research Section of the Postal Department, whose normal function was communications research. The Postal Minister was an engineer, Ohnesorge, who not only had the confidence of Hitler but who also managed to be on good terms with Himmler. Needless to say, his judgment on scientific questions was poor.

There was no lack of funds. The Research Council had more than it was able to spend. Half of the 50 million marks available for research in 1944 was not used. The principal expenditures were for research in electronics and the uranium project—about 5 million marks for each.

No description is complete without mentioning the activities of the Gestapo with respect to the Research Program. Osenberg derived his power chiefly from the fact that he was a top member of Section IIIC, the "cultural" department of Himmler's SD. Files which he tried to hide showed that, in all institutes and at all meetings, he had informers who reported to him on the value of the research, the personal obstacles, the lack of progress, the flaws in organization, and similar gossip.

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

-6-

The incompetents who headed the research effort caused serious trouble for the scientists. Money and apparatus were given to crackpots. There were actually held meetings to decide whether certain fields of physics conformed with Nazi philosophy. Such activities hampered the work of the real scientists, who usually found themselves on the wrong side of the argument.

Early in 1939, soon after the discovery of uranium fission by Otto Hahn, physicists in many countries tried to draw the attention of government authorities to the unusual importance of the uranium problem and its probable military implications. In Germany, official recognition of the problem came sooner than it did in the United States.

The Army Ordnance Research Section under Schumann began immediate secret research on the possibilities of an atom bomb. Independently, a group of six physicists, in April 1939, held a secret meeting, sponsored by the Department of Education's Research Council. They decided to create an informal secret "Uranium Club" made up of scientists who would concentrate their efforts on the atomic bomb and energy problem. Otto Hahn and Heisenberg were not present at this original meeting, joining the "U-Club" later.

In the summer of 1939, Heisenberg was invited to the United States. Back in Germany, he reported, on the basis of his observations, that there was no official interest in the uranium problem in the United States in spite of the extensive nuclear physics research being carried on at all American universities. Another visitor, the nuclear physicist Bothe, also travelled around the country that summer, probably equally surprised at what he thought was our lack of insight. Though Heisenberg and Bothe saw practically all physicists in the country, they kept the existence of the German "U-Club" a secret and did not drop the slightest hint that they were actively working on the uranium problem.

Chief of the "U-Club" was one Abraham Esau. He was president of the German equivalent of our Bureau of Standards, representative for physics on the Research Council, and an ardent Nazi. But, he was a complete outsider in matters of atomic physics.

In September 1939 came the inevitable clash between Esau and Schumann. Esau wanted to earmark all available uranium for his experiments but discovered, to his surprise, that Army Ordnance had

Figure D.37: Samuel Goudsmit. Failure of German Uranium Research—A Documentary Story of the Decline of German Science During the War. June 1946 draft article for publication [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].

-7-

already monopolized it. Moreover, Esau was ordered to stop uranium research at his Bureau of Standards. The fight ended in a compromise which, in the long run, was a victory for Esau. He remained, until the beginning of 1944, a powerful dictator on uranium research, heartily disliked by most of the active scientists on the project.

Headquarters of the "U-Club" was the Kaiser Wilhelm Institute for Physics in Berlin. Its director, Debye, was a Hollander, who refused to give up his Dutch citizenship and to have anything to do with secret work in his institute. He was granted a leave of absence and came to the United States.

Heisenberg, who was a professor at Leipzig, began to divide his time between Leipzig and Berlin and later became acting director of the Institute in Berlin. He took charge of the actual research on the uranium problem and had the cooperation of the best atomic experts in Germany. All in all, the "U-Club" included fewer than one hundred research scientists. Though the brains of the research was at Berlin, the experimental work was not centralized. Important work was done at the Kaiser Wilhelm Institute in Heidelberg under the guidance of the excellent experimenter, Bothe. Several physics laboratories at other universities, such as Munich, Hamburg, Vienna, were also part of the organization. Some of the laboratories received funds from the Air Force research organization to pursue nuclear physics investigations.

Competing with this group of mostly first-class physicists was the research work done by Army Ordnance. Its chief experimenter was Diebner, who was assisted by half a dozen equally poor scientists.

-8-

Their rather primitive laboratory was on the Ordnance Proving Ground at Kummersdorf, near Berlin. Schumann and Diebner appeared in Paris shortly after its occupation and intended to move the French cyclotron to Germany. This plan was given up, and, instead, Esau sent German physicists to Paris to do research work there.

Sometime early in the war, the Postal Department also engaged in uranium research, adding to the lack of coordination. It came about in this way. There lived in Berlin a self-made, first-rate technician and business man, the snobbish Baron Manfred von Ardenne. He was an expert in the construction of cyclotrons and other important research apparatus, but he was not a scientist. Von Ardenne succeeded in interesting the gullible Postal Minister, Ohnesorge, who fell for the popular notion that uranium energy might be developed in a short time and be used to run automobiles and revolutionize German economics. Ohnesorge is supposed to be the one who told Hitler and his staff about the wonders to be expected from these investigations, including the bomb. In official circles, Von Ardenne was, for a time, considered the expert on atomic physics in Germany, much to the chagrin of the "U-Club" members.

In spite of the jealousies among the various groups, there was complete exchange of secret information among them. Until late 1943, all research reports were reproduced and distributed by the Army Ordnance Research Section, a task taken over later by the representative for nuclear physics on the Research Council.

Early in 1942, the scientists began to see that their uranium project needed wider recognition and more support. A momentous meeting was planned for February 26, 1943, where the unprecedented

-9-

implications of the uranium problem were to be brought to the attention of the country's highest officials. Sponsored jointly by the Minister of Education, Rust, and by the Chief of Army Ordnance, General Leeb, this secret meeting took place in the headquarters of the Research Council, later to become the headquarters of our 82nd Airborne Division when it occupied Berlin. Schumann opened the session with a discussion of "Nuclear Physics as a Weapon". The closing talk was by Esau on "Wider Government and Industrial Participation for the Support of Nuclear Physics". Six additional technical lectures on the uranium problem were given by Otto Hahn, Heisenberg, Bothe, and other speakers.

The secret letter of invitation reads in part, "....there will be discussed a series of important questions in nuclear physics, which, so far, have been mainly investigated in secrecy because of their significance for the defense of the country. Of especial interest in this respect is the problem of utilization of atomic energy. I believe that I may assume your interest in this meeting, because the solution of these problems may become of extraordinary significance for German Armament industry and eventually for the whole German economy...."

Most of the high officials declined the invitation. The Chief of Staff, General Keitel, stated that he was too busy and would "let himself be informed about the results." The Naval Chief of Staff, Admiral Raeder, sent a representative.

The many refusals may well have been due to the dinner menu which was sent with the invitation, some sort of scientific repast of frozen pork and vegetables prepared with synthetic fat.

-10-

It is doubtful whether this meeting helped win more support for the uranium project.

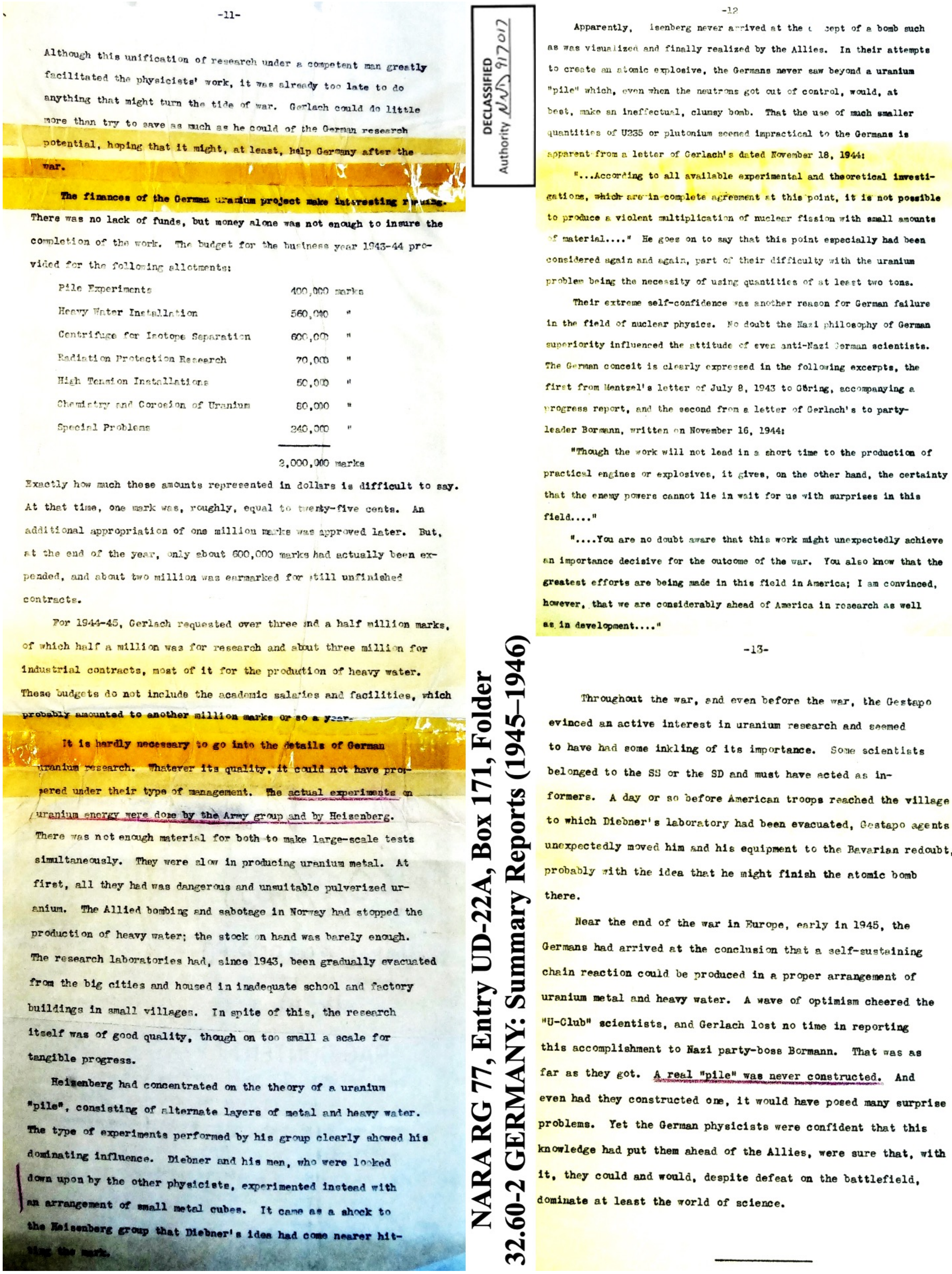
A significant contrast to the German atomic bomb effort is afforded by the administrative history of the American project as described in the "Smyth Report". Our project enjoyed President Roosevelt's keen and unflagging interest, the full support and understanding of the highest military authorities and scientists in policymaking positions, who were objective and perceptive in weighing the ideas of the research personnel. These were the men who supported and guided American nuclear research, while German effort was being hamstrung by an incompetent Mentzel, a gullible Ohnesorge, a heedless Keitel. There is no more damning evidence of the fallacy of German superior organizing talent than their handling of their uranium project. Many of us still persist in admiring German organizational methods. Yet, even the better German scientists were themselves aware of their shortcomings. They talked and wrote, warning the German authorities that the Americans had surpassed them both in scientific achievement and in organizing skill. It did no good. And the German scientists, giving up, finally settled down to a passive policy of "putting the war in the service of science," instead of the reverse.

Early in 1944, there took place a significant reorganization of the uranium project. Walther Gerlach, one of the best of the German experimental physicists, replaced Abraham Esau. Schumann and the Army having apparently given up hope that their uranium research would lead to success, the Army research group was turned over to the Research Council to work, thenceforth, under Gerlach.

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.38: Samuel Goudsmit. Failure of German Uranium Research—A Documentary Story of the Decline of German Science During the War. June 1946 draft article for publication [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].



-11-

Although this unification of research under a competent man greatly facilitated the physicists' work, it was already too late to do anything that might turn the tide of war. Gerlach could do little more than try to save as much as he could of the German research potential, hoping that it might, at least, help Germany after the war.

The finances of the German uranium project make interesting reading. There was no lack of funds, but money alone was not enough to insure the completion of the work. The budget for the business year 1943-44 provided for the following allotments:

Pile Experiments	400,000 marks
Heavy Water Installation	560,000 "
Centrifuge for Isotope Separation	600,000 "
Radiation Protection Research	70,000 "
High Tension Installations	50,000 "
Chemistry and Corrosion of Uranium	80,000 "
Special Problems	240,000 "
	2,000,000 marks

Exactly how much these amounts represented in dollars is difficult to say. At that time, one mark was, roughly, equal to twenty-five cents. An additional appropriation of one million marks was approved later. But, at the end of the year, only about 600,000 marks had actually been expended, and about two million was earmarked for still unfinished contracts.

For 1944-45, Gerlach requested over three and a half million marks, of which half a million was for research and about three million for industrial contracts, most of it for the production of heavy water. These budgets do not include the academic salaries and facilities, which probably amounted to another million marks or so a year.

It is hardly necessary to go into the details of German uranium research. Whatever its quality, it could not have prospered under their type of management. The actual experiments on uranium energy were done by the Army group and by Heisenberg. There was not enough material for both to make large-scale tests simultaneously. They were slow in producing uranium metal. At first, all they had was dangerous and unsuitable pulverized uranium. The Allied bombing and sabotage in Norway had stopped the production of heavy water; the stock on hand was barely enough. The research laboratories had, since 1943, been gradually evacuated from the big cities and housed in inadequate school and factory buildings in small villages. In spite of this, the research itself was of good quality, though on too small a scale for tangible progress.

Heisenberg had concentrated on the theory of a uranium "pile", consisting of alternate layers of metal and heavy water. The type of experiments performed by his group clearly showed his dominating influence. Diebner and his men, who were looked down upon by the other physicists, experimented instead with an arrangement of small metal cubes. It came as a shock to the Heisenberg group that Diebner's idea had come nearer hitting the mark.

DECLASSIFIED
Authority NND 917017

-12

Apparently, isenberg never arrived at the c cept of a bomb such as was visualized and finally realized by the Allies. In their attempts to create an atomic explosive, the Germans never saw beyond a uranium "pile" which, even when the neutrons got out of control, would, at best, make an ineffectual, clumsy bomb. That the use of much smaller quantities of U235 or plutonium seemed impractical to the Germans is apparent from a letter of Gerlach's dated November 18, 1944:

"...According to all available experimental and theoretical investigations, which are in complete agreement at this point, it is not possible to produce a violent multiplication of nuclear fission with small amounts of material...." He goes on to say that this point especially had been considered again and again, part of their difficulty with the uranium problem being the necessity of using quantities of at least two tons.

Their extreme self-confidence was another reason for German failure in the field of nuclear physics. No doubt the Nazi philosophy of German superiority influenced the attitude of even anti-Nazi German scientists. The German conceit is clearly expressed in the following excerpts, the first from Mentzel's letter of July 8, 1943 to Göring, accompanying a progress report, and the second from a letter of Gerlach's to party-leader Bormann, written on November 16, 1944:

"Though the work will not lead in a short time to the production of practical engines or explosives, it gives, on the other hand, the certainty that the enemy powers cannot lie in wait for us with surprises in this field...."

"....You are no doubt aware that this work might unexpectedly achieve an importance decisive for the outcome of the war. You also know that the greatest efforts are being made in this field in America; I am convinced, however, that we are considerably ahead of America in research as well as in development...."

-13-

Throughout the war, and even before the war, the Gestapo evinced an active interest in uranium research and seemed to have had some inkling of its importance. Some scientists belonged to the SS or the SD and must have acted as informers. A day or so before American troops reached the village to which Diebner's laboratory had been evacuated, Gestapo agents unexpectedly moved him and his equipment to the Bavarian redoubt, probably with the idea that he might finish the atomic bomb there.

Near the end of the war in Europe, early in 1945, the Germans had arrived at the conclusion that a self-sustaining chain reaction could be produced in a proper arrangement of uranium metal and heavy water. A wave of optimism cheered the "U-Club" scientists, and Gerlach lost no time in reporting this accomplishment to Nazi party-boss Bormann. That was as far as they got. A real "pile" was never constructed. And even had they constructed one, it would have posed many surprise problems. Yet the German physicists were confident that this knowledge had put them ahead of the Allies, were sure that, with it, they could and would, despite defeat on the battlefield, dominate at least the world of science.

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)

Figure D.39: Samuel Goudsmit. Failure of German Uranium Research—A Documentary Story of the Decline of German Science During the War. June 1946 draft article for publication [NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 GERMANY: Summary Reports (1945–1946)].

Samuel A. Goudsmit. 1947. *Alsos.* New York: Henry Schuman.

[pp. 11–12]: If only we could get hold of a German atomic physicist, we felt, we could soon find out what the rest of them were up to. To us physicists the problem seemed very simple. Even those of us who were not working on the atom bomb project knew pretty well what was going on over here. No amount of military security could have prevented us from knowing, difficult as it was for the military to understand this. Active scientists engaged in the same general field of research inevitably form a kind of clan; they work closely together and know all about each other's specialties and whereabouts. [...] The same thing, we knew, would be true of the Germans.

[pp. 31–33]: There are still a few secrets which members of the Mission are not supposed to reveal. We are not supposed to tell just who among the Army personnel were directly connected with the A-bomb Intelligence. We cannot divulge how much uranium and heavy water was found in Germany and what was done with it. We helped find it, but never knew how much it was until later press dispatches from Germany told us about it. [...]

To an outsider, a professor is a professor, but we knew that no one but Professor Heisenberg could be the brains of a German uranium project and every physicist throughout the world knew that.

There are people who ask us every so often, whether we are absolutely sure we now know everything the Germans did. How can we be sure that somewhere in Germany, still hidden, there isn't a group of men, whom we have never heard of, secretly manufacturing atom bombs even now. There were even Intelligence reports referring to such a possibility. During the time the Russians occupied the Danish island of Bornholm, one heard frequent official and unofficial rumors to the effect that there was a group of German scientists on the island who had completed an atom bomb. We came across similar rumors frequently during our investigations.

I still do not know how to explain the absurdity of these rumors and how to convince non-scientists. Possibly a paper hanger can become a military expert, and a wine merchant a diplomat; but an outsider simply can't acquire the necessary scientific knowledge for making an atom bomb overnight. We are always told, with some exaggeration, that only a dozen people in the world understand Einstein. It follows that at least one of that dozen must be included in any atom bomb project since its construction is so closely tied up with Einstein's theory! In other words, we knew who our chief targets were in Germany before we started. What we had to find out was how far they had advanced on their atom bomb project.

[pp. 80–83]: The director at that Medical Institute was the famous organic chemist, Richard Kuhn. When the chemists with our Mission, Professors Louis Fieser of Harvard and Carl Baumann of Wisconsin, met him, Kuhn was most co-operative. They had known him before and he welcomed them back in his laboratory. He told them that he had no connection with war work, but that it was all directed by the chemist Thiessen in Berlin. He had no secret reports and had merely worked on the chemistry of modern drugs. [...]

Richard Kuhn's record did not seem too clean to me. As president of the German Chemical Society he had followed the Nazi cult and rites quite faithfully. [...] I could not believe that he was not familiar with important war work, although I had no time to look into this matter further. We knew, however, that he had been one of the administration bosses of German war chemistry, and later in Berlin Baumann discovered some valuable secret reports on applied chemistry which were no doubt familiar to Kuhn. Back in Heidelberg we had him picked up by one of our officers.

I showed him the secret reports, and reproached him for not having told us about them half a year earlier, when he knew all the time what we were after and when he acted as if he were co-operating with us. [...]

It was quite important. It contained articles on industrially valuable applications of chemistry, such as the production of plastics, asbestos, the use of coal tar, aluminum, cellulose, sulfur, etc. This rare set of documents is now in the possession of the American Chemical Society, and I am still sore for allowing myself to be fooled by Herr Kuhn. We could have got these documents in April instead of September.

[pp. 112]: A few days afterward Munich fell. Here Carl Baumann, accompanied by a few officers and men, located Walther Gerlach, who had been in charge of nuclear research and all physics research for the last year. He also discovered Diebner and the uranium, which the Gestapo had taken from the secret laboratory in Thüringen, and brought back more interesting documents.

[pp. 121–122]: [Gerlach's] only wish was to save and to promote German physics without the help or obstruction of the Nazis. [...] But it was all too late. The war was over before Gerlach's influence took hold.

We could get nothing out of Diebner. He was as sullen as a real prisoner. He must have felt like an outcast, living in the same house with members of the Heisenberg clique. Their conversations with him were limited to monosyllables.

[pp. 123–126]: It was not until late in July that a small Alsos group was allowed to enter Berlin. As we expected, we found no new information but what we learned was very satisfying. It was like the last pieces of a jigsaw puzzle; the pieces of haphazard information we gathered completed the picture, plugged up a few minor holes, but the pattern remained the same.

We found, for instance, the chief chemist of the Auer Chemical Company, for whom we had been looking ever since we had entered Belgium. But he could tell us nothing we did not already know, nor could the few industrial physicists who still remained in Berlin. The Gestapo scientists had all cleared out before our arrival, some of them leaving sufficient clues in their deserted homes for us to track them down later. [...]

Our chief visit was, of course, to the now empty Kaiser Wilhelm Institute for Physics, where the uranium research had started in 1939. [...] We went in and found one room furnished with two desks and one officer. [...] He did not understand our interest in this building.

"It's all empty," he said. "Everything, even switches and wiring, has been removed by the Russians. We found some junk which we dumped in the back yard." [...]

We inspected the place thoroughly. The backyard "junk" contained various pieces of equipment for nuclear physics as well as blocks of pressed uranium oxide. There were also some notebooks indicating the type of research that had been going on.

[pp. 142–145]: Army research was conducted by the Ordnance Department headed by the mediocre physicist, Erich Schumann. Professor Schumann's right hand man was Diebner. [...]

Schumann was actually professor of military physics at the University of Berlin, although his few publications deal only with the vibrations of piano strings—an interest derived, presumably, from the fact that he was a descendant of the composer, Schumann.[...]

In Schumann's case, the work had been shrouded in secrecy even before the war, and so no one knew quite what was going on in the Second Institute, although the first rate physicists knew, from the type of personnel he was using, it could not be very important or successful. [...]

But the uranium problem is rather more difficult than the mysteries of piano strings and Schumann became impatient. By the end of 1942 he had lost interest in the project; he turned Diebner, personnel, equipment and material over to the civilian research organization, the Reich's Research Council, which had just been placed under Goering. He did not, however, turn over the two million marks his research group had been granted by the Army.

Schumann next devoted his talents to bacterial warfare. It is probable that in this field his competence was even less than in physics and its wartime applications. But he liked to be involved in things that looked important and his name shows up on many rosters of research committees.

When Berlin fell, Schumann fled to Bavaria. The Alsos Mission followed his trail for a short while, mainly out of curiousity, but we soon gave up. He was so obviously unimportant.

[pp. 160, 164–166]: As scientific adviser to Army Ordnance, Professor Schumann made immediate preparations for secret research into the uranium problem with a view to producing the super-explosive. But he himself was only a second-rate physicist, and his helpers were not much better. [...]

What made this even more irritating was that the academic scientists considered Schumann and his group far below their level. They thought it outrageous that such men should be given so much power, and felt certain that they would never succeed in their researches. [...]

Von Ardenne was not a physicist in the German academic sense, but he was a first-rate experimenter; a designer and builder of important laboratory apparatus, and a successful business man. He found out that the Postal Department had a research section with a large budget that was not being used. Contacting Ohnesorge, the gullible Postal Minister, he told him all about the wonders of atomic power and explosives.

And so it came about that Von Ardenne's Berlin laboratory was made a branch of Postal Research, and Ohnesorge, at a cabinet meeting, informed Hitler about the uranium bomb. [...]

For a time the technician Baron Manfred von Ardenne was the official expert on nuclear physics to the Nazi government. Even today the academic physicists refer to this as one of the severest insults they ever received from the government, and the reason for some of them becoming anti-Nazi. "If only the government had taken the true scientists into its confidence instead of those charlatans like Von Ardenne and Schumann," they complained to us on the Alsos Mission. [...]

The real brains of the project was Werner Heisenberg.

[pp. 176–177]: They knew, of course, of the possibility of a U-235 bomb, but they considered it practically impossible to separate pure U-235. One can hardly blame them for this. Perhaps only in America could one have visualized and realized an Oak Ridge, where pure U-235 was produced by the huge combined efforts of science, engineering, industry, and the Army. No such vision was apparent among the German scientists and certainly no such gigantic combination of all forces working on all cylinders.

Furthermore, the Germans never thought of using plutonium in the bomb, which enormously simplified the problem. The existence and probable properties of plutonium, though still unnamed, had been mentioned in scientific literature before the war, and in a few German secret reports, but they overlooked the practical phase of this side of the problem completely.

In fact, the whole German idea of the bomb was quite different from ours and more primitive in its conception. They thought that it might eventually be possible to construct a pile in which the chain reaction went so fast that it would produce an explosion. Their bomb, that is, was merely an explosive pile and would have proved a fizz compared to the real bomb.

[pp. 201–202:] During the war the SS had a few technical research laboratories of its own, under the direction of an SS-General Schwab, but these did not amount to anything. They tried some work on heavy water, but soon gave up and sent their "expert" on this subject to the University of Hamburg to continue his work with the legitimate physicists.

The principal "scientific" interest of the SS was ancient Germanic history, with a view to proving the greatness of their Teutonic ancestry. It was for this purpose that Himmler created his own "scientific academy" in 1935, Das Ahnenerbe, or Academy of Ancestral Heritage. Because some of the activities of this strange academy were shrouded in mystery that might just possibly have concealed something really important, we assigned Carl Baumann to make a thorough investigation of the organization for Alsos.

Except for Himmler's letter to hangman Heydrich about the physicist Heisenberg, [...] Baumann did not discover anything connected with atomic research in the Ahnenerbe material. [...]

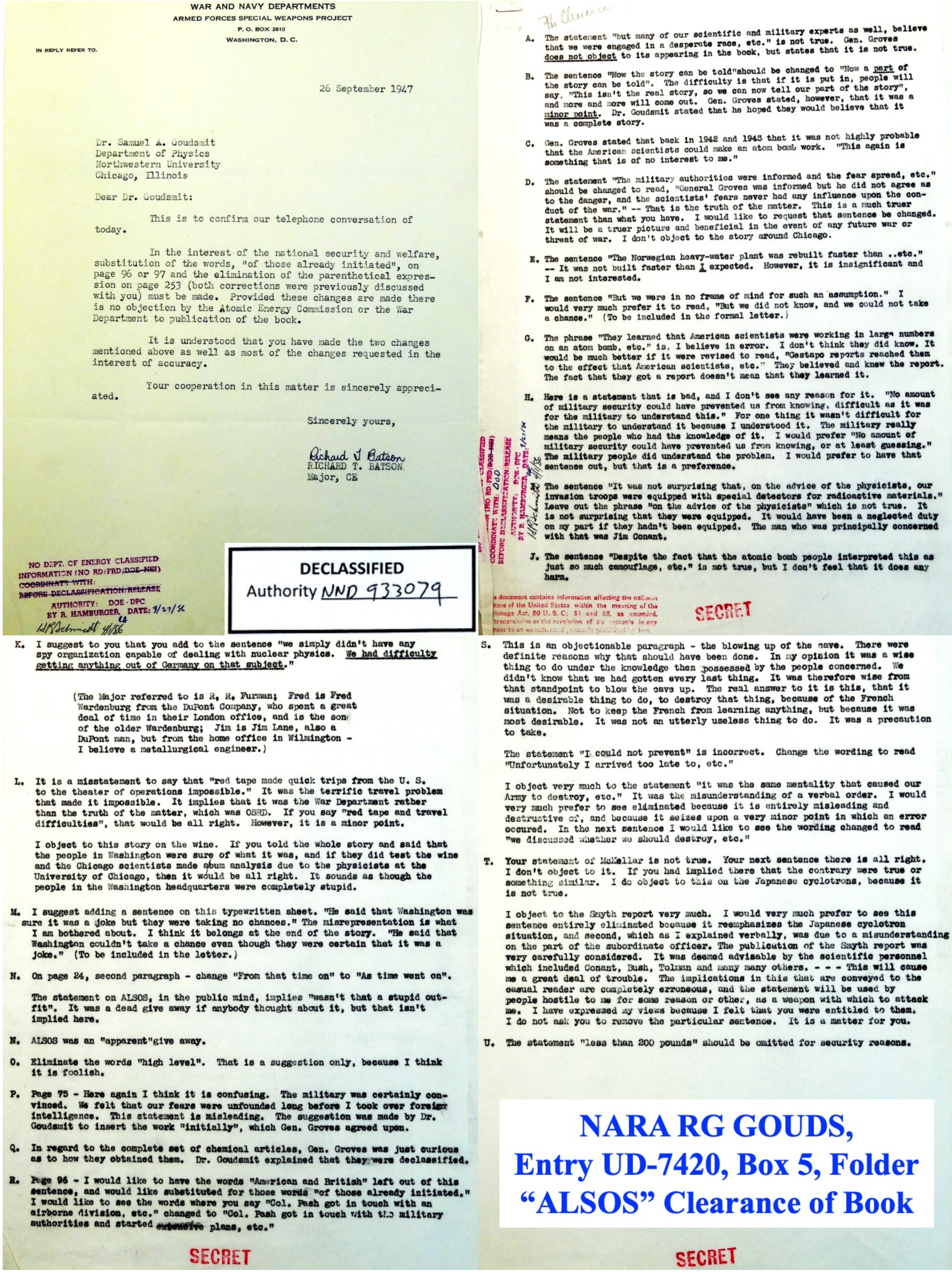
[In his 1947 book, Samuel Goudsmit repeated the erroneous claims he had made when he knowingly gave false testimony to the United States Senate in December 1945 (pp. 3315–3323). Goudsmit would have been well aware that his claims were false based on documents from Alsos's own files, including but not limited to those listed on p. 3316.

In this book publicly praising his own performance, Goudsmit also conveniently failed to include many details such as those listed on p. 3325.

Due to censorship in 1947, Goudsmit could only refer to Major Robert Furman as the "Mysterious Major," and he could not mention the specific quantities of uranium that had been found. In their books written much later, in the 1960s, Groves and Pash were able to mention the name of Robert Furman and the specific quantities of uranium.

Even as Goudsmit complained about the "absurdity" of people asking him if he might have overlooked any German scientists who could build atomic bombs, in 1947 there were literally hundreds of German scientists whom Goudsmit had overlooked and who were developing the Soviet Union's first atomic bombs.

Goudsmit's opinion that (unlike America) Germany was incapable of "huge combined efforts of science, engineering, industry, and the Army" is clearly contradicted by a number of massive and very successful German programs that involved all of those sectors: the missile programs, the nerve gas program, the jet programs, programs that developed and mass-produced synthetic fuels and rubber, and many others. In fact, whereas the United States was still very new to that sort of approach, it had been the foundation of German research and development for many decades.]



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

IN REPLY REFER TO.

26 September 1947

Dr. Samuel A. Goudsmit
Department of Physics
Northwestern University
Chicago, Illinois

Dear Dr. Goudsmit:

This is to confirm our telephone conversation of today.

In the interest of the national security and welfare, substitution of the words, "of those already initiated", on page 96 or 97 and the elimination of the parenthetical expression on page 253 (both corrections were previously discussed with you) must be made. Provided these changes are made there is no objection by the Atomic Energy Commission or the War Department to publication of the book.

It is understood that you have made the two changes mentioned above as well as most of the changes requested in the interest of accuracy.

Your cooperation in this matter is sincerely appreciated.

Sincerely yours,

Richard T. Batson
RICHARD T. BATSON
Major, CE

NO DEPT. OF ENERGY CLASSIFIED INFORMATION (NO RD/FRD/~~DOE-NSI~~)
~~COORDINATE WITH:~~
~~BEFORE DECLASSIFICATION/RELEASE~~
AUTHORITY: DOE-DPC
BY R. HAMBURGER DATE: 3/27/86
H.R. Schmidt 4/1/86

DECLASSIFIED
Authority NND 933079

A. The statement "but many of our scientific and military experts as well, believe that we were engaged in a desperate race, etc." is not true. Gen. Groves does not object to its appearing in the book, but states that it is not true.

B. The sentence "Now the story can be told"should be changed to "Now a part of the story can be told". The difficulty is that if it is put in, people will say, "This isn't the real story, so we can now tell our part of the story", and more and more will come out. Gen. Groves stated, however, that it was a minor point. Dr. Goudsmit stated that he hoped they would believe that it was a complete story.

C. Gen. Groves stated that back in 1942 and 1943 that it was not highly probable that the American scientists could make an atom bomb work. "This again is something that is of no interest to me."

D. The statement "The military authorities were informed and the fear spread, etc." should be changed to read, "General Groves was informed but he did not agree as to the danger, and the scientists' fears never had any influence upon the conduct of the war." -- That is the truth of the matter. This is a much truer statement than what you have. I would like to request that sentence be changed. It will be a truer picture and beneficial in the event of any future war or threat of war. I don't object to the story around Chicago.

E. The sentence "The Norwegian heavy-water plant was rebuilt faster than ..etc." -- It was not built faster than I expected. However, it is insignificant and I am not interested.

F. The sentence "But we were in no frame of mind for such an assumption." I would very much prefer it to read, "But we did not know, and we could not take a chance." (To be included in the formal letter.)

G. The phrase "They learned that American scientists were working in large numbers on an atom bomb, etc." is, I believe in error. I don't think they did know. It would be much better if it were revised to read, "Gestapo reports reached them to the effect that American scientists, etc." They believed and knew the report. The fact that they got a report doesn't mean that they learned it.

H. Here is a statement that is bad, and I don't see any reason for it. "No amount of military security could have prevented us from knowing, difficult as it was for the military to understand this." For one thing it wasn't difficult for the military to understand it because I understood it. The military really means the people who had the knowledge of it. I would prefer "No amount of military security could have prevented us from knowing, or at least guessing." The military people did understand the problem. I would prefer to have that sentence out, but that is a preference.

I. The sentence "It was not surprising that, on the advice of the physicists, our invasion troops were equipped with special detectors for radioactive materials." Leave out the phrase "on the advice of the physicists" which is not true. It is not surprising that they were equipped. It would have been a neglected duty on my part if they hadn't been equipped. The man who was principally concerned with that was Jim Conant.

J. The sentence "Despite the fact that the atomic bomb people interpreted this as just so much camouflage, etc." is not true, but I don't feel that it does any harm.

SECRET

K. I suggest to you that you add to the sentence "we simply didn't have any spy organization capable of dealing with nuclear physics. We had difficulty getting anything out of Germany on that subject."

(The Major referred to is R, R, Furman; Fred is Fred Wardenburg from the DuPont Company, who spent a great deal of time in their London office, and is the son of the older Wardenburg; Jim is Jim Lane, also a DuPont man, but from the home office in Wilmington - I believe a metallurgical engineer.)

L. It is a misstatement to say that "red tape made quick trips from the U. S. to the theater of operations impossible." It was the terrific travel problem that made it impossible. It implies that it was the War Department rather than the truth of the matter, which was OSRD. If you say "red tape and travel difficulties", that would be all right. However, it is a minor point.

I object to this story on the wine. If you told the whole story and said that the people in Washington were sure of what it was, and if they did test the wine and the Chicago scientists made some analysis due to the physicists at the University of Chicago, then it would be all right. It sounds as though the people in the Washington headquarters were completely stupid.

M. I suggest adding a sentence on this typewritten sheet. "He said that Washington was sure it was a joke but they were taking no chances." The misrepresentation is what I am bothered about. I think it belongs at the end of the story. "He said that Washington couldn't take a chance even though they were certain that it was a joke." (To be included in the letter.)

N. On page 24, second paragraph - change "From that time on" to "As time went on".

The statement on ALSOS, in the public mind, implies "wasn't that a stupid outfit". It was a dead give away if anybody thought about it, but that isn't implied here.

N. ALSOS was an "apparent"give away.

O. Eliminate the words "high level". That is a suggestion only, because I think it is foolish.

P. Page 75 - Here again I think it is confusing. The military was certainly convinced. We felt that our fears were unfounded long before I took over foreign intelligence. This statement is misleading. The suggestion was made by Dr. Goudsmit to insert the work "initially", which Gen. Groves agreed upon.

Q. In regard to the complete set of chemical articles, Gen. Groves was just curious as to how they obtained them. Dr. Goudsmit explained that they were declassified.

R. Page 96 - I would like to have the words "American and British" left out of this sentence, and would like substituted for those words "of those already initiated." I would like to see the words where you say "Col. Pash got in touch with an airborne division, etc." changed to "Col. Pash got in touch with the military authorities and started ~~extensive~~ plans, etc."

SECRET

S. This is an objectionable paragraph - the blowing up of the cave. There were definite reasons why that should have been done. In my opinion it was a wise thing to do under the knowledge then possessed by the people concerned. We didn't know that we had gotten every last thing. It was therefore wise from that standpoint to blow the cave up. The real answer to it is this, that it was a desirable thing to do, to destroy that thing, because of the French situation. Not to keep the French from learning anything, but because it was most desirable. It was not an utterly useless thing to do. It was a precaution to take.

The statement "I could not prevent" is incorrect. Change the wording to read "Unfortunately I arrived too late to, etc."

I object very much to the statement "it was the same mentality that caused our Army to destroy, etc." It was the misunderstanding of a verbal order. I would very much prefer to see eliminated because it is entirely misleading and destructive of, and because it seizes upon a very minor point in which an error occured. In the next sentence I would like to see the wording changed to read "we discussed whether we should destroy, etc."

T. Your statement of McKellar is not true. Your next sentence there is all right. I don't object to it. If you had implied there that the contrary were true or something similar. I do object to this on the Japanese cyclotrons, because it is not true.

I object to the Smyth report very much. I would very much prefer to see this sentence entirely eliminated because it reemphasizes the Japanese cyclotron situation, and second, which as I explained verbally, was due to a misunderstanding on the part of the subordinate officer. The publication of the Smyth report was very carefully considered. It was deemed advisable by the scientific personnel which included Conant, Bush, Tolman and many many others. - - - This will cause me a great deal of trouble. The implications in this that are conveyed to the casual reader are completely erroneous, and the statement will be used by people hostile to me for some reason or other, as a weapon with which to attack me. I have expressed my views because I felt that you were entitled to them. I do not ask you to remove the particular sentence. It is a matter for you.

U. The statement "less than 200 pounds" should be omitted for security reasons.

NARA RG GOUDS,
Entry UD-7420, Box 5, Folder
"ALSOS" Clearance of Book

SECRET

Figure D.40: Example of U.S. government censorship of Samuel Goudsmit's 1947 book, *Alsos* [NARA RG GOUDS, Entry UD-7420, Box 5, Folder "ALSOS" Clearance of Book]. "The sentence 'Now the story can be told' should be changed to 'Now a part of the story can be told'. The difficulty is that if it is put in, people will say, 'This isn't the real story, so we can now tell our part of the story', and more and more will come out... Dr. Goudsmit stated that he hoped they would believe that it was a complete story."

Boris T. Pash. 1969. *The Alsos Mission.* New York: Award House.

[pp. 156–158:] Our scientists soon joined us in Strasbourg. Bob Furman and Lt. Tony Biot, a Navy physicist, had already arrived. Sam Goudsmit and Fred Wardenberg reported two days later.

[...] Our scientific sleuths were more than usually agitated by the material probed although they would be the last to admit it. After a while, I heard Sam Goudsmit exclaim, "We've got it!"

"I know we have it," I remarked. "But do they?"

The two scientists were the only ones who knew to what I was referring. They smiled, and Sam Goudsmit's eyes were wide with excitement.

"No, no!" he said. "That's it. They don't!" The scientists remained up far into the night, poring over the papers. [...]

Interrogation of the captured scientists, study of the seized documents and inspection of the laboratories took several days. But the two days during which Sam Goudsmit, Fred Wardenberg and Bob Furman worked on our priority interest were as important to our top leaders and to the British as any other phase of the war. It was our Strasbourg operation which disclosed that it was unlikely that the Nazi could unleash an atom bomb in the near future.

Thus Alsos exploded the Nazi super-weapon myth that had so alarmed Allied leaders. The fact that a German atom bomb was not an immediate threat was probably the most significant single piece of military intelligence developed throughout the war. Alone, that information was enough to fully justify Alsos. [...]

[p. 162, early December 1944:] But in Paris I learned there was to be no rest for any of us. It was my turn to be called back to Washington, Sam Goudsmit having already preceded me there. He had left without designating a replacement for himself. Fortunately, among the scientists who had joined us for the Strasbourg operation was Dr. Henry Reid, an able and pleasant engineer.

After a conference with Commodore Schade, I asked Reid to assume the duties of Deputy Scientific Chief. This proved a good move. Henry's organizational and administrative skills were to be of great value to us during the winter of 1944–45 when the unit was rapidly expanding.

In Washington, the status of our scientists and their activities were the primary concern, formally and informally. While no one made any comments which could imply criticism, it was evident that some rumblings from the field might not have been complimentary.

Sam and I soon cleared the air. Even those previously hostile were mollified by our reports. [...]

[pp. 216–218:] In Hechingen, the entire Alsos scientific contingent was interrogating the German scientists and trying to locate significant lab reports and documents. [...]

Upon our return we learned that the secreted uranium of the Haigerloch pile, as well as the supply of heavy water, was buried near an old water-drive grist mill outside town. [...]

The 1269th provided trucks that hauled the uranium and heavy water, along with recovered graphite, to SHAEF Scientific Section for transhipment to the United States.

Thus ended Operation Big.

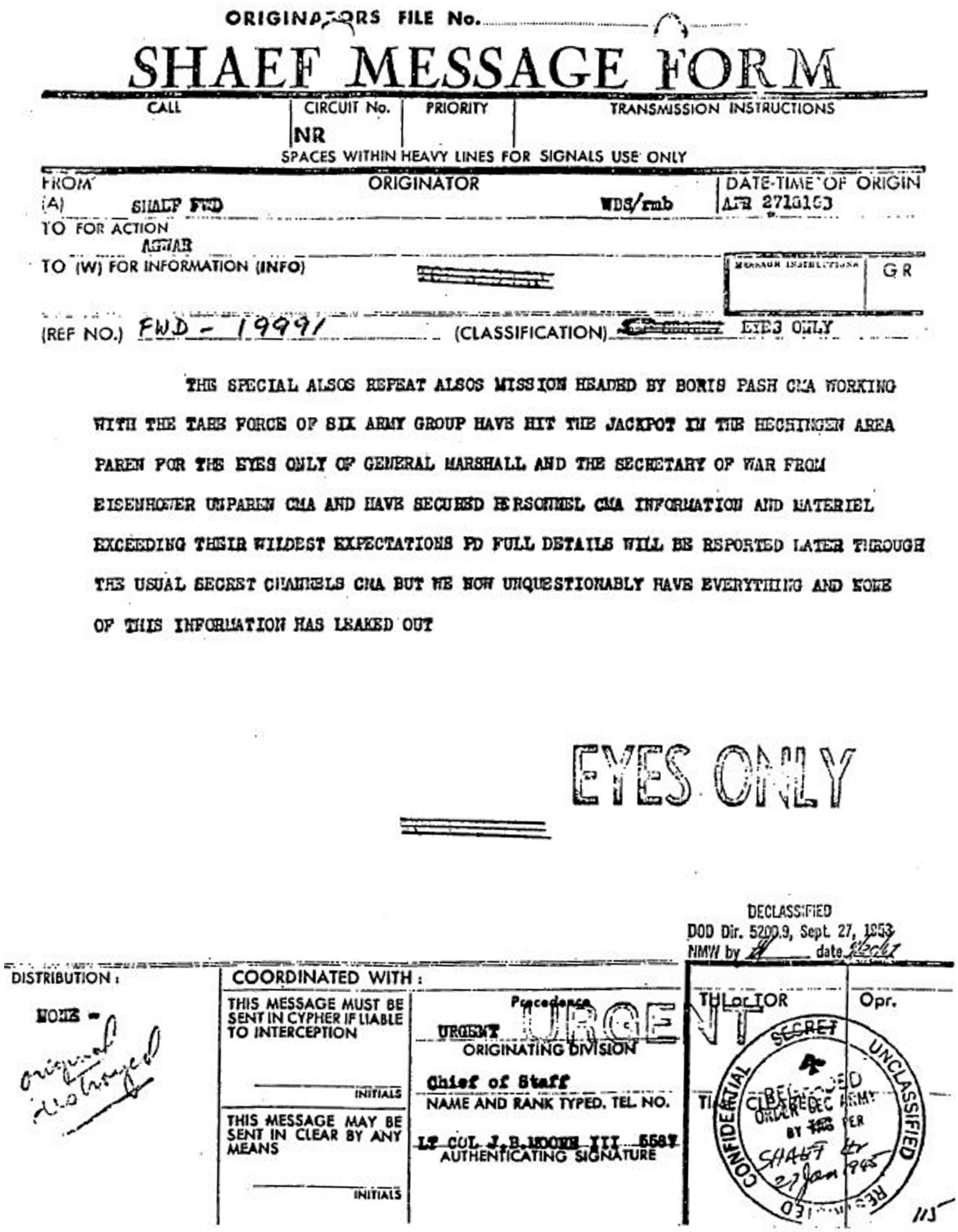
With the exception of Doctors Heisenberg, Gerlach and Diebner [who were found shortly later], Alsos had taken into custody every German scientist whose name appeared on the "wanted" list.

And the German atomic pile, with all related equipment and documents, were in American hands.

Upon receiving my report that "Alsos has hit the jackpot," General Harrison immediately sent a message to General Devers stating, "Boris Pash has hit the jackpot." [See p. 3341.]

[Pash confirmed that the scientific conclusions of Alsos were dominated by Goudsmit, that those conclusions were reached in Strasbourg in November 1944 (long before visiting most of the areas and scientists involved in the nuclear program), that Alsos was only interested in a few famous scientists on their short predetermined list, and that they were satisfied they were finished once they found the Haigerloch fission pile.

Pash also confirmed that Goudsmit had been suddenly relieved of duty in early December 1944 and sent back to the United States. Pash added that he himself had also been sent back to the United States, and that both he and Goudsmit had then had to answer criticisms of their performance in high-level meetings in Washington. Although Pash did not specify the criticisms, they must have been quite serious to warrant such actions in the middle of the war when Alsos personnel were urgently needed in Europe.]



ORIGINATORS FILE No.

SHAEF MESSAGE FORM

CALL | CIRCUIT No. NR | PRIORITY | TRANSMISSION INSTRUCTIONS

SPACES WITHIN HEAVY LINES FOR SIGNALS USE ONLY

FROM (A) SHAEF FWD — ORIGINATOR WBS/rmb — DATE-TIME OF ORIGIN APR 271815Z

TO FOR ACTION AGWAR

TO (W) FOR INFORMATION (INFO) — GR

(REF NO.) FWD - 19991 (CLASSIFICATION) EYES ONLY

THE SPECIAL ALSOS REPEAT ALSOS MISSION HEADED BY BORIS PASH CMA WORKING WITH THE TARB FORCE OF SIX ARMY GROUP HAVE HIT THE JACKPOT IN THE HECHINGEN AREA PAREN FOR THE EYES ONLY OF GENERAL MARSHALL AND THE SECRETARY OF WAR FROM EISENHOWER UNPAREN CMA AND HAVE SECURED PERSONNEL CMA INFORMATION AND MATERIEL EXCEEDING THEIR WILDEST EXPECTATIONS PD FULL DETAILS WILL BE REPORTED LATER THROUGH THE USUAL SECRET CHANNELS CMA BUT WE NOW UNQUESTIONABLY HAVE EVERYTHING AND NONE OF THIS INFORMATION HAS LEAKED OUT

EYES ONLY

DECLASSIFIED
DOD Dir. 5200.9, Sept. 27, 1958
NMW by — date

DISTRIBUTION: NONE — original destroyed

COORDINATED WITH:

THIS MESSAGE MUST BE SENT IN CYPHER IF LIABLE TO INTERCEPTION — INITIALS

THIS MESSAGE MAY BE SENT IN CLEAR BY ANY MEANS — INITIALS

Precedence: URGENT

ORIGINATING DIVISION: Chief of Staff

NAME AND RANK TYPED, TEL. NO.: LT COL. J.B. MOORE III 5587

AUTHENTICATING SIGNATURE

THI or TOR | Opr.

CONFIDENTIAL — SECRET — UNCLASSIFIED — CLEARED BY SHAEF 21 Jan 1945

113

Figure D.41: "For the Eyes Only of General Marshall and the Secretary of War from Eisenhower... have secured personnel, information and materiel exceeding their wildest expectations" [Pash 1969, frontispiece; also NARA RG 77, Entry UD-22A, Box 160, Folder APR 45–Dec. '45].

***Manhattan District History*, Book I, Volume 14, Foreign Intelligence Supplement No. 1. Undated but apparently ∼1947.**
[**https://ia803409.us.archive.org/14/items/ManhattanDistrictHistory/**]

[Some original Alsos documents are reproduced near the end of this file, with varying degrees of legibility. Why are nearly all of the references in this file redacted, when nothing else seems to be?]

4-1. General.

[...] Lt. Col. Boris T. Pash and Dr. Samuel A. Goudsmit had respectively been appointed Mission Chief and Scientific Chief.

[...] Based on preliminary lists from the United States, much of the early definition of German intelligence targets was accomplished at the London headquarters with the assistance of British technical and intelligence personnel. Priorities were assigned to locations and personnel, and while later events proved some of the investigations to be unproductive, no important elements were missed as far as the interest in atomic energy was concerned. [...]

4-2. Paris Operations.

[...] Advance personnel of the ALSOS Mission entered Paris on August 1944, with leading elements of the Allied troops, and promptly secured initial targets. [...] Joliot [...] added very little to the knowledge already possessed by the Manhattan Project; however, the following items were clarified:

(1) The College de France (Joliot's laboratory) cyclotron had remained in service at that institution, although, at one time, the enemy had given some consideration to transporting it into Germany

(2) Schumann, Diebner, Bothe, Esau, Gentner, Bagge, and Maurer, all enemy personnel of interest to the Manhattan Project, had spent varying lengths of time during the war at the College de France laboratory, concerning themselves with the cyclotron operation. [...]

[...] ALSOS Mission reached Brussels, Belgium, on 5 September 1944. A Mr. Gaston André, in charge of uranium, at the main office of the Union Minière du Haut Katanga, was contacted. [...]

(1) Prior to the war a number of German firms had received uranium products from Belgium for normal peacetime application or retrade. The shipments had, in general, consisted of quantities of less than one ton per month of assorted refined materia.

(2) From June, 1940, until August, 1941, the Auer Gesellschaft, a well-known German chemical concern, which had not been a recipient prior to the war, suddenly became an outstanding consumer of uranium products. Auer received about 60 tons of refined material during that period. It was learned that a Dr. Ihwe was apparently in charge of purchases for the Auer company.

(3) The next large German shipment of interest was in November, 1941, and consisted of about nine tons of uranium products to [...] Degussa. [...]

(4) During June, 1942, unusually large amounts of uranium products were sent to "Roges, m.b.H". [...] Within this organization a Dr. Faust was in charge of uranium ores. The amounts of uranium products ordered by Roges consisted of about 115 tons of assorted refined and half refined materials. In addition they obtained 610 tons of crude material, 17 tons of ferro-uranium, and about 110 tons of impure products (rejects). Also, in January and May, 1943, respectively, 50 tons and 80 tons of refined products were delivered to them.

[...] During the preceding investigation at Brussels, a preliminary study of uranium stock, by the Union Minière du Haut Katanga, indicated that a quantity of material remained in Belgium. [...] The captured material, amounting to 68 tons, was placed under joint American and British control and removed from Belgium.

[...I]t was learned that nine carloads of uranium (approximate total net weight 72 tons) had been shipped, in advance of the German invasion, from Hoboken, Belgium to le Havre, France, in May, 1940. Reports indicated subsequent German seizure, at le Havre, of two of the nine carloads and the movement of the remainder to Bordeaux. [...] 30 tons of the reported material was found at the Poudrerie de Toulouse, in Toulouse. This material was secured and shipped from Marseilles to the United States. Investigation continued for the remaining 42 tons, but that particular search was not successful. [...]

4-3. Strasbourg Operation.

On 25 November 1944, advance military members of the ALSOS Mission joined the T-Force in Strasbourg.

[...] Concerning the interest of the Manhattan Project, four of the academic personal targets—Rudolf Fleischmann, Head of the Physics Department; Fritz Weygand, Head of the Chemistry Department; Hugo Neuert, Experimental Physicist; and Werner Maurer, Experimental Physicist, had such backgrounds and occupations as to warrant their separation from other internees and transfer, at a later date, to the United States. [...] Field interrogation of these individuals failed to confirm that any of them had engaged in direct research on a nuclear weapon, and their replies to repeated questioning actually provided little worth-while information. [...] In contrast to the meager information obtained from personal targets, the written matter located at Strasbourg served as a source of outstanding intelligence. [...] While the information was unclassified, through the mediums of notes of meetings, fragments of computations, protocols of experiments and vague hints in personal correspondence, a revealing picture of the German nuclear research program was presented.

[...] That evidence in a great measure modified the fear of enemy competition with the Manhattan Project, but it was still believed to be highly essential that those encouraging indications be confirmed beyond all possible doubt. [...] All of the foregoing information, after being subjected to an analysis by both the Manhattan District and the OSRD, resulted in a comprehensive report "TA Targets–German" [...] which served as a dependable guide for subsequent exploitation.

4-4. Heidelberg Operation.

[...] Professor Walther Bothe, Director, Physics Division of KWI for Medical Research, Heidelberg, was interrogated on 30 and 31 March [...]

(1) It was confirmed that Hahn had been evacuated to Tailfingen, and that Heisenberg and von Laue were at Hechingen.

(2) The installation, including the experimental uranium pile which was at Berlin-Gottow, had been removed to Haigerloch.

(3) A German shortage of heavy water was reported, and reference was made to the only production having been that in Norway.

(4) Professor Bothe listed the following as having worked on the nuclear physics phase of the uranium problem.

(a) Himself, with three helpers

(b) Heisenberg, with ten men

(c) Döpel, in Leipzig, assisted by his wife only

(d) Kirchner, in Garmisch, with possibly two men

(e) Stetter, in Vienna, with four or five men

(5) Approval of Gerlach was required for physicists to secure means for scientific work, and if a "DE" (highest) priority was desired the additional approval of [Albert] Speer, Minister of War Production, had to be obtained.

(6) Bothe expressed his opinion that the separation of uranium isotopes by the thermal diffusion method was impossible. He indicated that the only work on isotope separation in Germany was being done by the centrifugal method under the direction of Harteck. Bothe was not aware of the location of this activity.

(7) Bothe believed that uranium hexafluoride was made by I.G. Farben, at Leverkusen.

(8) Bothe stated that no element higher than 93 was definitely known; however, he recognized that, as element 93 was a beta emitter, 94 must exist.

(9) Bothe repeatedly expressed his opinion that the uranium pile, as a source of energy, was decades from realization and that the use of uranium as an explosive was impracticable. He claimed not to know of any theoretical or experimental work being done in Germany on the military application of nuclear fission; but indicated that such work could be under way without his knowledge.

(10) After repeated questioning concerning the military value of the cyclotron, Bothe said it had been considered as a means of obtaining radioactive material for bombs.

(11) All secret documents in connection with his work were reported by Bothe to have been burned in accordance with government instructions.

[...] Dr. Wolfgang Gentner was interrogated on 1 April and, in general, confirmed the information given by Bothe. [...]

4-5. Frankfurt Operation.

On 31 March and 1 April, 1945, several of the Degussa plants were contacted and a number of the employees were interviewed. It was confirmed that Degussa had produced uranium metal under the name of "Spezialmetall"; however, personnel investigated professed indefinite knowledge concerning the use of the metal and the ultimate destinations to which it was shipped.

[...] Dr. Kohl, Works Manager, Degussa Plant No. 2, was interrogated on 3 April 1945, concerning the manufacture of "Spezialmetall". According to him the material was required by the Reich's Research Council (RFR) and all administrative matters were handled directly with RFR by Auer, in Oranienburg. Degussa acted as a sub-contractor for Auer and Kohl understood that deliveries of metal were made either to Auer or to the RFR, at Berlin-Dahlem. The use of the metal was secret, but Kohl believed it to be concerned with experiments in atomic physics. He stated that the material was manufactured, to a purity of 98 to 99 percent, from ammonium uranate which was converted to U_3O_8. The ammonium uranate was secured either from Joachimstahl or the Union Minière du Haut Katanga. Kohl referred to an early process where metallic uranium had been mixed with coal dust, with Tragacanth gum as a binding material, and pressed into blocks. The material was later delivered as powdered metallic uranium, production being between one and two tons. Kohl was emphatic that no deliveries of uranium were made to I. G. Farben Industrie. The Degussa plant, at Frankfurt, had been partially destroyed and parts of the equipment were reported to have initially been moved to a location in Mark Brandenburg, and later to the plant of the Chemische Fabrik Grünau at Berlin-Grünau. Approximately three tons of ammonium uranate were shipped with the equipment to Berlin-Grünau. It was reported that, prior to the war, about three tons per month of sodium uranate were used in the ceramic color business but that during the war such use had been prohibited.

[...] Dr. Baerwind, director of Degussa in charge of technical matters, was also interrogated at Frankfurt, on 3 April. Subject to the following comments Baerwind's statements in general confirmed those previously made by Kohl.

(1) While Baerwind was then a member of the Supervisory Board of Auer, nevertheless he was not familiar with the dealings between Auer and the nuclear scientists.

(2) Baerwind indicated his unfamiliarity with the technical details, and expressed his opinion that Kohl might also have been uninformed; however, he stated definitively that the uranium powder was not mixed with coal dust.

(3) Reference was made to Degussa production of from five to six tons per year of beryllium metal. Most of this material was reported to have been sent to Heraeus, for the manufacture of beryllium copper alloys, but a small amount had been sent to the RFR for experiments with radioactive materials.

(4) Baerwind believed that the "Spezialmetall", even under the secret handling, could have nothing to do with military weapons because the quantities involved were so small. He stated definitively that Degussa was the only manufacturer of uranium metal in Germany and that until 1944 the Frankfurt plant production constituted all of the Degussa production.

[...] In September, 1945, an account of the production of uranium metal by Degussa was obtained by the ALSOS Mission. This account was prepared by a Degussa employee (Völkel [...]) and presented production and shipping details as well as a description of the process employed. It revealed that the Frankfurt Plant No. 2 had handled about 12,8000 kg. of the material from 1940 to 1945. [...] The progress of the war had caused manufacture of uranium metal to be transferred from the Degussa, Frankfurt, plant to a factory at Berlin-Grünau. Production at Grünau started at the end of 1944. It was indicated that "Spezialmetall" had only been manufactured in quantities suitable for experimental purposes and that the purity of the product was not impressively high.

[...] The ALSOS Mission had learned that 11 tons of crude sodium uranate had been delivered to the Radium Chemie Companie, of Frankfurt, from Wirtschaftliche Forschungsgesellschaft, in July, 1943, and that information prompted a contact with the Frankfurt firm on 25 April, 1945. [...] Through questioning the Deputy Director of the firm it was learned that a stock of 11 tons of uranium products, ½ ton of Schmiedberg ore and a few drums of monazite sand were on hand. That material was confiscated. In addition to the material obtained, this operation proved to be of interest in providing evidence that the Joachimstahl mines were being worked and that the shortage of radium in Germany made it worth while to exploit the Schmiedeberg deposits. [...]

4-6. Stadtilm Operation.

[...] ALSOS team arrived at Stadtilm, Thuringen, on 12 April 1945, directly after fighting in the town had ceased. The laboratory and offices of Dr. Kurt Diebner were located in an old schoolhouse. It was found that the majority of the target personnel, together with their documents, materials and equipment, had been evacuated by the Gestapo, on 8 April, in order that they might carry on their work elsewhere. However, the following individuals, of interest to the ALSOS Mission, had been allowed to remain at Stadtilm: Hartwig, Physicist; Ebeling, Mechanic; Leimert, Librarian; Stuhlinger, Physicist; Pfetscher, Physicist; Berkei, Physicist; Ehlert, Office Manager; Seeger, Engineer; and Schutzmeister, Physicist.

[...] Gerlach was a frequent visitor at Stadtilm.

[...] The physics institute of the KWI and of the THS [Technische Hochschule] Berlin had been partially evacuated to Stadtilm about 6 months previously but, for some unknown reason, a number of the personnel had been extremely slow in the relocation.

[...] Documents, materials and equipment at Stadtilm consisted of: many files; 8 tons of uranium oxide; parts of a small low temperature pile; air liquefaction apparatus; heavy water equipment from Norway; counters; miscellaneous equipment; and an extensive physics laboratory.

For about four years [Dr. Berkei] had worked for the KWI for Physics, at Berlin-Dahlem and Berlin-Gottow, and later served as administrative assistant to Diebner. While, in his administrative capacity, he had not had the opportunity to learn of many of the technical details, nevertheless Berkei appeared to have a good overall picture of Diebner's work...

4-7. Göttingen Operation.

The subject of interest to the Manhattan Project was discussed with Professors Kopfermann and Houtermans, at Göttingen, on 17 April 1945. [...] Kopfermann and Houtermans had been only on the fringe of the German nuclear fission project and were unable to contribute additional intelligence of any particular consequence. [...]

4-8. Lindau Operation.

[...] Osenberg surrendered with some ceremony, making his personnel, files and the general establishment available for investigation. ALSOS scientific members began their examination of the Planning Board on the afternoon of 12 April, and continued with the interrogation of Osenberg, questioning of his personnel and study of his papers during the following three days. [...]

4-9. Celle Operation.

[...] Those Mission members entered Celle on 17 April and readily located the centrifuge laboratory. That laboratory was found to be under British guard. [...]

(1) The ultra-centrifuge experments, evacuated the preceding November from Hannover, were located within a spinning mill at Celle.

(2) The director of the activity, Harteck, was not present and was reported to be at Hamburg. Dr.

W. Groth was in charge of the Celle laboratory, together with Dr. Suhr and Dr. Faltings.

(3) The equipment consisted of a small-scale set-up. When working smoothly it was estimated to be capable of a production of 50 grams per day of enriched material. The enrichment was at best about 15 percent.

(4) The separation was done with gaseous UF_6. Groth discovered that it was possible to produce the gas directly from the oxide, without having to make metal first. This method had been patented by him, and the material was produced by I. G. Farben, at Leverkusen, in quantities of about 30 pounds per month.

(5) The oil used in the centrifuge contained powered sodium fluoride in suspension so as to saturate against the effect of UF_6.

(6) The centrifuge was manufactured by Anschütz Gesellschaft at Kiel.

(7) In general, the net result of the investigation was that it confirmed former investigations in revealing the nuclear energy effort in Germany to be on a relatively small scale.

4-10. Stassfurt Operation.

The ALSOS Mission investigation at Brussels, Belgium, in September 1944, revealed that certain quantities of Belgian uranium products had been removed to Germany. [...] Based upon that intelligence a considerable portion of the material was believed to have been delivered to a plant of the Wirtschaftliche Forschungsgesellschaft (WIFO), on the outskirts of Leopoldshall, near Stassfurt. That firm had been formed during the war as a storage agency for Roges. [...]

Removal of 260 truck loads of the material to the Hildesheim Air Strip was accomplished between 20 and 27 April. The material seized consisted of crude sodium uranate, refined products and ferro-uranium. The total weight was in the neighborhood of 1,000 metric tons. It was held at Hildesheim until 30 April, moved to Antwerp and then shipped to a location under Allied control.

4-11. Caterode and Nordhausen Operations.

Fragmentary information suggested material possibilities at Caterode and Nordhausen and these targets were visited with negative or minor results.

4-12. Haigerloch, Hechingen, Bisingen, and Tailfingen Operations.

Scientific members of the ALSOS Mission left Heidelberg on 23 April and proceeded to Haigerloch where it was found that the targets had been secured and placed under guard. Those members of the Mission then went directly to Hechingen.

At Hechingen, the branch of the KWI for Physics was located and secured. Important personnel apprehended consisted of von Weizsäcker, Wirtz, von Laue, Moliere, Hoecker, Hiby, Sauerwein, Gysae, Bagge, Korsching, Bopp, Fischer and Menzer. [...] The enemy personnel at first stated that all secret documents had been burned in accordance with a government order, but, later following the capture of a complete set of secret reports at Tailfingen, and after demands had been made, von Weizsäcker admitted that certain reports had been concealed in a cesspool. Those reports were recovered. Two new isotope separation experiments of interest were in progress at Hechingen—Bagge's velocity selector, and Korsching's diffusion apparatus. The facilities for both of these experiments were dismantled and evacuated.

[...] The experimental pile [at Haigerloch...] had been located in a cave. The pile did not contain metal or heavy water. It was photographed, dismantled and the cave laboratory destroyed by explosives. Approximately one and one-half tons of heavy water and one and one-half tons of uranium metal were subsequently found buried near Haigerloch. This material was evacuated to a more secure location.

On 24 April, Bisingen was taken and a research station (Forschungsstelle D) of the Kaiser-Wilhelm Gesellschaft was secured. Dällenbach, the Director, had gone to Switzerland in December 1944 but his assistant, Dr. Karl Weimer, was interrogated. Construction of a small experimental model of a 10,000,000 volt cyclotron had been started, and drawings, technical data and patent specifications were secured.

Tailfingen was captured on 24 April, and, with it, headquarters of the KWI Für Chemie. All members of Hahn's staff including Hahn, Mattauch, Strassmann, Erbacher, Klemm, Flammersfeld, Radoch, Seelmann-Eggebert, Waldmann, Wietig and others were located. The three groups of the KWI Für Chemie at Tailfingen were led respectively by Hahn, Mattauch and Erbacher.

Professor Hahn's group had been working on the separation, distribution and energy of the fission products of uranium. According to him the results of that work had all been published, even though it was originally treated as secret. [...] He stated that the development of an atomic bomb was not then possible, and had so been considered by the Germans since 1942. Hahn did, however, believe that the pile as a source of energy would be successfully developed in a few years. [...]

Dr. Erbacher assisted in an inspection of his laboratory where work was being done on the chemical separation of isotopes; on the protection of uranium from corrosion, and on the separation of an active element from its inactive isotopes. [...]

Dr. Mattauch's laboratory was then inspected. Work was being performed at that location on the mass-spectrographic method of fission-product (or isotope) analysis. One member of Mattauch's group had been working on a method of isotope separation by the electrolysis of a fused salt; however, such a method had not at that time proved feasible.

From the Manhattan Project viewpoint the above operations were the most important of the ALSOS Mission investigations of the German effort in nuclear development. Interrogation of the enemy scientists, study of the documents obtained and inspection of the experimental equipment added further confirmation to previous evidence and definitely revealed the extremely small-scale activity of the whole German uranium project. In view of the fact that this exploitation involved the main group of laboratories it could be appreciated that the German work was far behind that which had been accomplished in the United States. [...]

4-13. Urfeld and Munich Operations.

[...] The advance to Urfeld was resumed and on 3 May the ALSOS group was successful in contacting Heisenberg. Heisenberg was taken to Heidelberg on the next day.

The second ALSOS team had entered Munich on 1 May 1945, and located the residence of Gerlach. Gerlach was not at home, but was found at the Physics Laboratory of the University of Munich. [...] On 2 May, a portion of the ALSOS group went to Schongeising, located their target and evacuated Diebner, certain of his documents, and a quantity of uranium (previously evacuated by the Gestapo from the laboratory at Stadtilm), to Munich. On 3 May, Gerlach and Diebner together with the captured material were transferred to Heidelberg.

Heisenberg, Gerlach and Diebner were interrogated upon their arrival at Heidelberg. As was expected, the interrogations failed to produce any new positive information of interest to the Manhattan Project.

[...] Gerlach was merely in administrative charge of the nuclear physics project. He had a superficial knowledge of the status of the project but knew little of the technical details.

[...] Diebner was not cooperative and seemed to be rather antagonistic toward Heisenberg. Gerlach and Heisenberg were on very cordial terms with each other but appeared to consider Diebner an inferior scientist.

4-14. Hamburg Operation.

After the City of Hamburg had fallen into Allied hands, members of the ALSOS Mission went to that location, on 5 May 1945, to contact Professor P. Harteck.

[...] Harteck's statement was to the effect that after the initial research it was soon discovered that the development of a weapon was unlikely, if not entirely impossible. Emphasis was then placed on the production of energy from a uranium pile, but, in this connection also, he was of the opinion that there were numerous detailed questions which had to be solved before such a device could be successful.

[...] Harteck referred to a plan which had been considered to provide ultra-centrifuge machines, each of which was to produce above 180 kgs. of 1 percent enriched material per year. The centrifuges were planned to be located at Kandern, but the progress of the war prevented the work.

[...] Harteck had studied the production of heavy water and believed that his improved method would have made it possible to reach a production of almost 10 tons per year, at an appreciable reduction in the pre-war cost. It was stated that the Norsk-Hydro project was under the supervision of I. G. Farben.

4-15. Berlin Operation.

The Berlin location of the Kaiser-Wilhelm Institute for Physics was inspected on 30 July 1945. It was found that practically all of the laboratory equipment had been evacuated by the Russians. [...]

4-16. Vienna Operation.

Dr. C. P. Smyth and other members of the ALSOS Mission visited Vienna during the later part of August, 1945, and obtained information of the research carried out at the Physical Institute and the Radium Institute. Information of uranium materials taken by Russian investigators in May, 1945, as well as of the transportation to Moscow of Drs. Wombacker and Ortner, was obtained. Little additional useful intelligence of the German uranium projected resulted.

4-17. Overall Results and Termination of Western and Central European Investigations.

a. The rapid advance of the Allies in Germany caused difficulty in making thorough and deliberate investigations of many of the detailed items of enemy nuclear research. Nevertheless, all principal locations of that research activity were contacted, and, as of May, 1945, the ALSOS Mission had apprehended the following German scientific personnel of interest to the Manhattan Project:

At Strasbourg.
- Fleischmann
- Weygand
- Neuert
- Maurer

At Heidelberg.
- Bothe
- Kuhn
- Gentner

At Hechingen.
- von Weizsäcker
- Wirtz
- von Laue
- Moliere
- Hoecker
- Hiby
- Sauerwein
- Gysae
- Bagge
- Korsching
- Bopp
- Fischer
- Menzer

At Bisingen.
- Weimer

At Hamburg.
- Harteck

At Marburg.
- Justi

At Stadtilm.
- Hartwig
- Berkei

At Göttengen.
- Houtermans
- Kofpermann

At Lindau
- Osenberg

At Celle.
- Groth

At Tailfingen.
- Hahn
- Mattauch
- Strassmann
- Erbacher
- Klemm
- Flammersfeld
- Radoch
- Seelmann-Eggebert
- Waldmann
- Wietig

At Urfeld.
- Heisenberg

At Munich
- Gerlach

At Schongeising
- Diebner

Early in the German endeavor the uranium problem had been separately approached by a number of more or less competing groups. There was one group under Army Ordnance, another under the Kaiser-Wilhelm Institute for Physics, and still another under the Postal Department. A certain amount of bickering over the supply of material and a non-cooperative attitude in the exchange of information existed between those groups. The research efforts of the Postal Department amounted to little and did not continue for very long. [...] Many German scientists worked along their own lines and were not required to work at particular projects. Development of an atomic weapon was not believed to be possible.

As a consequence of the foregoing, atomic energy development in Germany did not pass beyond the laboratory stage; utilization for power production rather than for an explosive was the principal consideration; and, though German science was interested in this new field, other scientific objectives received greater official attention.

***The History of the CIC in the US Army* (30 Volumes). Volume VIII (*The CIC With Special Projects*). Part-III: *CIC With the ALSOS Mission*, pp. 116–130 [NARA RG 319, Entry UD-1080, Box 3]**

[This document generally gives the same information as the *Manhattan District History* previously quoted, but in much less detail. The few noteworthy exceptions are included below.]

[...] In December 1945 Lt Col George R. Eckman prepared a final report on the ALSOS Mission; it is from this document that the following history of CIC in the Mission has been extracted.[128]

128 "Final Report on the ALSOS Mission," prepared by Lt Col George R. Eckman, (Conf), is on file in the G2 Documents Lib, Pentagon, Wash DC.

[...] On 22 March, Colonel Pash led the ALSOS "spearhead" group into Ludwigshaven while the city was still being shelled by the enemy, who were holding their bridgehead on the west side of the Rhine to protect their retreat. The ALSOS party proceeded at once to the huge I. G. Farben Industries plant and secured guards for this important target from the armored unit driving through the city toward the Rhine. This major war plant was held by the ALSOS team and attached guards until the "T" Force moved in the next day.

[...] Other targets visited by members of the Northern Base during this closing period of the war in Europe included personnel and institutional objectives at Hamburg, Jena, Braunschweig, Clauthal, Halle, Erfurt, and Essen. In the early days of May, ALSOS investigators uncovered additional caches of uranium compounds and "heavy" water which had been hidden away by the Nazis in the Harz and the Bavarian Mountains.

[...] During the early planning stages of ALSOS in 1943 and early 1944, many potential Berlin targets had been evaluated and listed for ultimate examination. However, as ALSOS intelligence was collected in operations in the liberated countries and Western Germany, it became evident that Berlin would become an area of only secondary interest. Most high priority targets had already been discovered by the ALSOS teams.

As the Air Force continued to rain down high explosives on the city, many of the war research laboratories and bureaus of institutes and factories were evacuated or obliterated. Following the German surrender and the Soviet Occupation of Berlin, it was expected that what ALSOS targets remained had been thoroughly "worked over" by Russian intelligence agencies.

There were certain missing items, however, that ALSOS officials thought might be discovered among the rubble of Berlin, and Colonel Pash headed a party of 14 Mission members that entered Berlin on 28 July. Three weeks were spent in following investigative leads, including documents and personnel of the Kaiser Wilhelm Institute. The effort was well spent, for a number of additional facts were added to the ALSOS dossiers.

The Berlin Operation was the last major expedition of the Mission. Colonel Pash returned to Paris headquarters in the second week of August 1945.

[The Pentagon Library told me that they do not have a copy of Eckman's final report. Did the Pentagon Library actually lose the final report of one of their most famous missions? Can a copy of this report be located someplace?]

Leslie R. Groves. 1962. *Now It Can Be Told: The Story of the Manhattan Project.* New York: Harper.

[The three chapters on Alsos in Groves's book appear to be very closely based on the *Manhattan District History* quoted previously. The events, details, and wording of the sentences are all highly similar. The most noteworthy exceptions are included below.]

[pp. 196–197:] Thorium seemed out of the question, since it is mined chiefly in Brazil and India and, because of embargoes, Germany had been unable to import any since the war began, and had had only insignificant stocks on hand before the war. The basic fuel was thought to be uranium. Considering our own firsthand knowledge of the enormous industrial effort required to produce U-235, we were confident that we would have seen evidences of any such program had one existed. It seemed more likely that they would use plutonium. That they had enough to launch an atomic program seemed to be within the realm of possibility, for we knew there had been a large stockpile of refined uranium ore at Oolen, Belgium, a few miles outside Brussels, which originally had been the property of Union Minière.

The only other possible supply of uranium was the mines at Joachimsthal, Czechoslovakia, which was not a particularly significant source. Most of this ore was shipped to a uranium plant outside Berlin, the Auer-Gesellschaft. British Intelligence kept in touch with the activities of these mines, and in July, 1944, Calvert's group started periodic aerial surveillance over the entire mining area, studying the pictures in detail for new shafts and aboveground activity. Tailing piles from each mine were microscopically measured from one reconnaissance to the next. By knowing the general grade of the ore and measuring the piles, we could determine with some degree of accuracy the mine's daily production. There were no signs of extraordinary activity.

[pp. 230–231:] I have always considered Goudsmit's opinion much to the point: "On the whole, we gained the definite impression that German scientists did not support their country in the war effort. The principal thing was to obtain money from the government for their own researches, pretending that they might be of value to the war effort. One genuine selling point which they used extensively was that pure research in Germany in many fields was far behind the United States."

Although most of our objectives in Germany lay in the French zone of advance, one that was particularly important to us—the Auergesellschaft Works in Oranienburg, about fifteen miles north of Berlin—lay in what was to be the Russian zone. The information that Alsos had uncovered in Strasbourg had confirmed our earlier suspicions that the plant was engaged in the manufacture of thorium and uranium metals which were to be used in the production of atomic energy and hence probably for the manufacture of an atomic bomb. Since there was not even the remotest possibility that Alsos could seize the works I recommended to General Marshall that the plant be destroyed by air attack.

When he approved, I sent Major F. J. Smith, of my office, to explain the mission to General Carl Spaatz, who was then in command of our Strategic Air Forces in Europe. Spaatz co-operated whole-heartedly and, in the period of about thirty minutes during the afternoon of March 15, 612 Flying Fortresses of the Eighth Air Force dropped 1,507 tons of high explosives and 178 tons of incendiary bombs on the target. Poststrike analysis indicated that all parts of the plant that were aboveground had been completely destroyed.

[pp. 238–239:] [...O]n April 23, I handed the following memorandum to General Marshall:

> In 1940 the German Army in Belgium confiscated and removed to Germany about 1200 tons of uranium ore. So long as this material remained hidden under the control of the enemy, we could not be sure but that he might be preparing to use atomic weapons.
>
> Yesterday I was notified by cable that personnel in my office had located this material near Stassfurt, Germany, and that it was now being removed to a safe place outside of Germany where it would be under the complete control of American and British authorities.
>
> The capture of this material, which was the bulk of uranium supplies available in Europe, would seem to remove definitely any possibility of the Germans making any use of an atomic bomb in this war.

[pp. 245–246:] In the fall of 1944, Himmler's Security Service Organization apparently became interested in the atomic project and formed a War Research Pool, which remained under Göring to avoid duplication and useless work. Himmler's people did not seem to be entirely satisfied with progress under the National Research Council, however, and they subsequently proposed a plan to remove all obstacles to the project and obtain maximum results. Although this plan was sound, it came too late.

[p. 248:] After V-E Day, a number of searches for specific information and materials were conducted in various parts of Germany. Alsos sent groups to Berlin and Salzburg, but, by that time, I was no longer too much concerned with their work, beyond insuring that no information remained that might eventually fall into Russian hands. These operations only confirmed what we already knew and it was quite clear that there was nothing in Europe of further interest to us.

[In his book, Groves concealed most of his knowledge of and interactions with the German nuclear program.

For much more information on what really happened, see the files and sources in Section D.14.

As also shown in Section D.14, there are many further files that still remain classified even after all this time. People should advocate to have all files on this topic located, declassified, and released in archival collections around the world.]

D.1.2 Farm Hall Recordings

[Ten German nuclear scientists (Erich Bagge, Kurt Diebner, Walther Gerlach, Otto Hahn, Paul Harteck, Werner Heisenberg, Horst Korsching, Max von Laue, Carl Friedrich von Weizsäcker, and Karl Wirtz) rounded up by the Alsos Mission were kept under house arrest from July 1945 until January 1946 at Farm Hall in Great Britain, where their private conversations were recorded without their knowledge. The transcripts were not released to the public until 1992.]

Farm Hall transcripts [page numbers refer to Frank 1993; see also Bernstein 2001, Hoffmann 2023, and NARA RG 77, Entry UD-22A, Boxes 164–165.]

[Farm Hall Report 1, 6 July, soon after arrival, p. 33:]

DIEBNER: I wonder whether there are microphones installed here?

HEISENBERG: Microphones installed? (laughing) Oh no, they're not as cute as all that. I don't think they know the real Gestapo methods; they're a bit old fashioned in that respect.

[Farm Hall Report 2, 18 July, p. 46:]

WIRTZ: A man like GOUDSMIT doesn't really want to help us; he has lost his parents.

HARTECK: Of course GOUDSMIT can't forget that we [Germans] murdered his parents. That's true too and it doesn't make it easy for him.

DIEBNER: I would imagine that we will be given more freedom the moment the Russians say: "We agree, you will take over the scientists". They are negotiating with the Russians as to who shall be handed over to Russia and who shall not. Presumably that is being discussed in Berlin now.

[Farm Hall Report 2, 21 July, pp. 55–57:]

BAGGE: For the sake of the money, I should like to work on the Uranium-engine; on the other hand, I should like to work on cosmic rays. I feel like DIEBNER about this.

KORSCHING: Would you both like to construct a Uranium-engine?

DIEBNER: This is <u>the</u> chance to earn a living.

KORSCHING: Every layman can see that these ideas are exceedingly important. Hence there won't be any money in it. You only make money on ideas which have escaped the general public. If you invent something like artificial rubies for the watch making industry, you will make more money than with the Uranium-engine. Well, DIEBNER, we'll both go to the Argentine.

DIEBNER: I shall come with you. [...]

KORSCHING: Still, I should like to get to HECHINGEN once more to collect the rest of my things. After all I still have all my books there and the telescope—though mind you I have hidden it from the French. Of course I did not hand that over. I have got all my glass prisms, lenses, etc. I lifted a floorboard, hid the stuff and nailed the board down again. [...]

KORSCHING: [Talking to BAGGE...] (DIEBNER leaves the room) If you work together with HEISENBERG on a Uranium-engine, then you can write off your share. If you want to work on a Uranium-engine, then you would have to do it somewhere else. Of course it would be an idea to go to the Argentine with 2 people and say: "Here we are, we know how to do this and that; we have a good method for the separation of isotopes, we do not need to produce heavy water." Somehow in this fashion we have to do it. It would not come to anything if you collaborated with HEISENBERG on a Uranium-engine. They did not even bring along the small fry to this place; that is how outsiders judge the work. They get there and read all the secret reports before they take the people away from there.

BAGGE: How long before did they have the secret reports?

KORSCHING: Two or three days before. The principal question which GOUDSMIT put to me, was "Is that your idea? Has that been published already is that anything new?"—that is all he wanted to know. And BOPP and FISCHER they just ignore one and say "Oh well, they just made some calculations for HEISENBERG." Apart from that for instance, the ordering of apparatus from the firms and all the other various things which we have done, WIRTZ just told him (GOUDSMIT): "I have done that." Do you think WIRTZ is going to be modest in front of Mr. GOUDSMIT? No [...] And that is how WIRTZ has excluded them. GOUDSMIT takes his word for it. BOPP was quite disgusted and astonished that suddenly he was dropped like that. And that is how it is all over the world. A scientist is asked "What have you thought out, where is your idea?" If you then make the strategic mistake of moving in the shadow of a man who is already world famous, then you are out of the limelight for the rest of your life and if you then raise your voice against that, then on top of it you will be called a trouble maker.

[Farm Hall Report 2, 30 July, p. 50:]

HAHN: I read an article in the Picture Post about the Uranium bomb; it said that the newspapers had mentioned that such a bomb was being made in Germany. Now you can understand that we are being "detained" because we are such men. They will not let us go until they are absolutely certain that no harm can be done or that we will not fall into Russian hands or anything like that. To my mind it is a mistake to do anything. [...]

[Farm Hall Report 3, 5 August, p. 68:]

DIEBNER: It doesn't look as though BOTHE will join us.

BAGGE: I think GEHLEN (?) is behind it. It looks as though GEHLEN (?) had the decency to keep BOTHE informed of what was going on so that BOTHE could make his plans as far as these people are concerned and act accordingly. [...]

DIEBNER: In the end we really had no more radium. There was an awful row as someone wanted some. I fetched another 3 grammes at the last moment.

BAGGE: Didn't firms like BRAUNSCHWEIGISCHE CHEMIEFABRIK have any more?

DIEBNER: I don't know. They may have had 1 gramme; all the rest had been requisitioned by the State. I got mine from the HARZ, I sent a car specially for it.

BAGGE: That was the Reichsstelle for radium?

DIEBNER: Yes, the Reichsstelle for Chemistry had the radium—25 g (?).

BAGGE: It's a pity they didn't hide 10 grammes out of the 24 grammes.

DIEBNER: I wasn't there. If I had been there we wouldn't have handed it over. The cars drove up and it disappeared. A pity, I had made up my mind not to hand it over.

[Farm Hall Report 4, 6 August discussion after learning of Hiroshima, pp. 70–79:]

HAHN: They can only have done that if they have uranium isotope separation.

WIRTZ: They have it too.

HAHN: I remember SEGRE's, DUNNING's and my assistant GROSSE's work; they had separated a fraction of a milligramme before the war, in 1939.

LAUE: 235?

HAHN: Yes, 235.

HARTECK: That's not absolutely necessary. If they let a uranium engine run, they separate "93".

HAHN: For that they must have an engine which can make sufficient quantities of "93" to be weighed.

GERLACH: If they want to get that, they must use a whole ton. [...]

GERLACH: They have got "93" and have been separating it for two years, somehow stabilised it at low temperature and separated "93" continuously.

HAHN: But you need the engine for that.

DIEBNER: We always thought we would need two years for one bomb. [...]

HEISENBERG: I still don't believe a word about the bomb but I may be wrong. I consider it perfectly possible that they have about ten tons of enriched uranium, but not that they can have ten tons of pure U. 235.

HAHN: I thought that one needed only very little 235.

HEISENBERG: If they only enrich it slightly, they can build an engine which will go but with that they can't make an explosive which will—

HAHN: But if they have, let us say, 30 kilogrammes of pure 235, couldn't they make a bomb with it?

HEISENBERG: But it still wouldn't go off, as the mean free path is still too big.

HAHN: But tell me why you used to tell me that one needed 50 kilogrammes of 235 in order to do anything. Now you say one needs two tons.

HEISENBERG: I wouldn't like to commit myself for the moment, but it is certainly a fact that the mean free paths are pretty big. [...]

HARTECK: Do you want 4 or 5 centimetres,—then it would break up on the first or second collision.

HEISENBERG: But it needn't have the diameter of only 4 or 5 centimetres.

HAHN: I think it's absolutely impossible to produce one ton of uranium 235 by separating isotopes.

WEIZSACKER: What do you do with these centrifuges.

HARTECK: You can never get pure 235 with the centrifuge. But I don't believe that it can be done with the . . . centrifuge.

WIRTZ: No, certainly not.

HAHN: Yes, but they could do it too with the mass-spectrographs. EWALD has some patent.

DIEBNER: There is also a photo-chemical process. [...]

WIRTZ: I would bet that it is a separation by diffusion with recycling. [...]

HARTECK: They have managed it either with mass-spectrographs on a large scale or else they have been successful with a photo-chemical process.

WIRTZ: Well I would say photo-chemistry or diffusion. Ordinary diffusion. They irradiate it with a particular wave-length.—(all talking together).

HARTECK: Or using mass spectrographs in enormous quantities. It is perhaps possible for a mass-spectrograph to make one milligramme in one day—say of "235". They could make quite a cheap mass-spectrograph which, in very large quantities, might cost a hundred dollars. You could do it with a hundred thousand mass-spectrographs.

HEISENBERG: Yes, of course, if you do it like that; and they seem to have worked on that scale. 180,000 people were working on it.

HARTECK: Which is a hundred times more than we had.

BAGGE: GOUDSMIT led us up the garden path.

HEISENBERG: Yes, he did that very cleverly. [...]

KORSCHING: That shows at any rate that the Americans are capable of real cooperation on a tremendous scale. That would have been impossible in Germany. Each one said that the other was unimportant.

GERLACH: You really can't say that as far as the uranium group is concerned. You can't imagine any greater cooperation and trust than there was in that group. You can't say that any one of them said that the other was unimportant.

KORSCHING: Not officially of course.

GERLACH: (Shouting). Not unofficially either. Don't contradict me. There are far too many other people here who know. [...]

WEIZSACKER: How many people were working on the V 1 and V 2?

DIEBNER: Thousands worked on that. [...]

HARTECK: Considering the figures involved I think it must have been mass-spectrographs. If they had had some other good method they wouldn't have needed to spend so much. One wouldn't have needed so many men. [...]

HEISENBERG: I must say I think your theory is right and that it is spectrographs.

WIRTZ: I am prepared to bet that it isn't.

HEISENBERG: What would one want 60,000 men for?

KORSCHING: You try and vaporise one ton of uranium.

HARTECK: You only need ten men for that. I was amazed at what I saw at I.G.

HEISENBERG: It is possible that the war will be over tomorrow.

HARTECK: The following day we will go home.

KORSCHING: We will never go home again.

HARTECK: If we had worked on an even larger scale we would have been killed by the "Secret Service". Let's be glad that we are still alive. Let us celebrate this evening in that spirit.

DIEBNER: Professor GERLACH would be an Obergruppenführer and would be sitting in LUXEMBOURG as a war criminal. [...]

WEIZSACKER: If you had wanted to a make a bomb we would probably have concentrated more on the separation of isotopes and less on heavy water.

(HAHN leaves the room)

WEIZSACKER: If we had started this business soon enough we could have got somewhere. If they were able to complete it in the summer of 1945, we might have had the luck to complete it in the winter of 1944/45.

WIRTZ: The result would have been that we would have obliterated LONDON but would still not have conquered the world, and then they would have dropped them on us. [...]

HARTECK: The uranium content in the stone in the radium mines near GASTEIN was said to be so great that the question of price does not come into it.

BAGGE: There must be enormous quantities of uranium in UPPER SILESIA. Mining experts have told me that.

DIEBNER: Those are quite small quantities. [...]

HEISENBERG: About a year ago, I heard from SEGNER (?) from the Foreign Office that the Americans had threatened to drop a uranium bomb on Dresden if we didn't surrender soon. At that time I was asked whether I thought it possible, and, with complete conviction, I replied: "No."

WIRTZ: I think it characteristic that the Germans made the discovery and didn't use it, whereas the Americans have used it. I must say I didn't think the Americans would dare to use it.

Top Secret cable 70221 from U.S. Military Attaché London England to War Department. 25 January 1946 [NARA RG 77, Entry UD-22A, Box 160, Folder 205.2 Cables Incoming, Top Secret January 1946 thru December 1946]

Signed Tindall to MILID serial nbr 70221 TOP SECRET Loco personal to Groves for Shuler from Dean

Conference held yesterday afternoon at War Cabinet Office on disposition of GUESTS. [...]

(A) Harteck to return to his old position University of Hamburg. This proposal so logical it evoked no discussion.

(B) Gerlach to proceed to University of Bonn.

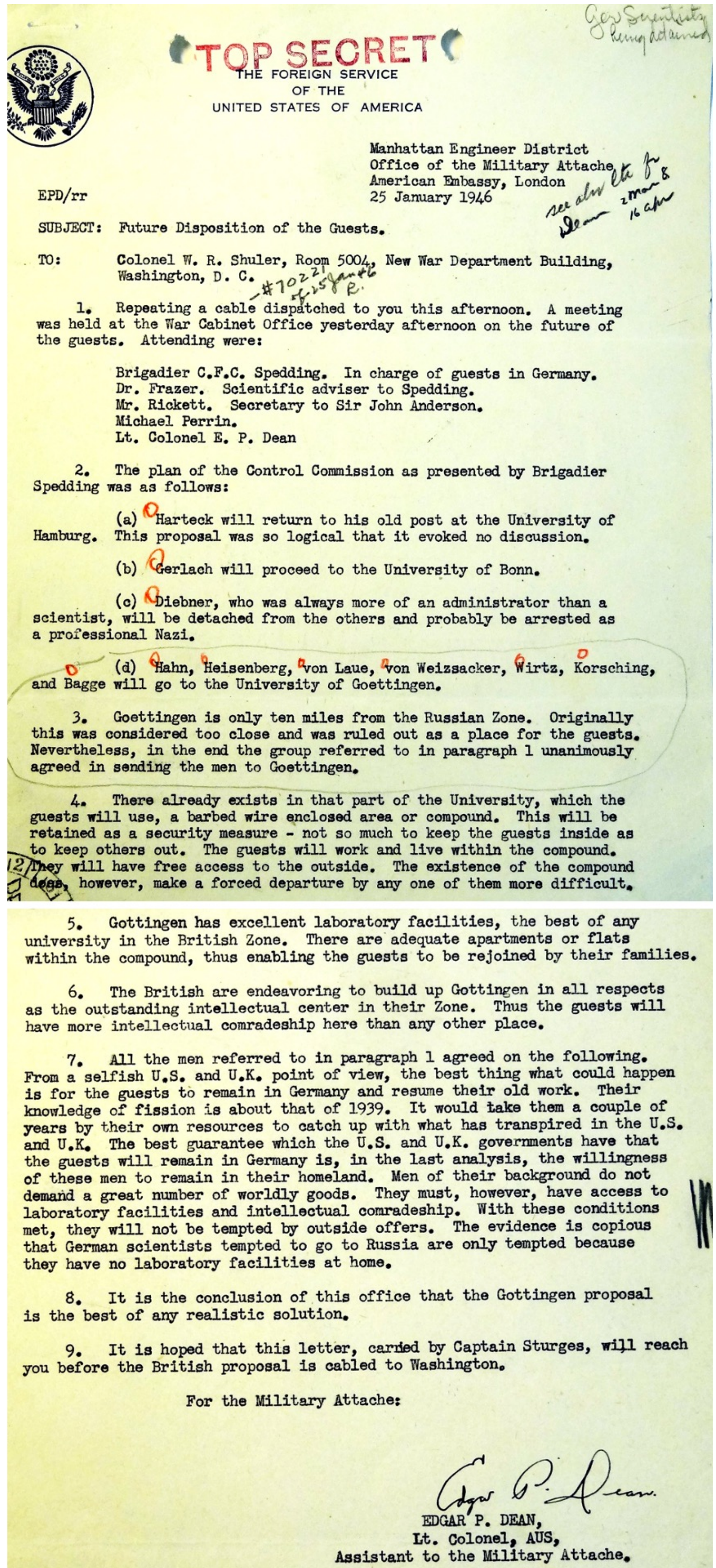
(C) Diebner more of an administrator than scientist will be detached and probably arrested as professional Nazi.

(D) Hahn, Heisenberg, Von Laue, Von Weizsäcker, Bagge, Korsching and Wirtz go to University of Göttingen. [...]

[See the related document on p. 3360.]

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 167, Folder 202.3-2
LONDON OFFICE: Combined Oper Ger Group



Ger Scientists Remaining Detained

TOP SECRET

THE FOREIGN SERVICE
OF THE
UNITED STATES OF AMERICA

Manhattan Engineer District
Office of the Military Attache
American Embassy, London
25 January 1946

see also ltr fr Dean 2 Mar 8 16 Apr

EPD/rr

SUBJECT: Future Disposition of the Guests.

TO: Colonel W. R. Shuler, Room 5004, New War Department Building, Washington, D. C.

#7022 ? 25 Jan 46 R.

1. Repeating a cable dispatched to you this afternoon. A meeting was held at the War Cabinet Office yesterday afternoon on the future of the guests. Attending were:

Brigadier C.F.C. Spedding. In charge of guests in Germany.
Dr. Frazer. Scientific adviser to Spedding.
Mr. Rickett. Secretary to Sir John Anderson.
Michael Perrin.
Lt. Colonel E. P. Dean

2. The plan of the Control Commission as presented by Brigadier Spedding was as follows:

(a) Harteck will return to his old post at the University of Hamburg. This proposal was so logical that it evoked no discussion.

(b) Gerlach will proceed to the University of Bonn.

(c) Diebner, who was always more of an administrator than a scientist, will be detached from the others and probably be arrested as a professional Nazi.

(d) Hahn, Heisenberg, von Laue, von Weizsacker, Wirtz, Korsching, and Bagge will go to the University of Goettingen.

3. Goettingen is only ten miles from the Russian Zone. Originally this was considered too close and was ruled out as a place for the guests. Nevertheless, in the end the group referred to in paragraph 1 unanimously agreed in sending the men to Goettingen.

4. There already exists in that part of the University, which the guests will use, a barbed wire enclosed area or compound. This will be retained as a security measure - not so much to keep the guests inside as to keep others out. The guests will work and live within the compound. They will have free access to the outside. The existence of the compound does, however, make a forced departure by any one of them more difficult.

5. Gottingen has excellent laboratory facilities, the best of any university in the British Zone. There are adequate apartments or flats within the compound, thus enabling the guests to be rejoined by their families.

6. The British are endeavoring to build up Gottingen in all respects as the outstanding intellectual center in their Zone. Thus the guests will have more intellectual comradeship here than any other place.

7. All the men referred to in paragraph 1 agreed on the following. From a selfish U.S. and U.K. point of view, the best thing what could happen is for the guests to remain in Germany and resume their old work. Their knowledge of fission is about that of 1939. It would take them a couple of years by their own resources to catch up with what has transpired in the U.S. and U.K. The best guarantee which the U.S. and U.K. governments have that the guests will remain in Germany is, in the last analysis, the willingness of these men to remain in their homeland. Men of their background do not demand a great number of worldly goods. They must, however, have access to laboratory facilities and intellectual comradeship. With these conditions met, they will not be tempted by outside offers. The evidence is copious that German scientists tempted to go to Russia are only tempted because they have no laboratory facilities at home.

8. It is the conclusion of this office that the Gottingen proposal is the best of any realistic solution.

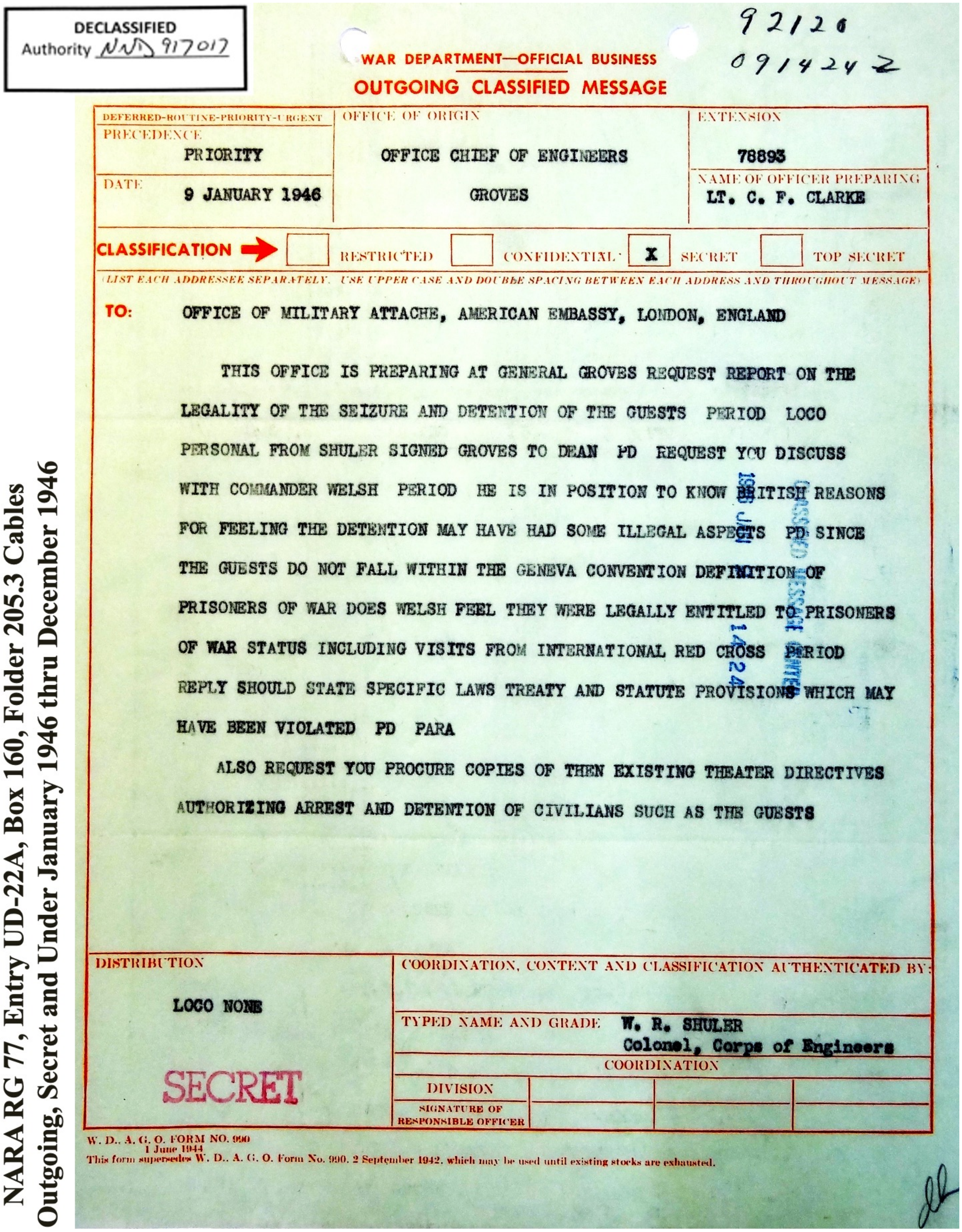
9. It is hoped that this letter, carried by Captain Sturges, will reach you before the British proposal is cabled to Washington.

For the Military Attache:

Edgar P. Dean

EDGAR P. DEAN,
Lt. Colonel, AUS,
Assistant to the Military Attache.

Figure D.42: Edgar P. Dean to W. R. Shuler. 25 January 1946 [NARA RG 77, Entry UD-22A, Box 167, Folder 202.3-2 LONDON OFFICE: Combined Oper Ger Group].



DECLASSIFIED
Authority NND 917017

92120
091424Z

WAR DEPARTMENT—OFFICIAL BUSINESS
OUTGOING CLASSIFIED MESSAGE

DEFERRED-ROUTINE-PRIORITY-URGENT PRECEDENCE	OFFICE OF ORIGIN	EXTENSION
PRIORITY	OFFICE CHIEF OF ENGINEERS	78893
DATE 9 JANUARY 1946	GROVES	NAME OF OFFICER PREPARING LT. C. F. CLARKE

CLASSIFICATION ☐ RESTRICTED ☐ CONFIDENTIAL ☒ SECRET ☐ TOP SECRET

(LIST EACH ADDRESSEE SEPARATELY. USE UPPER CASE AND DOUBLE SPACING BETWEEN EACH ADDRESS AND THROUGHOUT MESSAGE)

TO: OFFICE OF MILITARY ATTACHE, AMERICAN EMBASSY, LONDON, ENGLAND

THIS OFFICE IS PREPARING AT GENERAL GROVES REQUEST REPORT ON THE LEGALITY OF THE SEIZURE AND DETENTION OF THE GUESTS PERIOD LOCO PERSONAL FROM SHULER SIGNED GROVES TO DEAN PD REQUEST YOU DISCUSS WITH COMMANDER WELSH PERIOD HE IS IN POSITION TO KNOW BRITISH REASONS FOR FEELING THE DETENTION MAY HAVE HAD SOME ILLEGAL ASPECTS PD SINCE THE GUESTS DO NOT FALL WITHIN THE GENEVA CONVENTION DEFINITION OF PRISONERS OF WAR DOES WELSH FEEL THEY WERE LEGALLY ENTITLED TO PRISONERS OF WAR STATUS INCLUDING VISITS FROM INTERNATIONAL RED CROSS PERIOD REPLY SHOULD STATE SPECIFIC LAWS TREATY AND STATUTE PROVISIONS WHICH MAY HAVE BEEN VIOLATED PD PARA

ALSO REQUEST YOU PROCURE COPIES OF THEN EXISTING THEATER DIRECTIVES AUTHORIZING ARREST AND DETENTION OF CIVILIANS SUCH AS THE GUESTS

DISTRIBUTION
LOCO NONE

SECRET

COORDINATION, CONTENT AND CLASSIFICATION AUTHENTICATED BY:
TYPED NAME AND GRADE W. R. SHULER
Colonel, Corps of Engineers
COORDINATION
DIVISION
SIGNATURE OF RESPONSIBLE OFFICER

W. D., A. G. O. FORM NO. 990
1 June 1944
This form supersedes W. D., A. G. O. Form No. 990, 2 September 1942, which may be used until existing stocks are exhausted.

NARA RG 77, Entry UD-22A, Box 160, Folder 205.3 Cables Outgoing, Secret and Under January 1946 thru December 1946

Figure D.43: W. R. Shuler to Office of Military Attaché London. 9 January 1946 [NARA RG 77, Entry UD-22A, Box 160, Folder 205.3 Cables Outgoing, Secret and Under January 1946 thru December 1946]. Even the officials responsible for imprisoning and secretly recording ten civilians for six months with no charges, no judicial process, and no International Red Cross visitation stated in writing that they were concerned the operation was illegal. That raises interesting questions, such as whether the modern families of those ten civilians might be entitled to financial and legal restitution from the U.K. and U.S. governments.

[The Farm Hall transcripts record the scientists' surprise at news of the 6 August 1945 Hiroshima bombing and do not reveal significant apparent knowledge of nuclear weapons design and development. Proponents of the conventional history use that evidence to argue that the German nuclear program never attempted or accomplished much. However, that argument assumes that all of the following three conditions are true:

1. It assumes that these ten scientists knew all of the details of the German nuclear program. Wartime German programs such as the nuclear work, chemical weapons development, and other advanced military programs were highly secretive and compartmentalized, such that each individual scientist knew only what they needed to know in order to do their job. Max von Laue does not appear to have even been involved in the wartime nuclear program, and some of the others may not have played major roles in it.

2. It assumes that the scientists were telling the truth and the whole truth in their recorded conversations. These scientists had just survived more than a decade in Germany where secret SS informers and hidden microphones were commonplace, so that they had had to be very careful with their words at all times in order to survive. Almost immediately after arriving at Farm Hall, Diebner openly speculated to the other scientists that there could be microphones there. Later, Hahn stated that the German scientists would only be released if the Allies were convinced that they were harmless. Still later, Harteck said they would be killed if the Allies thought they had done "larger scale" work. Diebner said they would be tried as war criminals if that were the case. The 25 January 1946 cable demonstrates that even at the end of the Farm Hall internment, Allied officials were still formally debating which if any of the German scientists to put on trial. In addition to the Germans' open acknowledgement of the possibility that microphones might be present, presumably they would have been very cognizant that their British hosts might overhear their conversations, or even that some of their own members (such as von Laue or others) might give the British information about the others' conversations. Thus it would be reasonable to assume that the scientists withheld a great deal of useful information from their conversations, or even gave false information to make themselves appear as naive as possible for any audience that might be listening.

3. It assumes that the published Farm Hall transcripts contain all relevant conversations. However, the transcripts give just a small faction of the conversations that would have occurred with ten scientists interacting among themselves and with their British hosts on a daily basis over a period of six months. The original tapes were reused for new recordings and consequently unavailable. Even the original German conversations are unavailable—all that survives in the written transcripts are English translations of those conversations. It is possible that the scientists found locations or methods for conversing that were not recorded. Finally, if a particular conversation had revealed an advanced German nuclear program, would that conversation have been released with the other transcripts (which were all classified until 1992), or might it have been handled differently and remain classified to this day?

For comparison, imagine that after World War II, ten scientists from the United States (a few who had held significant positions in the Manhattan Project but most who had not) were captured by Soviet forces and held for six months in a house in Moscow that they knew was bugged. Imagine that those captured scientists deeply feared that if they said the wrong thing, they could be forced to work in the Soviet Union for the rest of their lives, be imprisoned for the rest of their lives, or be executed as war criminals. No credible scholars would expect the resulting transcripts to be a complete and accurate account of all people, places, and work that had been involved in the entire

Manhattan Project. Likewise no credible scholars should expect the Farm Hall transcripts to be a complete and accurate account of all people, places, and work that had been involved in the entire German nuclear program.

Hahn complained that during that war, Heisenberg used to say "that one needed 50 kilogrammes of 235 in order to do anything" (which is a very good value for the required mass of U-235 without implosive compression; the U.S. Little Boy bomb used 64 kg of 80% U-235), but that in Allied custody Heisenberg had changed to saying he thought it was two tons. This seems to be a good example of the German scientists making their Allied interrogators believe that the wartime work was much less advanced than it actually was.

The conventional historical view is that roughly 100 or fewer people worked on the German nuclear program. Harteck seemed to indicate that he knew of approximately 1800 people working on the program, and there may have been many others of whom he was not aware.

The scientists remarked that Samuel Goudsmit was very prejudiced because his parents had been killed in the Holocaust. They were surprised that Goudsmit simply asked each scientist what work he had done and just "takes his word for it."

Harteck said that one ton of uranium could be vaporized for enrichment by as few as ten men, saying that he was "amazed at what [he] saw at I.G." Farben. What did he see? Which I.G. Farben facility was that? Did I.G. Farben have a large-scale uranium enrichment program, or technologies that could have been readily adapted to large-scale enrichment? Note that as soon as Harteck brought up this mysterious large-scale activity at I.G. Farben, the other scientists immediately changed the subject.

For more information on the development in the German-speaking world of a "photochemical process" for isotope separation that requires irradiation "with a particular wavelength," see p. 3698.]

D.1.3 Postwar Public Statements by a Few German Nuclear Scientists

[In their public interviews and writings in the years after the war, German scientists professed a lack of desire, plans, materials and/or political support to produce nuclear weapons for the Third Reich [Cassidy 1992; Heisenberg 1953, 1971; Irving 1967; Powers 1993; NYT 1948-12-28 p. 10].

However, only a small number of nuclear scientists went on the public record. It is not clear how much of what they said was factual history versus personal spin meant to avoid postwar criticism; the answer may vary for different scientists in question. Certainly it would have been in their best personal interests to downplay their support for weapons-related work as much as possible.

Based on these postwar statements, as well as the Alsos and Farm Hall reports, history books for the last 75+ years have primarily focused on Werner Heisenberg's KWI research group without sufficiently considering other groups, and have concluded that Germany never even made a serious attempt to build an atomic bomb, let alone made significant progress toward one. The greatest difference among these books is where they fall on a spectrum ranging from viewing the German scientists' motives and competence more favorably [e.g., Irving 1967; Powers 1993], in relatively neutral terms [e.g., Walker 1989, 1995, 2020, 2024a, 2024b], or less favorably [e.g., Goudsmit 1947; Rose 1998].]

Werner Heisenberg. 1971. *Physics and Beyond: Encounters and Conversations.* New York: Harper & Row. pp. 182–183.

In the autumn of 1941, when we thought we had a fairly clear picture of the technical possibilities, we asked the German Embassy in Copenhagen to arrange a public lecture for me there. I think I arrived in Denmark in October 1941, and when I visited Niels in his home in Carlsberg, I did not broach the dangerous subject until we took our evening walk. Since I had reason to think that Niels was being watched by German agents, I spoke with the utmost circumspection. I hinted that it was now possible in principle to build atom bombs, but that a tremendous technological effort was needed, and that physicists ought perhaps to ask themselves whether they should work in this field at all. Unfortunately, as soon as I mentioned the mere possibility of making atom bombs, Niels became so horrified that he failed to take in the most important part of my report, namely, that an enormous technical effort was needed. Now this, to me, was so important precisely because it gave physicists the possibility of deciding whether or not the construction of atom bombs should be attempted. They could either advise their governments that atom bombs would come too late for use in the present war, and that work on them therefore detracted from the war effort, or else contend that, with the utmost exertions, it might just be possible to bring them into the conflict. Both views could be put forward with equal conviction, and, in fact, during the war it turned out that even in America, where conditions were incomparably more favorable for the attempt than in Germany, the atom bomb was not made ready before V-E Day.

Niels, as I have said, was so horrified by the very possibility of producing atomic weapons that he did not follow the rest of my remarks. Perhaps he was also too filled with justifiable bitterness at the brutal occupation of his country by German troops to entertain any hopes of international understanding among physicists. I found it most painful to see how complete was the isolation to which our policy had brought us Germans, and to realize how war can cut into even the most long-standing friendships, at least for a time.

Despite this failure of my mission to Copenhagen, the German "uranium club" was in a relatively simple situation. The government decided (in June 1942) that work on the reactor project must be continued, but only on a modest scale. No orders were given to build atom bombs, and none of us had cause to call for a different decision. As a result, our work helped to pave the way for a peaceful atomic technology in the postwar period, and as such it was to bear useful fruits, despite and after all the destruction.

[Heisenberg's postwar claims that Germany never attempted to develop nuclear weapons are disproven by:

- Niels Bohr's letter below.
- Heisenberg's 1942 presentation to German government and military officials informing them that a uranium-235 or plutonium bomb with a fission pit about the size of a pineapple could destroy a large Allied city and could be built within two years if sufficient resources were allocated (pp. 3368– 3369).
- Photos from 1943 of Hitler with Heisenberg and other nuclear scientists who were working on a high-priority project for the war (pp. 3911–3913).
- The 15 September 1945 final report by the joint chairs of CIOS, U.S. General Thomas Jeffries Betts, Deputy G-2 of SHAEF, and U.K. Ministry of Supply chief advisor and F.R.S. Professor Reginald Patrick Linstead: "Authorities stated that KWI had repeatedly assured Hitler that an atomic explosive would be available for use within a comparatively short time" (p. 5076).
- Hundreds of other documents quoted or cited throughout the rest of this appendix.]

Unsent draft letter from Niels Bohr to Werner Heisenberg, undated (circa 1958). [Document 1 at: https://www.nbarchive.dk/collections/bohr-heisenberg/documents/ See also other Bohr letters to the same effect at that website.]

[...] Personally, I remember every word of our conversations, which took place on a background of extreme sorrow and tension for us here in Denmark. In particular, it made a strong impression both on Margrethe and me, and on everyone at the Institute that the two of you spoke to, that you and Weizsäcker expressed your definite conviction that Germany would win and that it was therefore quite foolish for us to maintain the hope of a different outcome of the war and to be reticent as regards all German offers of cooperation. I also remember quite clearly our conversation in my room at the Institute, where in vague terms you spoke in a manner that could only give me the firm impression that, under your leadership, everything was being done in Germany to develop atomic weapons and that you said that there was no need to talk about details since you were completely familiar with them and had spent the past two years working more or less exclusively on such preparations. I listened to this without speaking since [a] great matter for mankind was at issue in which, despite our personal friendship, we had to be regarded as representatives of two sides engaged in mortal combat. That my silence and gravity, as you write in the letter, could be taken as an expression of shock at your reports that it was possible to make an atomic bomb is a quite peculiar misunderstanding, which must be due to the great tension in your own mind. [...] If anything in my behaviour could be interpreted as shock, it did not derive from such reports but rather from the news, as I had to understand it, that Germany was participating vigorously in a race to be the first with atomic weapons.

Besides, at the time I knew nothing about how far one had already come in England and America, which I learned only the following year when I was able to go to England after being informed that the German occupation force in Denmark had made preparations for my arrest.

Document Section, Third Army, Freising, Bavaria. 1945 translation. Memo on a letter re Heisenberg from Himmler to the SS Dozentenführer in Leipzig (in the files at Freising). [NARA RG 77, Entry UD-22A, Box 167, Folder 32.12-2 GERMANY: Personnel (Jan 45–Dec 45)]

Memo on a letter re Heisenberg from Himmler to the SS Dozentenführer in Leipzig (in the files at Freising)

1. Himmler thanks and congratulates the Leipzig SD for the very thorough and accurate report on Heisenberg.

2. While it is evident that Heisenberg's attitude (I think he used the word "Anshauung") was not exactly in line with that prescribed by the party, I (Himmler) regard him as essentially decent (anständig), and want the SS and SD organizations in Leipzig and the University informed of that fact.

3. In view of his comparative youth and influence and ability to attract future scientists (Nachwuchs), we cannot permit ourselves to remove or to kill him. (können wir uns es nicht erlauben diesen Mann beiseite zu setzen oder zu töten.)

4. It would be highly desirable to get Heisenberg to write a scientific article for one of the publications of the SS. Dr. Wüst is probably the best person to approach him on this subject.

5. It is hoped that Heisenberg can ultimately be brought to work with us, possibly within the framework on the Ahnenerbe.

[See document photo on p. 3367.

This document does not indicate the date of the Himmler letter it is translating, but that was probably July 1938; see for example Powers 1993, pp. 41–43.]

NARA RG 77, Entry UD-22A, Box 167, Folder 32.12-2 GERMANY: Personnel (Jan 45--Dec 45)

SECRET

TA

Memo on a letter re Heisenberg from Himmler to the SS Dozentenführer in Leipzig (in the files at Freising)

1. Himmler thanks and congratulates the Leipzig SD for the very thorough and accurate report on Heisenberg.

2. "While it is evident that Heisenberg's attitude (I think he used the word "Anschauung") was not exactly in line with that prescribed by the party, I (Himmler) regard him as essentially decent (anständig), and want the SS and SD organizations in Leipzig and the University informed of that fact.

3. In view of his comparative youth and influence and ability to attract future scientists (Nachwuchs), we cannot permit ourselves to remove or to kill him. (könnenwir uns es nicht erlauben diesen Mann beiseite zu setzen oder zu töten.)

4. It would be highly desirable to get Heisenberg to write a scientific article for one of the publications of the SS. Dr. Wüst is probably the best person to approach him on this subject. (Rector at Munich + "Scientific" Director of the Ahnenerbe)

5. It is hoped that Heisenberg can ultimately be brought to work with us, possibly within the framework of the Ahnenerbe. "

Document Section, Third Army, ~~Group~~
Freising, Bavaria

~~This is~~

We are trying to get the original
S.A.G.

SECRET

Incl. # 9

Thought you might be interested!

Figure D.44: Document Section, Third Army, Freising, Bavaria. 1945 translation. Memo on a letter re Heisenberg from Himmler to the SS Dozentenführer in Leipzig (in the files at Freising) [NARA RG 77, Entry UD-22A, Box 167, Folder 32.12-2 GERMANY: Personnel (Jan 45–Dec 45)]. The Himmler letter being translated was probably from July 1938.

So gross wie eine Ananas... *Der Spiegel* 4 June 1967, pp. 80–93.

Noch während der Vorbereitungen, am 4. Juni 1942, wurde Heisenberg zur entscheidenden Geheimsitzung des deutschen Atom-Gremiums nach Berlin berufen: Die Mitglieder der "Uran-Gemeinschaft" sollten dem neuen Reichsminister für Bewaffnung und Munition, Albert Speer, Bericht erstatten und mit ihm die Zukunft der deutschen Uranforschung erörtern.

While preparations were still underway, on 4 June 1942 Heisenberg was summoned to Berlin for the crucial secret meeting of the German atomic body: The members of the "uranium club" were to report to the new Reich Minister of Armaments and Munitions, Albert Speer, and discuss with him the future of German uranium research.

Zwei Monate zuvor hatte Göring Order gegeben, daß alle Programme, die nur für die Nachkriegszeit Bedeutung hätten, zu unterlassen seien. Allein Albert Speer konnte entscheiden, ob irgendein Unternehmen von dieser Bestimmung ausgenommen wurde.

Two months earlier, Goering had given orders that all programs that were only relevant to the postwar period were to be omitted. Albert Speer alone could decide whether any enterprise was exempt from this provision.

Sie trafen sich im Helmholtz-Hörsaal des Harnack-Hauses in Dahlem:

They met in the Helmholtz lecture hall of the Harnack House in Dahlem:

> Auf der einen Seite die Forscher Hahn und Heisenberg, Diebner, Harteck und Wirtz sowie der Präsident der Kaiser-Wilhelm-Gesellschaft, Dr. Albert Vögler.

> On one side the researchers Hahn and Heisenberg, Diebner, Harteck and Wirtz, and the president of the Kaiser Wilhelm Society, Dr. Albert Vögler.

> Auf der anderen Seite Rüstungsminister Speer, sein technischer Berater Karl-Otto Saur, VW-Konstrukteur Ferdinand Porsche sowie die Militärs Leeb, Fromm, Milch und Witzell.

> On the other side, armaments minister Speer, his technical advisor Karl-Otto Saur, VW designer Ferdinand Porsche, and the military officers Leeb, Fromm, Milch and Witzell.

Man muß sich vergegenwärtigen, daß während der vorangegangenen Wochen die schweren Flächenangriffe der Royal Air Force auf deutsche Städte begonnen hatten. Lübeck und Rostock lagen bereits in Trümmern, Köln war in der Nacht zum 31. Mai von mehr als tausend britischen Bombern heimgesucht worden—und der Generalinspekteur und Generalzeugmeister der Luftwaffe, Generalfeldmarschall Erhard Milch, war begierig auf Vergeltung.

It must be remembered that during the preceding weeks, the Royal Air Force's heavy area raids on German cities had begun. Lübeck and Rostock were already in ruins, Cologne had been hit by more than a thousand British bombers on the night of May 31—and the Inspector General and Generalzeugmeister of the Luftwaffe, Field Marshal Erhard Milch, was eager for retaliation.

So kam Heisenberg sogleich auf die militärischen Anwendungsmöglichkeiten der Kernspaltung zu sprechen—auf Uran 235 und auf Plutonium.

So Heisenberg immediately turned to the military applications of nuclear fission—to uranium-235 and to plutonium.

Als er sein Referat beendet hatte, ergab sich ein knapper Dialog, der allen Anwesenden lebhaft in Erinnerung geblieben ist.

When he had finished his paper, a brief dialogue ensued that has been vividly remembered by all present.

Milch erkundigte sich nach der Größe einer Bombe, deren Wirkung genügen würde, eine große Stadt zu zerstören.

Milch inquired about the size of a bomb whose effect would be enough to destroy a large city.

Heisenberg: “Etwa so groß wie eine Ananas.” Er bezog sich auf die Explosivladung und demonstrierte ihren Umfang mit den Händen.

Heisenberg: “About the size of a pineapple.” He referred to the [fissile] explosive charge and demonstrated its size with his hands.

Als er der Unruhe unter den anwesenden Militärs gewahr wurde, dämpfte er ihren Enthusiasmus: Eine solche Waffe lasse sich nicht innerhalb weniger Monate produzieren; und sollten die Amerikaner auch bald einen Uranmeiler und in frühestens zwei Jahren eine Uranbombe haben—in Deutschland sei ihre Herstellung unter den gegebenen Umständen eine wirtschaftliche Unmöglichkeit.

When he became aware of the agitation among the military officers present, he dampened their enthusiasm: Such a weapon could not be produced within a few months. The Americans might also soon have a uranium pile, and in two years at the earliest a uranium bomb. In Germany producing it was an economic impossibility under the given circumstances.

“Ich war sehr glücklich”, so gestand Heisenberg sechs Jahre später in einem Brief, “daß uns jede Entscheidung abgenommen war: Die damals ausgegebenen Führerbefehle verhinderten jeden großen Einsatz für Atombomben.”

“I was very happy,” Heisenberg confessed in a letter six years later, “that every decision had been taken from us: the Führer orders issued at that time prevented any great effort for atomic bombs.”

Hingegen betonte Heisenberg immer wieder, ein Reaktor sei von größter Bedeutung, sowohl für aktuelle militärische als auch für zivile Zwecke nach dem Kriege.

By contrast, Heisenberg repeatedly stressed that a reactor was of paramount importance, both for current military and postwar civilian purposes.

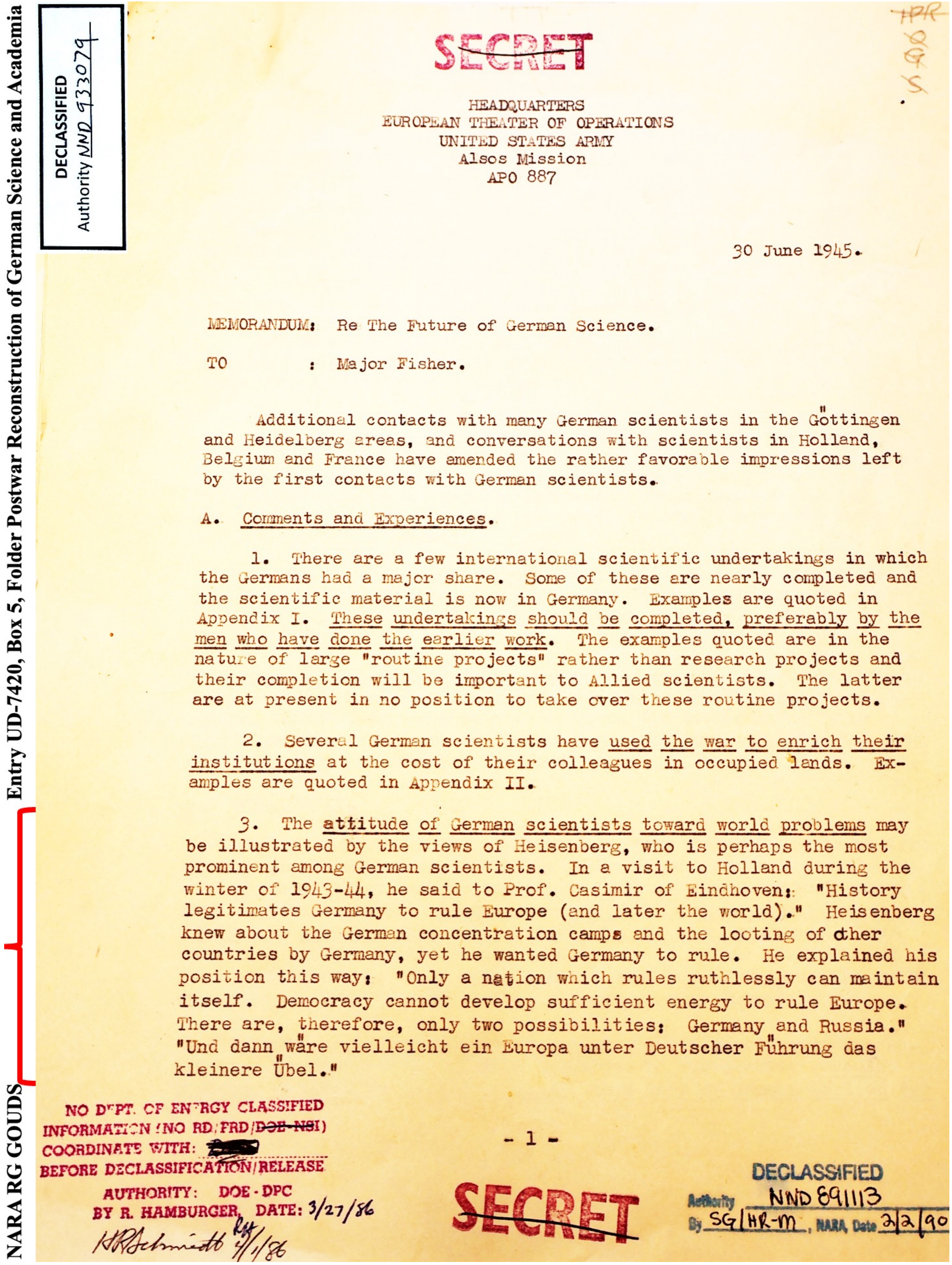
Die Partie, die eine Entscheidung hatte bringen sollen, endete pari: Das Vorhaben wurde weder eingestellt noch besonders unterstützt.

The match that should have brought a decision ended at par: the project was neither stopped nor particularly supported.

Speer genehmigte den Bau eines Bunkers, der—auf dem Gelände des Kaiser-Wilhelm-Instituts für Physik—den ersten großen deutschen Uranreaktor aufnehmen sollte.

Speer approved the construction of a bunker that would house—on the site of the Kaiser Wilhelm Institute of Physics—the first large German uranium reactor.

[There are several other accounts of the “pineapple” story; see for example the sources in Powers 1993, pp. 515–516.]



NARA RG GOUDS, Entry UD-7420, Box 5, Folder Postwar Reconstruction of German Science and Academia

DECLASSIFIED
Authority NND 933079

HPR
996

~~SECRET~~

HEADQUARTERS
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
Alsos Mission
APO 887

30 June 1945.

MEMORANDUM: Re The Future of German Science.

TO : Major Fisher.

Additional contacts with many German scientists in the Göttingen and Heidelberg areas, and conversations with scientists in Holland, Belgium and France have amended the rather favorable impressions left by the first contacts with German scientists.

A. Comments and Experiences.

1. There are a few international scientific undertakings in which the Germans had a major share. Some of these are nearly completed and the scientific material is now in Germany. Examples are quoted in Appendix I. These undertakings should be completed, preferably by the men who have done the earlier work. The examples quoted are in the nature of large "routine projects" rather than research projects and their completion will be important to Allied scientists. The latter are at present in no position to take over these routine projects.

2. Several German scientists have used the war to enrich their institutions at the cost of their colleagues in occupied lands. Examples are quoted in Appendix II.

3. The attitude of German scientists toward world problems may be illustrated by the views of Heisenberg, who is perhaps the most prominent among German scientists. In a visit to Holland during the winter of 1943-44, he said to Prof. Casimir of Eindhoven: "History legitimates Germany to rule Europe (and later the world)." Heisenberg knew about the German concentration camps and the looting of other countries by Germany, yet he wanted Germany to rule. He explained his position this way: "Only a nation which rules ruthlessly can maintain itself. Democracy cannot develop sufficient energy to rule Europe. There are, therefore, only two possibilities: Germany and Russia." "Und dann wäre vielleicht ein Europa unter Deutscher Führung das kleinere Übel."

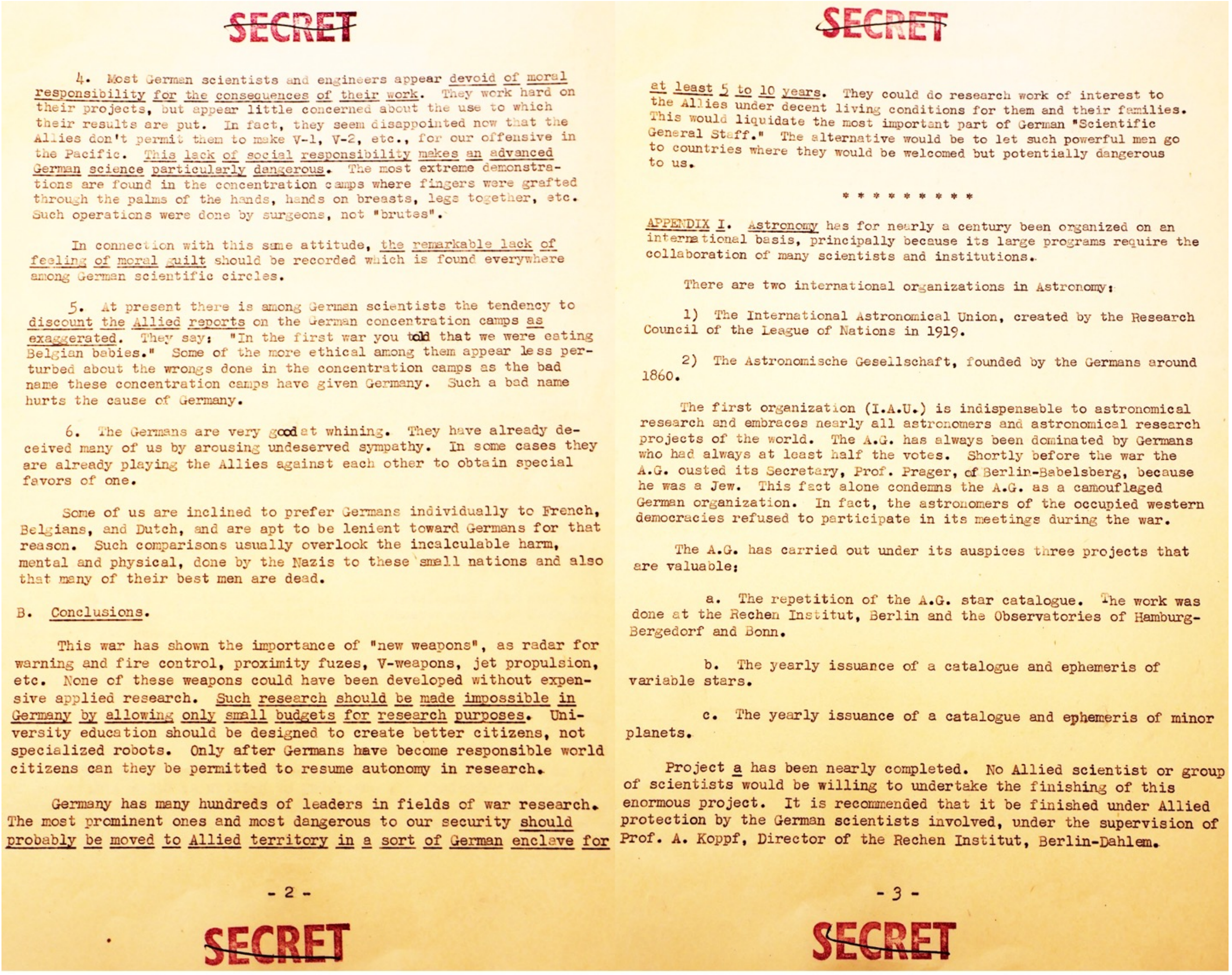
- 1 -

NO DEPT. OF ENERGY CLASSIFIED
INFORMATION (NO RD/FRD/~~DOE-NSI~~)
COORDINATE WITH: [redacted]
BEFORE DECLASSIFICATION/RELEASE
AUTHORITY: DOE-DPC
BY R. HAMBURGER, DATE: 3/27/86
HRSchmidt 4/1/86

~~SECRET~~

DECLASSIFIED
Authority NND 891113
By SG/HR-m, NARA Date 3/2/90

Figure D.45: Gerard P. Kuiper to Major Fisher. 30 June 1945. Re The Future of German Science [NARA RG GOUDS, Entry UD-7420, Box 5, Folder Postwar Reconstruction of German Science and Academia]. "Heisenberg... said to Prof. Casimir of Eindhoven: 'History legitimates Germany to rule Europe (and later the world)... Only a nation which rules ruthlessly can maintain itself.'"



~~SECRET~~

4. Most German scientists and engineers appear devoid of moral responsibility for the consequences of their work. They work hard on their projects, but appear little concerned about the use to which their results are put. In fact, they seem disappointed now that the Allies don't permit them to make V-1, V-2, etc., for our offensive in the Pacific. This lack of social responsibility makes an advanced German science particularly dangerous. The most extreme demonstrations are found in the concentration camps where fingers were grafted through the palms of the hands, hands on breasts, legs together, etc. Such operations were done by surgeons, not "brutes".

In connection with this same attitude, the remarkable lack of feeling of moral guilt should be recorded which is found everywhere among German scientific circles.

5. At present there is among German scientists the tendency to discount the Allied reports on the German concentration camps as exaggerated. They say: "In the first war you told that we were eating Belgian babies." Some of the more ethical among them appear less perturbed about the wrongs done in the concentration camps as the bad name these concentration camps have given Germany. Such a bad name hurts the cause of Germany.

6. The Germans are very good at whining. They have already deceived many of us by arousing undeserved sympathy. In some cases they are already playing the Allies against each other to obtain special favors of one.

Some of us are inclined to prefer Germans individually to French, Belgians, and Dutch, and are apt to be lenient toward Germans for that reason. Such comparisons usually overlook the incalculable harm, mental and physical, done by the Nazis to these small nations and also that many of their best men are dead.

B. Conclusions.

This war has shown the importance of "new weapons", as radar for warning and fire control, proximity fuzes, V-weapons, jet propulsion, etc. None of these weapons could have been developed without expensive applied research. Such research should be made impossible in Germany by allowing only small budgets for research purposes. University education should be designed to create better citizens, not specialized robots. Only after Germans have become responsible world citizens can they be permitted to resume autonomy in research.

Germany has many hundreds of leaders in fields of war research. The most prominent ones and most dangerous to our security should probably be moved to Allied territory in a sort of German enclave for

- 2 -

~~SECRET~~

~~SECRET~~

at least 5 to 10 years. They could do research work of interest to the Allies under decent living conditions for them and their families. This would liquidate the most important part of German "Scientific General Staff." The alternative would be to let such powerful men go to countries where they would be welcomed but potentially dangerous to us.

* * * * * * * * *

APPENDIX I. Astronomy has for nearly a century been organized on an international basis, principally because its large programs require the collaboration of many scientists and institutions.

There are two international organizations in Astronomy:

1) The International Astronomical Union, created by the Research Council of the League of Nations in 1919.

2) The Astronomische Gesellschaft, founded by the Germans around 1860.

The first organization (I.A.U.) is indispensable to astronomical research and embraces nearly all astronomers and astronomical research projects of the world. The A.G. has always been dominated by Germans who had always at least half the votes. Shortly before the war the A.G. ousted its Secretary, Prof. Prager, of Berlin-Babelsberg, because he was a Jew. This fact alone condemns the A.G. as a camouflaged German organization. In fact, the astronomers of the occupied western democracies refused to participate in its meetings during the war.

The A.G. has carried out under its auspices three projects that are valuable:

a. The repetition of the A.G. star catalogue. The work was done at the Rechen Institut, Berlin and the Observatories of Hamburg-Bergedorf and Bonn.

b. The yearly issuance of a catalogue and ephemeris of variable stars.

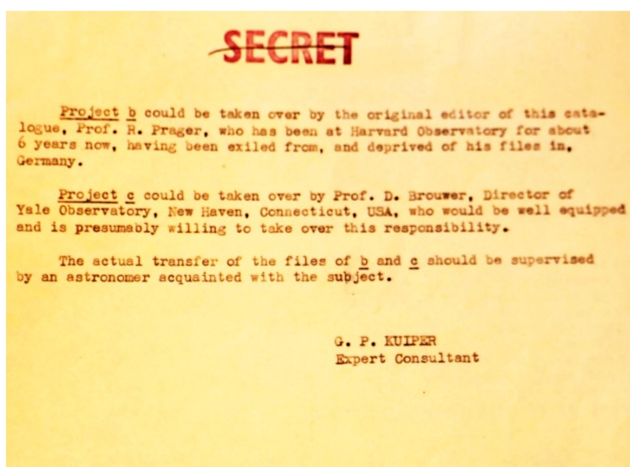
c. The yearly issuance of a catalogue and ephemeris of minor planets.

Project a has been nearly completed. No Allied scientist or group of scientists would be willing to undertake the finishing of this enormous project. It is recommended that it be finished under Allied protection by the German scientists involved, under the supervision of Prof. A. Koppf, Director of the Rechen Institut, Berlin-Dahlem.

- 3 -

~~SECRET~~

DECLASSIFIED
Authority NND 933079



~~SECRET~~

Project b could be taken over by the original editor of this catalogue, Prof. R. Prager, who has been at Harvard Observatory for about 6 years now, having been exiled from, and deprived of his files in, Germany.

Project c could be taken over by Prof. D. Brouwer, Director of Yale Observatory, New Haven, Connecticut, USA, who would be well equipped and is presumably willing to take over this responsibility.

The actual transfer of the files of b and c should be supervised by an astronomer acquainted with the subject.

G. P. KUIPER
Expert Consultant

NARA RG GOUDS, Entry UD-7420, Box 5, Folder Postwar Reconstruction of German Science and Academia

Figure D.46: Gerard P. Kuiper to Major Fisher. 30 June 1945. Re The Future of German Science [NARA RG GOUDS, Entry UD-7420, Box 5, Folder Postwar Reconstruction of German Science and Academia]. "Heisenberg... said to Prof. Casimir of Eindhoven: 'History legitimates Germany to rule Europe (and later the world)... Only a nation which rules ruthlessly can maintain itself.'"

Albert Speer. 1970. *Inside the Third Reich.* New York: Macmillan. Chapter 16.

I met regularly for lunch with General Friedrich Fromm in a *chambre séparée* at Horcher's Restaurant. In the course of one of these meetings, at the end of April 1942, he remarked that our only chance of winning the war lay in developing a weapon with totally new effects. He said he had contacts with a group of scientists who were on the track of a weapon which could annihilate whole cities, perhaps throw the island of England out of the fight. Fromm proposed that we pay a joint visit to these men. It seemed to him important, he said, at least to have spoken with them.

Dr. Albert Vögler, head of the largest German steel company and president of the Kaiser Wilhelm Gesellschaft, also called my attention at this time to the neglected field of nuclear research. He complained of the inadequate support fundamental research was receiving from the Ministry of Education and Science, which naturally did not have much influence during wartime. On May 6, 1942, I discussed this situation with Hitler and proposed that Goering be placed at the head of the Reich Research Council—thus emphasizing its importance.[23] A month later, on June 9, 1942, Goering was appointed to this post.

Around the same time the three military representatives of armaments production, Milch, Fromm, and Witzell, met with me at Harnack House, the Berlin center of the Kaiser Wilhelm Gesellschaft, to be briefed on the subject of German atomic research. Along with scientists whose names I no longer recall, the subsequent Nobel Prize winners Otto Hahn and Werner Heisenberg were present. After a few demonstration lectures on the matter as a whole, Heisenberg reported on "Atom-smashing and the development of the uranium machine [sic] and the cyclotron."[24] Heisenberg had bitter words to say about the Ministry of Education's neglect of nuclear research, about the lack of funds and materials, and the drafting of scientific men into the services. Excerpts from American technical journals suggested that plenty of technical and financial resources were available there for nuclear research. This meant that America probably had a head start in the matter, whereas Germany had been in the forefront of these studies only a few years ago. In view of the revolutionary possibilities of nuclear fission, dominance in this field was fraught with enormous consequences.

After the lecture I asked Heisenberg how nuclear physics could be applied to the manufacture of atom bombs. His answer was by no means encouraging. He declared, to be sure, that the scientific solution had already been found and that theoretically nothing stood in the way of building such a bomb. But the technical prerequisites for production would take years to develop, two years at the earliest, even provided that the program was given maximum support. Difficulties were compounded, Heisenberg explained, by the fact that Europe possessed only one cyclotron, and that of minimal capacity. Moreover, it was located in Paris and because of the need for secrecy could not be used to full advantage. I proposed that with the powers at my disposal as Minister of Armaments we build cyclotrons as large as or larger than those in the United States. But Heisenberg said that because we lacked experience we would have to begin by building only a relatively small type.

Nevertheless, General Fromm offered to release several hundred scientific assistants from the services, while I urged the scientists to inform me of the measures, the sums of money, and the materials they would need to further nuclear research. A few weeks later they presented their request: an appropriation of several hundred thousand marks and some small amounts of steel, nickel, and other priority metals. In addition, they asked for the building of a bunker, the erection of several barracks, and the pledge that their experiments would be given highest priority. Plans for building the first German cyclotron had already been approved. Rather put out by these modest requests in a matter of such crucial importance, I suggested that they take one or two million marks and correspondingly larger quantities of materials. But apparently more could not be utilized for the present,[25] and in any case I had been given the impression that the atom bomb could no longer have any bearing on the course of the war.

I was familiar with Hitler's tendency to push fantastic projects by making senseless demands, so that on June 23, 1942, I reported to him only very briefly on the nuclear-fission conference and what we had decided to do.[26] Hitler received more detailed and more glowing reports from his photographer, Heinrich Hoffmann, who was friendly with Post Office Minister Ohnesorge. Goebbels, too, may have told him something about it. Ohnesorge was interested in nuclear research and was supporting—like the SS—an independent research apparatus under the direction of Manfred von Ardenne, a young physicist. It is significant that Hitler did not choose the direct route of obtaining information on this matter from responsible people but depended instead on unreliable and incompetent informants to give him a Sunday-supplement account. Here again was proof of his love for amateurishness and his lack of understanding of fundamental scientific research.

Hitler had sometimes spoken to me about the possibility of an atom bomb, but the idea quite obviously strained his intellectual capacity. He was also unable to grasp the revolutionary nature of nuclear physics. In the twenty-two hundred recorded points of my conferences with Hitler, nuclear fission comes up only once, and then is mentioned with extreme brevity. Hitler did sometimes comment on its prospects, but what I told him of my conference with the physicists confirmed his view that there was not much profit in the matter. Actually, Professor Heisenberg had not given any final answer to my question whether a successful nuclear fission could be kept under control with absolute certainty or might continue as a chain reaction. Hitler was plainly not delighted with the possibility that the earth under his rule might be transformed into a glowing star. Occasionally, however, he joked that the scientists in their unworldly urge to lay bare all the secrets under heaven might someday set the globe on fire. But undoubtedly a good deal of time would pass before that came about, Hitler said; he would certainly not live to see it.

I am sure that Hitler would not have hesitated for a moment to employ atom bombs against England. I remember his reaction to the final scene of a newsreel on the bombing of Warsaw in the autumn of 1939. We were sitting with him and Goebbels in his Berlin salon watching the film. Clouds of smoke darkened the sky; dive bombers tilted and hurtled toward their goal; we could watch the flight of the released bombs, the pull-out of the planes and the cloud from the explosions expanding gigantically. The effect was enhanced by running the film in slow motion. Hitler was fascinated. The film ended with a montage showing a plane diving toward the outlines of the British Isles. A burst of flame followed, and the island flew into the air in tatters. Hitler's enthusiasm was unbounded. "That is what will happen to them!" he cried out, carried away. "That is how we will annihilate them!"

On the suggestion of the nuclear physicists we scuttled the project to develop an atom bomb by the autumn of 1942, after I had again queried them about deadlines and been told that we could not count on anything for three or four years. The war would certainly have been decided long before then. Instead I authorized the development of an energy-producing uranium motor for propelling machinery. The navy was interested in that for its submarines.

In the course of a visit to the Krupp Works I asked to be shown parts of our first cyclotron and asked the technician in charge whether we could not go on and build a considerably larger apparatus. But he confirmed what Professor Heisenberg had previously said: We lacked the technical experience. At Heidelberg in the summer of 1944, I was shown our first cyclotron splitting an atomic nucleus. To my questions, Professor Walther Bothe explained that this cyclotron would be useful for medical and biological research. I had to rest content with that.

In the summer of 1943, wolframite imports from Portugal were cut off, which created a critical situation for the production of solid-core ammunition. I thereupon ordered the use of uranium cores for this type of ammunition.[27] My release of our uranium stocks of about twelve hundred metric tons showed that we no longer had any thought of producing atom bombs.

Perhaps it would have proved possible to have the atom bomb ready for employment in 1945. But it would have meant mobilizing all our technical and financial resources to that end, as well as our scientific talent. It would have meant giving up all other projects, such as the development of the rocket weapons. From this point of view, too, Peenemünde was not only our biggest but our most misguided project.*

Our failure to pursue the possibilities of atomic warfare can be partly traced to ideological reasons. Hitler had great respect for Philipp Lenard, the physicist who had received the Nobel Prize in 1920 and was one of the few early adherents of Nazism among the ranks of the scientists. Lenard had instilled the idea in Hitler that the Jews were exerting a seditious influence in their concern with nuclear physics and the relativity theory.**

To his table companions Hitler occasionally referred to nuclear physics as "Jewish physics"—citing Lenard as his authority for this. This view was taken up by Rosenberg. It thus becomes clearer why the Minister of Education was not inclined to support nuclear research.

But even if Hitler had not had this prejudice against nuclear research and even if the state of our fundamental research in June 1942 could have freed several billion instead of several million marks for the production of atom bombs, it would have been impossible—given the strain on our economic resources—to have provided the materials, priorities, and technical workers corresponding to such an investment. For it was not only superior productive capacity that allowed the United States to undertake this gigantic project. The increasing air raids had long since created an armaments emergency in Germany which ruled out any such ambitious enterprise. At best, with extreme concentration of all our resources, we could have had a German atom bomb by 1947, but certainly we could not beat the Americans, whose bomb was ready by August 1945.

23. *Office Journal*, May 6, 1942.

24. *Office Journal*, 1942: "On June 4 the Minister flew back to Berlin.... That evening there was a lecture in Harnack House on atom-smashing and the development of the uranium machine [sic] and the cyclotron."

25. As late as December 19, 1944, I wrote to Professor Gerlach, who had been placed in charge of the uranium project: "You can always count on me to help you overcome any obstacles that may interfere with your work. Despite the very heavy drain on the labor force by the armaments industry, the relatively small [!] needs of your project can still be met."

26. *Führerprotokoll*, June 23, 1942, Point 15, states only: "Reported briefly to the Fuehrer on the conference on splitting the atom and on the backing we have given the project."

27. *Office Journal*, August 31, 1942, and March 1944. In 1940 twelve hundred metric tons of uranium ore had been seized in Belgium. Mining of domestic ore in Joachimstal was not pushed with any real urgency.

∗ From 1937 to 1940 the army spent five hundred and fifty million marks on the development of a large rocket. But success was out of the question, for Hitler's principle of scattering responsibility meant that even scientific research teams were divided and often at odds with one another. According to the *Office Journal*, August 17, 1944, not only the three branches of the armed forces but also other organizations, the SS, the postal system, and such, had separate research facilities. In the United States, on the other hand, all the atomic physicists—to take an example—were in one organization.

∗∗ According to L. W. Helwig, *Persönlichkeiten der Gegenwart* (1940), Lenard inveighed against "relativity theories produced by alien minds." In his four-volume work, *Die Deutsche Physik* (1935), Helwig considered physics "cleansed of the outgrowths which the by now well-known findings of race research have shown to be the exclusive products of the Jewish mind and which the German *Volk* must shun as racially incompatible with itself."

[In the above passage, Albert Speer made numerous claims about the German nuclear program that have been uncritically accepted and repeated by many historians, journalists, and members of the public in the decades since then. There is clear evidence that Speer's claims were false, and even that he knew they were false. For example:

Speer falsely claimed:	**In fact:**
"Dr. Albert Vögler... called my attention at this time to the neglected field of nuclear research... On May 6, 1942, I discussed this situation with Hitler and proposed that Goering be placed at the head of the Reich Research Council—thus emphasizing its importance."	Far from being neglected, German nuclear weapons research had been going strong since the late 1930s (e.g., pp. 3380–4427). Speer's claim that the nuclear program did not begin until 1942 also contradicts his own claim that the program *ended* in 1942 (see below).
Any German nuclear work, or any information on nuclear work, other than that by Heisenberg was "unreliable," "incompetent," and characterized by "amateurishness."	After the war, Heisenberg remained in (West) Germany and did not do any significant nuclear work, but many hundreds of what Speer called "unreliable," "incompetent," and "amateurish" former German nuclear scientists helped the Soviet Union, France, United Kingdom, United States, and other countries design and build nuclear weapons (Sections 8.7, 8.9, and D.14, plus pp. 2073–2086, 4306–4307).
"[T]he possibility of an atom bomb... quite obviously strained [Hitler's] intellectual capacity. He was also unable to grasp the revolutionary nature of nuclear physics." "Our failure to pursue the possibilities of atomic warfare can be partly traced to ideological reasons... Hitler occasionally referred to nuclear physics as 'Jewish physics'... Hitler... had this prejudice against nuclear research."	Quotes from many independent sources and even photographs prove that Hitler was very supportive of nuclear weapons development and had high hopes for its applications in the war (e.g., pp. 3911–3913, 4621–4622, 4637, 4640, 4680, 4681–4685, 4686–4710, 4713, 4716). There are also many other sources demonstrating strong support and expectations for the nuclear program from the German government (e.g., Section D.13).
"Hitler would not have hesitated for a moment to employ atom bombs against England" if he had possessed them; thus the fact that he did not supposedly proves Germany did not have any atom bombs.	Allied leaders publicly and repeatedly threatened to use their own weapons of mass destruction (mustard, phosgene, anthrax, etc.) against Germany if Germany used any form of weapons of mass destruction, which effectively deterred the use of German nuclear weapons through the end of the war in Europe (e.g., pp. 2644–2663, 3820–3825, 4714–4716).
"We scuttled the project to develop an atom bomb by the autumn of 1942."	The German nuclear weapons program continued at full speed from 1942 to the end of the war (e.g., pp. 4032, 4428–5127). Speer's claim that the program ended in 1942 contradicts his own claim that it began in 1942 (see above).

Speer falsely claimed:	**In fact:**
"Instead I authorized the development of an energy-producing uranium motor for propelling machinery."	Wartime programs to develop nuclear propulsion for submarines, aircraft, and rockets existed, but those programs were not directed by Speer (e.g., pp. 1484, 5855–5871).
"We lacked the technical experience. At Heidelberg in the summer of 1944, I was shown our first cyclotron splitting an atomic nucleus."	Germany had been designing and building particle accelerators since the 1920s, and it built and used many accelerators throughout the war (Sections C.1, D.6; pp. 4549–4555).
"In the summer of 1943... I thereupon ordered the use of uranium cores for this type of [conventional] ammunition. My release of our uranium stocks of about twelve hundred metric tons showed that we no longer had any thought of producing atom bombs."	Clearly Speer did not send the 1200 tons of uranium stocks off to be made into ammunition in the summer of 1943, since that 1200 tons of uranium was found in 1945 (e.g., p. 3475) and battlefields littered with German uranium bullets were not found.
"[I]t would have been impossible—given the strain on our economic resources—to have provided the materials, priorities, and technical workers corresponding to such an investment. For it was not only superior productive capacity that allowed the United States to undertake this gigantic project." "[T]o have the atom bomb ready for employment... would have meant mobilizing all our technical and financial resources to that end, as well as our scientific talent. It would have meant giving up all other projects, such as the development of the rocket weapons."	If much smaller and poorer nations have been able to successfully develop nuclear weapons, then the industrial power of almost all of Europe under German control certainly could have done so. Indeed, at sites all over Europe, Germany was mining and processing uranium (Sections D.3, D.4) and producing enormous quantities of other nuclear-related materials (Section D.7). Europe had sufficient population, industry, and resources to perform those plus all the other wartime tasks, just as the United States did (though German-controlled Europe could not outcompete the U.S. plus the British Empire plus the Soviet Union for sheer numbers).
"The increasing air raids had long since created an armaments emergency in Germany which ruled out any such ambitious enterprise."	The German nuclear weapons program began long before Allied bombing (e.g., pp. 3382–3421). For protection against Allied bombing later in the war, German industries were divided among a large number of sites, many of which were underground and/or in the east, which allowed them to continue effectively (e.g., pp. 2087–2088). Likewise the German nuclear weapons program was divided among a large number of sites, many of which were underground and/or in the east (e.g., pp. 4440–4443).

Speer falsely claimed:	**In fact:**
"Mining of domestic [uranium] ore in Joachimstal was not pushed with any real urgency."	Based on postwar inspections, 1946 U.S. intelligence reports on the Joachimstal uranium mine stated: "The Germans put mining on a high priority and only mining was done throughout the 6 years occupation. The ore was delivered by special planes to Germany and Austria" (p. 4032). "The Germans continued operations in this mine to the very last moment" (p. 5027). Germany was also actively mining uranium at many other sites from Portugal to Bulgaria (Section D.3).
"Hitler's principle of scattering responsibility meant that even scientific research teams were divided and often at odds with one another. According to the Office Journal, August 17, 1944, not only the three branches of the armed forces but also other organizations, the SS, the postal system, and such, had separate research facilities. In the United States, on the other hand, all the atomic physicists—to take an example—were in one organization."	The different parts of the German nuclear weapons program were coordinated with each other at the highest levels by the SS (e.g., pp. 3396–3421, 4960–5007, 5044–5045). The compartmentalization of the program made it more resistant to Allied intelligence, sabotage, and bombing.
In different parts of this passage, Speer claimed that Germany could have created an atom bomb as early as 1945, no earlier than 1947, or not at all.	Speer was making so many false statements that he could not even keep them consistent from one page to the next. According to numerous other sources, Germany appears to have successfully created and tested atomic bombs by 1944 (Sections D.10 and D.11).

Although Speer was not in charge of the German nuclear weapons program, he was in sufficiently close communication with those who were to know that his above statements were false (e.g., pp. 3368, 4502, 4639, 4662–4663, 4686–4710, 4984, 5384, 5411).

Thus the evidence presented throughout Appendix D demonstrates that Speer made a whole series of false claims about the German nuclear program just within this short passage. In several cases, what Speer wrote in one paragraph completely contradicted what he had written in another paragraph in this book, or in his other writings (e.g., pp. 4639, 4977).

Beyond the German nuclear program, other researchers have already documented Albert Speer's dishonesty about all sorts of personal and historical events [see for example: Kitchen 2015; Van Der Vat 1997]. The history books of the world should not be founded upon the postwar claims of Speer, a clearly proven serial fabulist. Anything he said should be viewed with extreme skepticism and compared very closely with more trustworthy sources.]

Paul Lawrence Rose. 1998. *Heisenberg and the Nazi Atomic Bomb Project: A Study in German Culture*. Berkeley, California: University of California Press. pp. xvi–xvii.

Since the war an apologetic campaign has been mounted by Heisenberg and other German physicists and historians to demonstrate that he understood fully both the moral and scientific issues involved in this work as chief physicist for the Nazi atomic bomb project from 1939 to 1945. [...] If we are to understand Heisenberg as he really was, we must enter into the German frame of mind, or mentality, or mind-set and sensibility, that had evolved out of the German culture of the nineteenth and twentieth centuries, strange though that mentality appears now to non-Germans, and even to those Germans who have been shaped by the changed and Westernized German culture that has been developing since 1945.

I cannot say that my British background has made me entirely sympathetic to German culture. Although I would be the first to admit its outstanding achievements in science, music, and intellectual life in general, its insistent abstraction as well as the more sinister traditions that accompanied it induce in me a certain skepticism and even aversion. As the American liberal philosopher John Dewey once observed, even Kant's categorical imperative has a whiff of the Prussian drill sergeant about it; the grand moral principle depended, despite its apparent universal reasonableness, on an all too German demand for conforming obedience. Some readers may be put off by what seems, following this spirit of distrust of Kant, the *Tendenz* of the present book, its lack of sympathy with German culture, and its seeming moral and scientific denigration of a great physicist who found himself born into an evil time. [...] The only real test of the historical truth of the present reconstruction is whether it makes better sense of the central problem of the Heisenberg affair and conforms more exactly to the facts as far as we may know them about Heisenberg, the German atomic bomb project, and German culture and society before, during, and after the Third Reich than do other versions. [...]

In this book I have tried to penetrate into how Germans think—or rather, perhaps, used to think—and to show how radically different are German and what I have termed "Western" mentalities and sensibilities. My regret is that in order to expose the nature and fallacies of much of this German thinking and feeling, I have, I fear, often been forced to be tediously analytical. This is not, in consequence, a graceful book, I am sorry to confess, but perhaps Heisenberg and his company have benefited too long from grace of various sorts.

[Such statements from the "expert historians" of this field should spur modern scholars to set aside this conventional historical narrative and make a *de novo*, detailed, and fully independent evaluation of the wartime German nuclear program. The rest of this appendix attempts to do just that, and also to offer leads for future scholars who would like to investigate this subject in further detail.]

D.2 Fundamental Scientific Knowledge and Program Planning

[Beginning in 1939, scientists such as Kurt Diebner (German, 1905–1964), Siegfried Flügge (German, 1912–1997), Paul Harteck (Austrian, 1902–1985), Fritz Houtermans (German, 1903–1966), Josef Schintlmeister (Austrian, 1908–1971), Georg Stetter (Austrian, 1895–1988), and Carl Friedrich von Weizsäcker (German, 1912–2007) gave detailed descriptions of how fission fuel could be used to create either reactors or bombs. They received support from the German government in 1939 and began ambitious programs to create fission reactors and bombs. During 1939–1942, the programs were coordinated by the German army. During 1942–1945, the programs were coordinated by the SS.

For early scientific knowledge regarding the breeding of fission fuel, see Section D.5.1.

For an organization chart and some key personnel from the programs, see pp. 1579, 1623–1641.]

Otto Hahn and Fritz Strassmann. January 1939. Über den Nachweis und das Verhalten der bei der Bestrahlung des Urans mittels Neutronen entstehenden Erdalkalimetalle. [About the Detection and Behavior of the Alkaline Earth Metals Formed During the Irradiation of Uranium with Neutrons.] *Die Naturwissenschaften* 27:11–15.

[...] Bei der energetisch nicht leicht zu verstehenden Bildung von Radiumisotopen aus Uran beim Beschießen mit langsamen Neutronen war eine besonders gründliche Bestimmung des chemischen Charakters der neu entstehenden künstlichen Radioelemente unerläßlich. Durch die Abtrennung einzelner analytischer Gruppen von Elementen aus der Lösung des bestrahlten Urans wurde außer der großen Gruppe der Transurane eine Aktivität stets bei den Erdalkalien (Trägersubstanz Ba), den seltenen Erden (Trägersubstanz La) und bei Elementen der vierten Gruppe des Periodischen Systems (Trägersubstanz Zr) gefunden. Eingehender untersucht wurden zunächst die Bariumfällungen, die offensichtlich die Anfangsglieder der beobachteten isomeren Reihen enthielten. Es soll gezeigt werden, daß Transurane, Uran, Protactinium, Thorium und Actinium sich stets leicht und vollständig von der mit Barium ausfallenden Aktivität trennen lassen. [...]

[...] Since it is not easy to understand from energy considerations how radium isotopes can be produced when uranium is bombarded with slow neutrons, a very careful determination of the chemical properties of the new artificially made radioelements was necessary. Various analytic groups of elements were separated from a solution containing the irradiated uranium. Besides the large group of transuranic elements, some radioactivity was always found in the alkaline-earth group (barium carrier), the rare-earth group (lanthanum carrier), and also with elements in group IV of the periodic table (zirconium carrier). The barium precipitate was the first to be investigated more thoroughly, since it apparently contains the parent isotopes of the observed isomeric series. The goal was to show that the transuranic elements, and also uranium, protactinium, thorium, and actinium could always be separated easily and completely from the activity which precipitates with barium. [...]

[At the Kaiser Wilhelm Institute for Chemistry in Berlin-Dahlem, Hahn and Strassmann discovered neutron-induced fission of uranium into lighter elements in 1938, and published their results in January 1939.]

synthetischem Asbest[1], von künstlichem Glimmer[2], von künstlichem Kaolin[3] und Montmorillonit[4]. Bei allen diesen Versuchen hat man zwar bisher nur sehr kleine Kristalle erhalten, deren Identifizierung nur mittels Röntgenanalyse sichergestellt werden konnte. Es ist jedoch kein Zweifel, daß hier fruchtbare Ansätze vorliegen, die verfolgt werden müssen.

Interessant ist auch die Tatsache, daß es der Technik gelungen ist, Gewebe aus Glas herzustellen, bei denen die einzelnen Glasfäden die bekannte Sprödigkeit des Glases vollkommen verloren haben, sowie ferner, daß die Beachtung des Isosterismus von Quarz und $AlPO_4$ zu technisch brauchbaren neuartigen Gläsern geführt hat.

Ich möchte schließen mit der Forderung, daß wir uns bei der Suche nach praktisch brauchbaren Stoffen für bestimmte Verwendungszwecke mehr als bisher loslösen müssen von unseren Kenntnissen über die chemische Zusammensetzung des bisher auf dem entsprechenden Anwendungsgebiet Bekannten und daß wir viel mehr als bisher unsere Kenntnisse über Kristallstruktur und Bindungsart der praktisch brauchbaren Stoffe vertiefen müssen, um in planmäßiger Weise diejenigen chemischen Elemente zur Verbindungsbildung beizuziehen, die aus den allgemeinen Erkenntnissen über Bau, Größe und Bindungsvermögen der Atome in Betracht kommen und in Deutschland als Rohstoffe vorhanden sind.

1 K. H. SCHEUMANN, Fortschr. d. Min. Krist. Petrographie **17**, 69 (1937). — W. LÜTTGE, Fortschr. d. Min. Krist. Petrographie **18**, 29 (1933); **15**, 40 (1935). — Vgl. auch MACHATSCHKI, Naturwiss. **24**, 742 (1936).

2 W. NOLL, Naturwiss. **20**, 283 (1932).

3 W. NOLL, Naturwiss. **20**, 366 (1932).

4 W. NOLL, Naturwiss. **23**, 197 (1935); vgl. auch W. NOLL, Ber. dtsch. keram. Ges. **19**, H. 5 (1938).

Über den Nachweis und das Verhalten der bei der Bestrahlung des Urans mittels Neutronen entstehenden Erdalkalimetalle[1].

Von O. HAHN und F. STRASSMANN, Berlin-Dahlem.

In einer vor kurzem an dieser Stelle erschienenen vorläufigen Mitteilung[2] wurde angegeben, daß bei der Bestrahlung des Urans mittels Neutronen außer den von MEITNER, HAHN und STRASSMANN im einzelnen beschriebenen Trans-Uranen — den Elementen 93 bis 96 — noch eine ganze Anzahl anderer Umwandlungsprodukte entstehen, die ihre Bildung offensichtlich einem sukzessiven zweimaligen α-Strahlenzerfall des vorübergehend entstandenen Urans 239 verdanken. Durch einen solchen Zerfall muß aus dem Element mit der Kernladung 92 ein solches mit der Kernladung 88 entstehen, also ein Radium. In der genannten Mitteilung wurden in einem noch als vorläufig bezeichneten Zerfallsschema 3 derartiger isomerer Radiumisotope mit ungefähr geschätzten Halbwertszeiten und ihren Umwandlungsprodukten, nämlich drei isomeren Actiniumisotopen, angegeben, die ihrerseits offensichtlich in Thorisotope übergehen.

Zugleich wurde auf die zunächst unerwartete Beobachtung hingewiesen, daß diese unter α-Strahlenabspaltung über ein Thorium sich bildenden Radiumisotope nicht nur mit schnellen, sondern auch mit verlangsamten Neutronen entstehen.

Der Schluß, daß es sich bei den Anfangsgliedern dieser drei neuen isomeren Reihen um Radiumisotope handelt, wurde darauf begründet, daß diese Substanzen sich mit Bariumsalzen abscheiden lassen und alle Reaktionen zeigen, die dem Element Barium eigen sind. Alle anderen bekannten Elemente, angefangen von den Trans-Uranen über das Uran, Protactinium, Thorium bis zum Actinium haben andere chemische Eigenschaften als das Barium und lassen sich leicht von ihm trennen. Dasselbe trifft zu für die Elemente unterhalb Radium, also etwa Wismut, Blei, Polonium, Ekacäsium.

Es bleibt also, wenn man das Barium selbst außer Betracht läßt, nur das Radium übrig.

Im folgenden soll kurz die Abscheidung des Isotopengemisches und die Gewinnung der einzelnen Glieder beschrieben werden. Aus dem Aktivitätsverlauf der einzelnen Isotope ergibt sich ihre Halbwertszeit und lassen sich die daraus entstehenden Folgeprodukte ermitteln. Die letzteren werden in dieser Mitteilung aber im einzelnen noch nicht beschrieben, weil wegen der sehr komplexen Vorgänge — es handelt sich um mindestens 3, wahrscheinlich 4 Reihen mit je 3 Substanzen — die Halbwertszeiten aller Folgeprodukte bisher noch nicht erschöpfend festgestellt werden konnten.

Als Trägersubstanz für die „Radiumisotope" diente naturgemäß immer das Barium. Am nächstliegenden war die Fällung des Bariums als Bariumsulfat, das neben dem Chromat schwerstlösliche Bariumsalz. Nach früheren Erfahrungen und einigen Vorversuchen wurde aber von der Abscheidung der „Radiumisotope" mit Bariumsulfat abgesehen; denn diese Niederschläge reißen neben geringen Mengen Uran nicht unbeträchtliche Mengen von Actinium- und Thoriumisotopen mit, also auch die mutmaßlichen Umwandlungsprodukte der Radiumisotope, und erlauben daher keine Reindarstellung der Ausgangsglieder. Statt der quantitativen, sehr oberflächenreichen Sulfatfällung wurde daher das in starker Salzsäure sehr schwer lösliche Ba-Chlorid als Fällungsmittel gewählt; eine Methode, die sich bestens bewährt hat.

Bei der energetisch nicht leicht zu verstehenden Bildung von Radiumisotopen aus Uran beim Beschießen mit langsamen Neutronen war eine besonders gründliche Bestimmung des chemischen Charakters der neu entstehenden künstlichen Radioelemente unerläßlich. Durch die Abtrennung einzelner analytischer Gruppen von Elementen aus der Lösung des bestrahlten Urans wurde außer der großen Gruppe der Transurane eine Aktivität stets bei den Erdalkalien (Trägersubstanz Ba), den seltenen Erden (Trägersubstanz La) und bei Elementen der vierten Gruppe des Periodischen Systems (Trägersubstanz Zr) gefunden. Eingehender untersucht wurden zunächst die Bariumfällungen, die offensichtlich die Anfangsglieder der beobachteten isomeren Reihen enthielten. Es soll gezeigt werden, daß Transurane, Uran, Protactinium, Thorium und Actinium

1 Aus dem Kaiser Wilhelm-Institut für Chemie in Berlin-Dahlem. Eingegangen 22. Dezember 1938.

2 O. HAHN u. F. STRASSMANN, Naturwiss. **26**, 756 (1938).

Die Naturwissenschaften 27:11-15 (January 1939)

Figure D.47: Otto Hahn and Fritz Strassmann. January 1939. Über den Nachweis und das Verhalten der bei der Bestrahlung des Urans mittels Neutronen entstehenden Erdalkalimetalle. *Die Naturwissenschaften* 27:11–15.

Paul Harteck and Wilhelm Groth to German War Office. 24 April 1939. [English translation in Samuel Goudsmit to Robert Furman, 25 May 1945, NARA RG GOUDS, Entry UD-7420, Box 6, Folder ALSOS—Reports and Operations; also NARA RG 77, Entry UD-22A, Box 167, Folder 32.12-2 GERMANY: Personnel (Jan 45–Dec 45)]

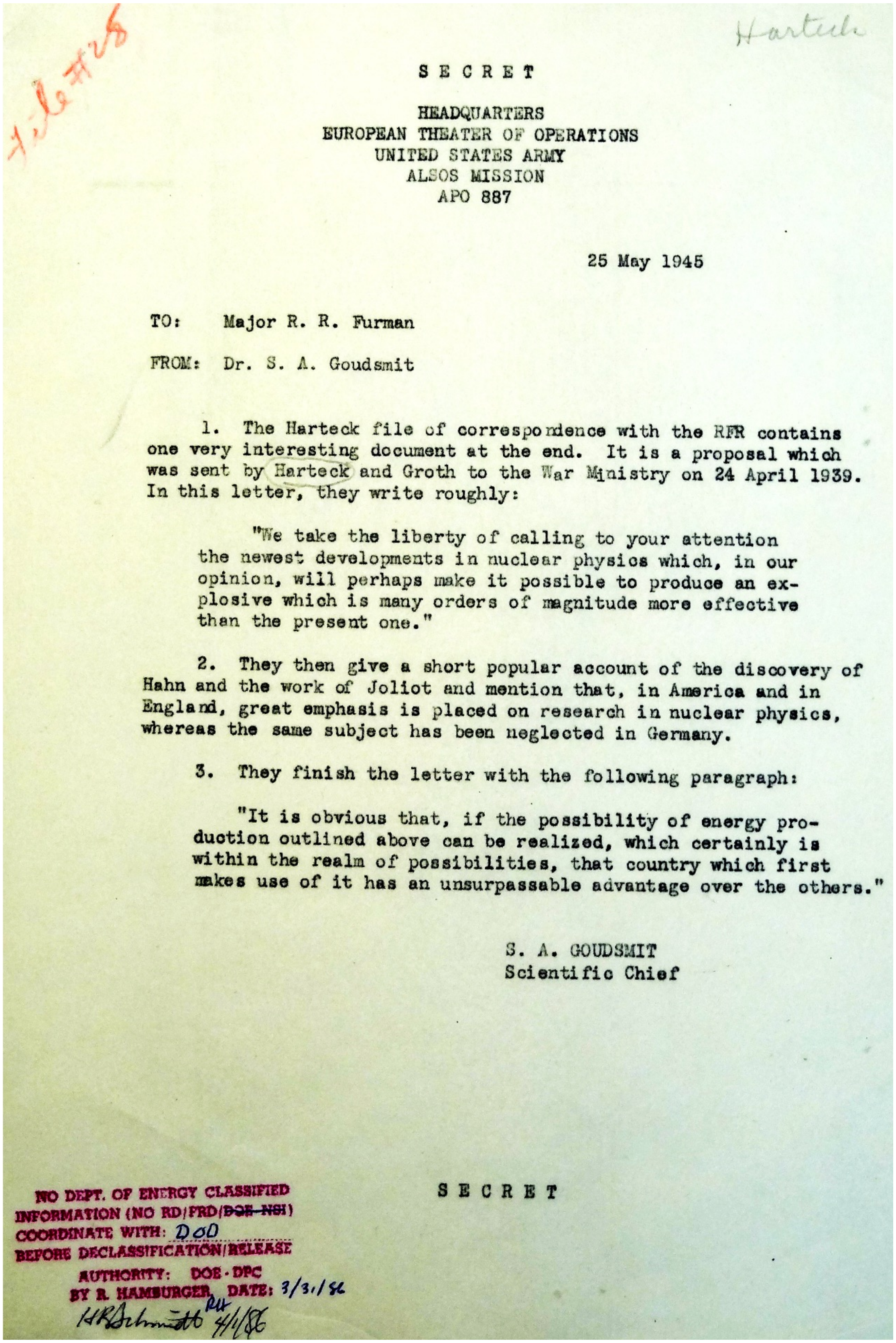
We take the liberty of calling to your attention the newest developments in nuclear physics which, in our opinion, will perhaps make it possible to produce an explosive which is many orders of magnitude more effective than the present one. [...]

It is obvious that, if the possibility of energy production outlined above can be realized, which certainly is within the realm of possibilities, that country which first makes use of it has an unsurpassable advantage over the others.

[Paul Harteck (1902–1985) and Wilhelm Groth (1904–1977) at the University of Hamburg were among the first to point out that Hahn and Strassmann's discovery of nuclear fission could be applied to create a new explosive thousands of times more powerful than conventional explosives, and they notified the German War Office. Harteck and Groth worked on many different important aspects of the German nuclear program throughout the war.]

DECLASSIFIED
Authority NND 933079

NARA RG GOUDS, Entry UD-7420, Box 6,
Folder ALSOS—Reports and Operations



File #28

Harteck

S E C R E T

HEADQUARTERS
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
ALSOS MISSION
APO 887

25 May 1945

TO: Major R. R. Furman

FROM: Dr. S. A. Goudsmit

1. The Harteck file of correspondence with the RFR contains one very interesting document at the end. It is a proposal which was sent by Harteck and Groth to the War Ministry on 24 April 1939. In this letter, they write roughly:

"We take the liberty of calling to your attention the newest developments in nuclear physics which, in our opinion, will perhaps make it possible to produce an explosive which is many orders of magnitude more effective than the present one."

2. They then give a short popular account of the discovery of Hahn and the work of Joliot and mention that, in America and in England, great emphasis is placed on research in nuclear physics, whereas the same subject has been neglected in Germany.

3. They finish the letter with the following paragraph:

"It is obvious that, if the possibility of energy production outlined above can be realized, which certainly is within the realm of possibilities, that country which first makes use of it has an unsurpassable advantage over the others."

S. A. GOUDSMIT
Scientific Chief

S E C R E T

NO DEPT. OF ENERGY CLASSIFIED INFORMATION (NO RD/FRD/~~DOE-NSI~~)
COORDINATE WITH: DOD
BEFORE DECLASSIFICATION/RELEASE
AUTHORITY: DOE-DPC
BY R. HAMBURGER DATE: 3/31/86
HR Schmidt RH 4/1/86

Figure D.48: Samuel Goudsmit to Robert Furman. 25 May 1945 [NARA RG GOUDS, Entry UD-7420, Box 6, Folder ALSOS—Reports and Operations].

Siegfried Flügge. Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden? [Can the Energy Content of Atomic Nuclei Be Made Technically Usable?] *Die Naturwissenschaften* 27:23/24:402–410. 9 June 1939. [For consistency, all numbers on this page use U.S. decimal points in place of German commas.]

[...] Als Beispiel betrachten wir zunächst die Verhältnisse an reinem Uranmetall. Für schnelle Neutronen besteht kein merkbarer Einfangquerschnitt; wir haben außer $\sigma_{Sp} = 0.1 \cdot 10^{-24}$ cm^2 nur noch Streuprozesse mit rund $6 \cdot 10^{-24}$ cm^2. Metallisches Uran (Dichte 18.6) enthält rund $2.2 \cdot 10^{22}$ Atome je Kubikzentimeter; es wird dann bei einer Neutronengeschwindigkeit von $2 \cdot 10^9$ cm/sec, entsprechend einer mittleren Energie der frei gesetzten Neutronen von 2 MeV:

[...] As an example, we consider the relations for pure uranium metal. For fast neutrons there is no significant capture cross-section; we have outside of [the fission cross section] $\sigma_{Sp} = 0.1 \cdot 10^{-24}$ cm^2 only scattering processes with around $6 \cdot 10^{-24}$ cm^2. Metallic uranium (density 18.6) contains around $2.2 \cdot 10^{22}$ atoms per cubic centimeter; there will be then, at a neutron velocity of $2 \cdot 10^9$ cm/sec, corresponding to a mean energy of released neutrons of 2 MeV [ν is the number of neutrons released per fission]:

$$\frac{1}{n}\frac{dn}{dt} = 0.44\,(\nu - 1) \cdot 10^7 \quad \text{sec}^{-1}\,.$$

Die Integration dieser Differentialgleichung ergibt

The integration of this differential equation yields

$$n(t) = n_0\, e^{0.44(\nu-1)\cdot 10^7 t}\,.$$

Läßt man die Reaktionskette mit $n_0 = 1$ Neutron zur Zeit $t = 0$ anlaufen und nimmt man den wahrscheinlichsten Wert $\nu = 2$, so findet man, da je Spaltung $3 \cdot 10^{-12}$ mkg frei werden, folgende Energiebeträge: Nach 10^{-7} sec: $4.7 \cdot 10^{-12}$ mkg, nach 10^{-6} sec: $2.4 \cdot 10^{-11}$ mkg, nach 10^{-5} sec: $3 \cdot 10^{+7}$ mkg und nach 10^{-4} sec: $3 \cdot 10^{+78}$ mkg. Die letzte Zahl hat natürlich keinen Sinn mehr; sie bedeutet nur, daß in weniger als 10^{-4} sec das gesamte Uran umgesetzt wird. Die Energiebefreiung geschieht also in einer so kurzen Zeit, daß wir es mit einer außerordentlich heftigen Explosion zu tun haben. [...]

If the reaction chain is started with $n_0 = 1$ neutron at time $t = 0$ and if the most probable value is $\nu = 2$, then one finds, if each fission releases $3 \cdot 10^{-12}$ mkg [9.8 Joules per meter-kilogram], the following energy amounts: After 10^{-7} sec: $4.7 \cdot 10^{-12}$ mkg, after 10^{-6} sec: $2.4 \cdot 10^{-11}$ mkg, after 10^{-5} sec: $3 \cdot 10^{+7}$ mkg and after 10^{-4} sec: $3 \cdot 10^{+78}$ mkg. The last number naturally has no more meaning; it only means that in less than 10^{-4} sec, the entire uranium is converted. The energy release happens in such a short time that we are dealing with an extraordinarily violent explosion. [...]

[Siegfried Flügge (German, 1912–1997) was a nuclear physicist at the Kaiser Wilhelm Institute for Chemistry. In this article, he explicitly showed the feasibility of using pure uranium fuel and fast neutrons to create an explosive chain reaction, estimating both the time scale and energy release for the explosion. Elsewhere in the article, he explicitly proposed water-moderated fission power reactors using thermal neutrons, derived and used the neutron diffusion and kinetics equations that are still taught in modern nuclear engineering textbooks, and correctly stated that cadmium could be used as a neutron absorber to maintain control of the neutron-induced fission reactions. A popularized version of this *Naturwissenschaften* article was published: Siegfried Flügge. Die Ausnutzung der Atomenergie. Vom Laboratoriumsversuch zur Uranmaschine—Forschungsergebnisse in Dahlem. *Deutsche Allgemeine Zeitung* No. 387, Supplement. 15 August 1939. [English translation in Hentschel and Hentschel 1996, pp. 197–206]. Flügge subsequently moved to the Reichspost, where he apparently played a key role in the wartime German nuclear program (pp. 3642, 5042).]

~~SECRET~~

G 5 (ref no 235)

Copy #1

Die Naturwissenschaften 27:402-410 (June 1939)

This document has been de-classified by ... of issuing ... dated 4/1/58

Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden?

Von S. FLÜGGE, Berlin-Dahlem*.

UNCLASSIFIED

Zu Beginn dieses Jahres entdeckten HAHN und STRASSMANN[1], daß beim Beschießen von Uran mit schnellen oder langsamen Neutronen Barium, Lanthan und andere Elemente mittleren Atomgewichts entstehen. Die Entdeckung wurde sofort von zahlreichen Forschern in vielen Ländern aufgegriffen, und eine intensive Arbeit auf diesem Gebiet hat den Sachverhalt weitgehend geklärt und in mehr als 50 Veröffentlichungen schon zahlreiches quantitatives Material ergeben.

Im folgenden soll nur über ein Teilgebiet des ganzen, durch die HAHN-STRASSMANNsche Entdeckung angeschnittenen Fragenkomplexes berichtet werden. Gleich nachdem die Entdeckung der Zerspaltung von Urankernen sichergestellt war, wurde im HAHNschen Institut und wohl auch anderwärts die Frage aufgeworfen, ob bei einem so gewaltsamen Eingriff nicht auch einige Neutronen aus dem zerbrechenden Kern „abgedampft" oder „abgesplittert" werden könnten? Die Frage wurde auch alsbald in Angriff genommen, da sie zu einer sehr interessanten Konsequenz führte: Wenn jedes Neutron, das eine Aufspaltung hervorruft, im Gefolge der Aufspaltung 2 oder 3 Neutronen frei macht, so muß es möglich sein, daß diese Neutronen ihrerseits wiederum neue Aufspaltungen anderer Urankerne herbeiführen und auf diese Weise ihre Zahl noch weiter vergrößert wird, so daß eine Kettenreaktion ohne Ende schließlich zu einer Umsetzung des ganzen in dem bestrahlten Präparat vorhandenen Urans führen kann.

Man konnte dazu sofort einige Überlegungen anstellen, noch ehe man Einzelheiten kannte: Die Hauptfrage ist natürlich, ob und wie viele Neutronen je Spaltungsprozeß in Freiheit gesetzt werden. Dann kommt alles auf das weitere Schicksal dieser Neutronen an. Sie werden elastische Stöße ausführen können, die im wesentlichen nur ihre Richtung ändern; sie können unelastisch gestreut werden, so daß sie außer der Richtungsänderung auch noch eine beträchtliche Energieeinbuße erleiden; sie können eingefangen werden in der bekannten Reaktion

$$ {}^{238}_{92}\mathrm{U} + {}^{1}_{0}n \longrightarrow {}^{239}_{92}\mathrm{U}^{*} \xrightarrow[23^{\mathrm{m}}]{\beta} {}^{239}_{93}\text{Eka-Re}; \qquad (1) $$

sie können endlich noch Einfangungen oder Umwandlungen an anderen Substanzen erleiden, die außer dem Uran anwesend sind, sofern man nicht reines Uranmetall bestrahlt, also z. B. am Sauerstoff von U_3O_8. Es wird darauf ankommen, ob all diese Reaktionen, welche nur Neutronen wegfangen ohne neue zu erzeugen, einen so großen Gesamtwirkungsquerschnitt haben, daß die beim Spaltungsprozeß erreichte Neutronenproduktion dadurch kompensiert wird oder nicht. Um zu erkennen, ob eine Kettenreaktion ablaufen kann, müssen wir also über eine genaue Kenntnis aller konkurrierenden Wirkungsquerschnitte verfügen.

Endlich spielt noch eine dritte Frage eine große Rolle: die räumliche Ausdehnung der bestrahlten Substanzmenge. Die erzeugten Neutronen werden, ehe sie wieder einen Kern aufspalten, einen Weg von der Größenordnung einiger Zentimeter in der Substanz zurücklegen. Läuft also die Reaktionskette an einer Stelle der Substanz an, so breitet sie sich mit zunehmender Neutronenzahl über ein immer größeres Gebiet aus. Nun haben die Neutronen bei jedem elastischen Stoß die gleiche Chance zurückgeworfen zu werden, wie weiter nach außen zu laufen. Daher wird die Konzentration der freigesetzten Neutronen auch an der Ausgangsstelle der Reaktionskette zeitlich rasch ansteigen, sofern das benutzte Substanzvolumen so groß ist, daß der größte Teil der Neutronen oft zurückgeworfen wird, ohne die Oberfläche zu erreichen, durch die er die Substanz endgültig verlassen würde. Mit anderen Worten: Der Durchmesser einer bestrahlten Kugel aus uranhaltiger Substanz muß groß sein gegen die freie Weglänge, wird also einige Meter betragen müssen.

Ehe wir zur Diskussion der bisher angeschnittenen Einzelfragen übergehen, soll noch ein Wort gesagt werden über die Größenordnung der freiwerdenden Energie. Man kann sie leicht ungefähr abschätzen[2], ja sogar ziemlich genau angeben, daß jeder Spaltungsprozeß eine Energie von 180 MeV in Freiheit setzt[3]. Das läßt sich aus der Differenz der Massendefekte des Urankerns und der entstehenden Spaltungsprodukte herleiten[3]; die Zahl ist einigermaßen auch durch direkte Messung der kinetischen Energie der beiden entstehenden mittelschweren Kerne experimentell sichergestellt. Daß sich hierbei statt der erwarteten 180 MeV nur rund 160 MeV ergaben[4], kann schon als Hinweis darauf dienen, daß der Rest der Energie entweder noch in abgespaltene Neutronen gesteckt oder in Form von γ-Quanten abgestrahlt wird.

Der so erhaltene Energiebetrag ist sehr beträchtlich. Da die vorstehenden Überlegungen zeigen, daß es durchaus nicht ausgeschlossen ist, durch eine geeignete Versuchsanordnung eine Reaktionskette hervorzurufen, bei der das ganze Uran eines großen Blocks verbraucht wird, ist es zweckmäßig, sich einmal auszurechnen, wie groß z. B. die Energiemenge ist, die freigesezt wird, wenn in 1 m³ U_3O_8 alles vorhandene Uran restlos umgewandelt wird. 1 m³ aufgeschüttetes U_3O_8-Pulver wiegt 4,2 t und enthält $3 \cdot 10^{27}$ Moleküle, also $9 \cdot 10^{27}$ Uranatome. Da je Atom etwa 180 MeV, d. h. rund $3 \cdot 10^{-4}$ erg oder $3 \cdot 10^{-12}$ mkg frei werden, wird insgesamt ein Energiebetrag von $27 \cdot 10^{13}$ mkg frei gesetzt, d. h. 1 m³ U_3O_8 genügt zur Aufbringung der Energie, welche nötig ist, um 1 km³ Wasser (Gewicht 10^{12} kg) 27 km hoch-

* Aus dem Kaiser Wilhelm-Institut für Chemie.

CAUTION

RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1946 which affects the National Defense of the United States. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited and may result in severe penalties under applicable Federal Laws.

K. 532. 39.

1 h

~~SECRET~~

CD 56469

Figure D.49: Siegfried Flügge. Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden? *Die Naturwissenschaften* 27:402–410. 9 June 1939. [https://digital.deutsches-museum.de/item/FA-002-746]

Die Naturwissenschaften 27:402–410 (June 1939)

zuheben! Da diese Energie, wie wir noch sehen werden, ohne besondere Vorsichtsmaßregeln in einem Zeitraum von weniger als $^1/_{100}$ sec in Freiheit gesetzt wird, ist die entscheidende Frage für die technische Anwendbarkeit des Reaktionsmechanismus, ob es gelingt, eine hinreichende Verzögerung herbeizuführen, die es ermöglicht, die Geschwindigkeit des Ablaufs nach Belieben zu steuern und herabzudrücken. Da auch zu diesem Punkte heute schon Angaben gemacht werden können, liegt hier wohl zum ersten Male ein Fall vor, bei dem die technische Nutzbarmachung der ungeheuren, in den Atomkernen gebundenen Energiebeträge auch zu technischen Zwecken in greifbare Nähe gerückt ist.

1. Die entstehenden Neutronen. Der Nachweis, daß bei der Uranspaltung Neutronen frei werden, wurde mit voller Sicherheit zuerst von DODÉ, v. HALBAN, JOLIOT und KOWARSKI[5] geführt. Eine Neutronenquelle, in der die γ-Strahlen eines Radiumpräparats auf Be einwirken und welche Neutronen von nur einigen 100 keV Energie liefert, wurde umgeben mit einer Schicht von Uranylnitrat $(UO_2)(NO_3)_2 \cdot 6\,H_2O$ in einer Dicke von 10 g/cm². Die ganze Anordnung befand sich im Innern eines großen Gefäßes, daß mit 8 l Schwefelkohlenstoff gefüllt war, in dem 200 mg Phosphor gelöst sind. Nach einer Bestrahlungsdauer von 6 Tagen wurde der Phosphor durch Abdestillieren von dem Schwefelkohlenstoff getrennt und gefunden, daß er eine Aktivität von 35 Teilchen je Minute zeigte. Ein Blindversuch ohne Uran ergab dagegen nur 5 Teilchen je Minute nach achttägiger Bestrahlung. Die Ursache der Aktivität muß in der Reaktion $^{32}_{16}S\,(n, p)\,^{32}_{15}P^*$ gesucht werden; diese Reaktion geht aber erst bei Neutronenenergien von mehr als 900 keV überhaupt vor sich, und so schnelle Neutronen liefert die benutzte Quelle gar nicht. Sie müssen also sekundär im Uran erzeugt worden sein.

JOLIOT und seine Mitarbeiter sowie FERMI und seine Mitarbeiter haben versucht, quantitativ sichere Angaben über die Zahl der Neutronen zu machen, die frei werden. Die von ihnen benutzte Methode ist die folgende: Befindet sich eine Neutronenquelle im Innern eines großen Wassertanks, so werden die Neutronen durch Zusammenstöße mit den Protonen des Wassers, an die sie je Stoß im Mittel etwa die Hälfte ihrer Energie abgeben, abgebremst bis zu so kleinen Geschwindigkeiten, wie sie dem thermischen Gleichgewicht mit der Substanz entsprechen. Man spricht dann von thermischen Neutronen und erhält bei Messungen mit einem geeigneten Indikator, ziemlich unabhängig von der Art der benutzten Neutronenquelle, eine bestimmte stationäre Dichteverteilung dieser thermischen Neutronen in dem Wassertank, die sich als Gleichgewicht zwischen Diffusion, Absorption durch Einfang an Protonen und Nachlieferung durch die Quelle einstellt und die rechnerisch durch die Lösung dieses etwas komplizierteren Diffusionsproblems erfaßt werden kann[6].

Löst man nun in dem Wasser ein Uransalz, so werden durch Spaltungsprozesse an allen Stellen des Tanks offenbar zusätzlich Neutronen erzeugt, die eine Veränderung der Dichteverteilung hervorrufen. Insbesondere wird der Abfall der Dichte bei großen Abständen von der Quelle etwas langsamer erfolgen, da man der Hauptverteilungskurve mit dem Zentrum am Ort der Neutronenquelle beliebig viele andere überlagern muß mit dem Zentrum an allen anderen Stellen des Wassertanks. Aus dem Vergleich der beiden Verteilungskurven muß es im Prinzip möglich sein, sowohl die Zahl als die Energie der zusätzlichen Neutronen abzuschätzen; die Zahl muß einfach gleich sein dem Unterschiede in den Gesamtzahlen, die man durch Integration der beobachteten Dichte mit und ohne Uransalz über den ganzen Wassertank erhält; der Abfall nach außen wird um so langsamer erfolgen, je höher die Energie der im Uran ausgelösten zusätzlichen Neutronen ist.

Die Abschätzung der Energie auf diesem Wege ist nun praktisch leider so gut wie unmöglich, da infolge der sehr rasch erfolgenden Abbremsung aller entstehenden Neutronen auf thermische Geschwindigkeiten die allein meßbare Dichteverteilung sehr unempfindlich gegen Änderungen in der Energie der entstehenden Teilchen ist. Daher rührt ja auch ihre ziemlich weitgehende Unabhängigkeit von der Art der benutzten Quelle.

Mehr kann man schon über die Zahl der freiwerdenden Neutronen aussagen. Die erste Abschätzung von JOLIOT und seinen Mitarbeitern[7] ergab einen mittleren Wert von 3,5 Neutronen je Spaltungsprozeß; die angegebene Fehlergrenze von $\pm$ 0,7 scheint aber doch etwas zu eng. Eine zweite Abschätzung unternahmen FERMI und seine Mitarbeiter[8] nach einer ganz ähnlichen Methode, die sich nur dadurch von der JOLIOTschen unterschied, daß das Uran nicht im Wasser gelöst, sondern in einer Schicht um die Quelle herumgelegt wurde. Sie geben einen Wert von rund 2 Neutronen je Spaltungsprozeß an, der wohl etwas sicherer ist. Abschätzungen von SZILARD und ZINN sowie von v. DROSTE und REDDEMANN[9] haben diese Größenordnung bestätigt durch unmittelbare Zählung der Helium-Rückstoßkerne, die die Neutronen in einer heliumgefüllten Ionisationskammer auslösen, aber bisher noch nicht gestattet, die Zahl genauer festzulegen. Nimmt man alle diese Erfahrungen zusammen, so darf man als wahrscheinlichsten Wert zur Zeit wohl etwa 2 Neutronen je Spaltungsprozeß ansehen.

Von HAFSTAD[10] und seinen Mitarbeitern ist behauptet worden, daß auch nach Aufhören der Bestrahlung noch Neutronen aus der Substanz austreten mit einer Halbwertszeit von rund 12 sec, deren Energie durch Rückstoßprotonen in der Nebelkammer zu etwa einer halben MeV bestimmt wurde. Dies Ergebnis konnte bisher von anderen Forschern noch nicht bestätigt werden. Während HAFSTAD und Mitarbeiter abschätzen, daß rund die Hälfte aller Spaltungsprozesse solche Neutronen

erzeugt, gelangten SZILARD und ZINN, denen es nicht gelang, die „Nachwirkungsneutronen" überhaupt nachzuweisen, zu der Überzeugung, daß deren Zahl sicher klein ist gegen die der sofort freigemachten Neutronen.

Über die Energie der letzteren liegen Messungen von v. DROSTE und REDDEMANN vor, die zeigen, daß mit Sicherheit noch schnellere Neutronen als solche von 2,5 MeV dabei entstehen.

2. Die Wirkungsquerschnitte am Uran. Die Prozesse, die im Uran stattfinden, sind die folgenden:

a) Der Einfangprozeß: Eine Einfangung des Neutrons nach der Reaktionsgleichung (1) kann nachgewiesen werden durch chemische Trennung des Urans von den anderen entstehenden Reaktionsprodukten und Nachweis eines β-Strahlers von 23 min Halbwertszeit, eben des $^{239}_{92}U^*$. Der Prozeß ist ein normaler Einfang, wie er an unzähligen anderen Elementen auch nachgewiesen und untersucht worden ist, mit allen typischen Eigenschaften einer derartigen Kernreaktion: Er wird mit einem meßbaren Wirkungsquerschnitt (WQ.) nur von langsamen Neutronen hervorgerufen, nämlich solchen, deren Energie entweder in eine Resonanzbande bei einigen eV oder in den thermischen Bereich fällt, der sich um eine mittlere Energie $\frac{\pi}{4}kT = 0{,}026$ eV bei Zimmertemperatur gruppiert.

Die Abhängigkeit des WQ von der Energie E oder Geschwindigkeit v der benutzten Neutronen kann, wie bei allen solchen Prozessen, durch die Formel von BREIT und WIGNER beschrieben werden:

$$\sigma_{\mathrm{Einf}} = \sqrt{\frac{E_r}{E}}\,\sigma_r \frac{\left(\frac{\Gamma}{2}\right)^2}{(E - E_r)^2 + \left(\frac{\Gamma}{2}\right)^2}; \qquad (2)$$

vorausgesetzt ist dabei lediglich, daß nur ein einziges Resonanzniveau merklich zum Einfang beiträgt, daß also alle weiteren Niveaus in einem Energiebereich liegen, in dem die Neutronenanzahl schon sehr gering ist. Dabei gilt im großen ganzen, daß die Anzahl der Neutronen mit wachsender Energie rasch abnimmt; auf das Intervall dv bei der Geschwindigkeit v entfällt nur ein Bruchteil, der dv/v^2 proportional ist.

Die Konstanten in Gl. (2) haben folgende einfache Bedeutung: E_r ist diejenige Energie, bei der das Resonanzmaximum liegt; der Wert von σ_{max} für diese Energie ist σ_r; die Halbwertsbreite der Resonanzlinie ist Γ.

Die Lage der Linie, also E_r, kann man bestimmen, indem man einmal die Absorption thermischer Neutronen der mittleren Energie $E_{\mathrm{th}} = \frac{\pi}{4}kT$, und einmal diejenigen der Resonanzneutronen von Uran in Borschichten mißt. Da der Absorptionsquerschnitt für Neutronen in Bor proportional $1/\sqrt{E}$ ist, verhalten sich die gemessenen Absorptionskoeffizienten wie

$$(\mu_{\mathrm{th}}/\mu_U)_{\mathrm{Bor}} = \sqrt{E_r/E_{\mathrm{th}}}\,.$$

Die Messung von μ_{th} geschieht, indem man zwischen Neutronenquelle und Absorber einmal ein einige Millimeter dickes Cd-Blech schaltet und einmal nicht. Da das Cd nur thermische Neutronen absorbiert, und diese quantitativ, gibt die Differenz beider Messungen unmittelbar die Zahl der thermischen Neutronen an. Zur Messung von μ_U schaltet man außerdem noch Uranfilter vor, die außer im thermischen Bereich — den man durch Kombinationen mit und ohne Cd wieder abtrennen kann — nur noch in der nächsten Umgebung der Resonanzenergie E_r merklich absorbieren.

Messungen dieser Art sind von MEITNER, HAHN und STRASSMANN durchgeführt[11] und ergaben $E_r = 25$ eVolt.

Zur Bestimmung von σ_r mißt man nach Wegfilterung aller thermischen Neutronen durch Cd die Absorption langsamer Neutronen in Uranschichten unter Benutzung ebenfalls einer Uranschicht als Nachweissubstanz für die Neutronen, die den Uranabsorber durchsetzt haben (Selbstabsorption). Ein solcher Detektor zeigt dann offenbar nur solche Neutronen an, deren Energie in die Resonanzlinie fällt; ihre Absorbierbarkeit wird aber im wesentlichen durch σ_r allein bestimmt. In der Arbeit von MEITNER, HAHN und STRASSMANN wird als mittlerer Absorptionskoeffizient innerhalb der Resonanzlinie rund 3 cm²/g angegeben; für die Mitte der Linie muß man danach etwa das Doppelte dieses Wertes erwarten. Eine genauere Ausführung der Integration über die Resonanzlinie bei Zugrundelegung von Gl. (2) und den experimentellen Zahlen der genannten Arbeit ergibt einen Wert von 7 cm²/g in der Linienmitte in guter Übereinstimmung mit dieser Schätzung. Daraus folgt dann $\sigma_r = 2800 \cdot 10^{-24}$ cm².

Die dritte Größe, die Linienbreite, ist bisher nicht direkt gemessen worden. Da solche Messungen auch nicht ganz leicht sind, ist es zweckmäßig, statt ihrer als dritte Größe den WQ für thermische Neutronen zu messen. Diese Bestimmung wurde von v. HALBAN und Mitarbeitern[12] jetzt auch ausgeführt. Sie verglichen die Aktivität des aus Uran erhaltenen 23 min-Körper mit derjenigen einer bestrahlten Goldfolie mit und ohne vorgeschaltetes Cd-Filter. Dabei befand sich zwischen Neutronenquelle und Versuchsanordnung stets noch ein Uranfilter und ein Goldfilter, die dafür sorgten, daß die benutzten Neutronen arm waren an denjenigen Energien, die mit einer der beiden Resonanzstellen nahe übereinstimmten, d. h. also, daß sie von vornherein im wesentlichen nur aus thermischen Neutronen bestanden. Da der Einfangquerschnitt von Gold für thermische Neutronen schon früher von AMALDI und FERMI bestimmt wurde, gestattet dieser Vergleich die Eichung auch für den Uranprozeß. Auf diesem Wege ergab sich ein Querschnitt von $(1{,}3 \pm 0{,}5) \cdot 10^{-24}$ cm². Berechnet man hieraus rückwärts die Linienbreite, so findet man $\Gamma = 0{,}2$ eV, einen Wert, der durch-

aus dem entspricht, was man von den Einfangprozessen an anderen Elementen gewöhnt ist.

b) Der Spaltungsprozeß: Für den Spaltungsprozeß wurden WQ-Messungen von DUNNING, FERMI und Mitarbeitern[13] durchgeführt. Zunächst wurde in einer Ionisationskammer, die mit einer so dünnen Schicht von Uranoxyd ausgelegt war, daß alle Trümmer in die Kammer gelangen und gezählt werden konnten, die Anzahl der von einer Standard-Neutronenquelle hervorgerufenen Spaltungsprozesse bestimmt. Durch Abdecken der Neutronenquelle mit Cd konnte der Teilquerschnitt der thermischen Neutronen zu $2 \cdot 10^{-24}$ cm² bestimmt werden. Für die schnellen Neutronen einer Rn + Be-Quelle ergab sich der viel kleinere Querschnitt von $0{,}1 \cdot 10^{-24}$ cm².

Auch über die Abhängigkeit des Wirkungsquerschnitts von der Neutronenenergie wurde bei langsamen Neutronen ein Versuch angestellt. Deckt man nämlich die Neutronenquelle mit immer dickeren Absorptionsfolien aus Bor ab, so werden, da die Absorption der Neutronen in Bor proportional $1/v$ ist, zunächst die langsamsten Neutronen, dann bei dickeren Schichten in zunehmendem Maße auch die schnelleren absorbiert. Es tritt also eine Härtung der Strahlung ein. Exponiert man nun einmal eine Borschicht und das andere Mal eine Uranschicht mit den auf diese Weise gewonnenen verschieden harten Neutronen so bekommt man genau den gleichen Verlauf der Ausbeute mit der Dicke des vorgeschalteten Borfilters. Es muß also, da der WQ im Bor proportional $1/v$ ist, auch der Prozeß für die Spaltungsprozesse in Uran proportional $1/v$ sein. Wir können daher die Formel anschreiben:

$$\sigma_{\mathrm{Spalt}} = 2\sqrt{E_{\mathrm{th}}/E} \cdot 10^{-24}\ \mathrm{cm}^2. \qquad (3)$$

In der gleichzeitigen Gültigkeit der Gleichungen (2) und (3) liegt übrigens eine erhebliche theoretische Schwierigkeit. Eine Formel vom Typus (3) sollte man nämlich nur dann erwarten, wenn die Lebensdauer des beim Einfang entstehenden Zwischenkerns sehr kurz ist, d. h. bei einer sehr starken Verbreiterung der Resonanzlinien. Andererseits haben wir aber vorhin gesehen, daß ein scharfes Resonanzniveau des Urankerns bei 25 eV existiert. BOHR[14] hat darauf hingewiesen, daß dieser Widerspruch vielleicht so zu verstehen ist, daß die Spaltungsprozesse, die von langsamen Neutronen hervorgerufen werden, das Isotop $^{235}_{92}U$ zum Ausgangskern haben, während am $^{238}_{92}U$ nur der Einfangprozeß stattfindet. Die umgekehrte Zuordnung zu den beiden Isotopen ist nicht möglich infolge der großen Seltenheit von ^{235}U, das nur zu $^1/_{139}$ im natürlichen Uran enthalten ist. Die Theorie von BREIT und WIGNER fordert nämlich, daß der Einfangquerschnitt für keine Energie den Wert λ^2/π übersteigt, wenn λ die De Broglie-Wellenlänge der Neutronen ist. An der Resonanzstelle ist nun $\lambda^2/\pi = 1{,}0 \cdot 10^{-19}$ cm², der Einfangquerschnitt aber wäre, wenn ^{235}U das Ausgangsisotop ist, $139 \cdot \sigma_r = 3{,}9 \cdot 10^{-19}$ cm², also rund 4 mal so groß wie der größte überhaupt theoretisch zulässige Wert.

c) Der Streuprozeß. Der Streuquerschnitt schneller Neutronen an Uran ist bisher zwar nicht direkt gemessen worden, kann aber zu rund $6 \cdot 10^{-24}$ cm² angenommen werden. Zunächst weiß man nämlich allgemein, daß bei schnellen Neutronen der Streuquerschnitt den Einfangquerschnitt bei weitem übertrifft; zweitens weiß man aus den Messungen des Gesamtquerschnitts durch DUNNING und seine Mitarbeiter[15] an zahlreichen Elementen, daß der Querschnitt als Funktion des Atomgewichts von $1{,}6 \cdot 10^{-24}$ cm² bei Wasserstoff bis zu $5{,}8 \cdot 10^{-24}$ cm² bei Blei ohne Unregelmäßigkeiten ansteigt. Der angegebene Wert kann demnach als ziemlich sicher angesehen werden, wenn auch natürlich eine experimentelle Kontrolle erwünscht wäre.

Völlig unbekannt ist gegenwärtig, ob die Streuung nur elastisch erfolgt, oder ob bei einem erheblichen Bruchteil der Streuvorgänge das Neutron den Kern anregt unter Zurücklassung eines wesentlichen Teiles seiner Energie. Der Nachweis solcher unelastischer Streuvorgänge ist nicht einfach und mit Sicherheit bisher nur in dem einen Falle des $^{115}_{49}In$ gelungen[16], wo der entstehende angeregte Kern metastabil ist und mit einer charakteristischen Halbwertszeit von 4,1 Stunden durch β-Zerfall in $^{115}_{50}Sn$ übergeht. Eine genaue Messung des Anregungsquerschnitts ist auch in diesem Falle leider bisher nicht durchgeführt; die Angaben über „starke Aktivität" lassen aber darauf schließen, daß der Querschnitt die Größenordnung von 10^{-24} cm² wohl erreicht.

Über den Streuquerschnitt langsamer Neutronen an Uran gibt es zwar direkte Messungen, doch scheinen sie unverträglich mit anderen Ergebnissen. Vor kurzem wurden an verschiedenen Stellen genaue Messungen des Gesamtquerschnitts von Uran gegenüber thermischen Neutronen angestellt[17]. Dabei ergab sich an metallischem Uran ein Gesamtquerschnitt von $(23{,}2 \pm 0{,}5) \cdot 10^{-24}$ cm², bei Uranoxyd äußert sich der geringe Einfluß der chemischen Bindung in einer Herabsetzung des Querschnitts auf $(20 \pm 2) \cdot 10^{-24}$ cm². Es wurde nun auch der Versuch gemacht, diese Zahl in einen Streu- und einen Absorptionsanteil zu zerlegen, indem der Detektor (ein Silberblech) einmal weit entfernt von der den Neutronenstrahl schwächenden Uranschicht aufgestellt wurde, wo er von den seitwärts herausgestreuten Neutronen nicht erreicht wurde und das andere Mal dicht hinter die Schicht gesetzt wurde, wo ein erheblicher Teil der gestreuten Neutronen noch darauf traf. Der Versuch führte zu einer Zusammensetzung des angegebenen Gesamtquerschnitts ungefähr zu gleichen Teilen aus Streuung und Absorption. Zur Absorption muß man dabei wohl außer dem Einfangprozeß auch die Spaltung rechnen, da die dabei frei werdenden schnellen Neutronen von dem benutzten Detektor nicht mitgezählt werden.

Dies Ergebnis ist nun sehr merkwürdig, wenn man bedenkt, daß die französischen Forscher für

thermische Neutronen einen Einfangquerschnitt von nur $1{,}3 \cdot 10^{-24}$ cm² fanden. Zählt man hierzu die von FERMI angegebenen $2 \cdot 10^{-24}$ cm² für die Spaltung, so erhält man für die gesamte Absorption erst etwa $^1/_7$ des angegebenen Gesamtquerschnitts und nicht die Hälfte. Es ist daher nicht unmöglich, daß bei der Messung noch Resonanzneutronen mitgewirkt haben, durch die das Resultat beträchtlich verfälscht wird. Immerhin können wir aus dem Versuch wohl entnehmen, daß Streuquerschnitt und Einfangquerschnitt bei langsamen Neutronen vergleichbar sind.

3. Das Auftreten von Reaktionsketten. Wir wollen die Frage, ob eine Reaktionskette zustandekommen kann, zunächst ganz ohne Berücksichtigung des Diffusionsproblems angreifen. Es sei n die Anzahl der Neutronen, die in einer Substanz von großem Volumen insgesamt enthalten ist. Wir nehmen zunächst an, diese Neutronen seien gleichmäßig dicht über die ganze Substanz verteilt. Ferner sollen verschiedene Arten von Atomen, unterschieden durch den Index i, anwesend sein, an denen Reaktionen stattfinden können, unterschieden durch den Index k, die jeweils ein Neutron zum Verschwinden bringen, also Einfang oder Umwandlung. Bezeichnen wir die Anzahl von Atomen der Art i im Kubikzentimeter mit ϱ_i, die Wirkungsquerschnitte mit σ_{ik}, und ist v die mittlere Geschwindigkeit der Neutronen, so nimmt die Gesamtneutronenzahl in der Zeiteinheit ab um

$$\frac{dn}{dt} = -n v \sum_{ik} \varrho_i \sigma_{ik}.$$

Eine Ausnahme von dieser Regel machen allein die Spaltungsprozesse am Uran, solange wir Thorium ausschließen, das noch nicht so gut untersucht ist, und Neutronenenergien unterhalb 8 MeV fordern, so daß noch keine $(n, 2n)$-Prozesse auftreten können. Ist der Spaltungsquerschnitt σ_{Sp} und die Zahl der bei jeder Spaltung abgedampften Neutronen ν, so haben wir unsere Gleichung zu erweitern zu

$$\frac{1}{n}\frac{dn}{dt} = v\{-\sum_{ik} \varrho_i \sigma_{ik} + \varrho_U \sigma_{Sp}(\nu - 1)\}. \qquad (4a)$$

Die Neutronenzahl nimmt also so lange zu, wie in der Klammer ein positiver Ausdruck steht. Streuprozesse sind nicht mitzuzählen, weil sie die Zahl der Neutronen nicht verändern.

Als Beispiel betrachten wir zunächst die Verhältnisse an reinem Uranmetall. Für schnelle Neutronen besteht kein merkbarer Einfangquerschnitt; wir haben außer $\sigma_{Sp} = 0{,}1 \cdot 10^{-24}$ cm² nur noch Streuprozesse mit rund $6 \cdot 10^{-24}$ cm². Metallisches Uran (Dichte 8,6) enthält rund $2{,}2 \cdot 10^{22}$ Atome je Kubikzentimeter; es wird dann bei einer Neutronengeschwindigkeit von $2 \cdot 10^9$ cm/sec, entsprechend einer mittleren Energie der frei gesetzten Neutronen von 2 MeV:

$$\frac{1}{n}\frac{dn}{dt} = 0{,}44\,(\nu - 1) \cdot 10^7\ \mathrm{sec}^{-1}. \qquad (4b)$$

Die Integration dieser Differentialgleichung ergibt

$$n(t) = n_0 e^{0{,}44\,(\nu - 1) \cdot 10^7 t}.$$

Läßt man die Reaktionskette mit $n_0 = 1$ Neutron zur Zeit $t = 0$ anlaufen und nimmt man den wahrscheinlichsten Wert $\nu = 2$, so findet man, da je Spaltung $3 \cdot 10^{-12}$ mkg frei werden, folgende Energiebeträge: Nach 10^{-7} sec: $4{,}7 \cdot 10^{-12}$ mkg, nach 10^{-6} sec: $2{,}4 \cdot 10^{-11}$ mkg, nach 10^{-5} sec: $3 \cdot 10^{+7}$ mkg und nach 10^{-4} sec: $3 \cdot 10^{+78}$ mkg. Die letzte Zahl hat natürlich keinen Sinn mehr; sie bedeutet nur, daß in weniger als 10^{-4} sec das gesamte Uran umgesetzt wird. Die Energiebefreiung geschieht also in einer so kurzen Zeit, daß wir es mit einer außerordentlich heftigen Explosion zu tun haben*.

Es ist gut möglich, daß diese Abschätzung noch in folgendem Sinne zu korrigieren ist: Der Streuquerschnitt für schnelle Neutronen ist rund 60 mal so groß wie der Spaltungsquerschnitt, d. h. ein Neutron wird 60 mal gestreut, ehe es ihm gelingt,

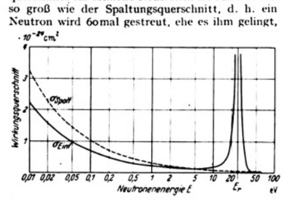


Fig. 1. Einfang- und Spaltungsquerschnitt von Uran für langsame Neutronen. Die Energie E ist in logarithmischer Skala gezeichnet.

einen Urankern zu spalten. Ist nun ein erheblicher Teil dieser Streuung unelastisch, was wir nicht wissen, so wird eine beträchtliche Verlangsamung eintreten. Obwohl bei jeder Spaltung schnelle Neutronen erzeugt werden, dürfen wir dann so rechnen, als ob wir es mit langsamen Neutronen zu tun hätten.

Den Verlauf von Spaltungs- und Einfangquerschnitt für langsame Neutronen zeigt Fig. 1. Dann tritt an Stelle von Gl. (4), wenn wir wieder $\nu = 2$ setzen,

$$\frac{1}{n}\frac{dn}{dt} = v \varrho_U (\sigma_{Sp} - \sigma_{\mathrm{Einf}}).$$

Die Neutronenproduktion wird also überall dort den Einfang überwiegen, wo der Spaltungsquerschnitt größer ist als der Einfangquerschnitt, d. h. überall außer in der Zone von etwa 5 eV bis 40 eV. Zur Durchlaufung dieser Zone sind vielleicht 4 oder 5 unelastische Streuungen notwendig, da-

* Infolge der Verarmung an Uran läuft die Reaktion allmählich langsamer. Auch dürfte sie nach Umsetzung eines kleinen, aber durchaus wägbaren Bruchteils abbrechen infolge konkurrierender Prozesse an den gebildeten Spaltungsprodukten.

Figure D.50: Siegfried Flügge. Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden? *Die Naturwissenschaften* 27:402–410. 9 June 1939. [https://digital.deutsches-museum.de/item/FA-002-746]

Heft 23/24. 9. 6. 1939 | FLÜGGE: Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden? 407

gegen infolge der großen Masse des Urankerns mehrere hundert elastische Stöße. Ob dies Gebiet also durchlaufen werden kann, ohne daß es zu einem Einfang der bei höherer Energie frei gesetzten Neutronen kommt, hängt davon ab, ein wie großer Anteil der Streuung in diesem Gebiet unelastisch ist.

Es ist sehr schwer zu überblicken, welche Prozesse überwiegen, wenn es sich nicht um extrem langsame, d. h. thermische Neutronen handelt. Es empfiehlt sich daher eine Anordnung zu prüfen, die mit Sicherheit dafür sorgt, daß die Neutronen im wesentlichen auf thermische Geschwindigkeiten abgebremst sind, ehe es zu einer Spaltung oder zu einem Einfangprozeß kommt.

Das bewährte Mittel zur Bremsung ist bekanntlich, für die Anwesenheit von vielen Protonen zu sorgen, also etwa das uranhaltige Material (am einfachsten U_3O_8) mit viel Wasser zu versetzen. Der Sauerstoff des U_3O_8 und des H_2O wirkt infolge seiner 16mal größeren Masse zwar sehr viel weniger, aber immerhin noch merkbar mit bei der Bremsung. Langsame Neutronen werden in Sauerstoff nicht spürbar absorbiert[18]. Die möglichen Kernumwandlungen ${}^{16}_{8}O(n,\alpha){}^{13}_{6}C$ und ${}^{16}_{8}O(n,p){}^{16}_{7}N^*$ sind beide stark endotherm und können überhaupt erst oberhalb von 2,6 MeV bzw. 6,5 MeV zustandekommen; der WQ der ersten Reaktion scheint[19] bei so großen Energien in die Größenordnung $2\cdot10^{-26}\,cm^2$ zu fallen, die zweite Reaktion ist überhaupt noch nicht mit Sicherheit beobachtet worden. Selbst wenn wir ganz trockenes U_3O_8 benutzen, genügt der Streuquerschnitt von etwa $1{,}3\cdot10^{-24}\,cm^2$ für schnelle Neutronen zwischen 2 und 3 MeV an Sauerstoff[20], um nach 7 elastischen Stößen die meisten Neutronen von 4 MeV Anfangsenergie unter den kritischen Wert von 2,6 MeV abzubremsen, während sicher eine größere Zahl von Stößen erforderlich ist, ehe eine Sauerstoffumwandlung erfolgt. Wir können im folgenden also, abgesehen von seiner bremsenden Wirkung, den Sauerstoff ganz außer acht lassen.

Die Anwesenheit des Wasserstoffes bewirkt elastische Streuung und Einfangprozesse, bei denen Deuteronen gebildet werden. In beiden Fällen sind die Querschnitte bei schnellen und langsamen Neutronen gut bekannt.

Der Streuquerschnitt wächst von rund $2\cdot10^{-24}\,cm^2$ bei schnellen Neutronen bis auf $14\cdot10^{-24}\,cm^2$ bei langsamen an. An thermischen Neutronen erfolgt die Streuung noch häufiger, etwa mit einem Querschnitt von $35\cdot10^{-24}\,cm^2$ infolge des Einflusses der chemischen Bindung. Solange diese keine Rolle spielt, d. h. bis herab zu Energien von etwa 1 eV, verliert ein Neutron bei jedem elastischen Stoß im Mittel die Hälfte seiner Energie an das Proton. Rund 20 Stöße an Wasserstoff genügen zur Abbremsung auch sehr schneller Neutronen von einigen MeV. Der Einfangquerschnitt des Wasserstoffs ist für schnelle Neutronen unmeßbar klein, für langsame steigt er umgekehrt proportional der Geschwindigkeit an bis auf $0{,}27\cdot10^{-24}\,cm^2$ für thermische Neutronen. Er kann also beschrieben werden durch die Formel

$$\sigma_{\mathrm{Einf.\,H}} = 0{,}27\sqrt{0{,}026\,E}\cdot10^{-24}\,cm^2,\quad (E \text{ in eV}). \qquad (5)$$

Wir betrachten nun eine Mischung, die auf 1 l Wasser M g U_3O_8 enthält. Bezeichnen wir mit $L = 6\cdot10^{23}$ die LOSCHMIDTsche Zahl, so befinden sich in 1 l Wasser 111 L H-Atome, zu denen noch $3\,ML/842$ U-Atome hinzukommen. Bei einer Dichte des U_3O_8 von 9 g/cm³ ist das hierzu benötigte Volumen $\left(1000+\frac{M}{9}\right)$ cm³. Wir haben also folgende Teilchenzahlen im Kubikzentimeter:

$$\varrho_U = \frac{\frac{3ML}{842}}{1000+\frac{M}{9}} \quad\text{und}\quad \varrho_H = \frac{111\,L}{1000+\frac{M}{9}}.$$

Die Gl. (4a) nimmt jetzt die Form an:

$$\left.\begin{aligned}\frac{1}{n}\frac{dn}{dt} &= v\{-\varrho_H\sigma_{\mathrm{Einf\,H}}-\varrho_U\sigma_{\mathrm{Einf\,U}}+\varrho_U(\nu-1)\sigma_{\mathrm{Sp\,U}}\}\\ &= \frac{vL}{1000+\frac{M}{9}}\cdot10^{-24}\frac{v_0}{v}\Big\{-111\cdot0{,}27\\ &\quad+\frac{3M}{842}[-1{,}3+2(\nu-1)]\Big\},\end{aligned}\right\} \qquad (6)$$

da im thermischen Bereich auch $\sigma_{\mathrm{Einf\,U}}$ proportional $1/v$ ist. Dabei bedeutet $v_0 = 2{,}5\cdot10^5$ cm/sec die mittlere thermische Geschwindigkeit. Damit eine Kette entsteht, muß die Klammer positiv sein, woraus sich die folgenden Mindestmassen ergeben: Für $\nu = 2$: 12 kg, für $\nu = 2{,}5$: 4,9 kg und für $\nu = 3$: 3,1 kg U_3O_8 je Liter Wasser.

Nehmen wir wieder den wahrscheinlichen Wert von $\nu = 2$ und arbeiten mit 15 kg U_3O_8, d. h. mit den Teilchenzahlen je Kubikzentimeter: $\varrho_U = 0{,}0200\,L$ und $\varrho_H = 0{,}0416\,L$, so haben wir immer noch mehr als doppelt so viel H-Atome wie U-Atome. Der Bremsmechanismus wird also durch die benutzte Uranmenge noch nicht gefährdet, und die Rechnung mit thermischen Neutronen ist statthaft. Wir erhalten:

$$\frac{1}{n}\frac{dn}{dt} = 420\,\mathrm{sec}^{-1};\quad n = n_0 e^{420t},$$

was folgende Zahlen von Neutronen ergibt, wenn die Kettenreaktion zur Zeit $t = 0$ mit $n_0 = 1$ Neutron beginnt: nach 10^{-3} sec: $n = 1{,}5$, nach 10^{-2} sec: $n = 67$ und nach 10^{-1} sec: $n = 4\cdot10^{18}$, d. h. die Umsetzung des Urans findet in etwa $1/_{10}$ sec statt; die Energiebefreiung erfolgt zwar langsamer als bei schnellen Neutronen, aber immer noch explosiv.

4. Die Steuerung von Reaktionsketten. Die entscheidende Frage für die technische Anwendbarkeit des Mechanismus ist offenbar die: Ist es möglich, den Ablauf der Reaktion beliebig zu verlangsamen? Hier haben nun ADLER und v. HALBAN[21] zum ersten Male einen Gedanken

408 FLÜGGE: Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden? | Die Naturwissenschaften

in die Diskussion geworfen, der geeignet ist, auch dies Problem seiner Lösung näher zu bringen.

Fügt man zu dem besprochenen Gemisch von U_3O_8 und H_2O etwas Cadmium, metallisch oder als Oxyd hinzu, so tritt in Gl. (6) noch ein weiteres Neutronen absorbierendes Glied $-\varrho_{Cd}\sigma_{\mathrm{Einf\,Cd}}$ in die Klammer. Die Absorption von Cd ist nun ziemlich gut bekannt. Aus zahlreichen Messungen[22] kann man schließen, daß der Einfangquerschnitt im ganzen thermischen Bereich und darüber bis hinauf zu 0,4 eV einigermaßen konstant ist, und zwar sehr groß, $= 2800\cdot10^{-24}\,cm^2$, während bei größeren Energien Cd praktisch durchlässig für Neutronen ist. Das entscheidende für die Betrachtung ist, daß alle Prozesse einschließlich der Spaltung im thermischen Bereich und noch ein gutes Stück darüber hinaus dem $1/v$-Gesetz folgen, mit alleiniger Ausnahme des überall gleichstark Neutronen wegfangenden Cd.

Läuft die Reaktionskette an, so wird die Temperatur der Substanz infolge der frei gesetzten Energie ansteigen; die mittlere Neutronengeschwindigkeit v wächst also ebenfalls und dementsprechend sinken alle Querschnitte einschließlich des Neutronen produzierenden Spaltungsquerschnitts, aber nicht der Einfangquerschnitt des Cd. Es wird nach einiger Zeit, die sehr kurz sein kann, ein Gleichgewichtszustand erreicht, bei dem das Cd genau so viele Neutronen wegfängt, wie produziert werden: Das System bleibt bei einer erhöhten Temperatur stehen, die um so höher ist, je weniger Cd man zusetzt, und die wir durch die Menge des Cd beliebig einregulieren können. Die allmähliche Verbrennung des Urans wird dann, je nachdem, wieviele Wärme nach außen zur Arbeitsleistung abgeführt wird, mit einer solchen Geschwindigkeit erfolgen, daß die Temperatur konstant gehalten wird.

Wäre das Cd nicht anwesend, so würde der stationäre Endzustand bei einer Temperatur liegen, die so hoch ist, daß für $\sigma_{\mathrm{Einf\,U}}$ das $1/v$-Gesetz nicht mehr gilt, d. h. bei Annäherung an die Resonanzstelle. Dann hätte man es aber immer schon mit Neutronen von einigen eV zu tun, d. h. mit Temperaturen um 10^5 Grad herum. Das gleiche gilt für Zusätze von anderen Elementen als Cd, die Resonanzstellen bei einigen eV haben. Die einzige derzeit bekannte Ausnahme ist Gadolinium, das ein ähnliches Verhalten wie Cd zeigt, aber nicht in dem Maße erforscht ist.

Die bei einem bestimmten Zusatz von Cd, etwa m g Cd, d. h. $mL/112{,}4$ Atomen Cd je Liter Wasser, sich einstellende Temperatur, kann man leicht ausrechnen. Man hat Gl. (6) jetzt nur noch durch ein Cd-Glied zu ergänzen. Mit den vorhin benutzten Werten $\nu = 2$ und $M = 15$ kg erhalten wir dann

$$\frac{1}{n}\frac{dn}{dt} = 420\left(1-3{,}4\,m\frac{v}{v_0}\right). \qquad (7)$$

Die Temperatur steigt solange an, bis die Klammer verschwindet, d. h. da $v \sim \sqrt{T}$, bis $3{,}4\,m\sqrt{T/T_0} = 1$, oder da $T_0 = 300°$ K, bis zur Temperatur

$$T = \frac{300°\,K}{(3{,}4\,m)^2}. \qquad (8)$$

Man erhält schon bei sehr geringfügigen Zusätzen von Cd $T = T_0$, d. h. überhaupt keine Reaktionskette mehr. Das folgt einfach aus dem extrem großen Einfangquerschnitt des Cd im thermischen Bereich. Man muß weniger als $1/_3$ g Cd zusetzen und findet z. B. folgende Temperaturen: Für $m = 0{,}25$ g Cd: 120° C, für $m = 0{,}20$ g: 350° C, für $m = 0{,}15$ g: 850° C und für $m = 0{,}10$ g: 2300° C.

Wir müssen uns an dieser Stelle noch einmal klarmachen, welche gigantischen Leistungen eine solche Maschine hervorbringen kann. Denken wir uns 4,2 t U_3O_8 (wie zu Anfang dieses Aufsatzes) mit 280 kg Wasser und 56 g Cd angesetzt, so beträgt die stationäre Verbrennungstemperatur 350° C, gleichgültig, wieviel Energie dauernd entzogen wird. Die gesamte, darin enthaltene Energiemenge, die bei Spaltung aller Uranatome frei wird, ist etwa $3\cdot10^{16}$ mkg $= 7\cdot10^{10}$ kWh. Diese Zahl können wir vergleichen mit der Gesamtleistung der Reichselektrowerke, also der auf Grund der mitteldeutschen Braunkohle arbeitenden Großkraftwerke zusammengenommen, die im Jahre 1929 rund $7\cdot10^5$ kW betrug. Das bedeutet, daß die angegebene Uranmenge ausreicht, um 10^5 Stunden $= 11$ Jahre lang, die ganze Leistung dieser Kraftwerke zu ersetzen! Dabei hat man allerdings, sobald ein kleiner Teil des Urans umgesetzt ist, etwa alltäglich einmal, die Maschine wieder von den Spaltungsprodukten zu reinigen, um sie neu betriebsfähig zu machen.

5. Die räumliche Verteilung der Neutronen. Alle bisherigen Überlegungen setzen immer eine unendlich große Menge von Substanz voraus, in der die Reaktionen ablaufen. In Wirklichkeit werden wir es natürlich stets mit einer begrenzten Menge zu tun haben, aus der die gebildeten Neutronen durch Diffusion entweichen können. Das Volumen der Anordnung muß nur groß genug sein, daß dieser Verlust an Neutronen durch Diffusion klein genug bleibt und die Reaktionskette nicht zum Abbrechen bringt.

Zur Behandlung dieses Problems haben wir die Diffusionsgleichung

$$\frac{\partial\varrho}{\partial t} = D\Delta\varrho + \lambda\varrho \qquad (9)$$

für die Dichte ϱ der Neutronen an die Stelle von Gl. (6) zu setzen, wobei λ die rechte Seite der Gl. (6) bedeutet. Sowohl $D = \frac{1}{3}vl$ als λ sind Funktionen der Geschwindigkeit und damit der Temperatur. Die freie Weglänge l wird ausschließlich durch die großen Querschnitte für elastische Stöße bestimmt; setzt man für thermische Neutronen den Streuquerschnitt an Uran rund gleich 20, an Wasserstoff gleich 35 und an Sauerstoff gleich $2\cdot10^{-24}\,cm^2$, so ergibt sich in der beschriebenen Mischung $l = 0{,}83$ cm. Unsere Diffusionstheorie

Heft 23/24. 9. 6. 1939 | FLÜGGE: Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden? 409

setzt also zunächst voraus, daß die Abmessungen der Anordnung groß sind gegen die Weglänge.

Diejenige Lösung der Differentialgleichung, die dem Anlaufen der Reaktionskette zur Zeit $t = 0$ am Punkte $r = 0$ entspricht, lautet

$$\varrho(r,t) = \frac{1}{(4\pi Dt)^{3/2}}\,e^{-\frac{r^2}{4Dt}}\,e^{\lambda t}. \qquad (10)$$

Das bedeutet ein allmähliches Nachaußenströmen der Neutronen, während ihre Gesamtzahl sich fortwährend vermehrt. Liegt eine Materiekugel vom endlichen Radius R vor, so daß alle Neutronen, die aus der Oberfläche austreten, endgültig verloren gehen, so ist die zur Zeit t in der Kugel enthaltene Anzahl Neutronen

$$N(t) = 4\pi\int_0^R \varrho r^2\,dr = e^{\lambda t}\frac{4}{\sqrt{\pi}}\int_0^{R/2\sqrt{Dt}} dx\,x^2 e^{-x^2}. \qquad (11)$$

Die freie Weglänge der Neutronen von $l = 0{,}83$ cm in der oben beschriebenen Anordnung mit U_3O_8, H_2O, Cd bedingt für thermische Neutronen eine Diffusionskonstante von $D_0 = \frac{1}{3}v_0 l = 0{,}7\cdot10^5$ cm²/sec. Wählt man R sehr klein, so sinkt $N(t)$ zuerst mit der Zeit rasch ab, ehe der Faktor $e^{\lambda t}$ wirksam wird und einen endgültigen Wiederanstieg hervorruft. Dann reißt die Kette auf jeden Fall ab, da die Neutronenzahl 1, mit der sie beginnt, dabei unterschritten wird. Man erhält dagegen ganz sicher einen Anstieg, sobald sich kein Minimum mehr ausbildet, sondern N von Anbeginn an monoton mit t ansteigt.

Um die Lage des Minimums aufzusuchen, setzen wir $dN/dt = 0$, dann erhalten wir die Bedingungsgleichung

$$\frac{R^2\lambda}{2D} = f(z),\quad f(z) = \frac{2z^5\Phi_1(z)}{\Phi(z)-z\Phi_1(z)}\quad\text{und}\quad z = \frac{R}{2\sqrt{Dt}}. \qquad (12)$$

Dabei bedeutet $\Phi(z)$ das GAUSSsche Fehlerintegral und $\Phi_1(z)$ dessen erste Ableitung. Bei vorgegebenen R, λ und D hat man also denjenigen z-Wert, d. h. denjenigen Zeitpunkt aufzusuchen, für den $f(z)$ gerade die Bedingung (12) erfüllt. Bei kleinen Radien gibt es zwei solche Zeitpunkte: $N(t)$ durchläuft nacheinander erst ein Minimum, dann ein Maximum. Die Funktion $f(z)$ verschwindet für $z = 0$ und $z = \infty$, dazwischen durchläuft sie ein Maximum der Höhe $f_{\max} = 2{,}35$. Ist nun

$$\frac{R^2\lambda}{2D} > 2{,}35,$$

so kann man sicher sein, daß $N(t)$ monoton mit der Zeit wächst und die Kette nicht abreißt. Es muß R groß genug sein, damit in jedem Augenblick die Ungleichung

$$R^2 > 4{,}7\,\frac{D}{\lambda} \qquad (13)$$

erfüllt ist. Bei unserer oben beschriebenen Anordnung ist

$$\lambda = 420\left(1-0{,}68\frac{v}{v_0}\right)\quad\text{und}\quad D = 0{,}7\cdot10^5\frac{v}{v_0};$$

es muß daher für $v = v_0$ (Zimmertemperatur) $R > 50$ cm sein.

Dies Ergebnis bedarf noch einer Klarstellung: Die Temperatur in der Anordnung steigt natürlich, so daß λ immer kleiner wird und schließlich gegen Null geht. Das erfordert aber keinen größeren Radius als den hier berechneten. Es kommt ja nicht darauf an, daß zu keiner Zeit die Ungleichung (5) verletzt wird, sondern nur, daß zu jeder Zeit $R^2 > 2\frac{D}{\lambda}f(z)$ bleibt. Die „Gefahrenzone" wird nun offenbar durchlaufen, wenn z von der Größenordnung 1 ist (das Maximum von f liegt etwa bei $z = 1{,}6$). Für $R = 50$ cm und Zimmertemperatur entspricht dem aber ein Zeitpunkt $t = 3{,}4\cdot10^{-3}$ sec und eine Neutronenzahl $N = e^{\lambda t} = 4{,}2$, d. h. die Zahl der Neutronen ist noch sehr klein und die Temperatur praktisch unverändert. Erst etwa für $z = 0{,}2$ wird die Neutronenanzahl so groß ($3\cdot10^{15}$), daß eine Temperaturerhöhung eintreten muß; dann ist aber auch $f(z)$ nur noch $= 0{,}107$, so daß die Bedingung (13) bei weitem nicht mehr eingehalten zu werden braucht.

6. Die geologische Frage. Gegen die hier angestellten Betrachtungen müßte man zunächst noch einen Einwand erheben: Wenn eine solche Umsetzung des Urans möglich ist, sobald nur ein einziges Neutron vorhanden ist, warum hat dann die Natur dies Experiment nicht schon vorweggenommen und im Gestein ausgeführt? Einzelne Neutronen befinden sich überall, wo es uran- oder thorhaltige Mineralien gibt; sie müssen fortwährend in geringer Menge erzeugt werden bei gelegentlichen Kernreaktionen, die die α-Teilchen des Urans und vor allem die der Emanation im umliegenden Gestein auslösen. Zudem liefert wohl auch die Ultrastrahlung stets einige Neutronen*.

Um diesen Einwand zu entkräften, ist es notwendig, sich über die Art des Vorkommens des Urans in der Natur nähere Angaben zu beschaffen. Zunächst weiß man, daß die radioaktiven Elemente nur in den obersten 10—15 km der Erdkruste überhaupt vorkommen, da die von ihnen permanent abgegebene Zerfallsenergie sonst im Widerspruch zu dem bekannten Wärmehaushalt der Erde stehen würde. Es handelt sich bei Uran um ein ausgesprochen lithophiles Verhalten; es tritt besonders in Eruptivgesteinen entweder fein verteilt oder in Gängen oder Einsprengungen nachgedrungener Restmagmen auf. Dies gilt vor allem für das Vorkommen der Pechblende. Über die Mächtigkeit solcher Gänge geben Auskunft folgende Zahlen[23]: In einem der ergiebigsten Gänge der Westgrube in St. Joachimsthal kommen auf

* Die auf diese Weise zustande kommenden Neutronenintensitäten sind viel zu gering, um die in uran- und thorhaltigen Mineralien fast immer auftretenden Beimengungen seltener Erden sowie von Zr und Y als Endprodukte der bei Spaltungsprozessen entstehenden β-Zerfallsketten ansprechen zu können. Dagegen spricht auch, daß das thorfreie Katangaerz besonders arm an diesen Elementen ist.

410 FISCHER: Bericht über den 5. Internationalen Zellforscherkongreß 1938 in Zürich. | Die Naturwissenschaften

1 m² Gangfläche 54 kg Uranroherz; dabei liegt der U_3O_8-Gehalt des Roherzes durchweg unter 50%. In der Edelleutstollner Grube kommt zwar auf 1 m² Gangfläche rund die 10fache Menge von Roherz, dafür ist aber der Urangehalt des Roherzes wieder um einen Faktor 10 kleiner, so daß die gleiche Menge nur disperser verteilt ist. Die Mächtigkeit dieser Gänge entspricht demnach, auf unsere Urananordnung umgerechnet, maximal einer Schichtdicke von weniger als 1 cm! Das ist eine Mächtigkeit, die selbst für den Ablauf einer Reaktionskette von thermischen Neutronen noch um mehr als den Faktor 100 zu klein ist; für schnelle Neutronen können die Verhältnisse noch gut um einen Faktor 10 ungünstiger liegen, sind aber schwer zu übersehen.

Ähnlich steht es mit anderen Lagerstätten wohl auch. Eine besondere Merkwürdigkeit sind die Carnotit-Imprägnationen in Sandstein und an tonigen Schichten der (sekundären) Lagerstätten von Colorado, die meist nur dünn, selten einige Zoll stark, in wenigen Ausnahmefällen bis zu 4 Fuß dick sind. Carnotit enthält auch Kristallwasser, so daß auf 1 Atom U 3 H-Atome kommen; es wäre also eine ideale Anordnung in unserem Sinne; vorausgesetzt, daß nicht Verunreinigungen wieder die für den Ablauf der Reaktionskette erforderliche Mächtigkeit wesentlich erhöhen, und zweitens, wenn nicht auch in gleicher Menge mit dem Uran auch V-Atome und K-Atome anwesend wären, die selbst in erheblichem Maße langsame Neutronen wegfangen.

Im ganzen kann man wohl sagen, daß das Auftreten einer Explosion in der Natur ein sehr unwahrscheinlicher Vorgang ist, da wir nirgends Anhäufungen von hinreichender Mächtigkeit bei zugleich hinreichender Abwesenheit stark Neutronen absorbierender Stoffe vorfinden. Dasselbe dürfte auch für Thorium zutreffen, nur sind dort die Reaktionsmöglichkeiten bisher viel schlechter bekannt. Im übrigen ist es natürlich durchaus möglich, daß derartige Prozesse gelegentlich vorkommen und im Zusammenhange mit vulkanischen Erscheinungen für die Geologie ein gewisses Interesse erlangen können.

Alles in allem sei noch einmal betont, daß unsere gegenwärtigen Kenntnisse die Möglichkeit einer „Uranmaschine" der beschriebenen Art wahrscheinlich machen, daß aber das vorliegende quantitative Zahlenmaterial noch mit zu hohen Fehlergrenzen behaftet ist, um diese Möglichkeit zur Gewißheit zu verdichten. Wie dem auch sei, bedeutet es doch eine wichtigen Fortschritt, daß derartige Möglichkeiten überhaupt diskutierbar geworden sind, ein Fortschritt, der auch, wenn sich die Hoffnungen nicht verwirklichen sollten, die eingehende Diskussion in diesem Aufsatze wohl berechtigt erscheinen läßt.

Literatur.

[1] O. HAHN u. F. STRASSMANN, Naturwiss. **27**, 11, 89, 163 (1939). — [2] L. MEITNER u. O. R. FRISCH, Nature (Lond.) **143**, 239 (1939). — [3] S. FLÜGGE u. G. v. DROSTE, Z. physik. Chem. B. **42**, 274 (1939). [4] W. JENTSCHKE u. F. PRANKL, Naturwiss. **27**, 134 (1939). — G. v. DROSTE, Naturwiss. **27**, 198 (1939). [5] M. DODÉ, H. v. HALBAN jun., F. JOLIOT u. L. KOWARSKI, C. r. Acad. Sci. Paris **208**, 995 (1939). [6] S. FLÜGGE, Z. Physik **111**, 109 (1938). — [7] H. v. HALBAN, F. JOLIOT, L. KOWARSKI, Nature (Lond.) **143**, 470, 680 (1939). — [8] H. L. ANDERSON, E. FERMI u. H. B. HANSTEIN, Physic. Rev. **55**, 797 (1939). [9] L. SZILARD u. W. H. ZINN, Physic. Rev. **55**, 799 (1939). — G. v. DROSTE u. H. REDDEMANN, Naturwiss. **27**, 371 (1939). — [10] R. B. ROBERTS, R. C. MEYER u. P. WANG, Physic. Rev. **55**, 510 (1939). — R. B. ROBERTS, L. R. HAFSTAD, R. C. MEYER u. P. WANG, Physic. Rev. **55**, 664 (1939). — [11] L. MEITNER, O. HAHN u. F. STRASSMANN, Z. Physik. **106**, 249 (1937). [12] H. v. HALBAN jun., L. KOWARSKI, P. SAVITCH, C. r. Acad. Sci. Paris **208**, 1396 (1939). — [13] H. L. ANDERSON, E. T. BOOTH, J. R. DUNNING, E. FERMI, G. N. GLASOE u. F. G. SLACK, Physic. Rev. **55**, 511 (1939). — [14] N. BOHR, Physic. Rev. **55**, 418 (1939). — [15] J. R. DUNNING, G. B. PEGRAM, G. A. FINK, D. P. MITCHELL u. E. SEGRÈ, Physic. Rev. **48**, 265 (1935). — [16] M. GOLDHABER, R. D. HILL u. L. SZILARD, Physic. Rev. **55**, 47 (1939). — S. W. BARNES u. P. W. ARADINE, Physic. Rev. **55**, 50 (1939). — G. B. COLLINS, B. WALDMAN, E. M. STUBBLEFIELD u. M. GOLDHABER, Physic. Rev. **55**, 507 (1939). — [17] M. D. WHITAKER, CH. A. BARTON, W. C. BRIGHT u. E. J. MURPHY, Physic. Rev. **55**, 793 (1939). — [18] O. R. FRISCH, H. v. HALBAN jun. u. J. KOCH, Nature (Lond.) **140**, 895 (1937). — [19] G. v. DROSTE, mündliche Mitteilung. — [20] H. AOKI, Physic. Rev. **55**, 795 (1939). — [21] F. ADLER u. H. v. HALBAN, Nature (Lond.) **143**, 793 (1939). — [22] J. G. HOFFMAN u. M. ST. LIVINGSTON, Physic. Rev. **52**, 1228 (1937). [23] C. DOELTER u. H. LEITMEIER, Handbuch der Mineralchemie **4**, 2, Artikel G. KIRSCH, S. 969—974.

K 532. II. 39.

Bericht über den 5. Internationalen Zellforscherkongreß 1938 in Zürich.

Von I. FISCHER, Berlin-Dahlem.

Vom 7. bis 13. August 1938 fand in Zürich der 5. Internationale Zellforscherkongreß statt. Die Verhandlungen zeigten, wie die experimentelle Zellforschung zur Lösung der vorliegenden Fragen sich in zunehmendem Maße physikalischer und chemischer Methoden bedient. Ein beträchtlicher Teil der neueren Fortschritte ist der Anwendung solcher Methoden zu verdanken, sowohl auf dem Gebiet der Protoplasmaals auch der Chromosomenforschung, und auch ebenso in der Histophysiologie, der Entwicklungsphysiologie, der Krebs- und Virusforschung. Zugleich hat sich ein engerer Zusammenschluß verschiedener Arbeitsrichtungen vollzogen, und besonders die Grenzen zwischen morphologischer und physiologischer Forschung sind vielfach aufgehoben. Nachdem die alte statische Betrachtungsweise der Zellstrukturen aufgegeben worden ist, kann der kausale Zusammenhang zwischen Struktur und Funktion ja auch weder übersehen werden noch unberücksichtigt bleiben.

Jeder Verhandlungstag wurde durch ein oder zwei größere Referate eingeleitet; die übrige Zeit war mit Einzelvorträgen, Demonstrationen und Filmvorführun-

Figure D.51: Siegfried Flügge. Kann der Energieinhalt der Atomkerne technisch nutzbar gemacht werden? *Die Naturwissenschaften* 27:402–410. 9 June 1939. [https://digital.deutsches-museum.de/item/FA-002-746]

ÖSTERREICHISCHES PATENTAMT

Kl. 21 i_{49}, 4/10

PATENTSCHRIFT NR. 219170

Ausgegeben am 10. Jänner 1962

ALPENLÄNDISCHER ZENTRALVEREIN
ZUR FÖRDERUNG SCHÖPFERISCHEN SCHAFFENS
IN SALZBURG

Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen

Angemeldet am 30. Juni 1958 (A 4597/58); als Tag der Anmeldung gilt der
14. Juni 1939 (Tag der Hinterlegung beim Deutschen Reichspatentamt).
Beginn der Patentdauer: 15. Juni 1961.
Längste mögliche Dauer: 14. Juni 1971.
Als Erfinder wird genannt: Dr. Georg Stetter in Zell am See (Salzburg).

Die Erfindung bezieht sich auf eine Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen, wobei außer den eigentlichen Spaltsubstanzen (Brennstoff) neutronenstreuende Substanzen (Moderator) und gegebenenfalls neutronenabsorbierende Substanzen (Absorber) verwendet sind.

In derartigen Vorrichtungen (Spaltungsreaktoren) wird die Aufrechterhaltung der energieproduzierenden, mit Hilfe der bei der Kernspaltung entstehenden Spaltneutronen (Sekundärneutronen) als Kettenreaktion ablaufenden Kernspaltungen dadurch bewirkt, daß die schnellen Spaltneutronen in den neutronenstreuenden Substanzen (Moderator) auf langsame Geschwindigkeiten gebremst (moderiert) werden. Dieser Vorgang erhöht die Häufigkeit der Kernspaltungen und damit auch der Neutronenproduktion, da Kernspaltungen in überwiegendem Maße von langsamen Neutronen bewirkt werden. Die Neutronenbilanz wird gehoben, wodurch erhöhte Neutronenverluste, welche den Abbruch der Kettenreaktion zur Folge haben, kompensiert werden können.

Eine derartige Vorrichtung wurde von S. Flügge in der Zeitschrift Naturwissenschaften 27 [1939] im Heft 23/24 vom 9. 6. 1939, S. 402/410 beschrieben, wobei nach dem Vorschlag von S. Flügge die Spaltsubstanzen (Brennstoff) mit den neutronenstreuenden Substanzen (Moderator) homogen gemischt sind (homogener Spaltungsreaktor).

Die Neutronenökonomie ist jedoch infolge starken Neutroneneinfanges durch die Spaltsubstanzen bei einer homogenen Mischung von Spaltsubstanzen und neutronenstreuenden Substanzen nicht gut, so daß eine Kettenreaktion nur unter erschwerenden technischen Bedingungen in Gang gesetzt und aufrechterhalten werden kann.

Dieser Mangel wird durch die Erfindung dadurch behoben, daß die Spaltsubstanzen (Brennstoff) von den Neutronen streuenden Substanzen (Moderator) räumlich getrennt angeordnet sind (heterogener Spaltungsreaktor). Unter "räumlich getrennt" wird hier das Gegenteil einer homogenen Mischung verstanden, nämlich die "makroskopische" Eigenständlichkeit der Bereiche der Spaltsubstanzen (Brennstoffbereiche) und der Bereiche der neutronenstreuenden Substanzen (Moderatorbereiche).

Dadurch, daß auf diese Weise die Spaltneutronen in von der Spaltsubstanz hinreichend entfernten Bereichen auf thermische Geschwindigkeit abgebremst werden, entgehen sie leichter den Einfangprozessen, welche bei bestimmten mittleren Geschwindigkeiten (Resonanzbereichen) der Neutronen in besonderem Maße auftreten. Der Vermehrungsfaktor für die Spaltneutronen erreicht auf diese Weise - bedingt auch durch die geometrische Anordnung der Spaltsubstanzen und neutronenstreuenden Substanzen - den kritischen Wert 1 für stationären Reaktorbetrieb.

Vor dem Prioritätszeitpunkt der Erfindung hatte man lediglich in Experimentieranordnungen die von einem Ra-Be-Präparat ausgesandten Primärneutronen in räumlich von der Spaltsubstanz getrennt angeordneten neutronenstreuenden Substanzen gebremst (vgl. Comptes Rendus 208, [1939], S. 898/900). Es ist jedoch vor dem Prioritätszeitpunkt der Erfindung nicht bekanntgeworden, eine derartige Anordnung auch zur Bremsung von in der Spaltsubstanz entstehenden Sekundärneutronen (Spaltneutronen) vorzusehen. Es

Figure D.52: Georg Stetter. Austrian patent AT219170. Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen [Apparatus for Technical Energy Production by Means of Nuclear Fission Reactions]. Filed 14 June 1939.

lag eben nicht nahe, die in der Spaltsubstanz entstehenden Sekundärneutronen, welche zur Aufrechterhaltung der Kettenreaktion in eben dieser Spaltsubstanz für weitere Spaltungsreaktionen benötigt werden, außerhalb der Spaltsubstanz abzubremsen (zu moderieren).

Eine weitere Möglichkeit, die Neutronenökonomie zu verbessern, besteht in der erfindungsgemäßen Anwendung eines reinen Isotops der Spaltsubstanz mit großem Spaltungswirkungsquerschnitt für Neutronen, vorzugsweise langsame (thermische) Neutronen bzw. einer mit einem solchen Isotop angereicherten Substanz. Es wurde zwar zum Prioritätszeitpunkt der Erfindung schon vermutet, daß z.B. das Uranisotop 235 das im wesentlichen spaltbare Isotop sei des Urans (vgl. Naturwissenschaften 27 [1939] , S. 405), jedoch wurden daraus keinerlei technische Maßnahmen gefolgert, insbesondere nicht bei räumlicher Trennung von Spaltsubstanz und neutronenstreuenden Substanzen.

Die Kettenreaktion, welche in der erfindungsgemäßen Vorrichtung abläuft, kann man auch steuern, sei es durch Nähern oder Entfernen des streuenden Materials (Moderator), sei es durch Beimengung neutronenabsorbierender (aber keine Neutronen liefernden) Substanzen (Absorber), schließlich dadurch, daß man durch die spezielle geometrische Anordnung der reagierenden Substanzen den Vermehrungsfaktor um ein geringes kleiner als 1 macht.

Beispiel: Eine dünne Platte aus Uranisotop 235, beiderseits bedeckt von dickeren Paraffinplatten oder etwa gleich von dem Wasser eines zu heizenden Dampfkessels, bestrahlt mit Ra-Be-Neutronen, bildet einen Heizkörper von ungeheurem Wärmevorrat. Der Gefahr der Explosion kann hier schon durch die Verwendung der langsamen Neutronen vorgebeugt werden, da bei entsprechender geometrischer Anordnung der oben erwähnte Vermehrungsfaktor bei einer bestimmten Temperatur unter seinen kritischen Wert 1 sinkt, so daß man geradezu auf eine bestimmte Temperatur einstellen kann.

PATENTANSPRÜCHE:

1. Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen, wobei außer den eigentlichen Spaltsubstanzen (Brennstoff) neutronenstreuende Substanzen (Moderator) und gegebenenfalls neutronenabsorbierende Substanzen (Absorber) verwendet sind, dadurch gekennzeichnet, daß die Spaltsubstanzen (Brennstoff) von den neutronenstreuenden Substanzen (Moderator) räumlich getrennt angeordnet sind.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß als Spaltsubstanz (Brennstoff) ein reines Isotop mit großem Spaltungswirkungsquerschnitt vorzugsweise für thermische Neutronen, z.B. Uran 235 bzw. eine mit einem solchen Isotop angereicherte Substanz verwendet ist.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß als Einheit eine Schicht aus Uran 235 (Brennstoff) beidseitig bedeckt mit dickeren Paraffinschichten (Moderator) verwendet ist.

Druck: Ing. E. Voytjech, Wien

Figure D.53: Georg Stetter. Austrian patent AT219170. Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen [Apparatus for Technical Energy Production by Means of Nuclear Fission Reactions]. Filed 14 June 1939.

Georg Stetter. Austrian patent AT219170. Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen [Apparatus for Technical Energy Production by Means of Nuclear Fission Reactions]. Filed 14 June 1939.

Die Erfindung bezieht sich auf eine Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen, wobei ausser den eigentlichen Spaltsubstanzen (Brennstoff) neutronenstreuende Substanzen (Moderator) und gegebenenfalls neutronenabsorbierende Substanzen (Absorber) verwendet sind.

In derartigen Vorrichtungen (Spaltungsreaktoren) wird die Aufrechterhaltung der energieproduzierenden, mit Hilfe der bei der Kernspaltung entstehenden Spaltneutronen (Sekundärneutronen) als Kettenreaktion ablaufenden Kernspaltungen dadurch bewirkt, dass die schnellen Spaltneutronen in den neutronenstreuenden Substanzen (Moderator) auf langsame Geschwindigkeiten gebremst (moderiert) werden. Dieser Vorgang erhöht die Häufigkeit der Kernspaltungen und damit auch der Neutronenproduktion, da Kernspaltungen in überwiegendem Masse von langsamen Neutronen bewirkt werden. Die Neutronenbilanz wird gehoben, wodurch erhöhte Neutronenverluste, welche den Abbruch der Kettenreaktion zur Folge haben, kompensiert werden können.

Eine derartige Vorrichtung wurde von S. Flügge in der Zeitschrift *Naturwissenschaften* 27 [1939] im Heft 23/24 vom 9. 6. 1939, S. 402/410 beschrieben, wobei nach dem Vorschlag von S. Flügge die Spaltsubstanzen (Brennstoff) mit den neutronenstreuenden Substanzen (Moderator) homogen gemischt sind (homogener Spaltungsreaktor).

Die Neutronenökonomie ist jedoch infolge starken Neutroneneinfanges durch die Spaltsubstanzen bei einer homogenen Mischung von Spaltsubstanzen und neutronenstreuenden Substanzen nicht gut, so dass eine Kettenreaktion nur unter erschwerenden technischen Bedingungen in Gang gesetzt und aufrechterhalten werden kann.

The invention relates to a device for the production of technical energy by means of nuclear fission reactions. Apart from the actual fission substances (fuel), neutron scattering substances (moderator) and possibly neutron-absorbing substances (absorbers) are used.

In such devices (fission reactors), the maintenance of the energy-producing nuclear fissions occurring as a chain reaction during secondary fission (secondary fission) is effected by slowing (moderating) the fast fission neutrons in the neutron scattering substances (moderator) to slow speeds. This process increases the frequency of nuclear fission and thus also neutron production, since nuclear fission is predominantly caused by slow neutrons. The neutron balance is lifted, as a result of which increased neutron losses, which result in the termination of the chain reaction, can be compensated for.

Such a device has been described by S. Flügge in the journal *Naturwissenschaften* 27 [1939] in issue 23/24 of 9 June 1939, p. 402/410. According to the proposal by S. Flügge, the fission substances (fuel) are homogeneously mixed with the neutron scattering substances (moderator) (homogeneous fission reactor).

The neutron economy, however, is not good due to strong neutron capture by the fission substances in a homogeneous mixture of fission substances and neutron scattering substances so that a chain reaction can only be initiated and maintained under aggravating technical conditions.

Dieser Mangel wird durch die Erfindung dadurch behoben, dass die Spaltsubstanzen (Brennstoff) von den Neutronen streuenden Substanzen (Moderator) räumlich getrennt angeordnet sind (heterogener Spaltungsreaktor). Unter "räumlich getrennt" wird hier das Gegenteil einer homogenen Mischung verstanden, nämlich die "makroskopische" Eigenständlichkeit der Bereiche der Spaltsubstanzen (Brennstoffbereiche) und der Bereiche der neutronenstreuenden Substanzen (Moderatorbereiche).

This deficiency is remedied by the invention in that the fissionable substances (fuel) from the neutron-scattering substances (moderator) are spatially separated (heterogeneous splitting reactor). The term "spatially separated" is understood here to mean the opposite of a homogeneous mixture, namely the "macroscopic" independence of the regions of the fissile substances (fuel regions) and the regions of the neutron scattering substances (moderator regions).

Dadurch, dass auf diese Weise die Spaltneutronen in von der Spaltsubstanz hinrei-chend entfernten Bereichen auf thermische Geschwindigkeit abgebremst werden, entgehen sie leichter den Einfangprozessen, welche bei bestimmten mittleren Geschwindigkeiten (Resonanzbereichen) der Neutronen in besonderem Masse auftreten. Der Vermehrungsfaktor für die Spaltneutronen erreicht auf diese Weise—bedingt auch durch die geometrische Anordnung der Spaltsubstanzen und neutronenstreuenden Substanzen—den kritischen Wert 1 für stationären Reaktorbetrieb.

By slowing the fission neutrons to thermal speed in areas which are sufficiently remote from the fissile substance, they are more likely to escape the capture processes which occur particularly at certain mean velocities (resonance regions) of the neutrons. In this way, the multiplication factor for the fission neutrons achieves the critical value 1 for stationary reactor operation, which is also due to the geometric arrangement of the fissionable substances and neutron-scattering substances.

Vor dem Prioritätszeitpunkt der Erfindung hatte man lediglich in Experimentier-anordnungen die von einem Ra-Be-Präparat ausgesandten Primärneutronen in räumlich von der Spaltsubstanz getrennt angeordneten neutronenstreuenden Substanzen gebremst (vgl. *Comptes Rendus* 208, [1939] S. 898/900). Es ist jedoch vor dem Prioritätszeitpunkt der Erfindung nicht bekanntgeworden, eine derartige Anordnung auch zur Bremsung von in der Spaltsubstanz entstehenden Sekundärneutronen (Spaltneutronen) vorzusehen. Es lag eben nicht nahe, die in der Spaltsubstanz entstehenden Sekundärneutronen, welche zur Aufrechterhaltung der Kettenreaktion in eben dieser Spaltsubstanz für weitere Spaltungsreaktionen benötigt werden, ausserhalb der Spaltsubstanz abzubremsen (zu moderieren).

Before the priority date of the invention, the primary neutrons emitted from a Ra-Be preparation had been slowed only in experimental setups in neutron scattering substances spatially separated from the fissile substance (cf. *Comptes Rendus* 208, [1939] p. 898–900). However, before the priority date of the invention, it was not known to provide such an arrangement also for slowing secondary neutrons (fission neutrons) arising in the fissile substance. It was not obvious to moderate (moderate) the secondary neutrons formed in the fissionable substance, which are needed to maintain the chain reaction in the same fissionable substance for further fission reactions, outside the fissionable substance.

Eine weitere Möglichkeit, die Neutronenökonomie zu verbessern, besteht in der erfindungsgemässen Anwendung eines reinen Isotops der Spaltsubstanz mit grossem Spaltungswirkungsquerschnitt für Neutronen, vorzugsweise langsame (thermische) Neutronen bzw. einer mit einem solchen Isotop angereicherten Substanz. Es wurde zwar zum Prioritätszeitpunkt der Erfindung schon vermutet, dass z. B. das Uranisotop 235 das im wesentlichen spaltbare Isotop sei des Urans (vgl. *Naturwissenschaften* 27 [1939], S. 405), jedoch wurden daraus keinerlei technische Massnahmen gefolgert, insbesondere nicht bei räumlicher Trennung von Spaltsubstanz und neutronenstreuenden Substanzen.

A further possibility of improving the neutron economy consists in the application according to the invention of a pure isotope of the fissionable substance with a large fission reaction cross-section for neutrons, preferably slow (thermal) neutrons or a substance enriched with such an isotope. Although it was already assumed at the priority date of the invention that the uranium isotope 235 is the essentially fissionable isotope of uranium (cf. *Naturwissenschaften* 27 [1939], p. 405), however, no technical measures were taken from this, especially in the case of spatial separation of fissile substances and neutron-scattering substances.

Die Kettenreaktion, welche in der erfindungsgemässen Vorrichtung abläuft, kann man auch steuern, sei es durch Nähern oder Entfernen des streuenden Materials (Moderator), sei es durch Beimengung neutronenabsorbierender (aber keine Neutronen liefernden) Substanzen (Absorber), schliesslich dadurch, dass man durch die spezielle geometrische Anordnung der reagierenden Substanzen den Vermehrungsfaktor um ein Geringes kleiner als 1 macht.

The chain reaction which proceeds in the apparatus according to the invention can also be controlled, whether by inserting or removing the scattering material (moderator), or by admixing neutron-absorbing (but not neutron-supplying) substances (absorbers), finally, the particular geometric arrangement of the reacting substances makes the multiplication factor a little less than 1.

Beispiel: Eine dünne Platte aus Uranisotop 235, beiderseits bedeckt von dickeren Paraffinplatten oder etwa gleich von dem Wasser eines zu heizenden Dampfkessels, bestrahlt mit Ra-Be-Neutronen, bildet einen Heizkörper von ungeheurem Wärmevorrat. Der Gefahr der Explosion kann hier schon durch die Verwendung der langsamen Neutronen vorgebeugt werden, da bei entsprechender geometrischer Anordnung der oben erwähnte Vermehrungsfaktor bei einer bestimmten Temperatur unter seinen kritischen Wert 1 sinkt, so dass man geradezu auf eine bestimmte Temperatur einstellen kann.

Example: A thin plate of Uranisotope 235, on either side covered by thicker paraffin plates or already by the water of a boiler to be heated, irradiated with Ra-Be neutrons, forms a radiator of immense heat. The danger of the explosion can already be presented here by the use of the slow neutrons, since, given the corresponding geometrical arrangement, the multiplication factor mentioned above drops below its critical value 1 at a certain temperature, so that it is virtually possible to adjust to a certain temperature.

PATENTANSPRÜCHE:

1. Vorrichtung zur technischen Energiegewinnung mit Hilfe von Kernspaltungsreaktionen, wobei ausser den eigentlichen Spaltsubstanzen (Brennstoff) neutronenstreuende Substanzen (Moderator) und gegebenenfalls neutronenabsorbierende Substanzen (Absorber) verwendet sind, dadurch gekennzeichnet, dass die Spaltsubstanzen (Brennstoff) von den neutronenstreuenden Substanzen (Moderator) räumlich getrennt angeordnet sind.

2. Vorrichtung nach Anspruch l, dadurch gekennzeichnet, dass als Spaltsubstanz (Brennstoff) ein reines Isotop mit grossem Spaltungswirkungsquerschnitt vorzugsweise für thermische Neutronen, z. B. Uran 235 bzw. eine mit einem solchen Isotop angereicherte Substanz verwendet ist.

3. Vorrichtung nach Anspruch l, dadurch gekennzeichnet, dass als Einheit eine Schicht aus Uran 235 (Brennstoff) beidseitig bedeckt mit dickeren Paraffinschichten (Moderator) verwendet ist.

PATENT CLAIMS:

1. Apparatus for technical energy production by means of nuclear fission reactions, wherein neutron-scattering substances (moderator) and optionally neutron-absorbing substances (absorber) are used in addition to the actual fission substances (fuel), characterized in that the fission substances (fuel) are arranged spatially separate from the neutron-scattering substances (moderator).

2. A device according to claim 1, characterized in that a pure isotope with a large fission reaction cross section, preferably for thermal neutrons, e.g. uranium 235 or a substance enriched with such an isotope, is used as the fission substance (fuel).

3. Device according to claim 1, characterized in that a layer of uranium 235 (fuel) is coated as a unit on both sides with thicker paraffin layers (moderator).

[Georg Stetter (Austrian, 1895–1988) led a nuclear physics group at the University of Vienna. In this patent application, Stetter gave a remarkably detailed description of a fission reactor.

See document photos on pp. 3388–3389. For an early 1939 draft of this patent application that also includes fusion reactions, see German nuclear report G-378 (p. 4368).

Austria was part of Germany from 1938 until the end of the war. Stetter and his group apparently played important roles in the wartime German nuclear program (pp. 4368–4383, 4834–4846, 5038).]

Philip Morrison to Samuel K. Allison. 20 December 1943. Report on Enemy Physics Literature: Survey Report P. [NARA RG 77, Entry UD-22A, Box 170, Folder 32.60-1 GERMANY: Summary Reports (1944)]

Several high-voltage machines are in operation. Excluding apparatus below 1 Mev (which may be good neutron sources for many purposes) there are machines: [...]

2) At Berlin-Lichterfelde, in the private laboratory of the radio engineer, M. von Ardenne. At this laboratory some neutron work is being done, and at least one well-known neutron physicist (Houtermans) is employed.(20) It is interesting that an electronic research laboratory should extend into nuclear physics in war-time. Ardenne mentions that he was urged to do nuclear physics in 1939 by the Reichspostminister Ohnesorge. [...]

(Can the presence and scale of secret work of these laboratories be determined?) [...]

(20) Physik. Z., 44, 167 (1943)

David Irving. 1967. *The Virus House.* London: William Kimber.

[p. 33:] The conference took place in all secrecy on 29th April 1939 at the Ministry's [Reich Ministry of Education, in charge of universities] building at Unter den Linden in Berlin.[1] [...]

[1] Those at this first meeting were: Professor [Abraham] Esau (*chairman*); Professors [Georg] Joos, [Wilhelm] Hanle, [Hans] Geiger, [Josef] Mattauch, [Walther] Bothe and [Gerhard] Hoffmann; and the Ministry's representative, Doctor [Wilhelm] Dames.

Professor Esau recommended that they secure at once all available uranium stocks in Germany. [...]

A general ban was placed on the export of uranium compounds from Germany, and negotiations were opened with the Reich Ministry of Economics for the provision of radium from the recently captured mines at Joachimsthal (Jachymov) in Czechoslovakia. [...]

[pp. 38–43:] The letter [from Harteck and Groth on 24 April 1939] had been passed to General Becker's Army Ordnance Department, and thence to the research branch under Professor Erich Schumann. Schumann in turn forwarded it to Doctor Kurt Diebner, the Army's expert on nuclear physics and explosives, and another key figure in this history. [...]

Diebner was at the time 34 years old. He had read nuclear physics at the University of Halle under Professor Pose, and graduated with a thesis on the ionisation [by] alpha rays late in 1931. For a time he had worked at the Bureau of Standards laboratory on the construction of a new high-voltage particle accelerator for atomic transformations; but in 1934 the Army had appointed him to an Ordnance Department research branch where together with Doctor Friedrich Berkei he had investigated hollow-charge explosives—a development similar to one being undertaken by the air force's Professor Schardin at Berlin-Gatow. [...] Doctor Kurt Diebner had at this time a growing reputation in nuclear physics with some twenty publications to his name. [...]

During the summer [of 1939], with further encouragement from Flügge's articles, and in particular from a patent application by the Viennese Professor Stetter for a process for extracting atomic energy, they obtained the first Army funds to start research on uranium and a laboratory was erected at Gottow, a section of the Army's vast Kummersdorf rocket-projectiles and explosives research establishment outside Berlin. An independent nuclear research office was at last opened in the Army Ordnance Department, and Diebner was put in charge. [...]

The energetic steps taken by Esau seem to have stimulated the War Office team to intensify their own efforts. [...] Together with Professor Schumann, Diebner explained that [Erich] Bagge had been sent for to help the War Office arrange an immediate secret conference to decide on the feasibility of a uranium project. Between them, Diebner and Bagge drew up a short list of the physicists and chemists most clearly concerned, including Professor Walther Bothe, Professor Geiger, Professor Stetter, Professor Hoffmann, Professor Mattauch, and Doctors Bagge, Diebner and Flügge. Otto Hahn was also summoned to attend. [...]

The 'important matter' was now a State secret. From this stage on, all reference to the possibilities of uranium reactors and atomic bombs was suppressed. [...I]n general nothing else appeared in print in Germany until 1942 when the impatient nuclear scientists were given permission to publish some of their lesser research papers, provided that no mention of their context was made.

[pp. 70–71:] Early in 1940, Baron Manfred von Ardenne, an outstanding technician in his particular field, tried to persuade Otto Hahn's instrumentation and equipment specialist, Professor Philipp, to apply for a subsidy from General Göring for the construction of large 'atom-smashing' installations. [...]

Von Ardenne cast around for a source of large-scale funds, and learned that the Post Office had a large and rich research department. He called personally on the Minister of Posts, Ohnesorge, and in general terms explained how Hahn's discovery made uranium bombs now possible; he called particular attention to hints about 'powering ships with uranium reactors' dropped in a commentary to the US naval construction programme. In personal exchanges between the Dahlem laboratories and his own laboratory in Lichterfelde, von Ardenne had asked both Hahn and Heisenberg outright how much pure uranium-235 was necessary for an atomic explosion. He was told it would be only a few kilograms. 'During these discussions,' von Ardenne describes, 'I expressed an opinion that it was technically quite feasible, by means of high-yield electromagnetic mass-separators (which we already had on our drawing boards) to make quantities of a few kilograms of uranium-235 available, if only the Reich government would resolve to direct the talents of the big electrical combines to that end.'

Minister Ohnesorge was so impressed by von Ardenne's argument, that he secured an audience with Adolf Hitler soon after, and informed him of the uranium bomb. [...]

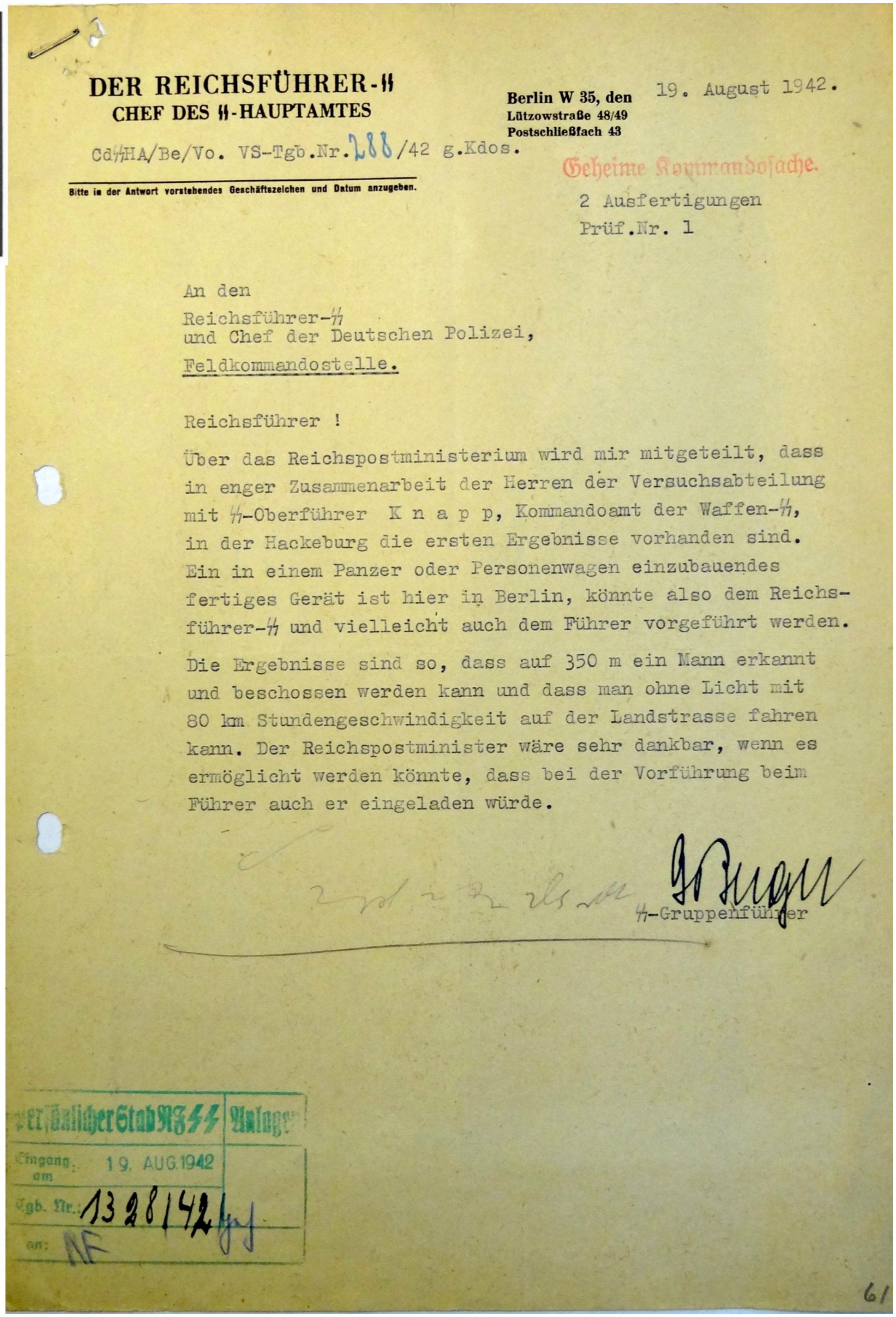
Von Ardenne saw Ohnesorge return angry and disappointed, but not defeated: he resolved to support von Ardenne's project within the framework of German Post Office research. There were thus now three factions in the nuclear research effort: the scientists allied to Doctor Diebner—including Berkei, Czulius, Herrmann, Hartwig and Kamin—at the Army Ordnance Department's Gottow laboratory; the scientists attracted to von Ardenne's laboratory; and the institutes of physics of the Kaiser-Wilhelm Foundation.

[Although David Irving was neither a trained historian nor a scientist (and ultimately went off the deep end), his book contains a great deal of useful information since he personally interviewed many of the German nuclear scientists within two decades after the end of the war.

Wilhelm Ohnesorge studied physics at the university before becoming head of the Reichspost. He had a large amount of research funding at his disposal, since his organization collected payments for all letters, packages, and telegrams sent throughout the Third Reich. He used that funding to support very advanced research programs in electronics, and he could have easily used it to support the early years of a nuclear weapons program as well. As reported by Irving, Ohnesorge sought larger amounts of nuclear funding from Hitler and was rejected, at least initially. Yet as also described by Irving, Ohnesorge did not give up easily.

Beginning no later than June 1942, Ohnesorge began a research collaboration with Heinrich Himmler and the SS, which could supply large amounts of funding, personnel, facilities, and other resources (see pp. 3396–3405 for a few surviving documents). In September 1942, Ohnesorge again lobbied Hitler for political and financial support, revealing his knowledge of the U.S. Manhattan Project in the process (p. 3397): "According to his [Ohnesorge's] observations, at the moment America is gathering all the professors of physics and chemistry to produce special achievements. He would like to give a short lecture about this to the Führer." However the further discussions with Hitler turned out, the collaboration between the Reichspost and the SS appears to have continued until the end of the war, with large investments of resources in the program.

Kurt Diebner's research group also appears to have become aligned with the SS as the war progressed.]



DER REICHSFÜHRER-SS
CHEF DES SS-HAUPTAMTES

Berlin W 35, den 19. August 1942.
Lützowstraße 48/49
Postschließfach 43

Cd SS HA/Be/Vo. VS-Tgb.Nr. 288/42 g.Kdos.

Bitte in der Antwort vorstehendes Geschäftszeichen und Datum anzugeben.

Geheime Kommandosache.
2 Ausfertigungen
Prüf.Nr. 1

An den
Reichsführer-SS
und Chef der Deutschen Polizei,
Feldkommandostelle.

Reichsführer !

Über das Reichspostministerium wird mir mitgeteilt, dass in enger Zusammenarbeit der Herren der Versuchsabteilung mit SS-Oberführer K n a p p, Kommandoamt der Waffen-SS, in der Hackeburg die ersten Ergebnisse vorhanden sind. Ein in einem Panzer oder Personenwagen einzubauendes fertiges Gerät ist hier in Berlin, könnte also dem Reichsführer-SS und vielleicht auch dem Führer vorgeführt werden.

Die Ergebnisse sind so, dass auf 350 m ein Mann erkannt und beschossen werden kann und dass man ohne Licht mit 80 km Stundengeschwindigkeit auf der Landstrasse fahren kann. Der Reichspostminister wäre sehr dankbar, wenn es ermöglicht werden könnte, dass bei der Vorführung beim Führer auch er eingeladen würde.

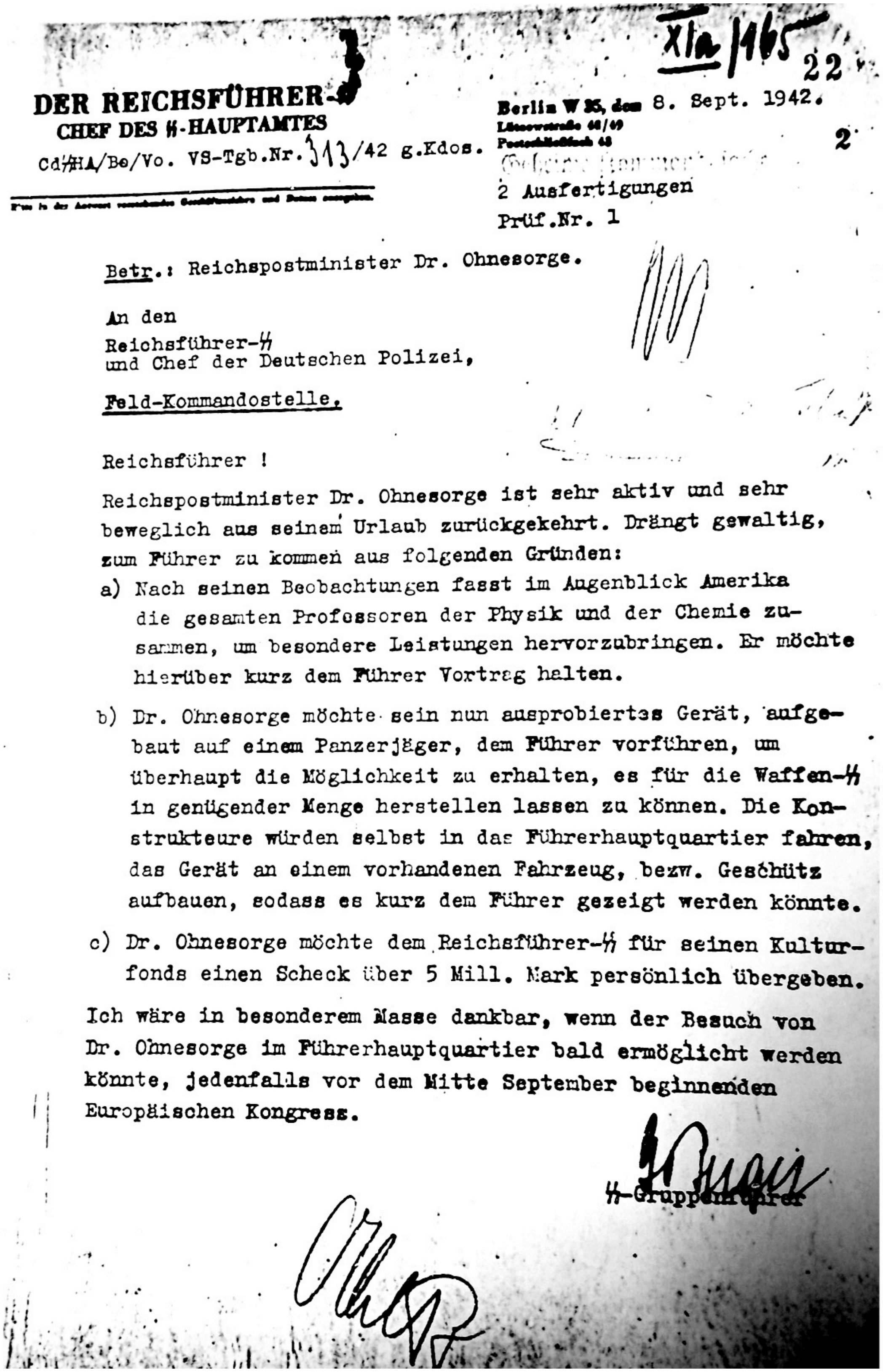
G Berger
SS-Gruppenführer

Persönlicher Stab RF SS | Anlage
Eingang am: 19. AUG. 1942
Tgb. Nr.: 1328/42 gej
an: AF

61

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made

Figure D.54: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].



XIa/1465

22

DER REICHSFÜHRER-SS
CHEF DES SS-HAUPTAMTES
Cd/SSHA/Be/Vo. VS-Tgb.Nr. 313/42 g.Kdos.

Berlin W 35, den 8. Sept. 1942.

2

2 Ausfertigungen
Prüf.Nr. 1

Betr.: Reichspostminister Dr. Ohnesorge.

An den
Reichsführer-SS
und Chef der Deutschen Polizei,

Feld-Kommandostelle.

Reichsführer !

Reichspostminister Dr. Ohnesorge ist sehr aktiv und sehr beweglich aus seinem Urlaub zurückgekehrt. Drängt gewaltig, zum Führer zu kommen aus folgenden Gründen:

a) Nach seinen Beobachtungen fasst im Augenblick Amerika die gesamten Professoren der Physik und der Chemie zusammen, um besondere Leistungen hervorzubringen. Er möchte hierüber kurz dem Führer Vortrag halten.

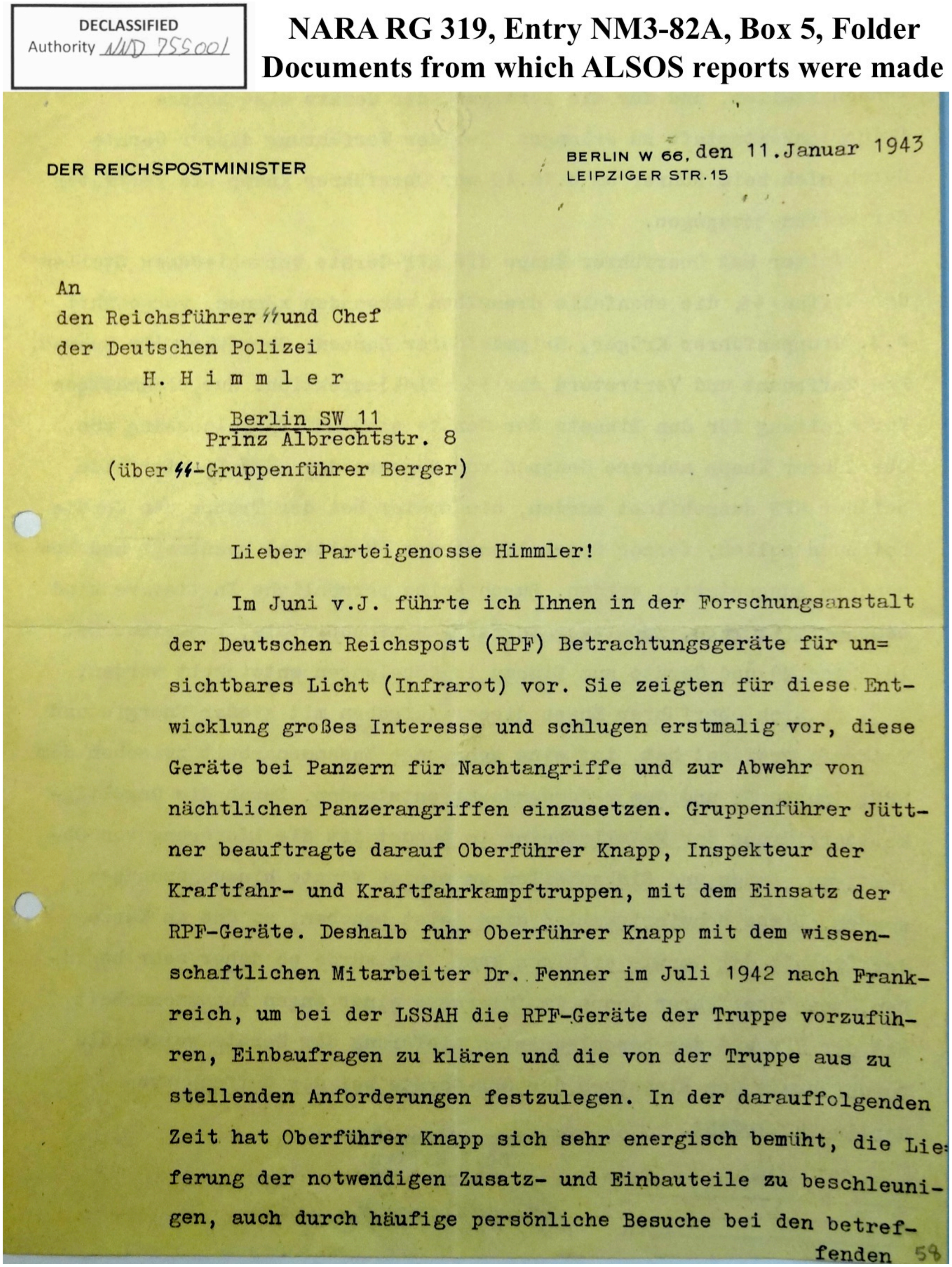
b) Dr. Ohnesorge möchte sein nun ausprobiertes Gerät, aufgebaut auf einem Panzerjäger, dem Führer vorführen, um überhaupt die Möglichkeit zu erhalten, es für die Waffen-SS in genügender Menge herstellen lassen zu können. Die Konstrukteure würden selbst in das Führerhauptquartier fahren, das Gerät an einem vorhandenen Fahrzeug, bezw. Geschütz aufbauen, sodass es kurz dem Führer gezeigt werden könnte.

c) Dr. Ohnesorge möchte dem Reichsführer-SS für seinen Kulturfonds einen Scheck über 5 Mill. Mark persönlich übergeben.

Ich wäre in besonderem Masse dankbar, wenn der Besuch von Dr. Ohnesorge im Führerhauptquartier bald ermöglicht werden könnte, jedenfalls vor dem Mitte September beginnenden Europäischen Kongress.

SS-Gruppenführer

Figure D.55: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [Bundesarchiv Lichterfelde, NS 19-2012.]. Point a) reveals very early and accurate German knowledge of the U.S. Manhattan Project: "According to his [Ohnesorge's] observations, at the moment America is gathering all the professors of physics and chemistry to produce special achievements. He would like to give a short lecture about this to the Führer."



DECLASSIFIED
Authority NND 755001

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made

DER REICHSPOSTMINISTER

BERLIN W 66, den 11.Januar 1943
LEIPZIGER STR.15

An
den Reichsführer SS und Chef
der Deutschen Polizei
H. H i m m l e r
Berlin SW 11
Prinz Albrechtstr. 8
(über SS-Gruppenführer Berger)

Lieber Parteigenosse Himmler!

Im Juni v.J. führte ich Ihnen in der Forschungsanstalt der Deutschen Reichspost (RPF) Betrachtungsgeräte für un= sichtbares Licht (Infrarot) vor. Sie zeigten für diese Entwicklung großes Interesse und schlugen erstmalig vor, diese Geräte bei Panzern für Nachtangriffe und zur Abwehr von nächtlichen Panzerangriffen einzusetzen. Gruppenführer Jüttner beauftragte darauf Oberführer Knapp, Inspekteur der Kraftfahr- und Kraftfahrkampftruppen, mit dem Einsatz der RPF-Geräte. Deshalb fuhr Oberführer Knapp mit dem wissenschaftlichen Mitarbeiter Dr. Fenner im Juli 1942 nach Frankreich, um bei der LSSAH die RPF-Geräte der Truppe vorzuführen, Einbaufragen zu klären und die von der Truppe aus zu stellenden Anforderungen festzulegen. In der darauffolgenden Zeit hat Oberführer Knapp sich sehr energisch bemüht, die Lieferung der notwendigen Zusatz- und Einbauteile zu beschleunigen, auch durch häufige persönliche Besuche bei den betref-

fenden 58

Figure D.56: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made

fenden Stellen, und für die Fertigung der Geräte eine höhere Dringlichkeitsstufe zu erlangen. Bei der Vorführung dieser Geräte durch mich beim Führer am 4.10.42 war Oberführer Knapp als Vertreter der Waffen-SS zugegen.

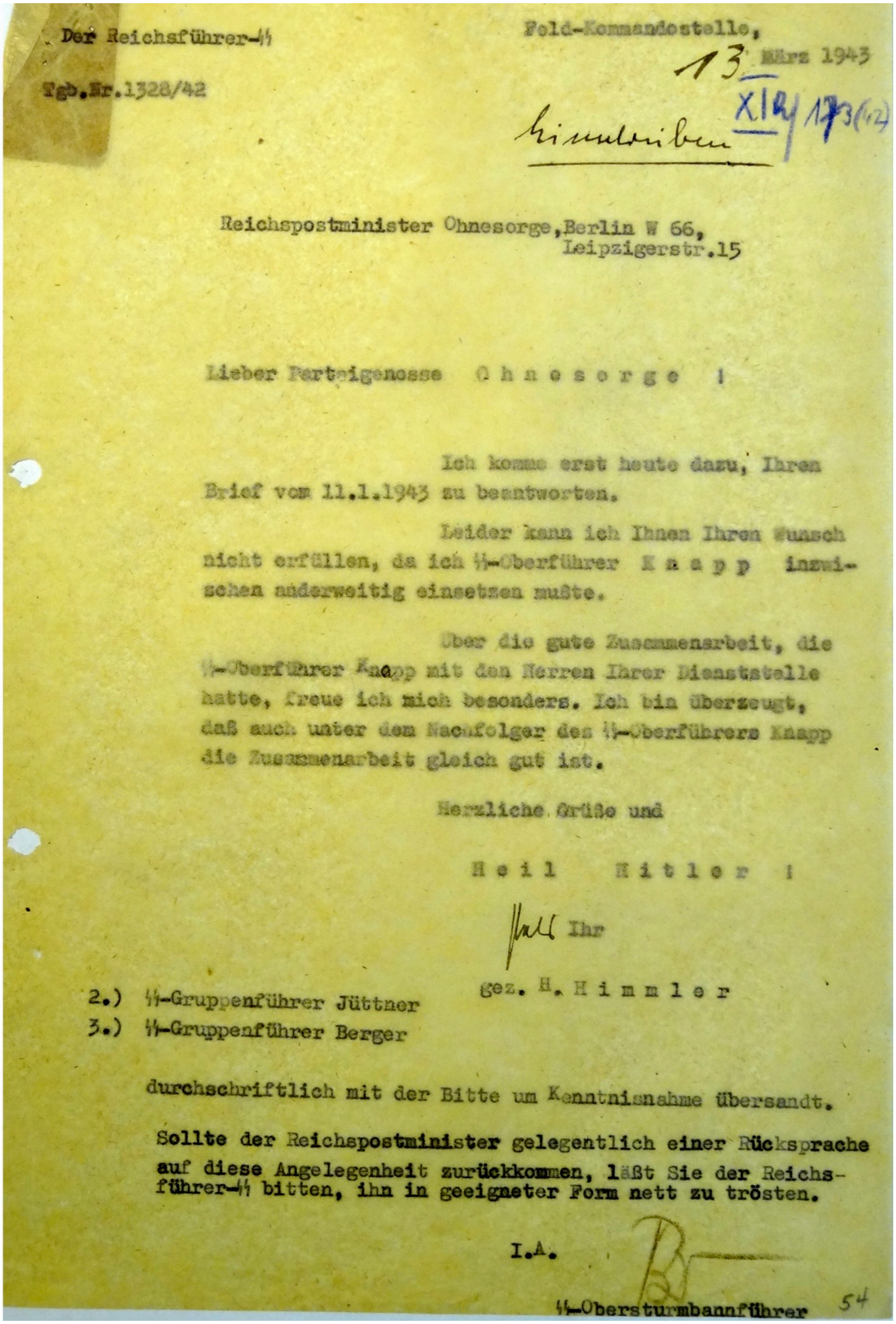
Weiter hat Oberführer Knapp die RPF-Geräte verschiedenen Stellen der Waffen-SS, die ebenfalls dieselben verwenden können, vorgeführt, z.B. Gruppenführer Krüger, Brigadeführer Hansen, Oberführer Dr.Schwab, SS-Waffenamt und Vertretern der SS-Flakinspektion. Zur planmäßigen Vorbereitung für den Einsatz der Geräte sind auf Veranlasssung von Oberführer Knapp mehrere Gruppen von Männern der KEA Lichterfelde bei der RPF ausgebildet worden, die später bei der Truppe die Geräte betreuen sollen, ferner Spezialfahrzeuge (Maultier) beantragt und be= sonders ausgestattet worden. Durch seine persönliche Initiative sind besonders Visiere, Zusatzgeräte für Maschinenpistole, Panzerbüchse, leichtes MG und Geräte zum Einbau in Kübelwagen entwickelt worden.

Da sich Oberführer Knapp dieser Aufgaben mit großer Energie und Tatkraft gewidmet hat, ist eine sehr enge Zusammenarbeit zwischen der RPF, Gruppe FE und dem SS-Kommandoamt entstanden. Durch die Ungültigkeitserklärung der Metallscheine im August ist die Lieferung von Objektiven, Lupen und Einbauteilen um einige Monate hinausgeschoben worden. Diese Schwierigkeiten sind jetzt behoben, so daß in Kürze der Einsatz der Geräte erfolgen kann. Ich würde es daher sehr begrüßen, wenn Oberführer Knapp im Interesse einer engen Zusammenarbeit mit der RPF und der beschleunigten Lieferung der Geräte weiter die Durchführung des Einsatzes der RPF-Geräte bei der Waffen-SS von Berlin aus leitet.

Mit herzlichen Grüßen
Heil Hitler!
Ihr
Ohnesorge

Tgb. Nr.: 1328/42

Figure D.57: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].



Der Reichsführer-SS

Tgb.Nr.1328/42

Feld-Kommandostelle,
13 März 1943

Einschreiben

XIa/173(42)

Reichspostminister Ohnesorge, Berlin W 66,
Leipzigerstr.15

Lieber Parteigenosse O h n e s o r g e !

Ich komme erst heute dazu, Ihren Brief vom 11.1.1943 zu beantworten.

Leider kann ich Ihnen Ihren Wunsch nicht erfüllen, da ich SS-Oberführer K n a p p inzwischen anderweitig einsetzen mußte.

Über die gute Zusammenarbeit, die SS-Oberführer Knapp mit den Herren Ihrer Dienststelle hatte, freue ich mich besonders. Ich bin überzeugt, daß auch unter dem Nachfolger des SS-Oberführers Knapp die Zusammenarbeit gleich gut ist.

Herzliche Grüße und

H e i l H i t l e r !

Ihr

gez. H. H i m m l e r

2.) SS-Gruppenführer Jüttner
3.) SS-Gruppenführer Berger

durchschriftlich mit der Bitte um Kenntnisnahme übersandt.

Sollte der Reichspostminister gelegentlich einer Rücksprache auf diese Angelegenheit zurückkommen, läßt Sie der Reichsführer-SS bitten, ihn in geeigneter Form nett zu trösten.

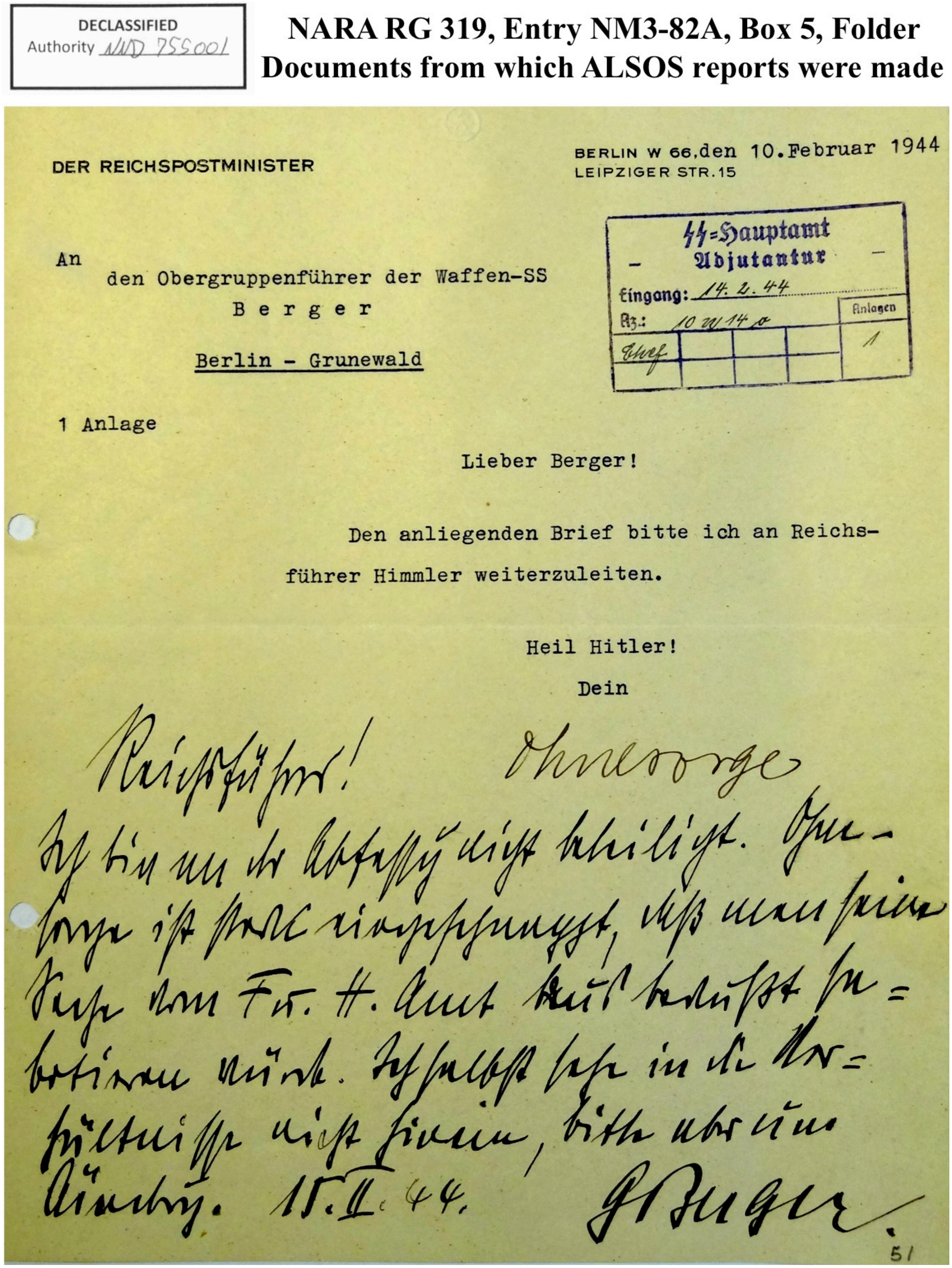
I.A.

SS-Obersturmbannführer

54

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made

Figure D.58: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].



DECLASSIFIED
Authority NND 755001

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made

DER REICHSPOSTMINISTER

BERLIN W 66, den 10. Februar 1944
LEIPZIGER STR. 15

SS-Hauptamt
Adjutantur
Eingang: 14. 2. 44
Az.: 10 w 14 a
Anlagen 1
Chef

An
den Obergruppenführer der Waffen-SS
B e r g e r

Berlin - Grunewald

1 Anlage

Lieber Berger!

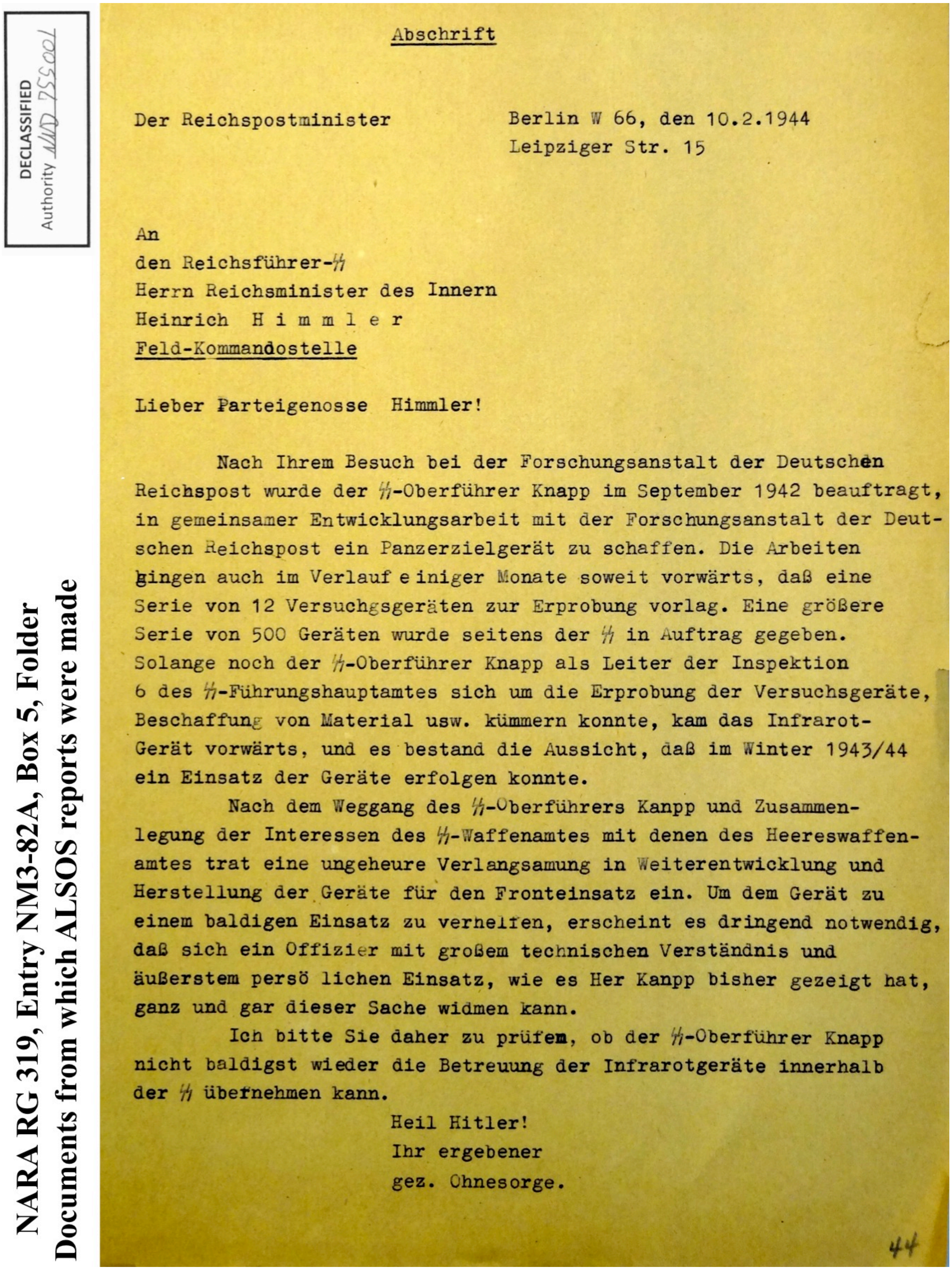
Den anliegenden Brief bitte ich an Reichsführer Himmler weiterzuleiten.

Heil Hitler!
Dein
Ohnesorge

Reichsführer!
Ich bin an der Abfassung nicht beteiligt. Ohnesorge ist stark eingeschnappt, daß man seine Leute vom Fo. H. Amt kurz befristet zu= [illegible] wird. Ich selbst sehe in die Verhältnisse nicht hinein, bitte aber um Änderung. 15.II.44. G Berger.

51

Figure D.59: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].



Abschrift

Der Reichspostminister

Berlin W 66, den 10.2.1944
Leipziger Str. 15

An
den Reichsführer-ꞩ
Herrn Reichsminister des Innern
Heinrich H i m m l e r
Feld-Kommandostelle

Lieber Parteigenosse Himmler!

Nach Ihrem Besuch bei der Forschungsanstalt der Deutschen Reichspost wurde der ꞩ-Oberführer Knapp im September 1942 beauftragt, in gemeinsamer Entwicklungsarbeit mit der Forschungsanstalt der Deutschen Reichspost ein Panzerzielgerät zu schaffen. Die Arbeiten gingen auch im Verlauf e iniger Monate soweit vorwärts, daß eine Serie von 12 Versuchsgeräten zur Erprobung vorlag. Eine größere Serie von 500 Geräten wurde seitens der ꞩ in Auftrag gegeben. Solange noch der ꞩ-Oberführer Knapp als Leiter der Inspektion 6 des ꞩ-Führungshauptamtes sich um die Erprobung der Versuchsgeräte, Beschaffung von Material usw. kümmern konnte, kam das Infrarot-Gerät vorwärts, und es bestand die Aussicht, daß im Winter 1943/44 ein Einsatz der Geräte erfolgen konnte.

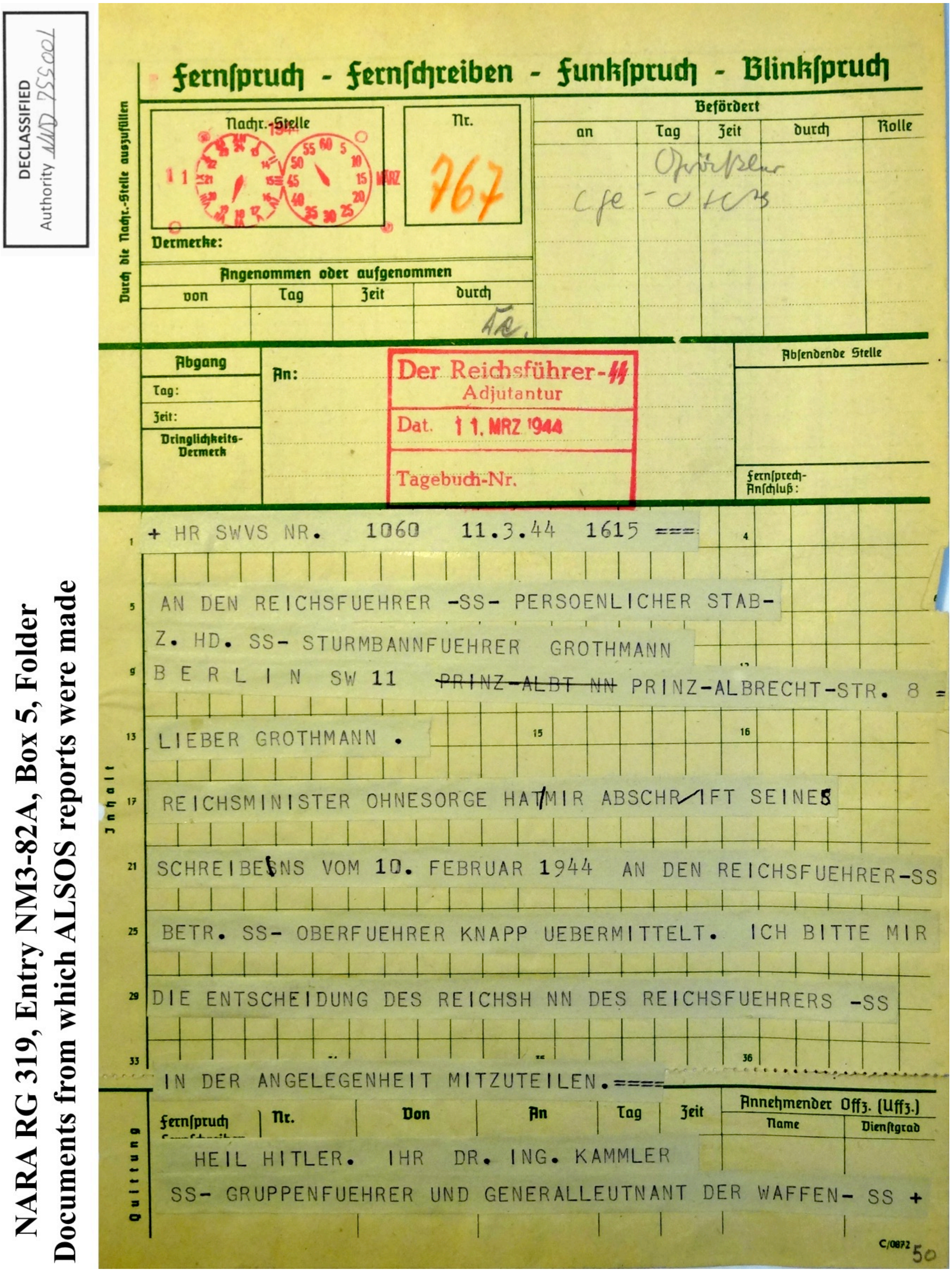
Nach dem Weggang des ꞩ-Oberführers Kanpp und Zusammenlegung der Interessen des ꞩ-Waffenamtes mit denen des Heereswaffenamtes trat eine ungeheure Verlangsamung in Weiterentwicklung und Herstellung der Geräte für den Fronteinsatz ein. Um dem Gerät zu einem baldigen Einsatz zu verhelfen, erscheint es dringend notwendig, daß sich ein Offizier mit großem technischen Verständnis und äußerstem persö lichen Einsatz, wie es Her Kanpp bisher gezeigt hat, ganz und gar dieser Sache widmen kann.

Ich bitte Sie daher zu prüfem, ob der ꞩ-Oberführer Knapp nicht baldigst wieder die Betreuung der Infrarotgeräte innerhalb der ꞩ übernehmen kann.

Heil Hitler!
Ihr ergebener
gez. Ohnesorge.

44

Figure D.60: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].



DECLASSIFIED
Authority NND 755001

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made

Fernspruch - Fernschreiben - Funkspruch - Blinkspruch

Nachr.-Stelle | Nr. 767 | Befördert: an, Tag, Zeit, durch, Rolle

Vermerke:

Angenommen oder aufgenommen: von, Tag, Zeit, durch

Abgang: Tag: Zeit: Dringlichkeits-Vermerk | An: | Absendende Stelle | Fernsprech-Anschluß:

Der Reichsführer-SS
Adjutantur
Dat. 11. MRZ 1944
Tagebuch-Nr.

+ HR SWVS NR. 1060 11.3.44 1615 ===

AN DEN REICHSFUEHRER -SS- PERSOENLICHER STAB-
Z. HD. SS- STURMBANNFUEHRER GROTHMANN
BERLIN SW 11 ~~PRINZ-ALBT NN~~ PRINZ-ALBRECHT-STR. 8 =

LIEBER GROTHMANN .

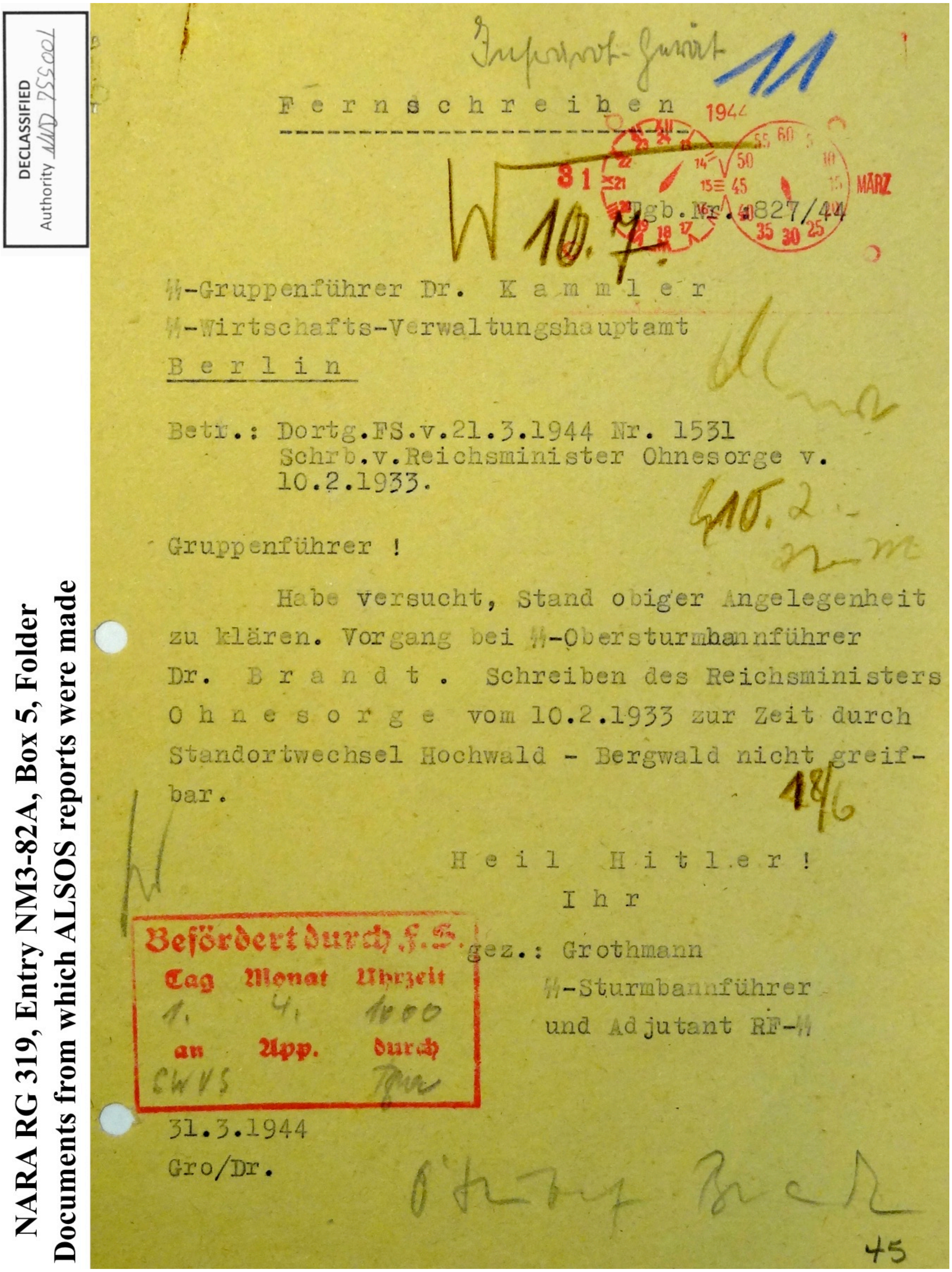
REICHSMINISTER OHNESORGE HAT MIR ABSCHRIFT SEINES
SCHREIBENS VOM 10. FEBRUAR 1944 AN DEN REICHSFUEHRER-SS
BETR. SS- OBERFUEHRER KNAPP UEBERMITTELT. ICH BITTE MIR
DIE ENTSCHEIDUNG DES REICHSH NN DES REICHSFUEHRERS -SS
IN DER ANGELEGENHEIT MITZUTEILEN.====

HEIL HITLER. IHR DR. ING. KAMMLER
SS- GRUPPENFUEHRER UND GENERALLEUTNANT DER WAFFEN- SS +

Quittung: Fernspruch | Nr. | Von | An | Tag | Zeit | Annehmender Offz. (Uffz.) Name, Dienstgrad

C/0872 50

Figure D.61: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].



DECLASSIFIED
Authority NND 755001

F e r n s c h r e i b e n

1944 MÄRZ 31

W 10.7.

Tgb. Nr. 827/44

SS-Gruppenführer Dr. K a m m l e r
SS-Wirtschafts-Verwaltungshauptamt
B e r l i n

Betr.: Dortg.FS.v.21.3.1944 Nr. 1531
Schrb.v.Reichsminister Ohnesorge v.
10.2.1933.

Gruppenführer !

Habe versucht, Stand obiger Angelegenheit zu klären. Vorgang bei SS-Obersturmbannführer Dr. B r a n d t . Schreiben des Reichsministers O h n e s o r g e vom 10.2.1933 zur Zeit durch Standortwechsel Hochwald - Bergwald nicht greifbar.

H e i l H i t l e r !
I h r
gez.: Grothmann
SS-Sturmbannführer
und Adjutant RF-SS

Befördert durch F.S.

Tag	Monat	Uhrzeit
1.	4.	1000
an	App.	durch
CWVS		

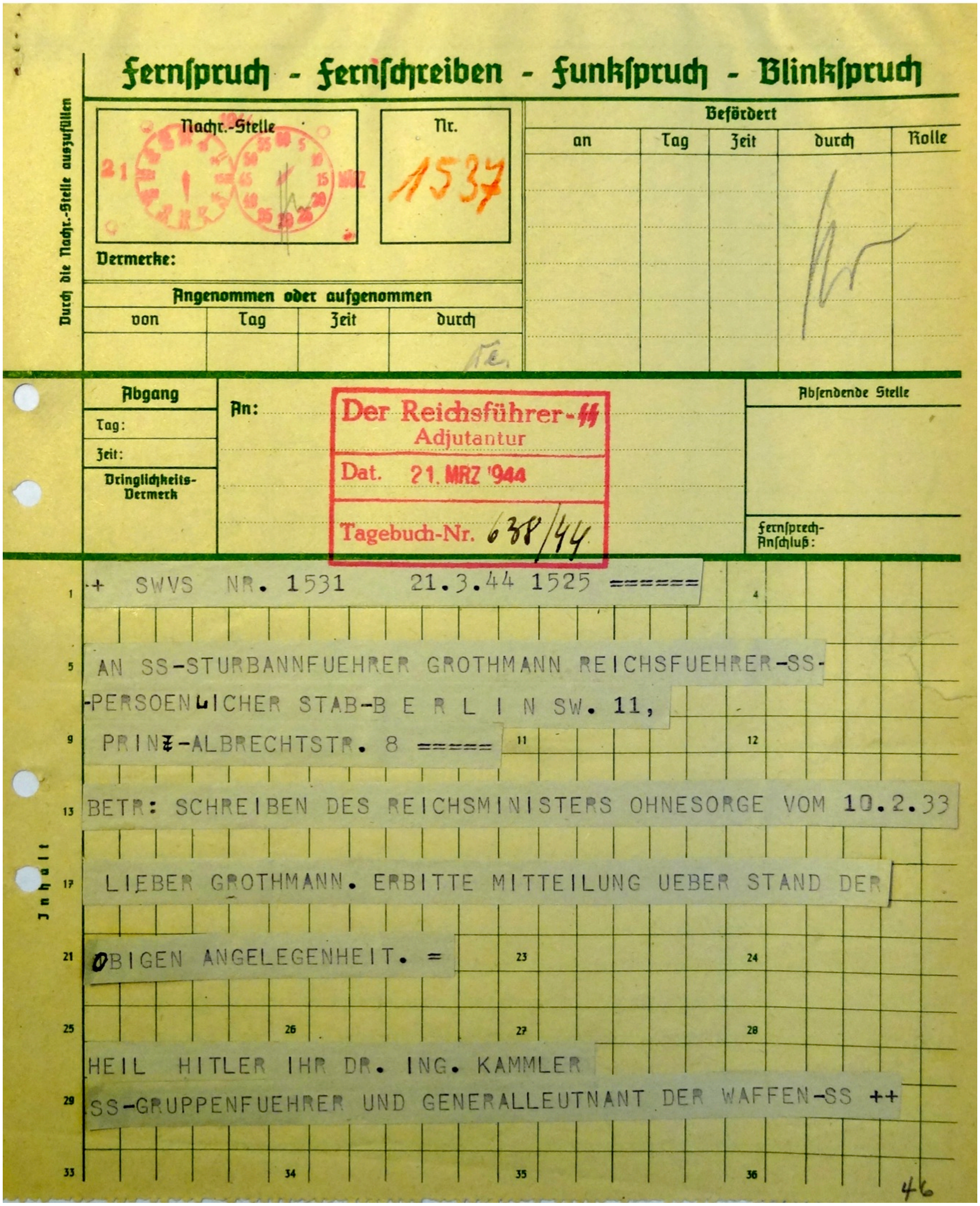
31.3.1944
Gro/Dr.

45

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made

Figure D.62: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].

NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made



Fernspruch - Fernschreiben - Funkspruch - Blinkspruch

Nachr.-Stelle
Nr. 1537
Vermerke:
Befördert: an | Tag | Zeit | durch | Rolle
Angenommen oder aufgenommen: von | Tag | Zeit | durch
Abgang: Tag: Zeit: Dringlichkeits-Vermerk
An:
Der Reichsführer-SS Adjutantur
Dat. 21. MRZ 1944
Tagebuch-Nr. 638/44
Absendende Stelle
Fernsprech-Anschluß:

+ SWVS NR. 1531 21.3.44 1525 ======

AN SS-STURBANNFUEHRER GROTHMANN REICHSFUEHRER-SS-
-PERSOENLICHER STAB-B E R L I N SW. 11,
PRINZ-ALBRECHTSTR. 8 =====

BETR: SCHREIBEN DES REICHSMINISTERS OHNESORGE VOM 10.2.33

LIEBER GROTHMANN. ERBITTE MITTEILUNG UEBER STAND DER
OBIGEN ANGELEGENHEIT. =

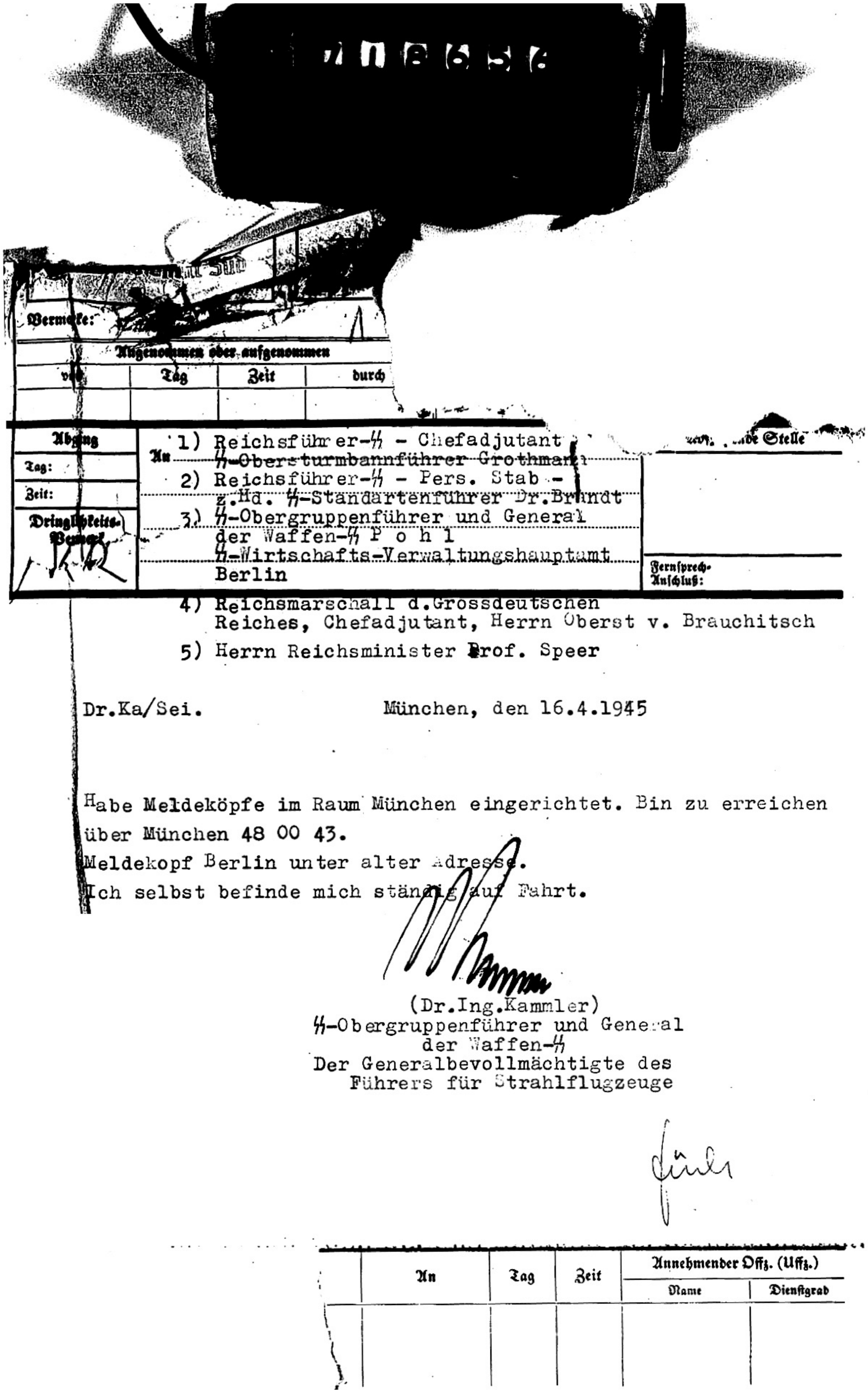
HEIL HITLER IHR DR. ING. KAMMLER
SS-GRUPPENFUEHRER UND GENERALLEUTNANT DER WAFFEN-SS ++

Inhalt

46

Figure D.63: A few surviving documents reveal that Wilhelm Ohnesorge and Heinrich Himmler collaborated on research projects from June 1942 onward [NARA RG 319, Entry NM3-82A, Box 5, Folder Documents from which ALSOS reports were made].

NARA RG 242, Records of the Reich Leader of the Schutzstaffel (SS) and Chief of the German Police, Microfilm 183, NAID 273992206 (https://catalog.archives.gov/id/273992206)



Vermerke:

Aufgenommen oder aufgenommen

von	Tag	Zeit	durch

Abgang

Tag:

Zeit:

Dringlichkeits-Vermerk

An

1) Reichsführer-SS - Chefadjutant SS-Obersturmbannführer Grothmann

2) Reichsführer-SS - Pers. Stab - z.Hd. SS-Standartenführer Dr.Brandt

3) SS-Obergruppenführer und General der Waffen-SS P o h l SS-Wirtschafts-Verwaltungshauptamt Berlin

4) Reichsmarschall d.Grossdeutschen Reiches, Chefadjutant, Herrn Oberst v. Brauchitsch

5) Herrn Reichsminister Prof. Speer

...de Stelle

Fernsprech-Anschluß:

Dr.Ka/Sei. München, den 16.4.1945

Habe Meldeköpfe im Raum München eingerichtet. Bin zu erreichen über München 48 00 43.
Meldekopf Berlin unter alter Adresse.
Ich selbst befinde mich ständig auf Fahrt.

(Dr.Ing.Kammler)
SS-Obergruppenführer und General
der Waffen-SS
Der Generalbevollmächtigte des
Führers für Strahlflugzeuge

An	Tag	Zeit	Annehmender Offz. (Uffz.) Name	Dienstgrad

Figure D.64: Hans Kammler. 16 April 1945 telegram [NARA RG 242, Records of the Reich Leader of the Schutzstaffel (SS) and Chief of the German Police, Microfilm 183, NAID 273992206 (https://catalog.archives.gov/id/273992206)]. Note that Werner Grothmann is first on the list.

[NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24]

[In postwar interrogations, one of Himmler's adjutants stated that Himmler had a panel of top science advisors. Of the eleven advisors named in the document, six were nuclear experts and the other five had expertise that could have been very useful for a nuclear weapons program:

- Erich Schumann (German, 1898–1985) appears first in this list, suggesting that he may have been one of Himmler's most important or most frequent scientific advisors. He ran the nuclear program of the Heereswaffenamt (Army Ordnance Office), was directly involved in designing and testing spherical implosion bombs (pp. 4225–4293), and was closely tied to other programs to develop biological weapons, rockets, etc. [Nagel 2012a].
- Christian Gerthsen (German, 1894–1956) was a top-ranked nuclear physicist (p. 4826) whose wartime activities have never been publicly described.
- Hans Geiger (German, 1882–1945) was one of Germany's earliest nuclear physicists (having invented the Geiger counter in 1908, p. 1529) and had been involved in the wartime German nuclear program at the highest levels since early 1939 (p. 3394).
- Walther Gerlach (German, 1889–1979) was the head scientific administrator of the German nuclear weapons program as well as some other advanced technology programs.
- Rudolf Tomaschek (German, 1895–1966) played an important but currently mysterious role in the wartime German H-bomb development program (p. 4372).
- Fritz Kirchner (German, 1896–1967) was a nuclear physicist who worked with the Heereswaffenamt (Army Ordnance Office) during the war. While the full extent of his wartime activities is unclear from currently available documents, he is known to have worked on particle accelerators, fission reactions, and fusion reactions [G-47, G-101, G-270, G-271, and pp. 3642, 4354, 4566, 3344, 4827].
- Leo von zur Mühlen (German, 1888–1953) was an expert on mining resources in central and eastern Europe, which would have been extremely useful for nuclear and other programs.
- August Schmauß (German, 1877–1954) was an expert on meteorology, which would have been important for planning battles in general, and attacks with weapons of mass destruction in particular.
- Heinrich von Ficker (German/Austrian, 1881–1957) was another authority on meteorology.
- Paul Guthnick (German, 1879–1947) was a noted astronomer; his input might have been useful for planning suborbital ballistic trajectories, teaching intercontinental pilots how to navigate to their targets by the stars, or developing other methods of reaching strategic objectives.
- Otto Heckmann (German, 1901–1983) was another astronomy expert.

See pp. 3408–3412 for photos of this document.]

~~CONFIDENTIAL~~ analysed B.

Ref No SAIC/FIR/15
27 Jul 45

SEVENTH ARMY INTERROGATION CENTER
APO 758

NOTES ON HIMMLER AND HIS STAFF
BY WILHELM FUEHRER, ADJ TO HIMMLER
Final Interrogation Report

SOURCE

FUEHRER, Wilhelm, Dr, SS-HPTSTUF (Capt) of ALLGEMEINE-SS and O/LT (1st Lt) of WAFFEN-SS; one of HIMMLER's adjutants.
Source is an intellectual idealist who had great faith in Nazi principles and teachings. The new political system became a form of religion for him; he could see only good in it and was blind to any wrong that the Party or its members committed. In spite of his close connection with HIMMLER and the SS, he claims to have no knowledge of any crimes committed by this man or his followers. He states that it would be difficult for him to forget or give up his beliefs of the past.

Rating: C-3 Date of Information: See Text Interrogator: F.T.M.

PERSONAL HISTORY

1904 Born in RUESTRINGEN, Oldenburg.

25-30 Studied astronomy, physics, physical education.

30 Joined NSDAP, KIEL.

30-33 Staff of ASTRONOMISCHE NACHRICHTEN (Astronomical News); worked at KIEL observatory.

31-32 BLOCKWALTER (Local Party administrator), ORTSGRUPPE MITTE (Party District Center), KIEL.

33 Joined SS.

33-36 Assistant at Observatory, MUNICH.

34-39 Superintendant of secondary schools, MUNICH, with membership in National Socialist Teacher's and Professor's organization.

35 With 19 Inf Regt, FREISING, for tng.

36-39 REGIERUNGSRAT (Govt counsellor) and REGIERUNGSRAT 1.Kl., Bavarian Ministry of Education and Culture.

36 USTUF (2nd Lt), ALLGEMEINE-SS, SS Hq, MUNICH.

39 With DAS AHNENERBE (instruction and research society), a part of REICHSFUEHRUNG SS (SS High Command). REGIERUNGSRAT (Govt Counsellor), and then OBERREGIERUNGSRAT (Senior Govt Counsellor), REICHS Ministry for Science and Culture.

Jan 42 Promoted to OSTUF (1st Lt), ALLGEMEINE-SS.

Aug 42 STURMMANN (Pvt), WAFFEN-SS; attached as USTUF-FACH (specialist) to field branch of REICHSFUEHRUNG-SS, where he instructed HIMMLER in astronomy.

~~CONFIDENTIAL~~ 1

750 B.

DECLASSIFIED NND 760041 By [signature] NARS, Date 11/7/78

NARA RG 238, Microfilm M1270, Interrogation Records
Prepared for War Crimes Proceedings at Nuernberg, Roll 24

Figure D.65: In postwar interrogations, one of Himmler's adjutants stated that Himmler had a panel of top science advisors, including Walther Gerlach, Erich Schumann, and other nuclear scientists [NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24].

CONFIDENTIAL

Ref No SAIC/FIR/15
27 Jul 45

Jan 44 Promoted to HPTSTUF (Capt), ALLGEMEINE-SS.

May-Jul 44 OSCHAF(S/Sgt)of WAFFEN-SS, 1 SS AA Bn, Central Russia.

22 Apr- 4 May 45 At SALZBURG-AIGEN SS Hq, having left HIMMLER's CP at WUSTRAU, near BERLIN.

15 May 45 Arrested by CIC at wife's apartment, REITGUTWEG 10, SALZBURG-AIGEN.

1. ACTIVITY AS HIMMLER'S ADJUTANT

Source's duties as adj to HIMMLER consisted almost entirely of providing personal services - quarters, entertainment, transportation, etc - for HIMMLER's guests. His execution of these duties was so pleasing to HIMMLER and his guests that source retained the position throughout the war years, except for brief periods of military training.

PW mentioned the following persons as frequent guests of HIMMLER: FUNK, SPEER, NAUMANN, DOENITZ, JODL, WARLIMONT, PUTTKAMMER,BAUMBACH, GUDERIAN, ZEITZLER, and the Gauleiters KOCH, FOSTER, HANKE and GREISER. In his last CP, at ZIETHEN Castle, WUSTRAU (NW of BERLIN), HIMMLER received the following guests:

BODIN	Manufacturer of the PANZERFAUST
POHL, SS-OGRUF (Lt Gen)	Chief of WIRTSCHAFTS- UND VERWALTUNGS-AMT(Economic and Administration Office)
HILDENBRAND, SS-OGRUF (Lt Gen)	SS and Police Chief of Silesia

2. HIMMLER'S DOCUMENTS AND VALUABLES

a. Locations

CP, SALZBURG) CP, WUSTRAU)	All documents at these CP's were burned, source claims.
Alternate CP, FRANKENHAUSEN, Thuringia	Taken by American forces early in Apr. Most important files were here.
WEWELSBURG Castle, near PADERBORN, Westphalia	Many valuables were stored here.
Old salt mines, HALLEIN (S of SALZBURG)	Personal property belonging to HIMMLER was stored here.
HIMMLER's house, LINDENFYCHT,GMUND/TEGERNSEE	BAUMERT (See below) told source no property had been removed from here.

b. Source believes that SS-OGRUF (Lt Gen) WOLF, SS and Police Chief, Italy, has information concerning HIMMLER's documents and property. WOLF was in BOZEN 4 May 45. Source also believes that SS-STAF (Col) BAUMERT (See 4b below) has information on this subject.

3. HIMMLER AND ASTRONOMY

Source claims that HIMMLER was a believer in Glacial Cosmogony. By converting the common man to this belief, he hoped to save him from the "illusions" preached by Christianity. To further his aims, HIMMLER wanted to make it possible for everyone to observe the phe-

NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24

Figure D.66: In postwar interrogations, one of Himmler's adjutants stated that Himmler had a panel of top science advisors, including Walther Gerlach, Erich Schumann, and other nuclear scientists [NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24].

C O N F I D E N T I A L

Ref No SAIC/FIR/15
27 Jul 45

nomena of the universe, especially the stars. He hoped to establish small observatories in SS schools and camps, and also planned to produce telescopes and microscopes in bulk at popular prices.

4. PERSONALITIES

a. HIMMLER's Field Hq

GROTHMANN, SS-OSTUBAF (Lt Col)	Adj to HIMMLER from 1941 to the last; supervised military matters of WAFFEN-SS. Born HAMBURG; 29 years old; blue eyes,1,75 m tall.
BRANDT, Dr Jur, STAF (Col)of ALLGEMEINE SS, OSCHAF(Sgt) of WAFFEN-SS	With HIMMLER for the last ten years. Was HIMMLER's personal secretary; contact man with SS HAUPTAEMTER (main offices). In charge of non-military mail. Born FRANKFURT/ODER; 35 years old; dark hair, brown eyes, 1,70 m tall.
SUCHANEK, Lt Col of Police	With HIMMLER for ten years. Adj for police matters. Went to SALZBURG-AIGEN 20 Apr 45 to meet WUNNENBERG, OGRUF (Lt Gen), Chief of Order Police(ORDNUNGSPOLIZEI). SUCHANEK was born BERLIN; 37 years old; blond, blue eyes; 1,75 m tall.
BENDER, SS-STAF (Col)	Judge; advisor on SS-HAUPTAMT (Central Dept of SS) decisions which were passed on by HIMMLER. Went to SALZBURG-AIGEN 20 Apr; left for BERCHTESGADEN 3 May. Born LYCK, E Prussia; 40 years old; dark hair;1,80 m tall.
WEHSER, SS-STUBAF (Maj) } GIESSELMANN, SS-STUBAF (Maj) }	Temporarily in Field Hq, working under BENDER.
KIERMEIER, STUBAF (Maj)	Chief of REICHSSICHERHEITSDIENST (National Dept of Security). In charge of HIMMLER's personal security. Born MUNICH; 50 years old; blue eyes;1,80 m tall.
SEIBERT, OSTUF (1st Lt) } SCHMIDT, OSTUF (1st Lt) } LORENZ, USTUF (2nd Lt) } MUELLER, OSCHAF(S/Sgt) }	Worked with KIERMEIER
TIEFENBACHER, SS-STUBAF (Maj)	In charge of HIMMLER's quarters. Born MUNICH; 44 years old; dark hair, brown eyes; 1,76 m tall.

C O N F I D E N T I A L 3

NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24

Figure D.67: In postwar interrogations, one of Himmler's adjutants stated that Himmler had a panel of top science advisors, including Walther Gerlach, Erich Schumann, and other nuclear scientists [NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24].

CONFIDENTIAL

Ref No SAIC/FIR/15
27 Jul 45

SCHMALOER, SS-STUBAF (Maj)	Chief of radio, telephone, teletype sec of field Hq. Born Westphalia; 30 years old; dark blond, blue eyes; 1,80 m tall.
MUELLER, Dr	HIMMLER's physician. Born vic MUNICH; 35 years old; blond, blue eyes; 1,78 m tall.
KERSTEN, Dr (Cf Report Ref No SAIC/15, 22 May 45)	HIMMLER's physician in special instances. Citizen of Germany, Finland and Holland.

b. HIMMLER'S BERLIN Hq

BAUMERT, SS-STAF (Col) (See above, 2b)	In SALZBURG-AIGEN at end Apr; then flew to BERLIN. Born Silesia; 42 years old; blond, blue eyes, 1,70 m tall.
REICHENBERGER, SS-OSTUF (1st Lt)	Adj to HIMMLER. In Swabia at end April. Thirty years old; dark hair, brown eyes; 1,70 m tall.
GUTGESELL, SS-HPTSTUF (Capt)	Adm officer. Probably in Swabia at end April. Fifty years old; dark hair, blue eyes; 1,75 m tall.
BREITFELDT, SS-STUBAF (Maj)	Pers officer. Rumored killed or captured in FRANKENHAUSEN, Thuringia. Blond, blue eyes; 1,90 m tall.
SCHNITZLER, SS-HPTSTUF (Capt)	Adm officer. Probably in Swabia at end April. Forty years old; dark hair, brown eyes; 1,75 m tall
BETHGE, Mrs	HIMMLER's stenographer, 1941-43 Husband was manager Hotel RUSSISCHER HOF.
MAENNER, Miss	HIMMLER's stenographer, 1943 on. Seen at WUSTRAU Hq 20 Apr. From MUNICH.

c. Scientific Personalities

SCHUMANN, Prof	Director, First Physics Institute, University of BERLIN, and of HEERESWAFFENAMT (Army Ord Dept).
GERTHSEN, Prof	Director, Second Physics Institute University of BERLIN; atom research.
GEIGER, Prof	Director, Physics Institute, TECHNISCHE HOCHSCHULE (Technical College), BERLIN; atom research.
GERLACH, Prof	Physics Institute, University of MUNICH.

CONFIDENTIAL 4

NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24

Figure D.68: In postwar interrogations, one of Himmler's adjutants stated that Himmler had a panel of top science advisors, including Walther Gerlach, Erich Schumann, and other nuclear scientists [NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24].

CONFIDENTIAL

Ref No SAIC/FIR/15
27 Jul 45

TOMASCHEK, Prof	Physics Institute, TECHNISCHE HOCHSCHULE, MUNICH.
VON UND ZUR MUEHLEN, Prof	Geological Institute, TECHNISCHE HOCHSCHULE, MUNICH. Expert on Geology of Russia.
SCHMAUSS, Prof	Meteorological Institute, MUNICH.
VON FICKER, Prof	Meteorological Institute, VIENNA.
GUTHNICK, Prof	Observatory, BERLIN-BABELSBERG.
HECKMANN, Prof	Director, Observatory, HAMBURG-BERGEDORF.
KIRCHNER, Prof	Director, Physics Institute, University of COLOGNE. Expert on atom physics.

5. HIMMLER'S CP LOCATIONS

At end Nov 44, when HIMMLER took command of Army Group OBER-RHEIN, his CP was transferred from East Prussia to the SCHWARZWALD (Black Forest). When he became commander of Army Group WEICHSEL, his CP was again transferred to the east. At end Mar 44, Gen HEINRICI took over Army Group WEICHSEL, and HIMMLER's CP was moved to its last location, ZIETHEN Castle, WUSTRAU.

6. HIMMLER AND OSHIMA

It was rumored at HIMMLER's Hq that OSHIMA, the Japanese Ambassador to Germany, was trying to bring about a peace settlement between Germany and Russia. Source believes that the primary purpose of OSHIMA's visit to HIMMLER in Aug 44 was to win him over to this plan. It was considered improbable that HIMMLER would agree to this, since he was fanatically opposed to Russia. He was said, however, to have sent peace overtures to the Western Allies via Sweden. His intermediary in Sweden supposedly was Dr KERSTEN. (See 4a, above)

7. Concentration Camp FUENFTEICHEN

In Nov 44 source visited the camp, which was in Lower Silesia and was commanded by SS-STUBAF (Maj) STOPPEL. Source describes the camp as "clean, with hygienic barracks, wash and bathing rooms". Medical care was provided by six Hungarian doctors. There were 6000 inmates, who worked in a nearby KRUPP factory which produced 50 percent of the total output of an unspecified type of gun.

27 Jul 45

SEVENTH ARMY INTERROGATION CENTER
Paul Kubala
PAUL KUBALA,
Maj, MI,
Commanding.

Distribution "C".
plus American Embassy, Paris, 1 copy
OSS Paris, 2 copies
L'Etat Major Defense Nationale, 1 copy

CONFIDENTIAL 5

NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24

Figure D.69: In postwar interrogations, one of Himmler's adjutants stated that Himmler had a panel of top science advisors, including Walther Gerlach, Erich Schumann, and other nuclear scientists [NARA RG 238, Microfilm M1270, Interrogation Records Prepared for War Crimes Proceedings at Nuernberg, Roll 24].

Figure D.70: Werner Grothmann with Heinrich Himmler (1943).

Heinrich Himmler's adjutant Werner Grothmann, transcript of interview by Wolf Krotzky [Krotzky 2002]

[Werner Grothmann (German, 1915–2002) was the chief adjutant or executive assistant of Heinrich Himmler (see pp. 3410, 3413). At the end of his life, during 2000–2002, Grothmann agreed to a series of interviews with Wolf Krotzky, one of his neighbors. Krotzky recorded the interviews on tapes and transcribed Grothmann's words in an unpublished document that is available in the archives of the Jonastalverein in Arnstadt. In the transcripts, Grothmann provided very important details about secret wartime German programs to develop nuclear weapons and improved rockets. Unfortunately, Krotzky said that he did not save the tapes,[5] and Grothmann is now dead and unable to confirm the information in the transcripts.

Without the recorded tapes or Grothmann himself, one cannot rule out the possibilities that Krotzky may have improperly prompted the elderly Grothmann to say certain things that he did not really mean, that Krotzky may have altered the transcripts after the fact, or that Krotzky may have even made up all the transcripts. Furthermore, even if Krotzky and the transcripts were trustworthy, there is no guarantee that Grothmann was trustworthy—his memories may have been incorrect after so long, or he may have had a personal motivation to make false claims about the past.

However, since so few sources are currently available regarding the most secretive details of the wartime German nuclear and advanced rocket programs, and the details provided by Grothmann would be extremely useful if they are real, it is important not to reject this source without careful consideration. In fact, there are many different lines of evidence that suggest that this source is indeed real and accurate (or as accurate as one could expect for a person's recollections so long after the events):

- Historians have been able to independently confirm a large number of details about people, places, dates, and events mentioned in the interviews that are so obscure they would probably not have been independently known by Krotzky [see for example: Karlsch and Petermann 2007, p. 29; Karlsch 2006; Nagel 2011, p. 64].

- Grothmann provided details of the March 1945 test explosion in Thuringia that are in excellent agreement with Ilyichev's March 1945 report to Stalin (see p. 4529), which was discovered in a Moscow archive only after Grothmann had already died.

- Grothmann's statements agree with many other sources about the secret wartime programs that have only emerged in recent years.

- Although Grothmann was not a scientist or engineer and recounted events and discussions from long ago, the scientific details that he mentioned are very consistent with known physics and engineering principles.

[5] Perhaps because they were reused to record each interview, and then later unrelated interviews? Or might Krotzky have been pressured by government officials who wanted to keep state secrets?

- In the transcript, Grothmann repeatedly said that he did not know many of the details of the programs, either because he did not have a need to know such classified details in his daily secretarial duties for Himmler, or else because he had forgotten some details over time. If Grothmann or Krotzky had been making up a story, one would have expected the narrator to claim a comprehensive and accurate knowledge of the secret programs, so it is reassuring that Grothmann did not.

- Grothmann frequently described various weapon systems as being unready, imperfect, or unproven by the end of the war. If he were making up a story, one would have expected him to make grander and more dramatic claims for wartime German accomplishments, so again, it is reassuring that he did not.

- In the transcript, Grothmann repeatedly mentioned bureaucratic obstacles, bad decisions, and political disagreements, from Hitler on down through the government. This demonstrates that Grothmann was not trying to make up a story to paint Hitler and the rest of the Third Reich in a positive light.

The complete Grothmann interview transcript is very long and unstructured (see for example pp. 3416–3417). I have translated some of the most relevant excerpts from the transcript, grouped them by topic, and placed them in the appropriate sections of this book. Those topics and page numbers are:

Research on nuclear propulsion for submarines (p. 1484).

Development of transistors and other microelectronics (p. 3029).

Secrecy of the German nuclear program (p. 3418).

Organization of the German nuclear program (pp. 3419–3421).

Enrichment of ^{235}U (pp. 3742–3743).

Fission reactor breeding of ^{239}Pu or ^{233}U (pp. 3899–3900).

Electronuclear (particle accelerator) breeding of ^{239}Pu or ^{233}U (pp. 4058–4059).

Nuclear weapon designs (pp. 4309–4311).

Nuclear weapon tests (pp. 4480–4483).

Reasons why German nuclear weapons were not used in combat (pp. 4714–4715).

Transfer of German nuclear technologies (pp. 5086–5089).

Development of rockets larger than the A-4/V-2 (pp. 5423–5427).

Research on nuclear propulsion for aircraft and rockets (p. 5869).]

wenn die Amerikaner die Waffe vor uns fertigstellen könnten und deshalb mit aller Macht auch daran gearbeitet und er war ja wirklich gut. Außerdem hatte er auch ein Händchen für die richtigen Leute, aber er hatte nicht die Möglichkeiten, über die Ohnesorge und Himmler jederzeit verfügten. Deshalb ging es bei ihm auch erst richtig los, als er sich von Ohnesorge und Himmler als gleichwertig geachtet sah, ganz im Gegensatz zu Heisenberg übrigens, der ihn wo immer es möglich war, heruntermachte. Die Österreicher lasse ich hier mal aus, das ist ein ganz eigenes Kapitel.
Übrigens hatte sich Otto Hahn mehrfach bei Diebner in Kummersdorf sehen lassen und Diebners Versuchsanlage begutachtet, nachdem es vielleicht eine unvorhergesehene Reaktion dort gab und der Atomreaktor durchging. Als Diebner Hahn gegenüber erwähnte, dass ein Teil der dabei entstandenen Stoffe wahrscheinlich gut als Sprengmaterial für die Bombe verwendbar wäre, ist Hahn nie wieder vorbeigekommen. Das hat Diebner meinem Chef selbst erzählt.

Der Postminister hat jedenfalls noch früher als mein Chef die Konsequenzen aus seiner Analyse gezogen, das war ihm auch leichter möglich, weil er ja ausgebildeter Physiker war und schon früh einen Stab ausgezeichneter Fachleute um sich versammelt hatte, die das machen sollten. Dann besaß die Reichspost eine eigene Forschungsanstalt, in deren Rahmen sich das Atomprojekt gut tarnen ließ. Außerdem war Ohnesorges Forschungsetat sehr hoch, da konnte ihm übrigens Speer trotz aller möglichen Intrigen auch nicht dazwischenfunken und schließlich wollte Ohnesorge unbedingt die Atomwaffe, weil er ein weitsichtiger Mann war und sich vorstellen konnte, dass die Amerikaner die bauen würden, ohne lange zu fackeln wenn es nur möglich wäre, wie ich ja vorhin schon gesagt habe. Dabei hat sich dann ja durch verschiedene Aktionen gezeigt, dass die Amerikaner tatsächlich mit einem Riesenaufwand in die Atombombenforschung eingestiegen waren.
Auch nach dem Befehl ist bei uns der Einsatz nicht gleich gewaltig erhöht worden. Das ging schon deshalb nicht, weil wir ja, ich meine Ohnesorge, Diebner und unsere Gruppen, besser Grüppchen, alles abgegrast hatten, was auf dem Markt war und was mit uns zusammenarbeiten wollte. Was jetzt einfach wurde, war die Abstimmung bezüglich der verschiedenen Systeme. Wie die im einzelnen funktionieren sollten, kann ich nicht sagen, es gab aber drei unterschiedliche Stoßrichtungen: Erstens die Uranbombe, das war Ohnesorges Leib- und Magen-Thema und an dem hat auch Diebner gearbeitet. Zweitens die Plutonium-Waffe, zu der hat Ohnesorge Grundlagen erarbeiten lassen und dazu ist auch in Österreich geforscht worden, neben anderen Richtungen. Man hat übrigens auch die Verwendung weiterer Materialien neben dem Plutonium erforscht. Drittens die Wasserstoffbombe. Zu der hat man auch gearbeitet, das war nach meiner Kenntnis eher ein akademisches Projekt und Himmler hat mal in kleinstem Kreis erwähnt, dass der erste Prototyp davon frühestens zwischen Juni und Oktober1946 kommen könnte. Immerhin ist aber schon die Wasserstoffproduktion hochgefahren worden – nicht wegen dieser Bombe. Die Technologie zur Wasserstoffherstellung war aber gut beherrschbar und wie ich hörte, hätte man damit auch gut einen wichtigen Grundstoff für diese Bombenart gehabt. Im Januar 1945 hat Hitler von meinem Chef Kurzberichte zum Stand dieser Projekte erhalten. Die Durchschläge davon zusammen mit wichtigen anderen Papieren sind von zwei Kameraden vor Kriegsende im Harz in Kisten sicher verwahrt. Die liegen noch dort. Es ist schade, wir können jetzt nicht ran, ohne Aufsehen zu erregen. Der Inhalt würde einigen Leuten heute doch Kopfzerbrechen bereiten.

Also, es ist so: Mir ist bekannt, dass es vier Atomversuche gab. Der erste noch 1943 im Herbst in der Nordsee, der ist gescheitert. Dann zwei 1944 im Herbst und im Spätherbst. Einer davon am Boden, also auf einem niedrigen Gestell, der spätere in der Atmosphäre am Fallschirm. Der im Winter 1944 in der Luft war brisant und die Ladung war auch größer. Das könnte im November gewesen sein. Der letzte Versuch war dann wieder mit kleiner Ladung

Figure D.71: A page from the interview of Werner Grothmann [Krotzky 2002, p. 31, Jonastalverein Archive, Arnstadt].

im März 1945. Wo die Versuche waren, möchte ich jetzt noch nicht sagen, weil sich sonst die Bevölkerung unnötig aufregen würde. Sie wissen ja, das Atom-Thema hat heute bei uns eine ganz besondere Bedeutung. Uns haben die Wissenschaftler damals erklärt, dass die Gefahr wegen der Strahlung schnell vorbei sein würde. Ich glaube aber, wenn man an der richtigen Stelle sucht, würden die Atomphysiker heute noch den Beweis dafür finden, dass alles so stimmt, wie ich sage. Es gab dann auch noch ein Unglück ohne schlimme Folgen in Gottow bei Diebner. Dem ist sein Reaktor vielleicht durchgegangen, wie ich ja sagte. Das war möglicherweise die erste wirkliche Kettenreaktion auf der Welt, die sich selbst erhalten hat. Leider ließ sie sich nicht stoppen.. Kurz vor Kriegsende ist es dann noch zu einem schweren Unfall gekommen, als auf einem unserer Munitionstransporte ein LKW mit Mörsergranaten in die Luft flog. Das war im Salzburger Land. Trotz Verbot hatte dieser LKW eine geringe Menge strahlendes Material geladen, das aus unserer Anlage im Erzgebirge kam und das durch die Detonationswucht verbreitet wurde. Heute werden Sie das nicht mehr nachweisen können. Leider sind aber durch die konventionelle Explosion einige unserer Leute ums Leben gekommen.. Das war sozusagen „loses Material", das noch nicht mal in einem Bombenkörper steckte. Ich kann aber mit Bestimmtheit erklären, dass mir von sechs Atombomben berichtet wurde, die aus drei verschiedenen Forschungsanlagen stammten. Alle waren Prototypen. Darüber hinaus gab es einige Kleinstkörper, die für die Laborversuche vorgesehen waren. Für den Versuch im Winter 1944 ist allerdings eine größere Ladung verwendet worden, wie ich ja schon sagte. Die erste Schwierigkeit bestand in der Herstellung des Materials, also des Sprengstoffes. Das hat sich bis wenige Monate vor Kriegsende auch nicht drastisch verbessern lassen. Erst für 1946 rechneten wir eigentlich mit der Serienproduktion von Atombomben. Die zweite Schwierigkeit bestand darin, dass die Zünder für die Waffe nicht so funktionierten, wie man sich das ursprünglich dachte. Die haben mit allem möglichen experimentiert. Es war, glaube ich, erst im Herbst 1944, dass jemand bei Diebner eine praktikable Lösung fand, die aber immer noch sehr aufwendig war. Und ungefähr zur selben Zeit hat dann bei uns jemand in Zusammenarbeit mit ..., glaube ich, und noch ein Unternehmen war beteiligt, oder dort ein Experte, mit Infrarot-Zündern einigen Erfolg. Wir nannten die Dinger damals Ultrarot-Zünder. Zünder

Ich habe erst später begriffen, dass die ganze Atom-Sache, obwohl es doch ein Wort ist, ganz unterschiedliche physikalische Abläufe mit sich bringt. Das heißt, wer an der Uranbombe arbeitet, hat damit nicht die Lösung für die Plutoniumbombe. Und die Wasserstoffbombe bringt wieder ganz andere Probleme. Trotzdem war es so, dass Himmler, Ohnesorge und Diebner intensive Zusammenarbeit verabredet hatten. Dazu ist auch extra eine Verbindungsstelle eingerichtet worden., Der Chef hat es so geregelt, dass die außerhalb unseres Waffenamtes arbeitete und auch was Spengler machte, war davon nur ganz am Rande beteiligt und auch nur soweit es den Reaktor betraf. Über die Bombe sollten sie nichts erfahren, sie haben das aber doch gehört, wenn auch nur ganz begrenzt, soweit mir bekannt ist. Das heißt, wir haben die Arbeit an den Bombenprojekten durch besondere und sehr unterschiedliche Maßnahmen innerhalb unserer eigenen Organisation nach außen abgeschottet. Es ließ sich nach dem Befehl allerdings nicht vermeiden dass Speer offiziell und umfangreich informiert werden musste, und Hitler selbst hat ja danach auch gegenüber ausgewählten Leuten Klartext geredet. Wer uns unheimlich war, das war Bormann. Wir stellten sofort fest, dass der sich immer alle diesbezüglichen Berichte oder Kurzfassungen zu neuen Entwicklungen vorlegen ließ; und leider gehörte auch er zu denen, die mit diesem Staatsgeheimnis nicht souverän umgehen konnten. Er hat überall hinter vorgehaltener Hand herumposaunt, dass es jetzt bald losgeht und der „Endsieg" vor der Türe steht. Es war nur gut, dass seine Umgebung ihn richtig einschätzte. Goebbels, der Erfinder der Endsiegpropaganda, war ja geradezu heilfroh, als er erfuhr, dass bestimmte Projekte sich so entwickelten, dass wir intern bereits eine Linie von der V 2 bis zur V 9 ziehen konnten. Projekte also, die schon in der Vorstufe der Verwirklichung standen oder die doch schon ganz deutliche Fortschritte

Figure D.72: A page from the interview of Werner Grothmann [Krotzky 2002, p. 32, Jonastalverein Archive, Arnstadt].

Werner Grothmann on the secrecy of the nuclear program [Krotzky 2002]

[S. 1] Bloß war es so, dass die einzelnen Bearbeiter eines Projekts nicht über Dinge informiert wurden, die sie nichts angingen. Ich habe lange nach dem Krieg mal gelesen, wie die Amerikaner ihre Forschung und Entwicklung organisiert hatten. Ich glaube, das war besser und wirkungsvoller als bei uns. Vielleicht hatten die ja nicht solche Sorge vor Verrat, obwohl es den bei ihnen auch gab. Aber wenn man bedenkt, wie es bei uns geregelt war und dann sieht, wie viel trotzdem verraten wurde, glaube ich, dass durch die besondere Abschottung bei speziellen Projekten doch manches verzögert wurde. Bei der Atomforschung hatten wir ja extra eine Koordinierungsstelle eingerichtet. Das soll sich bewährt haben, wie ich hörte.

[p. 1] It was just that the individual workers on a project were not informed about things that did not concern them. Long after the war, I read about how the Americans had organized their research and development. I think [their organization] was better and more effective than ours. Perhaps they did not have such concern about treason, although there was also some with them. But when you consider, how it was protected by us and then see how much was nevertheless betrayed, I believe that by the special security in special projects some things were delayed. In nuclear research, we had set up a special coordination center. That would have proved itself, as I have heard.

[S. 6] Wenn man sich überlegt, warum die Wissenschaftler und Techniker geschwiegen haben, muß man sehen, dass ja längst nicht alle, die an der Atombombe gearbeitet haben, auch erfahren mussten, wie weit die Entwicklung überhaupt kam. Ich kenne die Zahl nicht, es sind aber bestimmt nicht sehr viele gewesen, die das gesamte Geheimnis kannten.

[p. 6] If you consider why the scientists and technicians were silent, you have to see that not all those who worked on the atomic bomb needed at all to know how far the development came. I do not know the number, but there were certainly not very many who knew the whole secret.

[Grothmann stated that the nuclear program was highly compartmentalized, with every person who was involved only knowing as much information as they absolutely needed in order to do their job. The wartime German chemical weapons program operated in this same fashion [Tucker 2006]. Grothmann repeatedly mentioned how little even he knew about the program. This extreme secrecy would help explain why so little information about the nuclear program leaked out during the war or in the years since.]

Werner Grothmann on the organization of the nuclear program [Krotzky 2002]

[S. 29] Außerdem hatten wir ja bereits Ende 1943 wenn zunächst auch ganz bescheiden, mit unserem eigenen Atomprojekt begonnen, während doch Diebner, Ohnesorge und die Österreicher viel früher gestartet waren.

[p. 29] Besides, at the end of 1943, we were very modest at first; we [SS scientists] had begun with our own atom project, while Diebner, Ohnesorge, and the Austrians had started much earlier.

[S. 31] Auch nach dem Befehl ist bei uns der Einsatz nicht gleich gewaltig erhöht worden. Das ging schon deshalb nicht, weil wir ja, ich meine Ohnesorge, Diebner und unsere Gruppen, besser Grüppchen, alles abgegrast hatten, was auf dem Markt war und was mit uns zusammenarbeiten wollte. Was jetzt einfach wurde, war die Abstimmung bezüglich der verschiedenen Systeme. Wie die im einzelnen funktionieren sollten, kann ich nicht sagen, es gab aber drei unterschiedliche Stoßrichtungen:

[p. 31] Even after the [Hitler] order, the program was not increased accordingly. This was not possible, because we, I mean Ohnesorge, Diebner and our [SS] groups, or rather little groups, had already worked out what resources were available and who would work with us. What now became easy was the coordination of the different systems. How the details were supposed to work, I cannot say, but there were three different directions:

Erstens die Uranbombe, das war Ohnesorges Leib- und Magen-Thema und an dem hat auch Diebner gearbeitet.

First the uranium bomb, which was Ohnesorge's main passion and on which Diebner also worked.

Zweitens die Plutonium-Waffe, zu der hat Ohnesorge Grundlagen erarbeiten lassen und dazu ist auch in Österreich geforscht worden, neben anderen Richtungen. Man hat übrigens auch die Verwendung weiterer Materialien neben dem Plutonium erforscht.

Second the plutonium weapon, on which Ohnesorge had worked on the fundamentals, and which was also researched in Austria, along with other directions. Incidentally, the use of other materials besides plutonium was also investigated.

Drittens die Wasserstoffbombe. Zu der hat man auch gearbeitet, das war nach meiner Kenntnis eher ein akademisches Projekt und Himmler hat mal in kleinstem Kreis erwähnt, dass der erste Prototyp davon frühestens zwischen Juni und Oktober 1946 kommen könnte.

Third the hydrogen bomb. That was also worked on; to my knowledge, it was rather an academic project, and Himmler once mentioned in a small circle that the first prototype of this could come at the earliest between June and October 1946.

[Grothmann's comment that "the use of other materials besides plutonium was also investigated" for fission bombs likely refers to converting thorium-232, which was readily available from monazite ore, into uranium-233, another excellent fission fuel (pp. 3866–3873).]

[S. 7] Zu unserem Verbindungsbüro muß ich noch was sagen. Das sollte auch sicherstellen, daß bloß keine Doppelarbeit mehr gemacht würde. Das ist aber trotzdem so geblieben, weil ja die Reichspost ihre eigene Forschung weiterbetrieben hat, eigentlich bis zum Schluß. In den letzten Kriegsjahren, kann im Herbst 43 gewesen sein, ist aber zwischen Ohnesorge und Himmler eine enge Abstimmung beschlossen worden. Die Einzelheiten kenne ich bis heute nicht, Kammler war aber eingeweiht. Wenn also die Reichspost und natürlich die Diebner-Gruppen einbezogen sind, heißt das nicht, daß es viele Leute sein mußten. Für die spätere Serienproduktion sah es anders aus, aber dann hätten wir ja gegenüber den anderen Gruppen einen Vorsprung besessen und wir hätten auch Mittel gefunden, um den Geheimnisverrat zu begrenzen.

[p. 7] I have something to say about our liaison office. That should also make it clear that there would be no more duplication of effort. That remained the case, however, because the Reichspost continued its own research, right to the end. During the last years of the war, that may have been in autumn 1943, a close agreement was reached between Ohnesorge and Himmler. I still do not know the details, but Kammler was privy. So if the Reichspost and of course the Diebner groups are included, that does not mean that there had to be many people. It looked different for the later serial production, but then we would have had a lead over the other groups and we would also have found means to limit the betrayal of secrets.

[Grothmann described an extensive nuclear program that was spread over several autonomous organizations, which coordinated with each other and also with a central office run by the SS:

- Beginning no later than 1942, the SS provided coordination of all nuclear (and other research) activities through Heinrich Himmler and Hans Kammler, secretive funding for other organizations involved in the work, in-house R&D and production facilities, underground facilities, and massive amounts of slave labor.

- The Heereswaffenamt or Army Ordnance Office, with its own Army funding, had a scientific team led by Kurt Diebner and (except possibly during the final stages of the war) by Erich Schumann. It worked on implosion bomb designs and testing, fission chain reactions, gas centrifuges for uranium enrichment, and other aspects of the program. During 1939–1942, the Heereswaffenamt appears to have helped to coordinate the program with other organizations. After the overall coordination was assumed by the SS, Kurt Diebner seems to have continued to help manage the scientific details of the overall program.

- The Reichspost or Post Office, led by the physicist Wilhelm Ohnesorge, used its considerable direct income from postal payments to secretly fund its own nuclear laboratories and scientists, including Manfred von Ardenne, Fritz Houtermans, and Siegfried Flügge. The Reichspost began work no later than 1939 (p. 3393), and focused largely on enriching uranium for an implosion bomb, although it was also involved with other aspects of the overall program. No later than 1942, the Reichspost program became closely coupled to and partially funded by the SS, due to a close working relationship between Ohnesorge and Himmler (pp. 3396–3397).

- Austrians played a major role in the overall nuclear program, although Grothmann did not name or described them in detail. The most prominent Austrian nuclear physicists were the group led by Georg Stetter in Vienna. They began working on nuclear physics no later than 1928, and began seriously pursuing both fission and fusion devices no later than 1939 (pp. 3390–3393, 4368–4383, 4834–4846, 5038). There were a number of known or suspected nuclear-related sites in Austria (p. 3707). According to Grothmann, the Austrian scientists played critical roles in the development of both plutonium weapons and the hydrogen bomb.

- Czechs also played an important role in the overall nuclear program, yet Grothmann provided even less detail about that. There were many known or suspected nuclear-related sites in Czech territory (p. 3708).

- Grothmann mentioned a late-1944 nuclear bomb test that was conducted in Poland, indicating that there was also important nuclear work in Poland, but he did not give any details about work there. There were many known or suspected nuclear-related sites in Polish territory (p. 3708).

- Grothmann mentioned that only a few companies could provide what the nuclear program needed. Although he did not name the companies, they would likely include the major companies for uranium (especially Union Minière, Auer/Degussa, Buchler Braunschweig, and Treibacher Chemische Werke), the major chemical company (I. G. Farben, for chemical compounds involved in uranium enrichment or plutonium extraction), and the major companies for large electrical machinery (especially Siemens and AEG).

- Grothmann stated that Werner Heisenberg and Otto Hahn were not supportive of the nuclear weapons program and therefore were not involved in it. Their experiments were funded separately and at a relatively low level. The U.S. Alsos Mission and most books on the history of the German nuclear program have focused on that sideline and ignored the main program described by Grothmann and numerous documents in this appendix.

- It is possible that other important organizations were involved in aspects of the overall nuclear program yet not named by Grothmann; perhaps he either did not know much about their roles or else focused on other areas in his interviews. Among the most prominent organizations not named by Grothmann are the Kriegsmarine or Navy, the Luftwaffe or Air Force, and a group of scientists led by Paul Harteck in the Hamburg/Kiel area. More information is needed to clarify whether or how these organizations played roles in the overall nuclear program.

Grothmann's statements about the secrecy, organization, and achievements of the wartime German nuclear program are supported by many other documents presented in this appendix. As just one example, the next pages show several surviving documents that demonstrate that Wilhelm Ohnesorge and Heinrich Himmler began collaborating on various research projects no later than June 1942 and continued to do so thereafter, involving both Werner Grothmann and Hans Kammler in their communications about the projects, exactly as claimed in the transcripts of Grothmann's 2000–2002 interviews with Wolf Krotzky.

Of course, communications specifically regarding any nuclear weapons project would have been destroyed or never committed to writing in the first place, but these handful of surviving documents do demonstrate the general research collaboration between the Reichspost and the SS, as well as several of the key people who were involved.

I am not aware of any documents that contradict or disprove Grothmann's statements.

Thus while Krotzky's method of preserving Grothmann's testimony was unorthodox, relevant statements from Grothmann will be presented periodically throughout this appendix so that their details may be compared with those from other sources.]

D.3 Sources of Uranium and Thorium

[During the war, Germany had access to large amounts of natural uranium and thorium ore by (see map on p. 3423):

- Acquiring at least 1200 tons, and according to some well-informed sources 3500 tons, of uranium compounds (originally mined in the Belgian Congo) from Union Minière in Brussels [e.g., pp. 3353, 3426–3432].
- Expanding uranium mining at St. Joachimsthal (Jachymov), Bohemia [e.g., pp. 3436–3447, 3463, 3487–3488, 5024–5030; Hayes 2004, pp. 132–133, 235, 243].
- Mining uranium at Příbram/Przibram/Pibrans, Bohemia [e.g, pp. 3442, 3488, 3785–3788].
- Mining uranium at Schmiedeberg, Silesia [e.g., pp. 3346, 3442, 3447, 3463, 3489].
- Possibly using any of several uranium deposits in Thuringia [e.g., pp. 3486–3487; Zeman and Karlsch 2008].
- Mining uranium at Schneeberg, Saxony [e.g., pp. 3434, 3442, 3444–3446, 3451–3455, 3463, 3474, 3486–3487, 3742, 4968; Zeman and Karlsch 2008].
- Mining uranium at Johanngeorgenstadt, Saxony [e.g., pp. 3434, 3442, 3444–3446, 3451–3455, 3474, 3486–3487, 3742, 4968; Zeman and Karlsch 2008].
- Mining uranium at Freiberg, Saxony [e.g., pp. 3442, 3444–3447, 3463, 3486–3487].
- Mining uranium at Durrnaul near Marienbad [e.g., p. 3442].
- Mining or planning to mine uranium at Mladkov/Wichstadt, Bohemia [e.g., p. 3443].
- Operating and receiving shipments from Bulgarian uranium mines such as a mine at Buchovo (or Buhovo, a suburb of Sofia), since 1938 [e.g., Hayes 2004, p. 235; https://ejatlas.org/conflict/life-after-the-uranium-mines-in-buhovo-bulgaria]. See also pp. 3464, 3488, 4634.
- Mining uranium at Băiţa-Plai and other sites in Romania [e.g., pp. 3467–3473, 3489].
- Acquiring uranium from mines at Viseu and Guarda, Portugal [e.g., p. 3463; Hayes 2004, p. 235].
- Procuring all available monazite thorium ore in occupied Europe [e.g., Irving 1967].
- Exploiting other possible sources—Spain, Scandinavia, etc.?

One 1946 U.S. intelligence report on Czech uranium mines noted, “The Germans put mining on a high priority and only mining was done throughout the 6 years occupation. The ore was delivered by special planes to Germany and Austria” (p. 4032). Another 1946 U.S. intelligence report added: “The Germans continued operations in this mine to the very last moment” (p. 5027).

Thus Germany began actively mining uranium in 1938 and continued until the end of the war. During that time, Germany had access to (1) the same quality and a comparable quantity of Congolese uranium that served the Manhattan Project well, (2) Central/Eastern European uranium mines that later served the Soviet nuclear program well, and (3) additional uranium mines too.

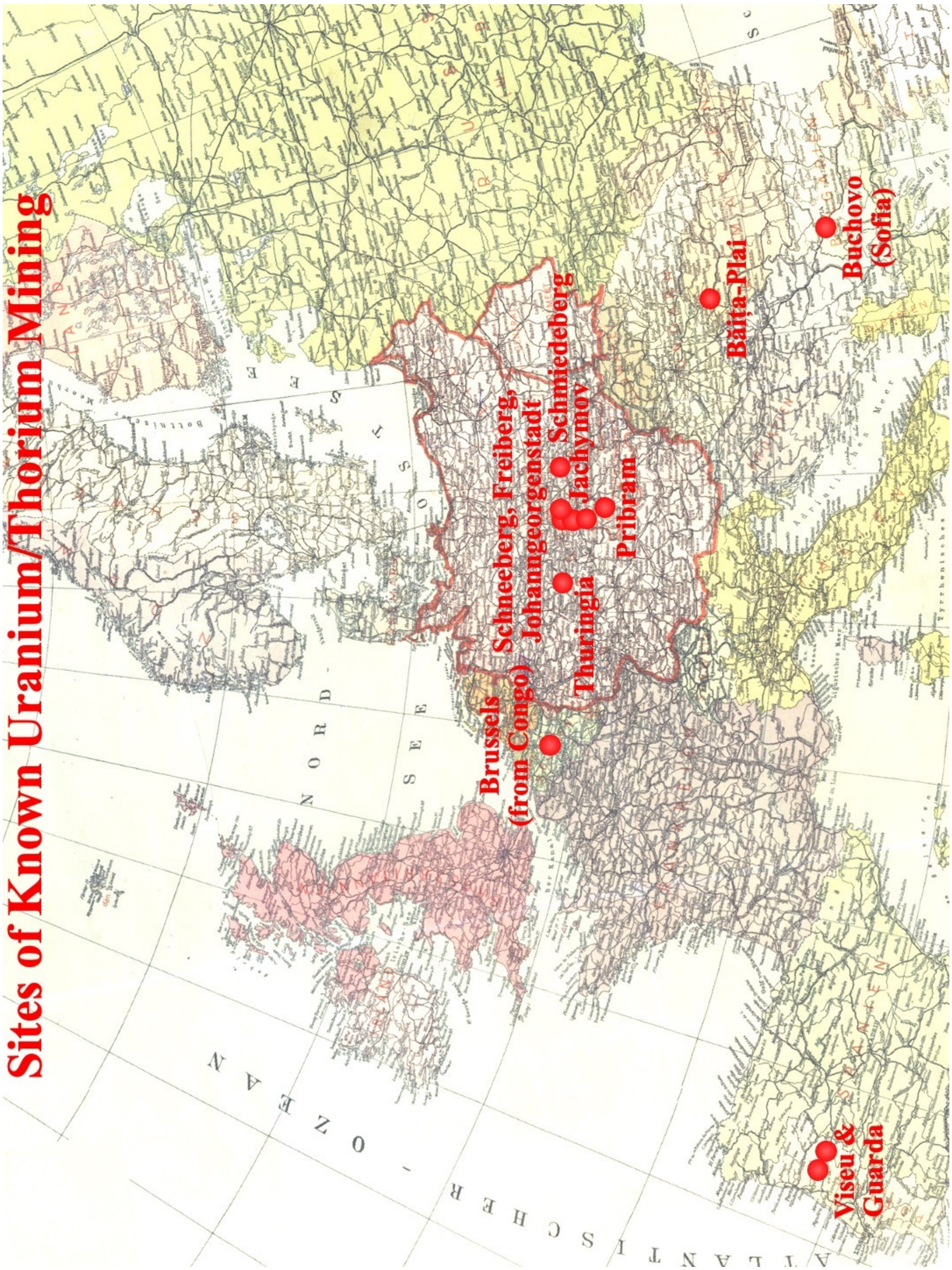


Figure D.73: Sites of known uranium/thorium mining for the German nuclear program.

Germany processed uranium and thorium ore to uranium oxide and thorium oxide, and thence to uranium or thorium metal or to a variety of useful chemical compounds—uranium hexafluoride, uranium tetrachloride, uranium nitrate, etc.—at numerous locations including (see map on p. 3425):

- Union Minière in Brussels [e.g., pp. 3353, 3426–3432; Irving 1967, p. 65].
- Auer in Oranienburg, Katowice/Kattowitz, and other locations [e.g., pp. 3464, 3476, 3479–3481, 3483, 5026; Nagel 2016].
- Buchler in Braunschweig [e.g., pp. 3438, 3448–3449, 3476, 3478–3481, 3483, 5026].
- Treibacher Chemische Werke in Althofen, Austria [e.g., pp. 3438, 3450–3455, 3476, 3478, 5026; Gollmann 1994].
- Degussa in Frankfurt, Berlin, Stadtilm, and possibly other locations [e.g., pp. 3476, 3479–3483; Hayes 2004; Nagel 2016].
- Chemische Fabrik Grünau in Berlin [e.g., pp. 3456–3457, 3479–3481].
- I.G. Farben in Leverkusen and other locations [e.g., pp. 3506–3507, 3510–3511, 3712–3714, 3782–3784, 4484–4521; Mader 1965, pp. 193–202, 229-233].
- Krupp in Essen [e.g., pp. 3476, 3479–3481, 3483–3485].
- W. de Boer in Hamburg and Wittingen [e.g., pp. 3476, 3479–3481, 3483].
- Radium-Chemie AG in Frankfurt [e.g., pp. 3458–3459, 3476, 3483].
- W. Maier KG Radiumchemische Industrie und Laboratorium in Villingen-Schwenningen am Neckar and other locations [e.g., Oleynikov 2000].
- Příbram/Przibram/Pibrans, Bohemia [e.g., pp. 3441, 3785–3788].
- Facilities in Dresden [e.g., pp. 3441, 3444].
- Reichswerke Hermann Göring in Linz and other locations [e.g., pp. 3911–3914].
- Possibly other facilities.

At the end of the war, Allied countries removed over 2800 tons of uranium and thorium compounds from former German-controlled territory (p. 3474). In addition, in 1974, Alwin Urff, deputy technical plant manager of the Asse nuclear disposal site in Germany, stated: "When we began storage in 1967, our company first sank radioactive waste from the last war, that uranium waste which arose in the preparation of the German atomic bomb" (p. 3490).]

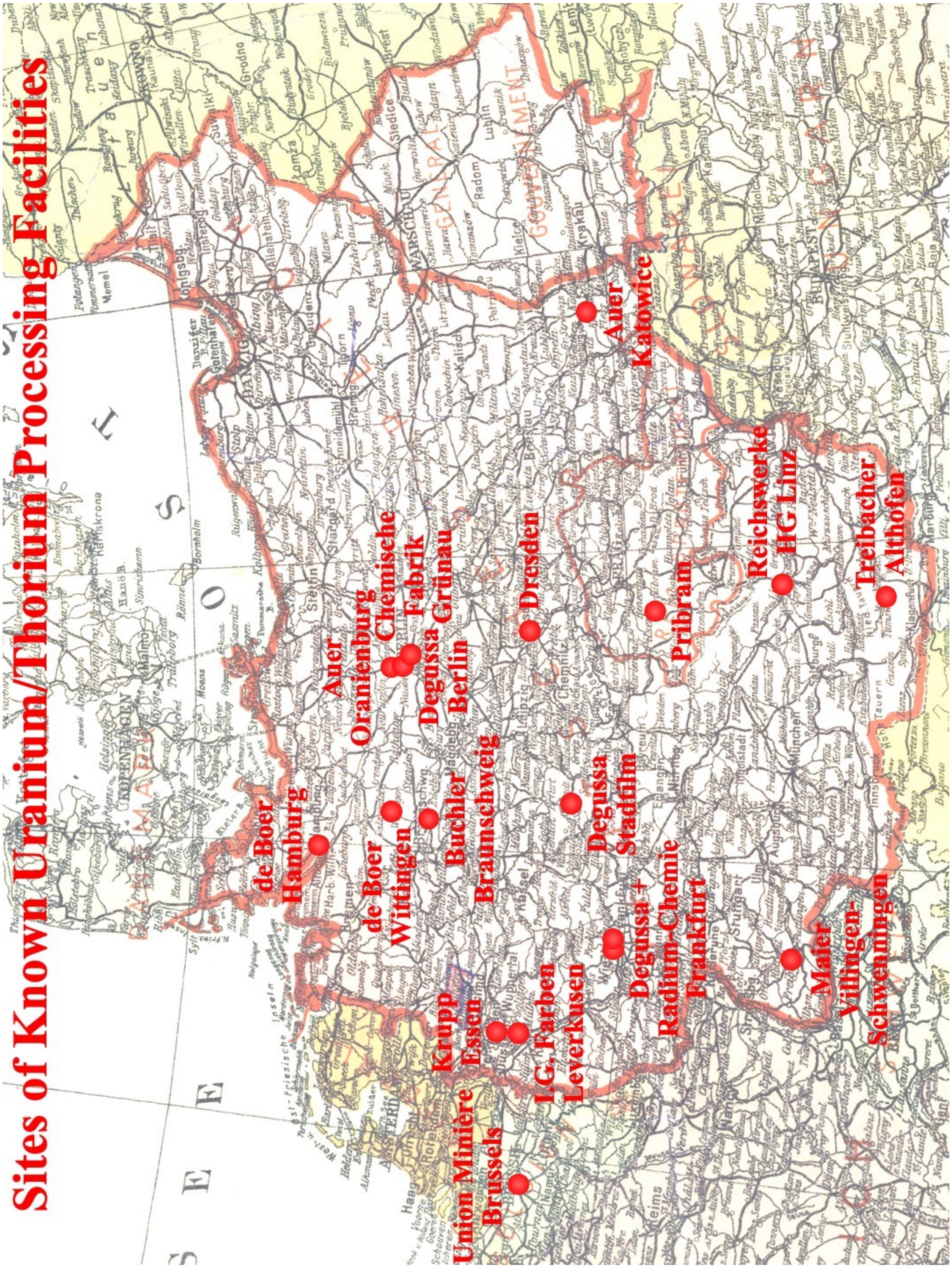


Figure D.74: Sites of known uranium/thorium processing facilities for the German nuclear program.

[While uranium ores found at various sites in Europe were good (and later proved sufficient for the large postwar Soviet nuclear weapons program), the ore with the highest natural concentration of uranium was found in Congo, which was controlled by Belgium at that time [Susan Williams 2016].

Just exactly how much Congolese ore did the whole German nuclear program manage to acquire, via Belgium or any other means?

Most sources give a total number of 1200 tons or so (see for example p. 3353).

However, at least two sources say that the actual amount was 3500 tons:]

1. Nikolaus Riehl, the head nuclear chemist at Auergesellschaft, in information that he gave to David Irving [Irving 1967, pp. 65, 90–91].

The Ministry of Economic Warfare, whose department it was, was requested to attempt to deprive the Germans of the stockpiles of uranium-oxide in Belgium; Tizard opposed the outright purchase of the thousands of tons of uranium-oxide there, and proposed that it should merely be moved to the United Kingdom. The Ministry acted with ponderous precision, and when the German armies fell upon Belgium a month later by far the greater part of the uranium was still there.

Up to June 1940, Union Minière had sold no more than about a ton of the various compounds to Germany each month; the company now received an immediate order for sixty tons of refined uranium compounds, to be supplied to the Auer company in Berlin. During the next five years, the Germans seized three thousand five hundred tons of uranium compounds from the Belgium stockpiles, and shipped it under the general supervision of Dr. Egon Ihwe[6] back to Central Germany, where it was stacked in the surface buildings of the old salt-mines at Stassfurt, owned by the Industrial Research Association (*WiFo*). It was from this huge stockpile of sodium- and ammonium-uranate that the Auer company would now meet its requirements. [...]

[T]he committee stressed: '[...] Although steps were taken beforehand to induce the Belgian company to reduce stocks of uranium oxide, some of which are now in Canada, some eight tons[7] are believed to have fallen into the hands of the Germans when Belgium was invaded.'

[6]General Manager of Auer's subsidiary, the Oranienburg Rare Earths Factory; and an agent of the *Reichsstelle Chemie*, the Reich Chemicals Authority.

[7]Margaret Gowing, *Britain and Atomic Energy 1939–1945*, quoting the committee's report, drew attention to this error and said that it was discovered that the Germans had acquired the equivalent of 600 tons of uranium-oxide; but Professor N. Riehl has informed the author that it was in fact very much more.

2. William Casey, who was a senior official in the OSS and later head of the CIA, and thus should have been in a position to know the correct answer, along with his staff archivists and analysts [Casey 1988, p. 49].

When the British government learned that the Germans, on occupying Norway and Belgium, were increasing Norwegian heavy water production and had seized 3500 tons of uranium from Union Minière in Belgium, the Ministry of Supply was directed to study what would happen if an atom bomb was detonated in the center of a large British city.

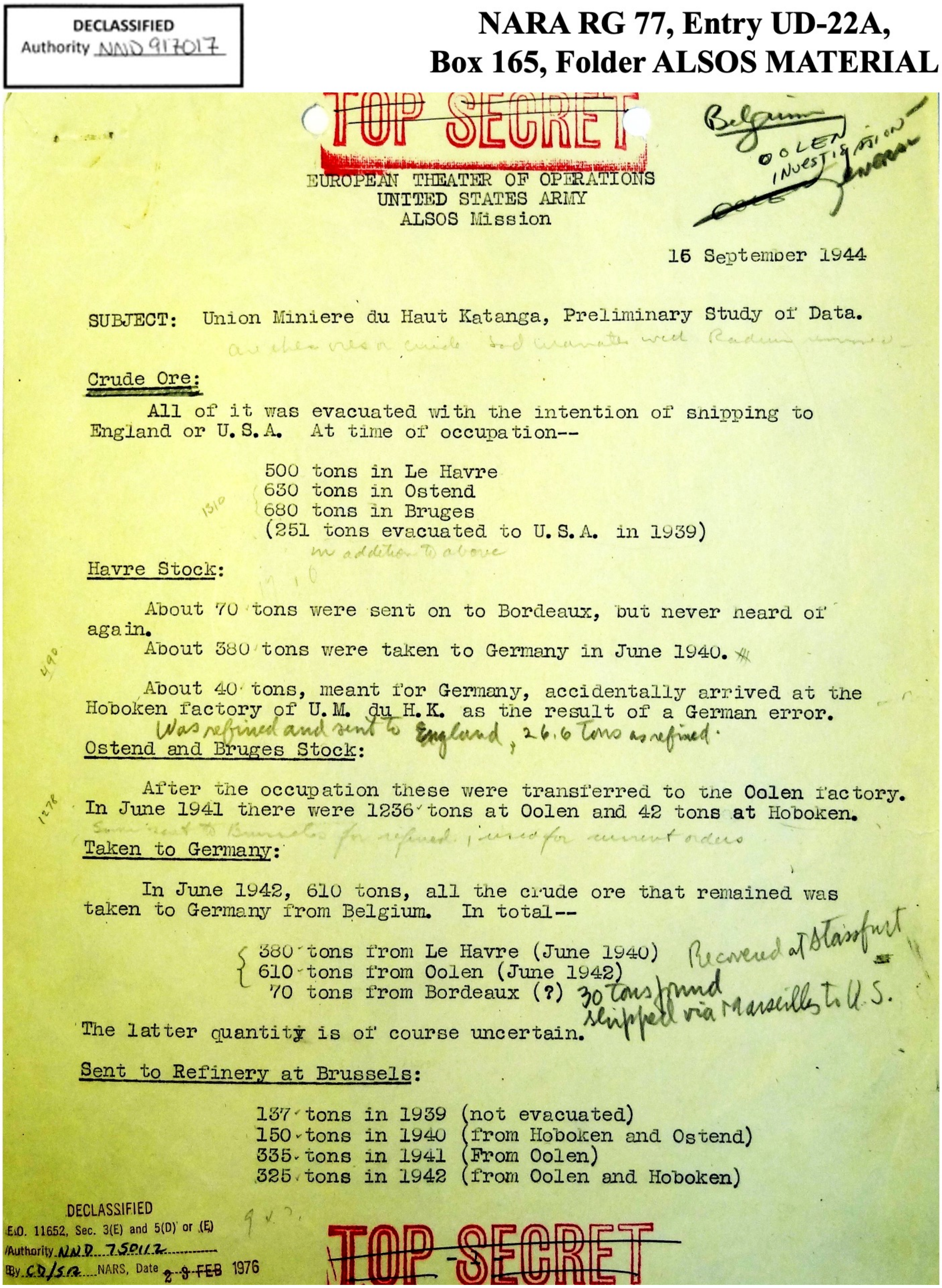
[Dust jacket back flap:] WILLIAM CASEY was Chief of the London OSS headquarters during World War II, and Chief of Secret Intelligence for General Dwight D. Eisenhower's European operations. He was awarded the Bronze Star. In 1981 Mr. Casey became director of the CIA. He died May 6, 1987.

[During the war, the United States had a comparable amount of the same Congolese ore (∼1100 metric tons from a warehouse in New York, with more arriving later in the war) and managed most of the Manhattan Project with that stock. See for example:

https://www.osti.gov/includes/opennet/includes/MED_scans/Book%20VII%20-%20%20Volume%201%20-%20Feed%20Materials%20and%20Special%20Procuremen.pdf

https://www.governmentattic.org/5docs/TheNewWorld1939-1946.pdf

The Germans could potentially have done just as well with what they had.]



DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A,
Box 165, Folder ALSOS MATERIAL

~~TOP SECRET~~

Belgium
OOLEN INVESTIGATION

EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
ALSOS Mission

15 September 1944

SUBJECT: Union Miniere du Haut Katanga, Preliminary Study of Data.

Crude Ore:

All of it was evacuated with the intention of shipping to England or U. S. A. At time of occupation--

500 tons in Le Havre
630 tons in Ostend
680 tons in Bruges 1310
(251 tons evacuated to U. S. A. in 1939)
in addition to above

Havre Stock:

About 70 tons were sent on to Bordeaux, but never heard of again.
About 380 tons were taken to Germany in June 1940.

About 40 tons, meant for Germany, accidentally arrived at the Hoboken factory of U. M. du H. K. as the result of a German error.
Was refined and sent to England, 26.6 tons as refined.

Ostend and Bruges Stock:

After the occupation these were transferred to the Oolen factory. In June 1941 there were 1236 tons at Oolen and 42 tons at Hoboken.

Taken to Germany:

In June 1942, 610 tons, all the crude ore that remained was taken to Germany from Belgium. In total--

380 tons from Le Havre (June 1940)
610 tons from Oolen (June 1942) Recovered at Stassfurt
70 tons from Bordeaux (?) 30 tons found shipped via Marseilles to U.S.

The latter quantity is of course uncertain.

Sent to Refinery at Brussels:

137 tons in 1939 (not evacuated)
150 tons in 1940 (from Hoboken and Ostend)
335 tons in 1941 (From Oolen)
325 tons in 1942 (from Oolen and Hoboken)

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By CD/SR NARS, Date 2-8 FEB 1976

-3-

~~TOP SECRET~~

Figure D.75: Samuel A. Goudsmit. 15 September 1944. SUBJECT: Union Minière du Haut Katanga, Preliminary Study of Data [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL].

TOP SECRET

Union Miniere du Haut Katanga - cont'd. 15 Sept. 1944

No crude ores remained in the possession of the U. M. du H. K.

The Germans paid prewar prices for all the material, except the booty found in France. (ca 10 + 15% water)

(Note that this ore is a "wet" product and that thus the amounts need not add up to the original value. Quantities are in round numbers in metric tons of 2200 pounds).

Rejects: (Impure)

All stocks were taken to Germany in June 1942, with the exception of 25 tons of "uranium residues" which were sent to Brussels for refining in 1941 up to June 1942.

Removed to Germany:

Ferro-uranium	17 tons	(40% U-metal)
Residues	53 tons	(30% U_3O_8)
Uranyl carbonate	44 tons	(40% U_3O_8)
Black Oxyde	4 tons	(90% U_3O_8)
Sodium Uranate	8 tons	(70% U_3O_8)

Finished Products:

On 8 September 1944 the data indicated that there remained in Belgium about 45 tons of ammonium uranate, 2.5 tons of black oxide and about 10 tons of other products. Part of this was ready for shipment but probably has not been removed yet.

This, at present, seems to be all that is left in Belgium. However, a further detailed check must be made as soon as the factory at Oolen becomes available.

Details of movements of refined products as well as precise data on crude ore are given on the data sheets prepared by the U. M. du H. K.

Summary:

Indicating only the principal movements we find--

Summer 1940 - 11 tons oxyde to Auer 380 tons crude to ?
Fall 1940 - 44 tons oxyde to Auer 70 tons crude lost ?
1941 - no large movements
Summer 1942 - 120 tons finished pr. to Roges
610 tons crude to Roges
125 tons rejects to Roges
Summer 1943 - 50 tons finished pr. to Roges
Winter 1943 - 40 tons finished pr. to Roges

* * * * * *

S.A.G.

DR. S. A. GOUDSMIT
Scientific Chief

TOP SECRET

-2-

Figure D.76: Samuel A. Goudsmit. 15 September 1944. SUBJECT: Union Minière du Haut Katanga, Preliminary Study of Data [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL].

TOP SECRET

EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
ALSOS Mission

15 September 1944

SUBJECT: German Recepients of Uranium Products from Belgium.

Several firms received small amounts apparently for normal peace time applications or retrade. The quantities being usually less than one ton of assorted refined material per month.

From June 1940 until August 1941 the Auer Gesellschaft, who never was a customer before the war, suddenly became a large consumer, a total of roughly 60 tons of refined materials over this period. The last two shipments to this firm were in July and August 1941 and were ten tons each.

The engineer at Auer Gesellschaft who was apparently in charge of uranium ore purchases was Dr. Ihwe. He visited Belgium in October 1940.

The next large shipment was in November 1941 of about nine tons to the Deutsche Gold und Silber Scheide Anstalt, who was a prewar customer for amounts of about two tons. This shipment may therefore have no special significance.

Suddenly in June 1942 unusually large amounts were requisitioned and sent to Roges, m.b.H., namely about 115 tons of assorted refined and half refined materials. In addition, they obtained 610 tons of crude material, 17 tons of ferro-uranium and about 110 tons of impure products designated as "produits non-marchands" that is "rejects". Also in Jan 43, 50 tons and in May 80 tons of refined products.

115
610
17
110
50
80

Roges m.b.H. is a war created trading office most likely directly connected with the German ministry of trade and Finance (Handels und Finanzministerium). Its full name is Rohstoff Handels Gesellschaft m.b.H (-Raw materials trade company Ltd.) and probably supervised the trade of all metallic ores.

The man in charge of uranium ores was Dr. Faust

The company was bombed out at least twice and requested new copies of their records from Belgium. An old address was:

Tirpitz Ufer 2024, Berlin W9

the latest address is probably:

Chaussee Strasse 6 - 10
Berlin - Mariendorf
Phones 70.08.31, 75.64.06 and
75.66.31 (long distance)

TOP SECRET

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 730112
By [illegible] NARS, Date 3/26/76

- 1 -

Reported by: Mr. Gaston André in charge of uranium at the main office of the Union Miniere du Haut Katanga, Brussels. Interviewed September 10-14, 1944.

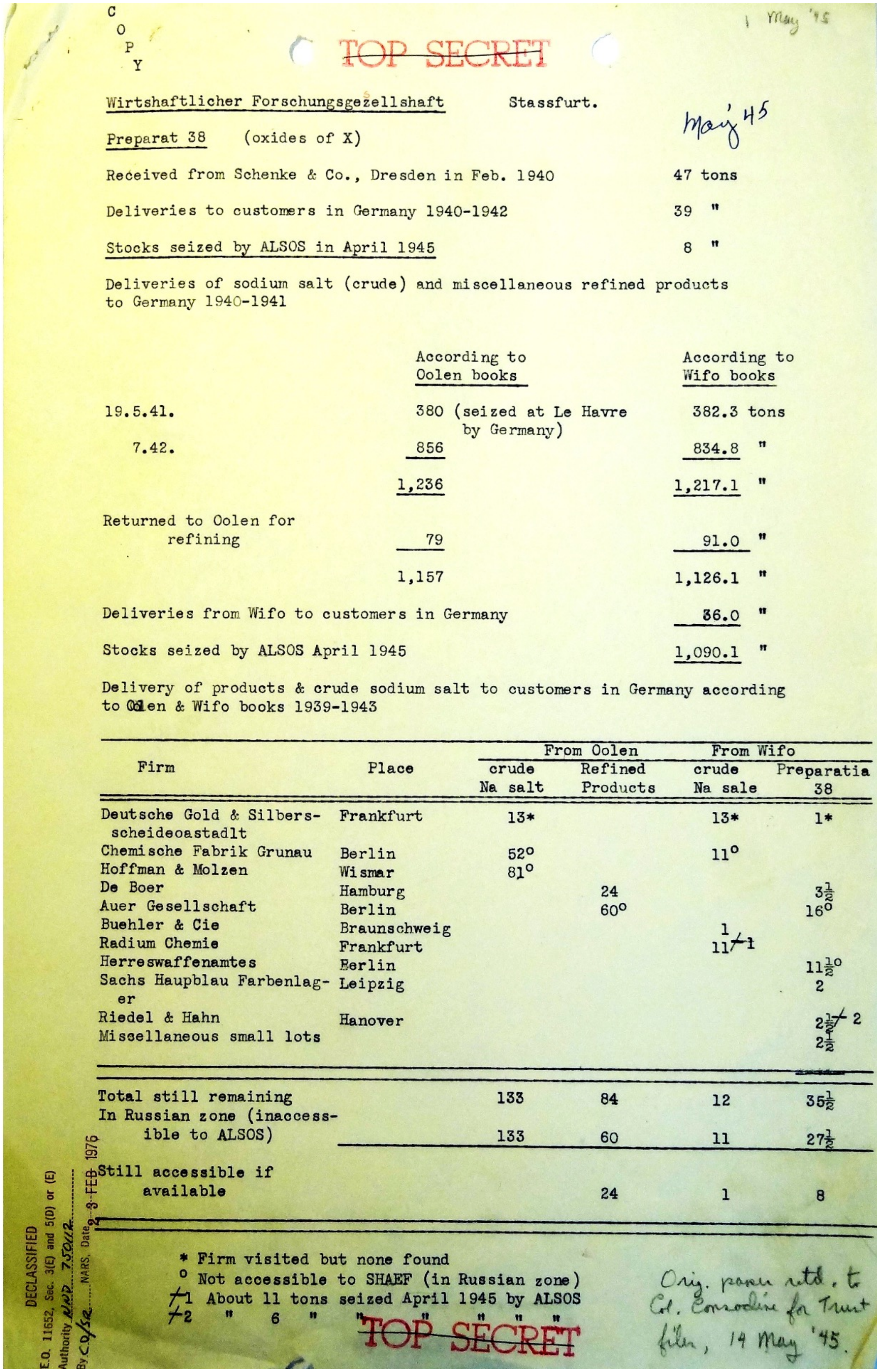
(Quantities in this report are only approximate and in metric tons.)

S.A.G.

DR. S. A. GOUDSMIT
Scientific Chief

NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL

Figure D.77: Samuel A. Goudsmit. 15 September 1944. SUBJECT: German Recipients of Uranium Products from Belgium [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL].



C
O
P
Y

TOP SECRET

1 May '45

Wirtshaftlicher Forschungsgezellshaft Stassfurt.

May 45

Preparat 38 (oxides of X)

Received from Schenke & Co., Dresden in Feb. 1940	47 tons
Deliveries to customers in Germany 1940-1942	39 "
Stocks seized by ALSOS in April 1945	8 "

Deliveries of sodium salt (crude) and miscellaneous refined products to Germany 1940-1941

	According to Oolen books	According to Wifo books
19.5.41.	380 (seized at Le Havre by Germany)	382.3 tons
7.42.	856	834.8 "
	1,236	1,217.1 "
Returned to Oolen for refining	79	91.0 "
	1,157	1,126.1 "
Deliveries from Wifo to customers in Germany		36.0 "
Stocks seized by ALSOS April 1945		1,090.1 "

Delivery of products & crude sodium salt to customers in Germany according to Oolen & Wifo books 1939-1943

Firm	Place	From Oolen: crude Na salt	From Oolen: Refined Products	From Wifo: crude Na sale	From Wifo: Preparatia 38
Deutsche Gold & Silbers-scheideoastadlt	Frankfurt	13*		13*	1*
Chemische Fabrik Grunau	Berlin	52°		11°	
Hoffman & Molzen	Wismar	81°			
De Boer	Hamburg		24		3½
Auer Gesellschaft	Berlin		60°		16°
Buehler & Cie	Braunschweig			1	
Radium Chemie	Frankfurt			11†1	
Herreswaffenamtes	Berlin				11½°
Sachs Haupblau Farbenlager	Leipzig				2
Riedel & Hahn	Hanover				2½†2
Miscellaneous small lots					2½
Total still remaining		133	84	12	35½
In Russian zone (inaccessible to ALSOS)		133	60	11	27½
Still accessible if available			24	1	8

* Firm visited but none found
° Not accessible to SHAEF (in Russian zone)
†1 About 11 tons seized April 1945 by ALSOS
†2 " 6 " " " " "

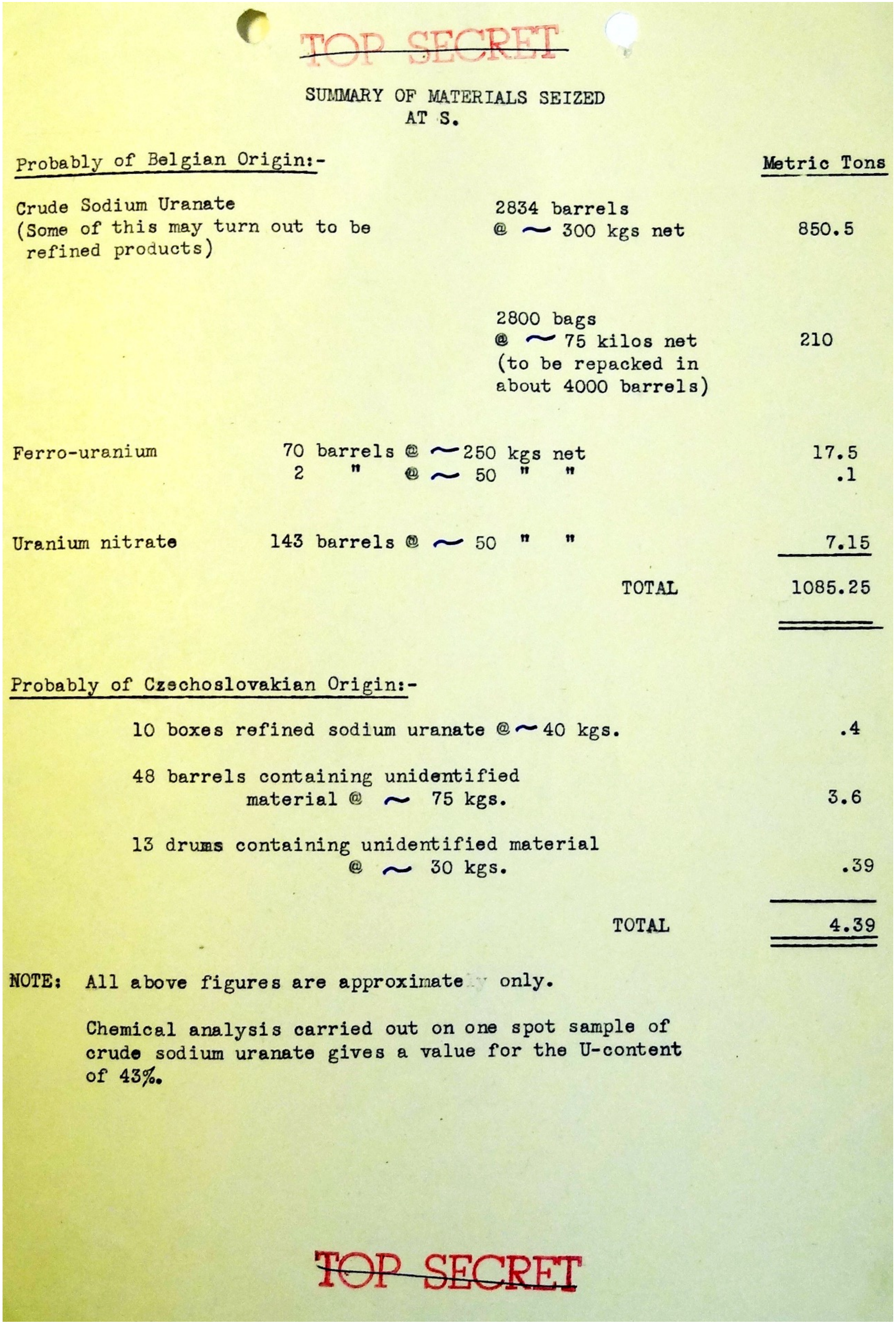
Orig. page rtd. to Col. Consodine for Trust file, 14 May '45.

TOP SECRET

NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL

Figure D.78: 1 May 1945. Wirtschaftlicher Forschungsgesellschaft Stassfurt [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL].

DECLASSIFIED
Authority NND 917017



TOP SECRET

SUMMARY OF MATERIALS SEIZED
AT S.

Probably of Belgian Origin:-		Metric Tons
Crude Sodium Uranate (Some of this may turn out to be refined products)	2834 barrels @ ~ 300 kgs net	850.5
	2800 bags @ ~ 75 kilos net (to be repacked in about 4000 barrels)	210
Ferro-uranium	70 barrels @ ~ 250 kgs net	17.5
	2 " @ ~ 50 " "	.1
Uranium nitrate	143 barrels @ ~ 50 " "	7.15
	TOTAL	1085.25

Probably of Czechoslovakian Origin:-	
10 boxes refined sodium uranate @ ~ 40 kgs.	.4
48 barrels containing unidentified material @ ~ 75 kgs.	3.6
13 drums containing unidentified material @ ~ 30 kgs.	.39
TOTAL	4.39

NOTE: All above figures are approximately only.

Chemical analysis carried out on one spot sample of crude sodium uranate gives a value for the U-content of 43%.

TOP SECRET

NARA RG 77, Entry UD-22A,
Box 165, Folder ALSOS MATERIAL

Figure D.79: Summary of Materials Seized at S[tassfurt]. [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL]

Jonathan E. Helmreich. 1986. *Gathering Rare Ores: The Diplomacy of Uranium Acquisition, 1943–1954.* Princeton, New Jersey: Princeton University Press. p. 70.

The CDT [Combined Development Trust, run by Leslie Groves] was aware of the uranium at Joachimstal and apparently did not think the Russians would be able to mine there extensively enough to gain the needed amounts of oxide. Despite the survey efforts of the UMDC and the Murray Hill area, however, the CDT did not know of the valuable deposits in Saxony, just north of the East German border with Czechoslovakia and the Joachimstal mines. Discovered by the Germans in 1943, the deposits were explored by the Soviets in the months after June 1945; mining operations began a year later and were feverishly expanded after April 1948.

[The Saxony/Erzgebirge uranium deposits were enormous, and the Soviet Union mined them for decades after the war to supply uranium for its nuclear weapons program.

Germany began exploiting those deposits during the war (see also for example pp. 3451, 3474–3434, 3742, 4968), so it had access to even more uranium ore than it is already publicly known to have possessed.]

Zbynek Zeman and Rainer Karlsch. 2008. *Uranium Matters: Central European Uranium in International Politics 1900-1960*. Budapest: Central European University Press. pp. 25–29, 24.

The Soviets were initially more interested in tracing the German atomic program and recruiting German scientists than in the search for uranium. Despite strong opposition from the Communist Party bureaucracy, Zaveniagin sent a group of forty Soviet physicists to Germany. They succeeded in convincing eminent German scientists, including Manfred von Ardenne, Gustav Hertz, Heinz Pose, Nikolaus Riehl, Peter Adolf Thiessen and Max Volmer, to work for the Soviet atomic program.

As early as 15 May 1945, NKVD presented in Moscow the results of their investigations into the German plants and research institutes which concerned themselves with nuclear matters. Among the institutions visited were the Kaiser-Wilhelm-Institut für Physik in Berlin-Dahlem, Manfred von Ardenne's institute in Berlin-Lichterfelde, Institut der Reichspostforschungsanstalt in Zeuthen (Miersdorf), the Siemens cyclotron laboratory run by Gustav Hertz, as well as the plants and warehouses of the Auer company in Berlin-Charlottenburg, Berlin-Grunau, Oranienburg and Zechlin.

The objects came under NKVD control and were soon dismantled. Special units found about 300 tons of uranium oxide and 7 tons of uranium metal in Berlin, Gottow, Zechlin, Kagar, and Rheinsberg. In Stadtilm, a small town in Thuringia, the special unit found a uranium processing plant that used to belong to the Degussa Company. The Auer Company's plant in Oranienburg, destroyed in the American air raid in March 1945, was also thoroughly searched; a few tons of pure uranium oxide and several hundred tons of thorium derivatives were found there.

[...] The first group came to Bulgaria at the end of November 1944. It followed a German trace: Soviet troops had discovered some German documents concerning uranium reserves in the vicinity of the town of Buchovo. [...] Political prisoners were employed in the uranium mines and, by the middle of 1946, the company had produced 272 tons of pitchblende, which was then sent to the Soviet Union.

[...] Beria's special committee for the atomic bomb received the first report on Jáchymov [Sankt Joachimsthal, Bohemia until 1945, then Czechoslovakia] on 14 September 1945. The estimated uranium reserves in Jáchymov amounted to 300 tons.

[...] Early in August 1945, an expedition of Soviet geologists, led by Professor Kreiter, came to Saxony. The geologists visited the headquarters of the Sachsenerz-Bergwerks AG in Freiberg and the mines near Schneeberg and Johanngeorgenstadt. [...] the estimates reached the figure of 1,600 tons.

[...] by the time mining was concluded there after 1989, it would produce over 231,000 tons of uranium.

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 170, Folder 32.60-1 GERMANY: Summary Reports (1944)

SECRET

THE UNIVERSITY OF CHICAGO

DATE 4-20-44

rule for Summary

(7)

TO R. R. Furman DEPARTMENT

FROM P. Morrison DEPARTMENT

MUC- PM - 34
This document consists of 1 pages and 0 figures
No. 1 of 5 copies, Series A.

IN RE: The Czech Mines

1) We know that the normal uranium extraction at the old Czech mines in Joachimstahl (Jacymov) is insufficient for our present purpose. If metal is to be obtained from this source, a considerable expansion of the works is necessary. Our airplane dial analysis and your information indicate that sizable quantities of radium are not required for dial paint. It is possible that therapeutic needs and especially gamma-ray radiography of heavy metal parts require a large increase in the radium output, but it seems probable that any large scale activity at Joachimstahl is of real significance.

2) It must be recognized that the literature increasingly hints at an intensive activity at Joachimstahl. This information is derived from the publications and reports of the group working under B. Rajewsky at the KWI für Biophysik at Frankfort a. M. We early reported his references to seeking new radium veins and to continued work on the health hazards presented by uranium ore dusts. The latest publication to come to our attention (dated November 1943, written several months earlier) gives a report of the general activities of this section of the KWI for the year ending March 1943. In this report is emphasized the war-important character of the work of this Institute, particularly that carried out at the subsidiary site of the Institute, the so-called Radiumforschungsinstitut, located at the small town of Radiumbad Oberschlema in the Erzgebirge. It is quite clear that these people have been given a governmental responsibility to safeguard the health of the radium workers at Joachimstahl and perhaps at other nearby newer radium mines.

8-12-11.12 4 8-12-23.

3) We very strongly recommend that you obtain as definite a report as possible on all the activities connected with radium mining and extraction in the Erzgebirge of Czechoslovakia. You will recognize the connection between this work and many of the reports which you have lately obtained. The scale of any possible uranium ore removal for radium extraction purposes is considerably less than the scale for more important purposes. This might possibly take an almost decisive character for us.

4) The scientific workers involved in the work of the KWI für Biophysik are listed below; the most important of them is B. Rajewsky. The list follows:

B. Rajewsky	A. Krebs
M. Dorneich	H. Schaefer
W. Drublow	A. and E. Schraub
G. Kahlau	

SECRET

Not only the circles of physicists will know these people, but perhaps even more the radiologists or research workers in the field of X-ray and radium cancer therapy.

P Morrison
P. Morrison

PM me
cc. J. King; K. Cohen; L. Szilard

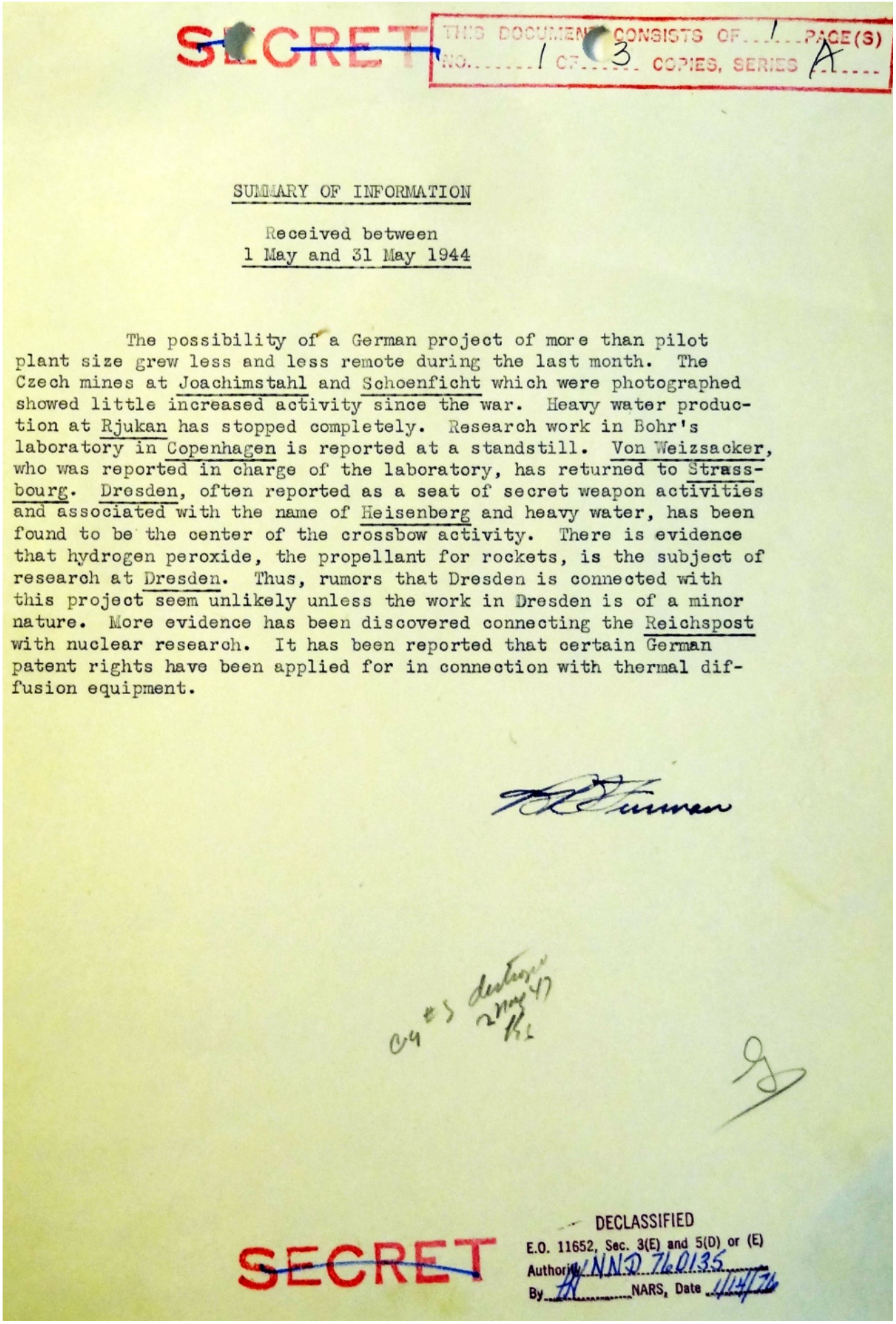
This document contains information affecting the national defense of the United States within the meaning of the Espionage Act ...

The urgency ... of this document ... such that it will not reach the addressee ... time by the next available office-courier. The originator, therefore authorizes the ...

Figure D.80: Philip Morrison to Robert R. Furman. 20 April 1944. In Re: The Czech Mines [NARA RG 77, Entry UD-22A, Box 170, Folder 32.60-1 GERMANY: Summary Reports (1944)]. An important new German nuclear research institute was built at Oberschlema, within the rich uranium mining area immediately around Schneeberg.

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 170, Folder 32.60-1 GERMANY: Summary Reports (1944)



~~SECRET~~ THIS DOCUMENT CONSISTS OF 1 PAGE(S)
NO. 1 OF 3 COPIES, SERIES A

SUMMARY OF INFORMATION

Received between
1 May and 31 May 1944

The possibility of a German project of more than pilot plant size grew less and less remote during the last month. The Czech mines at Joachimstahl and Schoenficht which were photographed showed little increased activity since the war. Heavy water production at Rjukan has stopped completely. Research work in Bohr's laboratory in Copenhagen is reported at a standstill. Von Weizsacker, who was reported in charge of the laboratory, has returned to Strassbourg. Dresden, often reported as a seat of secret weapon activities and associated with the name of Heisenberg and heavy water, has been found to be the center of the crossbow activity. There is evidence that hydrogen peroxide, the propellant for rockets, is the subject of research at Dresden. Thus, rumors that Dresden is connected with this project seem unlikely unless the work in Dresden is of a minor nature. More evidence has been discovered connecting the Reichspost with nuclear research. It has been reported that certain German patent rights have been applied for in connection with thermal diffusion equipment.

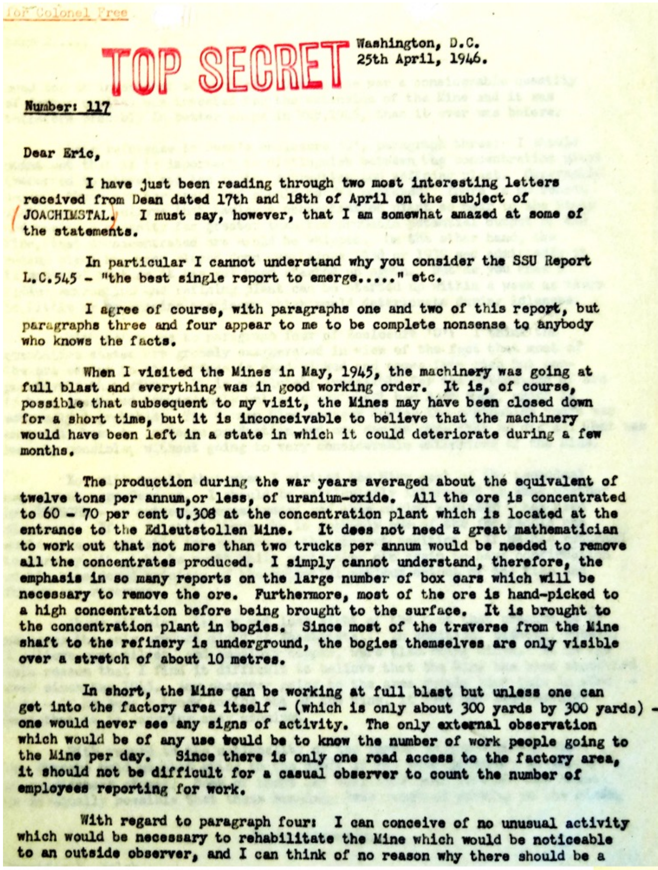
R R Furman

cy #3 destroyed 2 May 47 KL

~~SECRET~~

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 760135
By HH NARS, Date 1/14/76

Figure D.81: Robert R. Furman. Summary of Information Received between 1 May and 31 May 1944 [NARA RG 77, Entry UD-22A, Box 170, Folder 32.60-1 GERMANY: Summary Reports (1944)]. Note uranium mining at Schoenficht.



for Colonel Free

TOP SECRET

Washington, D.C.
25th April, 1946.

Number: 117

Dear Eric,

I have just been reading through two most interesting letters received from Dean dated 17th and 18th of April on the subject of JOACHIMSTAL. I must say, however, that I am somewhat amazed at some of the statements.

In particular I cannot understand why you consider the SSU Report L.C.545 - "the best single report to emerge....." etc.

I agree of course, with paragraphs one and two of this report, but paragraphs three and four appear to me to be complete nonsense to anybody who knows the facts.

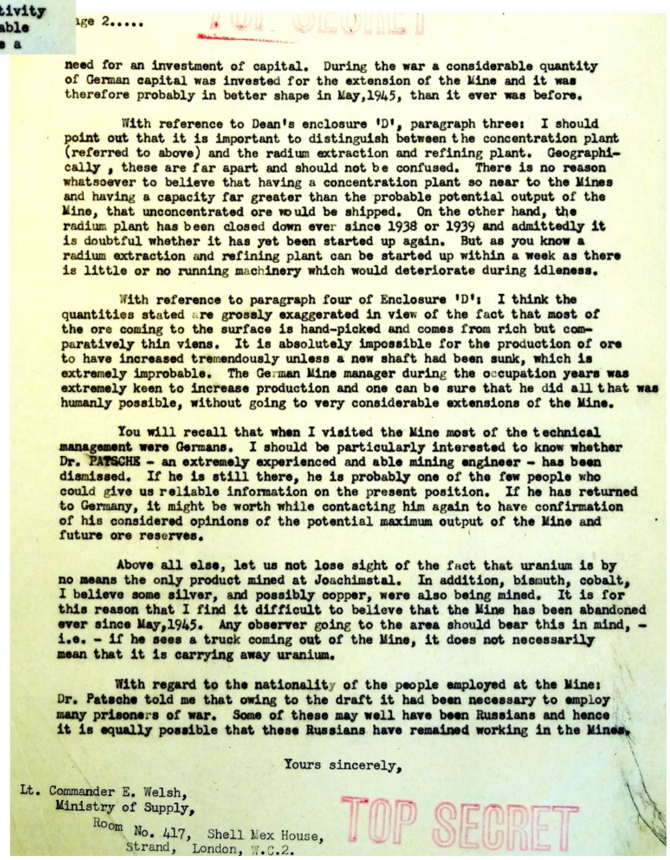
When I visited the Mines in May, 1945, the machinery was going at full blast and everything was in good working order. It is, of course, possible that subsequent to my visit, the Mines may have been closed down for a short time, but it is inconceivable to believe that the machinery would have been left in a state in which it could deteriorate during a few months.

The production during the war years averaged about the equivalent of twelve tons per annum,or less, of uranium-oxide. All the ore is concentrated to 60 - 70 per cent U.308 at the concentration plant which is located at the entrance to the Edleutstollen Mine. It dees not need a great mathematician to work out that not more than two trucks per annum would be needed to remove all the concentrates produced. I simply cannot understand, therefore, the emphasis in so many reports on the large number of box cars which will be necessary to remove the ore. Furthermore, most of the ore is hand-picked to a high concentration before being brought to the surface. It is brought to the concentration plant in bogies. Since most of the traverse from the Mine shaft to the refinery is underground, the bogies themselves are only visible over a stretch of about 10 metres.

In short, the Mine can be working at full blast but unless one can get into the factory area itself - (which is only about 300 yards by 300 yards) - one would never see any signs of activity. The only external observation which would be of any use would be to know the number of work people going to the Mine per day. Since there is only one road access to the factory area, it should not be difficult for a casual observer to count the number of employees reporting for work.

With regard to paragraph four: I can conceive of no unusual activity which would be necessary to rehabilitate the Mine which would be noticeable to an outside observer, and I can think of no reason why there should be a

DECLASSIFIED
Authority NND 917017



Page 2.....

need for an investment of capital. During the war a considerable quantity of German capital was invested for the extension of the Mine and it was therefore probably in better shape in May,1945, than it ever was before.

With reference to Dean's enclosure 'D', paragraph three: I should point out that it is important to distinguish between the concentration plant (referred to above) and the radium extraction and refining plant. Geographically , these are far apart and should not be confused. There is no reason whatsoever to believe that having a concentration plant so near to the Mines and having a capacity far greater than the probable potential output of the Mine, that unconcentrated ore would be shipped. On the other hand, the radium plant has been closed down ever since 1938 or 1939 and admittedly it is doubtful whether it has yet been started up again. But as you know a radium extraction and refining plant can be started up within a week as there is little or no running machinery which would deteriorate during idleness.

With reference to paragraph four of Enclosure 'D': I think the quantities stated are grossly exaggerated in view of the fact that most of the ore coming to the surface is hand-picked and comes from rich but comparatively thin viens. It is absolutely impossible for the production of ore to have increased tremendously unless a new shaft had been sunk, which is extremely improbable. The German Mine manager during the occupation years was extremely keen to increase production and one can be sure that he did all that was humanly possible, without going to very considerable extensions of the Mine.

You will recall that when I visited the Mine most of the technical management were Germans. I should be particularly interested to know whether Dr. PATSCHE - an extremely experienced and able mining engineer - has been dismissed. If he is still there, he is probably one of the few people who could give us reliable information on the present position. If he has returned to Germany, it might be worth while contacting him again to have confirmation of his considered opinions of the potential maximum output of the Mine and future ore reserves.

Above all else, let us not lose sight of the fact that uranium is by no means the only product mined at Joachimstal. In addition, bismuth, cobalt, I believe some silver, and possibly copper, were also being mined. It is for this reason that I find it difficult to believe that the Mine has been abandoned ever since May,1945. Any observer going to the area should bear this in mind, - i.e. - if he sees a truck coming out of the Mine, it does not necessarily mean that it is carrying away uranium.

With regard to the nationality of the people employed at the Mine: Dr. Patsche told me that owing to the draft it had been necessary to employ many prisoners of war. Some of these may well have been Russians and hence it is equally possible that these Russians have remained working in the Mines.

Yours sincerely,

Lt. Commander E. Welsh,
Ministry of Supply,
Room No. 417, Shell Mex House,
Strand, London, W.C.2.

TOP SECRET

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

Figure D.82: George C. Davis or David Gattiker to Eric Welsh. 25 April 1946 [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia].

DECLASSIFIED
Authority NND 917017

~~DRAFT~~

HSL/1s
3 May 1946

TOP SECRET

~~SUMMARY ANALYSIS OF JOACHIMSTHAL INFORMATION RECEIVED UP TO 1 MAY 1946.~~

II Precis of all pertinent reports follow. Those having underlined headings are considered valid reports. Those ~~receipted~~ preceded by asterisks are considered invalid reports. Those without any mark are newspaper and radio reports from Czechoslovakia or Russia.

1. Interrogation of P/W Uffz, 31G-1520041, 28 December 1944.

In April 1939 Joachimsthal came under control of the German Government. The radium refining plant in the center of town was discontinued, the working force reduced from 250 to 180 workers in the mine, and 15 men were left in the office. Plant output remained at 10 tons U_3O_8 per year. About 1/3 of the output was delivered to the Chinin Fabrik in Braunschweig and the other 2/3 to the Chemischewerke in Treibach, Austria. Simultaneously laboratory control was eliminated with the exception of medical control tests.

2. Letter from Gattiker and Davis to Groves, 15 May 1945. Visit to Joachimsthal Mines.

There are three mine shafts spaced at one mile intervals lying approximately in a straight line, ~~each pair about a mile apart~~. From west to east are: (a) the Wernerschact with 4 veins being worked, (b) the Einigkeitschact in the center of the town, no longer worked, and (c) the Edelleutstollen, with 3 veins being worked. The Germans concentrated the mined ore to 12% by hand picking underground, and then concentrated it to 60% U_3O_8 in the concentration plant near the Edelleutstollen shaft by crushing followed by tabling. The concentration plant has a capacity of 10 tons of crude ore per day.

Stocks on 15 May 1945 were given as 3 tons of 60% concentrate, 20 tons of 11% crude ore concentrate, and 3,000 tons of residue in the concentration

- 2 -

TOP SECRET

plant containing 0.8 to 1% U_3O_8. No successful method for the extraction of the residue had been evolved up to that time.

3. OSS Report, No. LC-259, 11 September 1945. Undetermined reliability.

On 11 September 1945 Russian soldiers were observed in complete occupation of Joachimsthal uranium mines.

4. Military Attache Report, No. R-32-45, Prague, 30 September 1945.

A Czechoslovakian General Staff source stated that after the meeting of the Foreign Ministers in London when unsuccessful demands had been placed for the secrets of the atomic bomb, one battalion of Russian infantry and certain technical troops occupied on the next day the uranium mine in Joachimsthal, and immediately demanded a trebling of output.

5. Letter from Sir Charles Hambro, 18 October 1945.

Mr. Loebl, Czechoslovakian Undersecretary of State for Foreign Trade, implied in conversation that the Russians were obtaining the output of Joachimsthal on the legal basis that the Russians were acquiring all German assets in Czechoslovakia.

*6. SSU Report from Col. Skinner, information dated 19 November 1945, evaluation B-2.

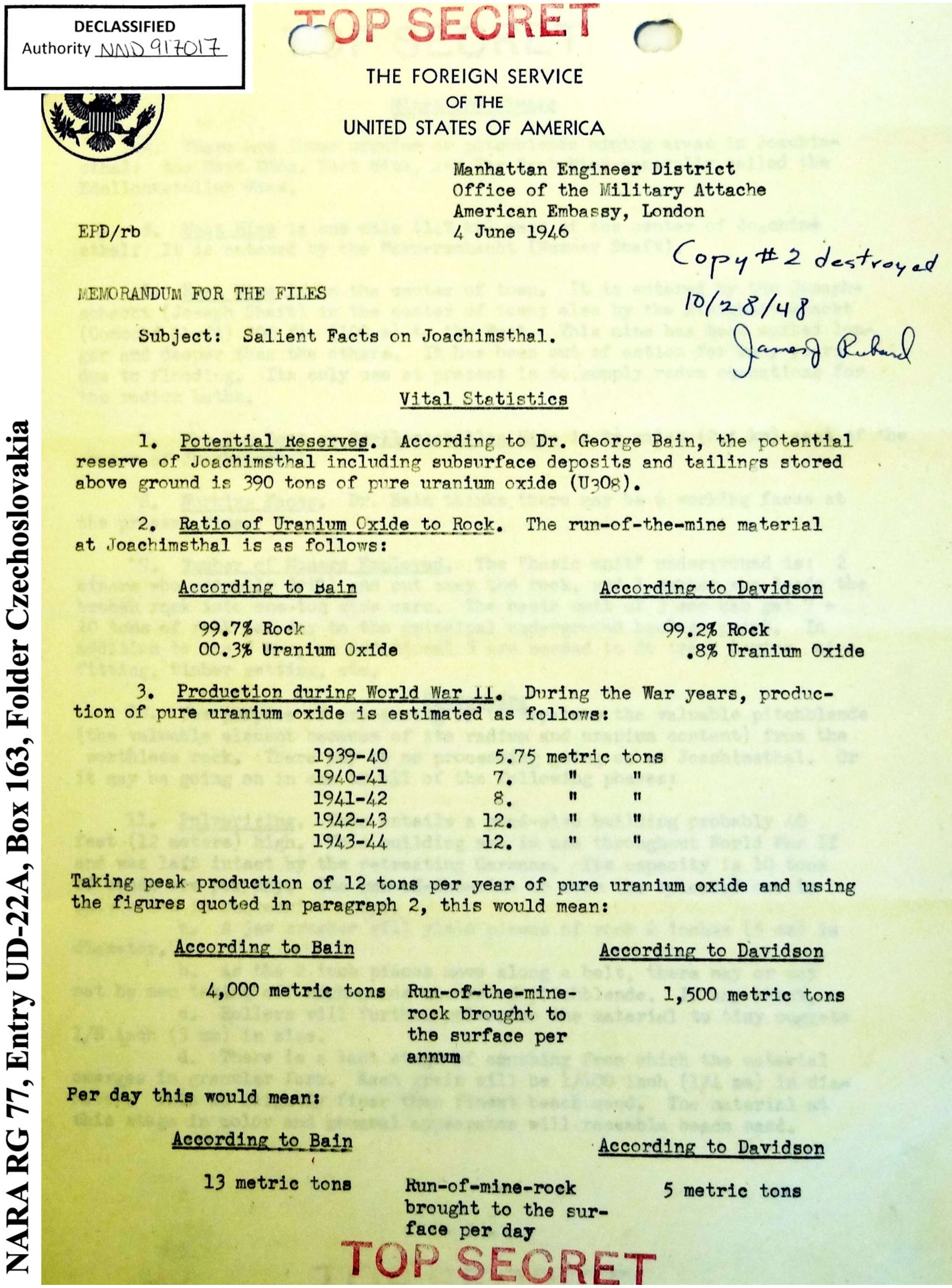
The Russians proposed a joint company to operate Joachimsthal. The Czechs stated that they would operate the mines after nationalization without the aid of the Russians. The absence of Russian troops at Joachimsthal has been confirmed, and until a governmental control agency has been set up the mines are only partly active.

*7. SSU Report, 6 December 1945, evaluation B. (partly false)

The Russians have not left the Joachimsthal area, are guarding the area, and workers are the only ones allowed to enter. *As no ore has been mined since 1944, only necessary maintenance and ventilating equipment is

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

Figure D.83: H. S. Lowenhaupt. 3 May 1946. Draft: Summary Analysis of Joachimsthal Information Received Up To 1 May 1946 (only the first two pages shown) [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia].



DECLASSIFIED
Authority NND 917017

TOP SECRET

THE FOREIGN SERVICE
OF THE
UNITED STATES OF AMERICA

Manhattan Engineer District
Office of the Military Attache
American Embassy, London
4 June 1946

EPD/rb

Copy #2 destroyed
10/28/48
James J. Rickard

MEMORANDUM FOR THE FILES

Subject: Salient Facts on Joachimsthal.

Vital Statistics

1. Potential Reserves. According to Dr. George Bain, the potential reserve of Joachimsthal including subsurface deposits and tailings stored above ground is 390 tons of pure uranium oxide (U_3O_8).

2. Ratio of Uranium Oxide to Rock. The run-of-the-mine material at Joachimsthal is as follows:

According to Bain	According to Davidson
99.7% Rock	99.2% Rock
00.3% Uranium Oxide	.8% Uranium Oxide

3. Production during World War II. During the War years, production of pure uranium oxide is estimated as follows:

1939-40	5.75 metric tons	
1940-41	7. "	"
1941-42	8. "	"
1942-43	12. "	"
1943-44	12. "	"

Taking peak production of 12 tons per year of pure uranium oxide and using the figures quoted in paragraph 2, this would mean:

According to Bain		According to Davidson
4,000 metric tons	Run-of-the-mine-rock brought to the surface per annum	1,500 metric tons

Per day this would mean:

According to Bain		According to Davidson
13 metric tons	Run-of-mine-rock brought to the surface per day	5 metric tons

TOP SECRET

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

Figure D.84: U.S. Military Attaché London. 4 June 1946. Subject: Salient Facts on Joachimsthal [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia].

TOP SECRET

Mines and Miners

4. There are three uranium or pitchblende mining areas in Joachimsthal: the West Mine, East Mine, and Far East Mine generally called the Edellentstollen Mine.

5. West Mine is one mile (1.7 km) west of the center of Joachimsthal. It is entered by the Wernerschacht (Werner Shaft).

6. East Mine is in the center of town. It is entered by the Josephschacht (Joseph Shaft) in the center of town; also by the Einigkeitschacht (Concord Shaft) 300 ft. (100 m) to the West. This mine has been worked longer and deeper than the others. It has been out of action for many years due to flooding. Its only use at present is to supply radon emanations for the radium baths.

7. The Far East or Edellentstollen Mine is 1½ miles (2.4 km) east of the center of Joachimsthal.

8. Working Faces. Dr. Bain thinks there may be 6 working faces at the present time.

9. Number of Miners Employed. The "basic unit" underground is: 2 miners who actually drill and cut away the rock, and 1 mucker who loads the broken rock into one-ton mine cars. The basic unit of 3 men can get 7 - 10 tons of rock per day to the principal underground haulage point. In addition to the 3 men, an additional 3 are needed to do track laying, pipe fitting, timber setting, etc.

Processing

10. The purpose of processing is to separate the valuable pitchblende (the valuable element because of its radium and uranium content) from the worthless rock. There may be no processing going on at Joachimsthal. Or it may be going on in one or all of the following phases:

11. Pulverizing. This entails a good-size building probably 40 feet (12 meters) high. This building was in use throughout World War II and was left intact by the retreating Germans. Its capacity is 10 tons of crude ore per day. The run-of-the-mine or even the selected ore is pulverized in successive steps.

a. A jaw crusher will yield pieces of rock 2 inches (5 cm) in diameter.

b. As the 2 inch pieces move along a belt, there may or may not be men taking off high-grade chunks of pitchblende. In any event,

c. Rollers will further pulverize the material to tiny nuggets 1/8 inch (3 mm) in size.

d. There is a last stage of crushing from which the material emerges in granular form. Each grain will be 1/100 inch (1/4 mm) in diameter. This is slightly finer than finest beach sand. The material at this stage in color and general appearance will resemble beach sand.

TOP SECRET

12. Separating. This will take place in a different building or shed. The purpose now is to separate grains of pitchblende from the worthless grains of rock. This can be done by: shaking tables and jigs.

13. Chemical Plant. The uranium refinery was working until 1939. (The radium refinery was closed in 1935 as a result of cheaper radium production in Belgium and Canada. It is probably still closed.)

Scrap or Tailings

14. Scrap or Tailings. In former years, the pitchblende mined at Joachimsthal was processed almost solely for its radium content. Radium processing ended in 1935 because of lower-priced radium coming from Belgium and Canada. Both radium and uranium can be obtained from the pitchblende. But in earlier years there was no appreciable commercial use for uranium. Hence the granular residue, once the radium was extracted, was dumped on a scrap pile. The scrap is also called "tailings".

15. The scrap or tailings are likely to be stored in the open air and in depression areas. It will resemble light colored beach sand, and will be finer than the finest beach sand. Its uranium oxide content is 1/4 - 1/3 of 1%. There may be 30,000 tons of tailings in the area. (This would yield about 90 tons of pure uranium oxide.

Characteristics of Pitchblende and Uranium Oxide

16. There are several characteristics of pitchblende and uranium oxide:

a. Weight. The outstanding characteristic is their heavy weight. This however, must be carefully defined:

(1) Let us assume no selection is done underground. The run-of-the-mine material which is brought to the surface will have a normal weight. For the run-of-the-mine material is only 00.3% pitchblende and 99.7% rock.

(2) Let us assume some selection is done above ground, much worthless rock is thrown away, so that the resulting mass is 10% pitchblende and 90% rock. This mass will be 1/2 again heavier than the comparable mass of run-of-the-mine material.

(3) Let us assume the selection is more intense so that the resulting mass is 60% pitchblende and 40% rock. This mass will be 3 times heavier than the comparable mass of ordinary rock or run-of-the-mine material.

b. Color. Pitchblende is black. The run-of-the-mine material is gray or white. Pitchblende is usually dull, but sometimes it may be shiny.

c. Shape. Pitchblende will break into irregular lumps. The worthless rock will break into flat, irregular shaped slabs or sheets.

TOP SECRET

Physical Appearance When Shipped

17. Whether shipped by rail or truck, the following characteristics will prevail:

a. If no processing takes place locally, the product shipped will be run-of-the-mine material. It will be loaded loose (not boxed or packaged). The rock as loaded will be gray or white in color; the shape will be flat, irregular-shaped slabs or sheets. Ten tons will in bulk as well as weight fill a 10-ton rail car.

b. Let us assume they are shipping a mixture of 90% rock and 10% pitchblende, as described in paragraph 16a (2). This will be loaded on rail cars or motor trucks loose (not boxed or packaged). The color will be dark gray with splotches of black, as if pieces of coal were mixed with it. Because of the high specific gravity of the now concentrated rock, a 10-ton rail car when loaded with its full 10 tons will appear only 60% full. In other words, if coal cars are used they will appear about half full.

c. Let us assume Joachimsthal is shipping a greatly enriched mixture of 40% rock and 60% pitchblende, as described in paragraph 16a (3). This will be in granular form. It will be packaged and will be very heavy.

(1) If it is shipped in bags or sacks, each bag will be half the size and twice the weight of a bag of Portland cement.

(2) It may be shipped in wood or steel drums. The drums must be very small (because of the great weight) to be lifted by laborers. If the drums are large, special equipment will be needed for lifting and hauling.

d. If the long-stored scrap or tailings are shipped by rail or truck, the following will be true. The granular tailings or "sand" will be shipped loose. The color will be a dirty yellow or gray. The granular tailings will be heavy and a rail car or truck will be but partially filled when loaded to capacity.

Other Intelligence Signs

18. Look for dirty wooden boxes of these unusual dimensions: 5 feet long, 1 foot wide, 2 inches high. Such boxes are used in transporting drill bores. A diamond drill in operation will loom up at least 12 feet above the surface of the ground. A typical sign when a drill is in operation: the surface of the ground will be covered with dirty oil for a great area around.

19. People resident in old mining towns are apt to talk about the extensive workings beneath the town. The accounts may be exaggerated but they are frequently indicative of the extent, limits and trend of the deposits. Should the conversation develop along such lines it would be good to express doubt whether the work went that far, or thirty feet less, or make some such innocuous statement to learn where present activity is located: (a) at the north side or south side (b) on the Schweizer, Hillebrand, Franz Joseph or other veins (c) in the west, east or Edellent mines (d) cleaning out old workings or in new development (e) extension of old galleries or opening new levels below 540 meters.

TOP SECRET

20. The really high grade and wide vein was the old Schweizer (Swiss) vein. There is a strong tendency of miners to recall the glory that the mine had and to compare each new rich pocket with the great bonanza. Any loose talk on rich pockets might be made good working capital by recalling the Schweizer vein on the upper levels and suggesting that the new one couldn't be half as good as that place had been.

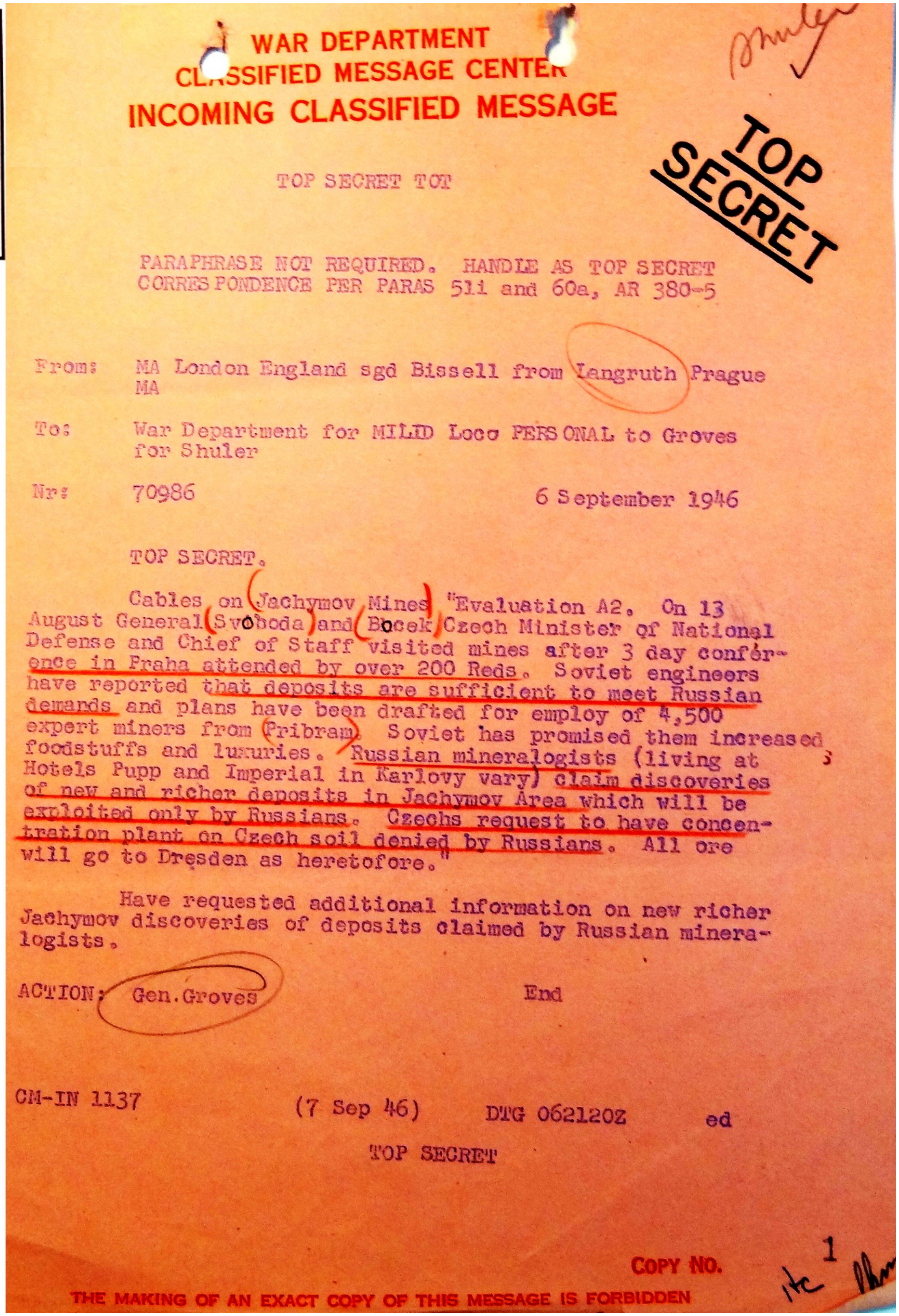
Edgar P. Dean.
EDGAR P. DEAN,
Lt. Colonel, AUS.

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

Figure D.85: U.S. Military Attaché London. 4 June 1946. Subject: Salient Facts on Joachimsthal [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia].

NARA RG 77, Entry UD-22A, Box 160, Folder 205.2 Cables Incoming, Top Secret January 1946 thru December 1946



WAR DEPARTMENT
CLASSIFIED MESSAGE CENTER
INCOMING CLASSIFIED MESSAGE

Shuler

TOP SECRET

TOP SECRET TOT

PARAPHRASE NOT REQUIRED. HANDLE AS TOP SECRET CORRESPONDENCE PER PARAS 51i and 60a, AR 380-5

From: MA London England sgd Bissell from Langruth Prague MA

To: War Department for MILID Loco PERSONAL to Groves for Shuler

Nr: 70986 6 September 1946

TOP SECRET.

Cables on Jachymov Mines "Evaluation A2. On 13 August General Svoboda and Bocek Czech Minister of National Defense and Chief of Staff visited mines after 3 day conference in Praha attended by over 200 Reds. Soviet engineers have reported that deposits are sufficient to meet Russian demands and plans have been drafted for employ of 4,500 expert miners from Pribram. Soviet has promised them increased foodstuffs and luxuries. Russian mineralogists (living at Hotels Pupp and Imperial in Karlovy vary) claim discoveries of new and richer deposits in Jachymov Area which will be exploited only by Russians. Czechs request to have concentration plant on Czech soil denied by Russians. All ore will go to Dresden as heretofore."

Have requested additional information on new richer Jachymov discoveries of deposits claimed by Russian mineralogists.

ACTION: Gen. Groves End

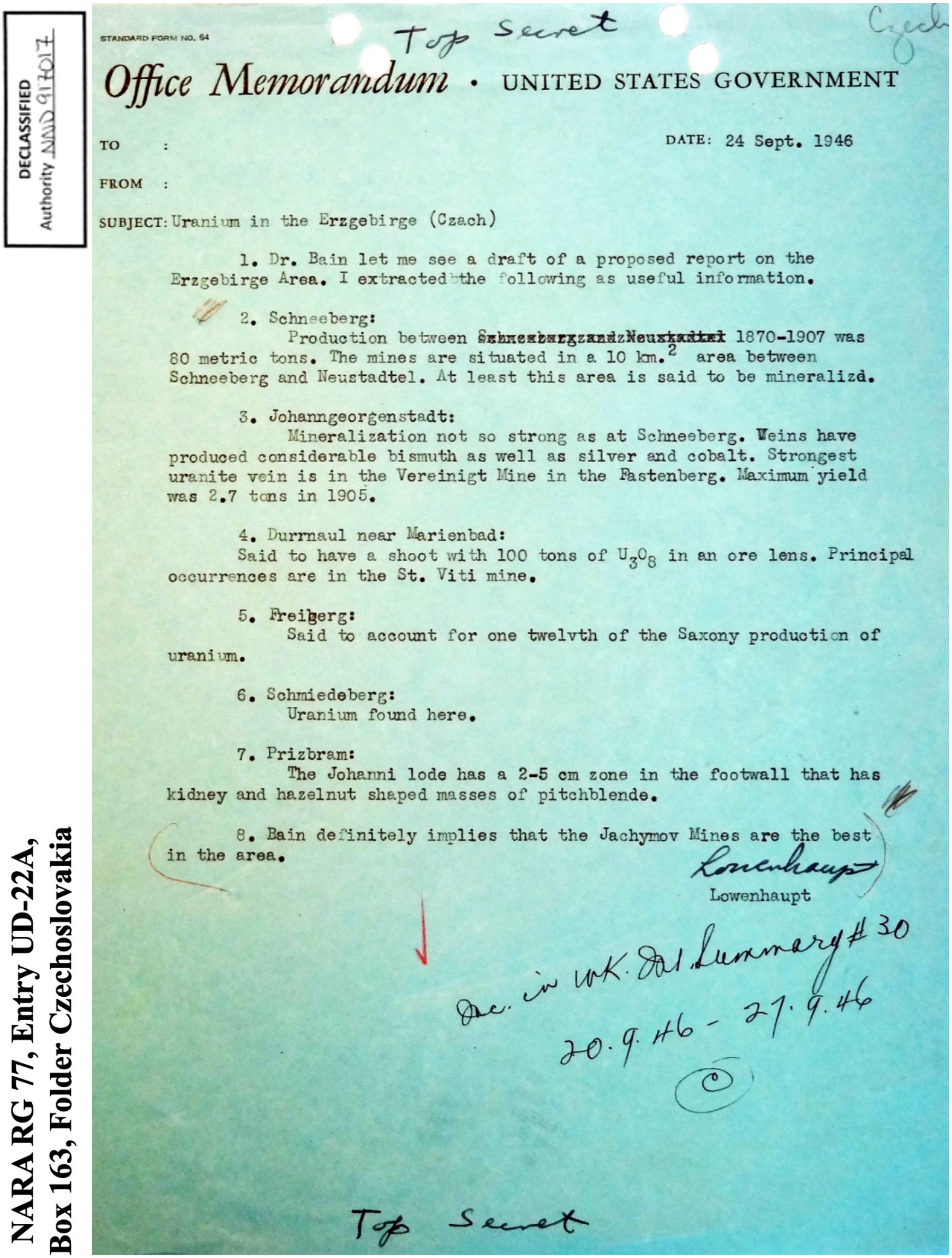
CM-IN 1137 (7 Sep 46) DTG 062120Z ed

TOP SECRET

COPY NO. 1

THE MAKING OF AN EXACT COPY OF THIS MESSAGE IS FORBIDDEN

Figure D.86: U.S. Military Attaché London to Leslie Groves. 6 September 1946 [NARA RG 77, Entry UD-22A, Box 160, Folder 205.2 Cables Incoming, Top Secret January 1946 thru December 1946]



DECLASSIFIED
Authority NND 917017

STANDARD FORM NO. 64

Top Secret

Czech

Office Memorandum • UNITED STATES GOVERNMENT

TO :

FROM :

DATE: 24 Sept. 1946

SUBJECT: Uranium in the Erzgebirge (Czach)

1. Dr. Bain let me see a draft of a proposed report on the Erzgebirge Area. I extracted the following as useful information.

2. Schneeberg:
Production between ~~Schneeberg and Neustadtel~~ 1870-1907 was 80 metric tons. The mines are situated in a 10 $km.^2$ area between Schneeberg and Neustadtel. At least this area is said to be mineralizd.

3. Johanngeorgenstadt:
Mineralization not so strong as at Schneeberg. Veins have produced considerable bismuth as well as silver and cobalt. Strongest uranite vein is in the Vereinigt Mine in the Fastenberg. Maximum yield was 2.7 tons in 1905.

4. Durrnaul near Marienbad:
Said to have a shoot with 100 tons of U_3O_8 in an ore lens. Principal occurrences are in the St. Viti mine.

5. Freiberg:
Said to account for one twelvth of the Saxony production of uranium.

6. Schmiedeberg:
Uranium found here.

7. Prizbram:
The Johanni lode has a 2-5 cm zone in the footwall that has kidney and hazelnut shaped masses of pitchblende.

8. Bain definitely implies that the Jachymov Mines are the best in the area.

Lowenhaupt

Lowenhaupt

Inc. in WK. Int. Summary # 30
20.9.46 - 27.9.46

Top Secret

NARA RG 77, Entry UD-22A,
Box 163, Folder Czechoslovakia

Figure D.87: H. S. Lowenhaupt. 24 September 1946. SUBJECT: Uranium in the Erzgebirge (Czech) [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia].

TOP SECRET THIS DOCUMENT CONSISTS OF 1 PAGES
NO. 1 (5 SERIES A

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

WAR DEPARTMENT
P. O. BOX 2610
WASHINGTON, D. C.

29 October 1946

SUBJECT: Uranium at Wichstadtl, Czechoslovakia.

TO: Area Engineer, Madison Square Area, Post Office Box 42, Station F, New York, N. Y. Attention: Lt. Col. A. W. Oberbeck

1. The following information has been obtained from an untested source:

a. The radioactive waters near Mladkov (Wichstadtl) Czechoslovakia (50° 8' N., 16° 37' E.) have three times the radioactivity of the Jachymov (Joachimsthal) waters.

b. Uranium deposits are known to be associated with these waters.

c. These deposits were never exploited by the Czechs because competition with Jachymov was not desired.

d. The Germans had planned to exploit these deposits.

e. The Russians are not interested in this area, possibly because it is unknown to them.

2. It is requested that this office be informed if anything further is known on radioactive waters or uranium lodes near Wichstadtl.

L. E. Seeman

L. E. SEEMAN
Colonel, Corps of Engineers

TOP SECRET

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

Figure D.88: Lyle E. Seeman. 29 October 1946. SUBJECT: Uranium at Wichstadtl, Czechoslovakia [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia].

TOP SECRET

THIS DOCUMENT CONSISTS OF 10 PAGES
COPY NO. 5 OF 5 SERIES A

DECLASSIFIED
Authority NND 917017

Washington, D. C.
5 December 1946

RUSSIAN MINING OPERATIONS IN THE GERMAN-CZECH BORDER REGION

By H. S. Lowenhaupt

I. Summary

a. This report is an attempt to coordinate intelligence on Russian uranium mining in the Erzgebirge. It must be clearly understood that not one single absolutely reliable informant has submitted a report on any area mentioned. At best, the report is a compilation of probably reliable to possibly reliable intelligence in which the number of informants agreeing, rather than the personal character of individual informants, is the standard of reliability.

b. All uranium mining and prospecting operations in the Saxony-Czechoslovak Border Region (the Erzgebirge) are carried out under the administration of the Soviet Army headquarters in Potsdam, Germany. Operations at Jachymov were under direct Russian control from August 1945 until February 1946, when administration of Jachymov was turned over to the Czechs under the Secret Fierlinger Agreement. Since late January 1946 Soviet geological reconnaissance parties have been stationed at Karlsbad. With the exception of Jachymov all uranium mines in the Erzgebirge are under direct Russian operational and security control.

c. Sites identified are:

1. Jachymov

Two mines in operation under Czech management and Russian scientific control. Probably 300 miners employed against pre-war total of 200 miners. Concentration plant no longer used, material being sent towards Dresden (Saxony) after preliminary handpicking. Pre-war output 12 tons U_3O_8 annually.

2. Johanngeorgenstadt

16 km. west of Jachymov. 6 mines in operation. 600 to 700 miners employed on three 8-hour shifts with 1200 more expected. Preliminary concentration done in the mines and then this material shipped to Russia. Mining operations started in July 1946 and it is known that the Russians were elated with their finds. Maximum pre-war output was 2.7 tons U_3O_8 in 1905.

3. Oberwiesenthal and Gottesgab

7 km. N.E. of Jachymov. Discovered in October. About 300 miners there starting digging operations and 300 more due. It is known that Russians consider Gottesgab better than Johanngeorgenstadt.

TOP SECRET

23.40
CR 33,9143

TOP SECRET

4. Schneeberg

35 km. N.W. of Jachymov. Between 1870 and 1907 produced 80 metric tons U_3O_8. Operations apparently started in August 1946. Recruiting of miners still in progress and Russians with families still moving in.

5. Spa Oberschlema

45 km. N.W. of Jachymov. Spa area taken over by Russians in September 1946. By October drilling and shaft sinking in full swing. It is not known what success was had.

6. Schonficht

40 km. S.W. of Jachymov. It is known that uranium occurs here in low concentration. An August report states that uranium was to be mined here.

7. Bad Elster

50 km. west of Jachymov. The Russians took over the Spa in September, apparently as a preliminary step to prospecting by drilling.

8. Bad Brambach

45 km. west of Jachymov. The Russians took over the Spa in September, apparently as a preliminary step to prospecting by drilling.

9. Schonfeld-Schlaggenwald

40 km. S.W. of Jachymov. An unconfirmed report of September 1945 states 2-3 tons of uranium ore shipped to Jachymov per week. No later report received.

d. The distance of all sites from Jachymov has been emphasized because current geological opinion is that the richness of mines falls off with their distance from Jachymov. Thus, as Jachymov produces 12 tons U_3O_8 per year, Johanngeorgenstadt may be expected to produce perhaps 8 tons annually at the same mining rate. Tending to increase output of all mines in the Erzgebirge, except Jachymov, is the apparent increase in the number of miners at any single mine by a factor of from 2 to 5 over the number expected under German practice. This may double expected output if these miners are used efficiently. Another factor to consider is that while the output of a single mine may be quite small, the sum of the outputs of a number of mines may become quite significant. We can thus set a minimum annual production of 15 tons U_3O_8 for the Erzgebirge region, and possibly 30 tons as a maximum.

TOP SECRET

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

Figure D.89: H. S. Lowenhaupt. 5 December 1946. Russian Mining Operations in the German-Czech Border Region [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia].

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

TOP SECRET

e. Of greater significance than current and possible output of the Erzgebirge mines is the precise destination of ores in Russia. It is fairly well established that concentration further than by handpicking is not done in the Erzgebirge area, that the concentrate from Jachymov is sent towards Dresden (north), and that the Johanngeorgenstadt ores go directly to Russia. But there the trail ends. There exists only one piece of information that may be of significance. One informant, of unknown reliability, stated that railroad cars of ore at Jachymov were supposed to go to Elektrostal (a town devoted to electro-alloy-steel manufacture some 30 miles east of Moscow.)

II. The Fierlinger Secret Agreement

a. It is now apparent that early in January 1946 a secret agreement was made between ex-Prime Minister Fierlinger and the Russian Government. From rumors and intelligence reports received since the end of January (8, 11, 14, 27, 18, 33, 36, 37, 38, 43, 47, 48, 49, 51)(Numbers refer to Appendix) this agreement is, in part at least, the basis for Russian mining operations in northwest Czechoslovakia, and must have contained the following terms:

1. The Russians will turn over to the Czechs the Stalin synthetic oil plant at Most.
2. The Czechs will retain and operate the Jachymov Mines, but the Russians will obtain all or at least half of the output, pay for uranium transferred, and act in consultant capacity on which ores are to be mined.
3. The Red Army will have the use of the Imperial and Richmond Hotels as well as some minor facilities at Karlsbad.
4. The Russians will be allowed a free hand in prospecting and mining for uranium anywhere in the Erzgebirge region near Karlsbad, and may set up such security restrictions around mining sites as they shall choose.
5. The Czechoslovakian Government will not permit export or sale of uranium to any nation except Russia.

III. Karlsbad, Czechoslovakia (50° 13' N., 12° 54' E.)

a. As a result of the Fierlinger treaty, the Russians took over the Karlsbad (20 km. S.W. of Jachymov) hotels Imperial and Richmond, a farm at Dalovice one mile to the north, and Giesshube Castle (38) sometime around 22 January 1946 (49). Apparently these hotels were chosen (48) because good physical security could be obtained without security measures being readily apparent. Early reports (34, 38) state that the Karlsbad area was being used as a resort for convalescent Russian soldiers.

b. By July, however, reports (34, 36, 57, 64) had made it apparent that Russian geologists and mining engineers were using the Imperial Hotel as a headquarters for the prospecting of the Erzgebirge area. So far as is known, the Karlsbad area is still the Russian prospecting headquarters.

* Appendix with original only.

-3-

TOP SECRET

TOP SECRET

c. Union Mines states that uranium specimens have been found at Karlsbad, but there is no indication that the Russians have seriously considered mining for uranium in this area.

IV. Jachymov, Czechoslovakia (50° 22' N., 12° 55' E.)

a. At Jachymov (2) there are three main mine shafts spaced in line at approximately one-mile intervals. They are:

1. The Wernerschacht and the Elias Adit west of town, with four veins being worked.
2. The Einigkeitschacht, near the Radium Palace in the center of town - no longer being worked.
3. The Edelleutstollen, east of town, with three veins being worked.

The veins themselves run north and south. The Germans concentrated the mined ore from about .2% as mined to 12% by hand-picking underground. This concentrate was then raised to 60% U_3O_8 in a concentration plant near the Edelleutstollen shaft, having a capacity of 10 tons of crude ore per day. The working force (1) ran about 200 miners. Stocks on 15 May 1945 were given as 3 tons of 60% concentrate, 20 tons of 11% crude ore concentrate, and 3,000 tons of concentration plant residue containing 0.8 to 1.0% U_3O_8. Probable reserves are estimated at 120 tons U_3O_8. The Czechs had evolved no method for the extraction of uranium from the low concentrate residue.

b. Intelligence reports on events at the mine since 15 May 1945 have been confusing and in many cases contradictory. The following picture has been evolved by ignoring many of good evaluation. It must, therefore, be taken as provisional. It appears that following the defeat of Germany (41) mining operations were desultory and carried on mainly by Czechs, the Sudeten German miners being forbidden to work in the mines. However, probably soon after the bombing of Hiroshima, the Russians occupied Jachymov with a fair concentration of troops, recalled the Sudeten miners and immediately set about the mining of uranium as fast as practicable. The legal basis for this action was probably that the Jachymov mines were German assets in Czechoslovakia (5), to which the Russians were entitled by the Potsdam agreement, while the use of German miners was secretly ordered by Deputy Prime Minister Gottwald (50). It is definitely known that from the end of September to the beginning of February Russian soldiers maintained road blocks at some distances from Jachymov (3, 4, 16, 18). Following the Fierlinger Agreement, sometime in early January, the mines were probably turned over to the Czech administration and operation. All but some 60 Russian soldiers left the area (19, 25, 23). Apparently, however, Russian experts remained at the mines (2, 28). In April a commission (29a), composed of Soviet scientists and senior officers and headed by Professor Lebedev, visited Prague to discuss the Jachymov situation. Soon afterwards there were reports of the arrival of Soviet scientists at Jachymov (29b, 29c), and also a report of the use of a Schlumberg geophysical prospecting machine. The remaining Russian soldiers (29c, 30) left the area early in April. Intelligence reports in March mentioned the erection of a building in the mining area, possibly

-4-

TOP SECRET

DECLASSIFIED
Authority NND 917017

TOP SECRET

for laboratories (19). A November report (44) indicates that a laboratory was installed at Jachymov to study extraction of uranium and that the personnel of this new laboratory are entirely Russian civilians.

c. Since early June there has been no restriction on access to Jachymov and a number of reports have mentioned the fact that Jachymov looks like a very sleepy town with nothing much doing (30,33). The number of Russians in Jachymov in recent months would appear to be increasing and several reports (29c, 32, 35, 38, 39, 40) indicate up to a hundred of them in town, although this is improbable. However, it is fairly certain that the Czechs are still in nominal control of the mines, and Russian engineers blocking out the ore they wish to be mined (35, 38, 42). A recent report (36) states that the Russians intend to import 4,500 miners from Pribram (probably mostly for mines other than Jachymov). Several reports indicate that miners are already obtaining increased foodstuffs (39), that this has caused some dissension in town, for the majority of people (9) in town are Czechs (most Sudetens having been displaced) and the miners are German. A November report (43) by an American industrialist states that Czech families are now being replaced by Russian families speaking flawless Czechoslovakian. Another November report states that the taking of pictures have been forbidden. These indicate a tightening of security in this area (39).

d. Reports on mine production since 15 May 1945 are likewise confusing. Reports of considerable trucking at night in October may mean the removal of the low concentrate residues at that time (19,21). It is possible that when the Czechs first took over the mines in February the concentration plant was run for a time (21). But July reports (35) indicated that about 400 to 500 tons of material per month were being moved out of Jachymov, mostly at night. This amount of material being moved out could only mean that material as mined without hand-picking was being shipped, and would be approximately .2 to .3% U_3O_8. A May report states that about one ten-ton railway car is shipped every ten days (29b). It this were so, material would be about 3% U_3O_8. A 10% concentrate (as under the Germans) would give an annual production of 36 tons, which is believed to be impossible. Of course it is possible that the mined ore is concentrated by hand-picking and then both the concentrate and the residue are sent as separate lots. A September report states that the Russians made it clear to the Czechs that they did not want to have a concentrating plant (36) on Czech territory, so it is assumed that no high-grade concentrate is shipped from Jachymov. An October report states that the output of pitchblende from the Elias Adit to the west of town has increased (46). A September report states that there is a rumor in Jachymov that the Radium Spa may be discontinued (40). This may be taken to mean that the Russians may intend to work the long-abandoned Einigkeitschacht in the center of town, for the Radium Baths receive their water from this mine. The increased foodstuffs, the alleged decision to bring in more miners, and the apparent increase in the number of Russian experts in the mine over a period of several months, all tend to show that the Russians are extremely interested in increasing production from Jachymov, which is probably not much greater than wartime production (22, 42, 35, 2 (original report)). Present number of miners is estimated at 300 (13, 32, 35, 40, 39).

TOP -5- SECRET

TOP SECRET

e. Reports on the destination of ore from Jachymov are almost unanimous in stating that the ore goes by truck and rail to Saxony, possibly either Dresden or Chemnitz (12, 26, 17, 20, 25, 27, 35, 36), and thence to Russia. There are two reports which indicate specific destinations in Russia: one, a June report (29d) of undetermined reliability states that on 21 February 1946 a Russian officer, Capt. Sherbatov, took delivery in Jachymov of two railway cars of ore consigned to "Polarnaya Lisistschka" (Polar Fox) - search fails to disclose any such town and it must be assumed that Polar Fox is a code name; the other report, rated fairly reliable, states that 10-ton railway cars are sent every ten days to Russia and that about 16 May it was noted that the destination was Elektrostal (29b). Inasmuch as the informant states that he had never heard the word "Elektrostal" before, it is possible that this information is of considerable value. Elektrostal is about 30 miles east of Moscow, the site of a large electric alloy-steel manufacturing plant.

V. Johanngeorgenstadt, Saxony: (50° 26' N., 12° 44' E.)

a. Johanngeorgenstadt is in Germany on the German-Czechoslovakian border some 16 km. west of Jachymov. The Czech town of Breitenbach is less than a kilometer to the east, the border running north and south between them. There are rail connections to Karlsbad (Karlovy Vary) in Czechoslovakia and by way of Aue to Zwickau and Chemnitz in Germany.

b. Uranium is known to occur (60) in a number of silver-bismuth-cobalt veins 10 to 20 cm. in thickness cutting the slates within a 2½ km. radius to the northwest, west, and southwest of Johanngeorgenstadt. This town has been a mining center for centuries, although Dr. G. W. Bain says that mineralization is not so strong as at Schneeberg (65). He states that the strongest pitchblende vein is in the Vereinight Mine. From 1870 to 1913, 12.2 tons U_3O_8 were produced with a maximum yield of 2.7 tons in 1905. Dr. Davidson (60) considers an output in excess of a few tons per year unlikely.

c. In January 1946, (51), or possibly as late as June (56), Soviet geological parties now stationed at Karlsbad (64) started to investigate these deposits. By July security measures were in force and the ore heap between the Talstrasse and the railroad was being sifted to recover discarded pitchblende from former mining operations. Exploratory shafts had been driven into the hillside west of Talstrasse. The inhabitants of three or more streets in this area were warned to move by the middle of July to avoid possible collapse of houses due to blasting. A 5000 volt, 3-wire (3 phase) electric power line from Schwartzberg to Johanngeorgenstadt was installed by Siemens-Dresden, but reports (55) and (63) indicate that it was early October before power was being used by the mines themselves.

d. Report (51) states that considerable finds of pitchblende were made in abandoned gold and silver mines 3 to 5 km. southwest of town. Davidson (60) states that this area is granite and therefore the likelihood of large veins is low. Other reports concentrate on an area close to town in a southwesterly direction. It may be that veins, discovered to have pitchblende in the granite area, were followed northeast by the Soviets into the slate area where wider veins might be expected. In any event (54) states core drilling was in progress in July and apparently cores were being analyzed on the spot.

TOP -6- SECRET

Figure D.90: H. S. Lowenhaupt. 5 December 1946. Russian Mining Operations in the German-Czech Border Region [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia]. "Uranium is known to occur... in a number of silver-bismuth-cobalt veins 10 to 20 cm. in thickness cutting the slates within a 2 1/2 km. radius to the northwest, west, and southwest of Johanngeorgenstadt... [T]he strongest pitchblende vein is in the Vereinigt Mine. From 1870 to 1913, 12.2 tons U_3O_8 were produced with a maximum yield of 2.7 tons in 1905."

NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia

TOP SECRET

It is reliably known (47) that the main Soviet Headquarters in Potsdam were greatly excited over Soviet discoveries at Johanngeorgenstadt.

e. Report (54) also mentions a prospecting party of 20 specialists under a Red Army General. As there are other references to Soviet generals (68) in charge of mining activities, this reference has some weight. Lt. Col. Richard H. Free interprets the presence of generals to mean that pitchblende mininghas a high-priority, that the Army is being used as the only organization in this area with adequate facilities for accomplishing the task, and that generals have been used to command operations because all officers of lower grade in the Red Army are not allowed command authority with independent action.

f. Labor for the mines has been supplied by drafting local inhabitants through the local labor office. Apparently their first request was for 6-8,000 persons (53). October reports (63, 62, 64) state that 600 to 700 miners are employed with recruiting still in progress. The Russian Military under Colonel Bachvalov act as supervisors and guards. Aided by seven Russian scientists (61, 62), German foremen direct the miners in three 8-hour shifts. There are no laboratory buildings in the area (63) and none contemplated. Apparently local unemployed people were being drafted in October to build barracks for an additional 1200 men.

g. Reports (58), (61) and (63) state that Vereinigt Felt and Gottes Segen mines southeast of town, the Himmelsfahrt Schacht northwest of town, and the Frischglueck, Lehmergrube and Guentherschacht mines are being worked for pitchblande. It is to be noted that only operations at Himmelsfahrt Schacht and Vereinigt Felt are confirmed by two or more reports. Russian security measures may account for this. Report (62) states that the mines appear to have reached a depth of 300 meters. A sample of pitchblende (58) obtained in September from the Vereinight mine was analyzed as being high-gradd,coming from a stringer at least 2" wide, and having been recently mined from around the depth of the water table. This is in some measure a confirmation of the figure of 300 meter depth, as the water table at Jachymov is 1000 ft. below surface. The installations (62) are said to be primitive, being without ventilation or mining cages. A mid-October report (63) states that at the Vereinigt Felt the ore is sorted underground for a high-grade pitchblende concentrate and then the residue re-sorted on the basis of color (presumably for a low-grade concentrate possibly containing other desired elements.)

h. Report (51) states that regular shipments of pitchblende occurred as early as July. A September report (55) stated that the pitchblende was crated under close supervision and shipped out as soon as mined. Report (61) states that a freight train carries the pitchblende to Russia every three months, with one leaving on 15 October with destination Moscow, according to rail employees. (62) states ore is shipped to Russia possibly by plane. (63) states that the concentrates (high and low-grade) are shipped in special three-day express trucks to Moscow. Thus the majority of reports indicate immediate shipment of concentrates; all indicate a destination of Russia; and some state Moscow as the specific destination.

- 7 -

TOP SECRET

TOP SECRET

i. Report (11) estimates the monthly concentrate to weigh about 6 tons, but only names mines west of Johanngeorgenstadt. Report (62) says that it is rumored that findings at the mines have not been up to Russian expectations and that miners are being driven to increase production. Some measure of confirmation is provided by the statement in (63) that barracks for 1200 more men are being built, since the Russian method of increasing production is usually to put more manpower on the job.

j. Report (57) states that by October the MVD had taken over the towns of Johanngeorgenstadt and Breitenbach. Reports as early as July indicate strict security measure (51). Roads to the mines (56) had been road-blocked and the resort hotel in Breitenbach has been forbidden to take guests. A private communication from D. C. G. Gattiker indicates that the whole area is patrolled by Russian soldiers. Since, however, this is a frontier town of some strategic importance, the mere presence of Russian troops is not necessarily significant. It is significant that the restricted area extends into Czechoslovakia.

VI. Oberwiesenthal and Gottesgab, Czechoslovakia (50° 36' N., 12° 58' E.)

a. Oberwiesenthal is on the German-Czech border about 7 km. northeast of Jachymov. Union Mines has recorded the finding of pitchblende at the Annaberg Mine, Oberwiesenthal, but there is no record of there ever having been any serious mining for uranium. Gottesgab is 3 km. west of Oberwiesenthal on the road to Jachymov, 5 km. away.

b. Mid-September reports (36, 66) state that in the vicinity of the village new pitchblende deposits have been discovered and were at that time being worked.

c. It is reliably reported (47) that on or about 27 October 1946 Soviet geologists discovered uranium near Gottesgab. Secret orders have been issued from Potsdam proclaiming Gottesgab a restricted area. The Soviets believe this deposit to be richer than the one found at Johanngeorgenstadt. By November there were 311 miners working there and 294 miners being moved there on a Top Priority basis.

VII. Schneeberg, Saxony (50° 36' N., 12° 43' E.)

a. Schneeberg is some 35 km. northwest of Jachymov near the town of Aue. Aue has rail connections with Karlsbad through Johanngeorgenstadt, and with Chemnitz and Zwickau. Dr. G. W. Bain (65) states that the Schneeberg mines are in a 10 km^2 mineralized area between Schneeberg and Neustadtel to the south. Production in the thirty-seven year interval between 1870 and 1907 was 80 metric tons. Union Mines lists uranium at Schneeberg, Neustadtel, Burckhardt Grauen, Rohna, and Pfannenstiel. But whether the last three are mines or villages is not stated.

b. An intercept (67) dated 25 August 1945 states that the Russians are going to finance and enlarge the uranium mines at Schneeberg. The labor exchange makes returning young men work in the mines, and additional foodstuffs are provided for miners. Russian engineers, many with their families, are

- 8 -

TOP SECRET

TOP SECRET

coming to Schneeberg. Report (68) states the mines are being worked under two Russian Generals by Russian experts. It also states that no Germans are employed there, obviously at variance with (67). (68) concludes by stating that the pitchblende is shipped as soon as it is mined.

VIII. Spa Oberschlema, Saxony (50° 40' N., 12° 40' E.)

a. Oberschlema is about 5 km. north of Schneeberg and some 45 km. northwest of Jachymov.

b. Information, mostly from letter intercepts, indicates that the Kurhotel (73) was requisitioned in late August for the billeting of Russian officers. By 15 September (73, 74) a large number of miners were billeted in private houses, large tracts of land fenced in, and a great many Russians were said to be in town. During the week of 23 September 500 miners were due to arrive to do boring and dynamiting (76). Some houses were to be evacuated because of possible danger of collapse. Intercept (78) of late September states that drilling was going on in the park of the Spa, and the writer of (76) was worried lest the Spa be ruined. The labor office has been ordered to draft all necessary men for the job.

c. Intelligence reports (72) and (77) are difficult to reconcile with the foregoing, for they indicate marked increase in pitchblende extraction by mid-September and state that the pitchblende was going to Russia. As this office has no record of previous pitchblende mining at Oberschlema, it must be assumed that these informants were overenthused.

IX. Schonficht, Czechoslovakia (50° 4' N., 12° 36' E.)

a. Schonficht is 12 km. northwest of Marienbad and some 40 km. southwest of Jachymov. Welsh (71) states that a commercial report on the possibilities of pitchblende at Schonficht sums up the situation by saying that the uranium occurs in small quantities irregularly distributed in mica shist. Davidson feels that unless a new set of veins have been found, Schonficht is unlikely to yield much uranium.

b. An August report (69) states that extensive uranium deposits have been found here. The same report indicates Schonficht is going to be the site of a large military camp and that the population of 16 villages is being moved out of the area. No mention is made as to whether this is to be a Czech post or a Russian post.

X. Bad Elster, Saxony (50° 16' N., 12° 14' E.)

a. Bad Elster is a watering resort 10 km. northeast of the Saxony town of Asch and 50 km. west of Jachymov.

b. A single September report (46) states that the Russians have taken over the spa area, apparently for prospecting, but at that time no drilling or mining was being done in the area.

- 9 -

TOP SECRET

TOP SECRET

XI. Bad Brambach, Saxony (50° 13' N., 12° 19' E.)

a. Bad Brambach is a watering resort 9 km. east of Asch and 50 km. west of Jachymov.

b. A single September report (46) states that the Russians have taken over the spa area, apparently for prospecting purposes, but at the time of the report no drilling or mining was seen in the spa area.

XII. Schonfeld-Schlaggenwald, Czechoslovakia Mine (50° 8' N., 12° 48' E.)

a. The Schonfeld-Schlaggenwald Mine is a tin and tungsten mine 12 km. northwest of Marienbad and 40 km. southwest of Jachymov.

b. In November 1945 the Managing Director of the British and Continental Mining Syndicate, Ltd., a supposedly reliable person (79), stated that there were weekly shipments of 2 to 3 tons of ore to Jachymov that could not be logically explained unless these shipments contained uranium. At the mine he had heard that there was a uranium-bearing vein in the mine which the Germans had proposed to work. He submitted a sample for analysis. No uranium was found in the sample. However, Union Mines lists Schlaggenwald as a site where uranium has been reported in the literature. Thus it is possible that this mine is shipping uranium, but that the director did not get hold of a proper sample.

c. In any event, no further intelligence has come in on uranium mining activities at this mine.

H. S. LOWENHAUPT

- 10 -

TOP SECRET

DECLASSIFIED
Authority NND 917017

Figure D.91: H. S. Lowenhaupt. 5 December 1946. Russian Mining Operations in the German-Czech Border Region [NARA RG 77, Entry UD-22A, Box 163, Folder Czechoslovakia]. "Schneeberg mines are in a 10 km^2 mineralized area between Schneeberg and Neustadtel to the south. Production in the thirty-seven year interval between 1870 and 1907 was 80 metric tons [U_3O_8]. Union Mines lists uranium at Schneeberg, Neustadtel, Burckhardt Grauen, Rohna, and Pfannenstiel."

TOP SECRET

THIS DOCUMENT CONSISTS OF 2 PAGES
COPY NO. 1 OF 3 SERIES A

17 December 1946

MEMO TO FILE

FROM: H. S. Lowenhaupt

SUBJ: Tin and Tungsten Mining in the Erzgebirge.

1. Altenberg and Zinnwald (50° 46' N., 13° 47' E.)

According to a U. S. report, cassiterite, wolframite, and pure bismuth occur in strata surrounding a granite dome. These two mines were owned by the Zwitterstocks Corporation and the Zinnwalder Mining Company. Both mines were worked regularly up to 1938. Presumably about 1938 a central ore dressing plant was set up in Altenberg and a crushing plant for further benefication was set up in Freiberg* (50° 55' N., 13° 21' E.) some 20 km. northeast of Chemnitz. This plant had a daily capacity of 300 tons.

2. Ehrenfriesdendorf (50° 39' N., 12° 58' E.)

The Ehrenfriedersdorfer Vereinigt Felt Fundgrube, 24 Km. east northeast of Schneeberg, consisting of 6 ranges of veins of total length of 2 km. and locally containing molybdenum as well as cassiterite and wolframite, may have been worked by the Germans.

U.K. Int. Summary #42 13-20 Dec/46

3. Tannenbergstal (50° 26' N., 12° 27' E.)

The Tannenberg mine with tin bearing "greisen" may have been worked. (20 km. southwest of Schneeberg and 19 km. west of Johanngeorgenstadt.) Mine is in giant quartz vein in the Aue granite.

4. Gottesburg* (50° 25' N., 12° 28' E.)

The Gottesberg-Weidmannsheil-Vereinigt Felt mines may have been worked for tungsten. Gottesburg is 1½ km. southeast of Tannenbergstal.

5. Zschorlau* (50° 34' N., 12° 39' E.)

The Zschorlauer Bergsegen, some 3 km. south of Schneeberg may have been worked for tungsten.

6. Pobershau* (50° 38' N., 13° 11' E.)

Near Marienberg. There were no regular operations undertakn by the Germans at the tungsten veins here.

7. Eibenstock* (50° 30' N., 12° 36' E.)

At Donitzgrund near Eibenstock, 12 km. northwest of Johanngeorgenstadt

Cy #1 –
#2 – Comb. Office
#3 – [illegible]

~~TOP~~ SECRET

per Him 24 Feb 53

and 11 km. south of Schneeberg there is tungsten which was not worked by the Germans.

8. Schmiedeberg* (50° 35' N., 13° 9' E.)

Sadisdorf near Schmiedeberg contains a tungsten vein which was not worked by the Germans.

9. Olsnitz in Vogtland near Lauterbach* (not found) has tungsten which was not regularly worked by the Germans.

U.K. Int. Summary #42 13-20 Dec/46

10. A wolframite sample has recently been received reputedly from Zschorlau.

11. From the evidence in (3) and (4) above, it must be recognized that the Russians may be mining only tungsten in localities at which uranium mining has been reported.

Lowenhaupt
H. S. LOWENHAUPT

*Uranium specimens have been reported from all places marked with an asterisk, according the Union Mines bibliographical search.

NARA RG 77, Entry UD-22A, Box 163, Folder Australia

Figure D.92: H. S. Lowenhaupt. 17 December 1946. SUBJ: Tin and Tungsten Mining in the Erzgebirge [NARA RG 77, Entry UD-22A, Box 163, Folder Australia].

HEADQUARTERS
EUROPEAN THEATER OF OPERATIONS
UNITED STATES ARMY
ALSOS MISSION
Northern Base

11 May 1945

SUBJECT: 1. Medical Publications Given by Dr. Georg Mattig, 9 May 1945.
2. Interview with Prof. K. Bonnhoefer of the University of Leipzig, 10 May 1945.
3. Interview with Dr. W. Büchler, Director of the Büchler Chemische Fabrik of Braunschweig, 11 May 1945.
4. Interview with Dr. Eisenberg, Braunschweig, 11 May 1945.

TO : Scientific Chief, Alsos Mission, APO 887, U. S. Army.

1. MEDICAL PUBLICATIONS GIVEN BY DR. GEORG MATTIG, 9 MAY 1945.

Dr. Mattig having sent word that a number of recent medical publications were available in the library of the Hygienisches Institut of the University of Göttingen, selected a number of recent Army Medical Publications together with Atlas's showing the spread of diseases, and gave them to the writer. They appeared to be of no interest to Alsos, but will be forwarded to the Paris office, where Captain Cromartie may care to examine them and turn them over to the medical authorities to whom they may be of interest. Dr. Mattig, who normally engages in medical research in Frankfurt, is confined to Göttingen as a prisoner of war.

2. INTERVIEW WITH PROF. K. BONNHOEFER OF THE UNIVERSITY OF LEIPZIG, 10 MAY 1945.

A visit to Prof. K. Bonnhoefer, Director of the Physicochemical Institute of the University of Leipzig, was made at his summer place in Friedrichsbrunn über Gernrode, Ost-Harz. As was anticipated, the visit yielded no information of real importance but threw a certain amount of light upon matters of personnel interest. Prof. Bonnhoefer was greatly aged and worn. Two of his brothers had been condemned to death for participation in the 20 July revolution of last year, and he did not know whether the sentence had been carried out. Under the circumstances, he is strongly anti-Nazi. Although he has been working on war projects,

NO DEPT. OF ENERGY CLASSIFIED INFORMATION (NO RD/FRD/~~DOE-NSI~~)
COORDINATE WITH: DOD
BEFORE DECLASSIFICATION/RELEASE
AUTHORITY: DOE-DPC
BY R. HAMBURGER, DATE: 3/28/86
HRSchmitt 4/1/86

- 1 -

SECRET

he claimed that they were of no real military importance. He followed the line taken by a number of other German scientists in saying that the war had been made to serve science rather than science the war. He played down the importance of heavy water, and expressed the view that it would be ten years before any practical use could be made of it in the atomic energy problem. He claimed to be very much on the outside in this problem and said that Harteck and Clusius were in the inner circle with Gerlach, Heisenberg and Bothe. He said that Harteck, Hahn, Hund and Jost were among the good scientists who were very definitely not Nazis. He had had under consideration for some months, a full time position with Osram.

3. INTERVIEW WITH DR. W. BÜCHLER, DIRECTOR OF THE BÜCHLER CHEMISCHE FABRIK OF BRAUNSCHWEIG, 11 MAY 1945.

Dr. W. Büchler, Director of the Büchler Chemischen Fabrik, Frankfurterstr. 294, Braunschweig, was interviewed on 11 May 1945, in the one small building remaining of his factory at that address. The principal function of his company at the present time is producing quinine under the supervision of Allied Military Government. One of the company's normal lines of work is the extraction of radium from ore obtained from their own mine in Joachimstal, a mine rented from the government. Of recently produced radium, approximately one (1) gram was shipped to Strassburg, while one (1) gram remained with the company. Before the war, the major portion of the uranium oxide produced was donverted to a yellow pigment for use in paint manufacture. With the coming of the war, the government forbade that use of uramium and required that it be converted to ammonium uranate, which was shipped to the Roges Company in Berlin. Roges may have shipped it in turn to Auer, but Büchler is not certain of the destination of the material after it was sent to Roges. He volunteered the information that it was converted into metallic uramium for use in atom smashing ("Atomzertrümmerung"). Büchler estimated that the company had on hand about four (4) tons of ammonium uranate, one (1) to two (2) tons of sodium uranate, and three (3) tons of raw material containing about 55% uranium oxide. The records of the company are at Boerssum. The radium produced by the company was used for the filling of small tubes, for cancer treatment, and was handled by Allgemeine Radium A.G., Berlin, a small company "bought" from Katanga, the Belgium concern. A certain amount of radioactive material was shipped to various watch making companies in the Schwarzwald.

When asked about radium supplies in Germany, Dr. Büchler said that considerable quantities were available in hospitals throughout Germany, and that a quantity of about thirty (30) grams acquired by the Reichsanstalt from Belgium was hidden in a cave which he thought to be in the Thüringerwald. He said that the Belgians were aware of

- 2 -

SECRET

of this. This would appear to be the material of which we have heard from other sources.

4. INTERVIEW WITH DR. EISENBERG, BRAUNSCHWEIG.

Dr. Eisenberg of Gausstr. 13, Braunschweig, was interviewed with his wife at Nordstr. 46, Braunschweig, where he is staying with his sister. He said that he had developed an acoustic fuse which had received a successful try-out. It was designed for a bomb to be dropped from a plane on enemy bombers. In the single try-out, it was dropped from a height of about a thousand meters above another plane and exploded at a distance of about 15 meters from the second plane. As his institute was destroyed by bombing, and as materials could not be obtained for further work, the fuse did not go into production. The reports dealing with the work are at Eisenberg's summer place at Auerhahn bei Goslar. Dr. Kuiper and the writer expect to visit Auerhahn and obtain these reports within the next 24 hours and will forward them. Dr. Heinz Stappenbeck, Braunschweig-Lehndorf, Saarstr. 7, was also engaged on the work.

CHARLES P. SMYTH,
Expert Consultant.

- 3 -

SECRET

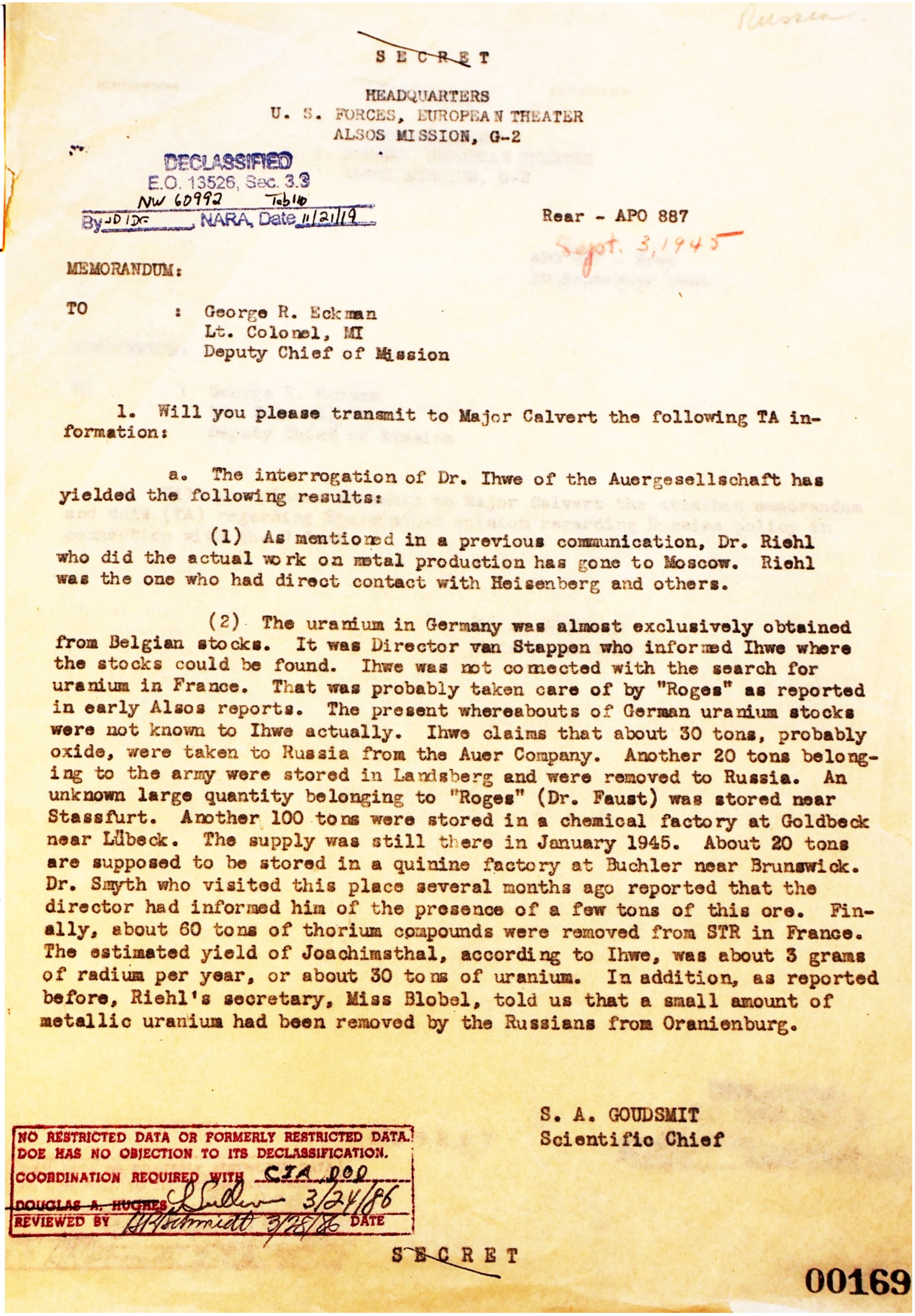
NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Reports and Operations 5/21

DECLASSIFIED
Authority NW87071

Figure D.93: Charles P. Smyth. 11 May 1945. SUBJECT... 3. Interview with Dr. W. Buchler, Director of the Buchler Chemische Fabrik of Braunschweig, 11 May 1945... [NARA RG GOUDS, Entry UD-7420, Box 6, Folder Alsos Reports and Operations 5/21].

DECLASSIFIED
Authority NW87071

NARA RG GOUDS, Entry UD-7420, Box 3, Folder
"Historian's Office Inventory Control Job Goudsmit Box 4 Folder 6"



Russia

~~SECRET~~

HEADQUARTERS
U. S. FORCES, EUROPEAN THEATER
ALSOS MISSION, G-2

DECLASSIFIED
E.O. 13526, Sec. 3.3
NW 60992 Tab 1b
By JD/DC NARA, Date 11/21/19

Rear - APO 887
Sept. 3, 1945

MEMORANDUM:

TO : George R. Eckman
Lt. Colonel, MI
Deputy Chief of Mission

1. Will you please transmit to Major Calvert the following TA information:

a. The interrogation of Dr. Ihwe of the Auergesellschaft has yielded the following results:

(1) As mentioned in a previous communication, Dr. Riehl who did the actual work on metal production has gone to Moscow. Riehl was the one who had direct contact with Heisenberg and others.

(2) The uranium in Germany was almost exclusively obtained from Belgian stocks. It was Director van Stappen who informed Ihwe where the stocks could be found. Ihwe was not connected with the search for uranium in France. That was probably taken care of by "Roges" as reported in early Alsos reports. The present whereabouts of German uranium stocks were not known to Ihwe actually. Ihwe claims that about 30 tons, probably oxide, were taken to Russia from the Auer Company. Another 20 tons belonging to the army were stored in Landsberg and were removed to Russia. An unknown large quantity belonging to "Roges" (Dr. Faust) was stored near Stassfurt. Another 100 tons were stored in a chemical factory at Goldbeck near Lübeck. The supply was still there in January 1945. About 20 tons are supposed to be stored in a quinine factory at Buchler near Brunswick. Dr. Smyth who visited this place several months ago reported that the director had informed him of the presence of a few tons of this ore. Finally, about 60 tons of thorium compounds were removed from STR in France. The estimated yield of Joachimsthal, according to Ihwe, was about 3 grams of radium per year, or about 30 tons of uranium. In addition, as reported before, Riehl's secretary, Miss Blobel, told us that a small amount of metallic uranium had been removed by the Russians from Oranienburg.

S. A. GOUDSMIT
Scientific Chief

NO RESTRICTED DATA OR FORMERLY RESTRICTED DATA.
DOE HAS NO OBJECTION TO ITS DECLASSIFICATION.
COORDINATION REQUIRED WITH CIA DOD
DOUGLAS A. HUGHES 3/24/86
REVIEWED BY H Schmidt 3/28/86 DATE

~~SECRET~~

00169

Figure D.94: Samuel Goudsmit to George R. Eckman. 3 September 1945 [NARA RG GOUDS, Entry UD-7420, Box 3, Folder "Historian's Office Inventory Control Job Goudsmit Box 4 Folder 6"]. "About 20 tons are supposed to be stored in a quinine factory at Buchler near Brunswick."

Sabine Elisabeth Gollmann. 1994. *Die Radium- und Uranabteilung der Treibacher Chemischen Werke: Unter Berücksichtigung des deutschen Atombombenprojektes während des Zweiten Weltkrieges.* Ph.D. thesis. Graz: University of Graz. p. 128.

Der Anschluß an das Dritte Reich wurde seitens der Treibacher Geschäftsleitung sehr positiv aufgenommen, da man sich eine Verbesserung der wirtschaftlichen Lage erhoffte. 1939 wurden die TCW Mitglied der St. Joachimsthaler Bergbaugesellschaft m. b. H. und bezogen dadurch den größten Teil der Rohstoffe aus St. Joachimsthal (Böhmen). Das Kärntner Unternehmen erhielt von dieser wichtigen Erzlagerstätte auch Uranpechblende und es wurde 1940 innerhalb der Radiumabteilung ein eigener Bereich für Uran eingerichtet. Ein Gesellschaftspartner der JOBERG war die Auergesellschaft in Berlin, welche eng mit dem deutschen Atombombenprojekt im Zweiten Weltkrieg verknüpft war. Die Berliner Firma ließ während des Krieges ihre Erzkonzentrate aus St. Joachimsthal in Treibach umarbeiten. Daher sind Beziehungen der TCW, wenn auch über Dritte, zum Kernenergieprojekt sehr wahrscheinlich. Mehrere Indizien sprechen dafür, absolute Beweise sind allerdings nicht mehr auffindbar. Wichtig ist sicherlich, daß ab Anfang der vierziger Jahre radioaktive Substanzen nur mehr für Rüstungszwecke verwendet werden durften. So wurde Radium ab 1942 nur mehr für die Leuchtfarbenherstellung innerhalb der Rüstungsindustrie genutzt.

Im Mai 1945 wurde Kärnten von englischen Truppen besetzt. Die Treibacher Werke wurden als Deutsches Eigentum eingestuft, da ein beträchtlicher Aktienanteil im Besitz eines deutschen Unternehmens gewesen ist. Das gesamte Mesothor und Radiothor wurde von den Engländer beschlagnahmt und später entschädigt. Auf Grund des dadurch entstandenen Rohstoffmangels wurde die Radium- und Uranabteilung 1946 stillgelegt.

The [Austrian] Anschluss by the Third Reich was very positively received by the Treibacher management, because they hoped for an improvement of the economic situation. In 1939 the TCW became a member of the St. Joachimsthaler Bergbaugesellschaft m. b. H. and thus obtained most of the raw materials from St. Joachimsthal (Bohemia). The Carinthian company also received uranium pitch blends from this important ore deposit and in 1940 a separate uranium division was set up within the radium department. One of JOBERG's partners was the Auergesellschaft in Berlin, which was closely linked to the German atomic bomb project in the Second World War. During the war, the Berlin company had its ore concentrates from St. Joachimsthal reworked in Treibach. Therefore, TCW's relations to the nuclear energy project, albeit via third parties, are very probable. There are several indications, but absolute evidence is no longer to be found. It is certainly important to note that from the beginning of the forties radioactive substances were only allowed to be used for armament purposes. From 1942 onwards, radium was only used for the production of fluorescent paints within the armaments industry.

In May 1945 Carinthia was occupied by British troops. The Treibacher Werke were classified as German property, as a considerable share was owned by a German company. All of the mesothorium and radiothorium was confiscated by the British and later compensated. Due to the resulting shortage of raw materials, the radium and uranium division was shut down in 1946.

[Treibacher Chemical Works in Austria had very similar uranium- and thorium-processing capabilities to Auergesellschaft in Germany, yet historically it has been much less well known and much less studied. How much work could Treibacher Chemical Works have done for a nuclear weapons program during the war? From how many different sources did Treibacher receive uranium and thorium ore? How much uranium and thorium did Treibacher process during the war? Where did Treibacher send the uranium and thorium that it processed?]

Report on Treibacher Chemical Works AG. 10 October 1945. [See document photos on pp. 3452–3454. CIOS ER 343; AFHRA folder 119.0412-340 Nos. 340/347, IRIS 110766; AFHRA A1008 frames 0794–0797.]

[...]

Firm representatives seen:

Dr. Harmann Auer von Welsbach
Dr. Techn. Fritz Gemillscheg
Dr. Karl Buche
Dr. Haas (?) (in charge of radium plant)

1. This firm was founded in its present form by the great chemist Auer von Welsbach who invented the Thorium oxide gas mantle, "Mischmetall" lighter flint metal and did a great deal of research work on "Rare Earth" group of elements.

This is a firm of first class importance as it is one of the very few firms in the world which produces radium.

2. Principal Products.

(a) Radium Salts

Before the war this firm produced on an average of 8 or 9 grammes of Radium (as Radium Bromide) per year. This is a very large output. The radium was produced mostly on British orders from Pitchblende ore imported from the Congo. During the war they used Pitchblende from Joachimstahl in Czechoslovakia (where it was first discovered) and from Erzgebirge. These sources of supply are now closed, and the firm has not pitchblende in stock. [...]

(b) Mesothorium Salts

This element is even more powerfully radioactive and more dangerous to handle than Radium. It is produced in small quantities.

(c) Uranium Salts

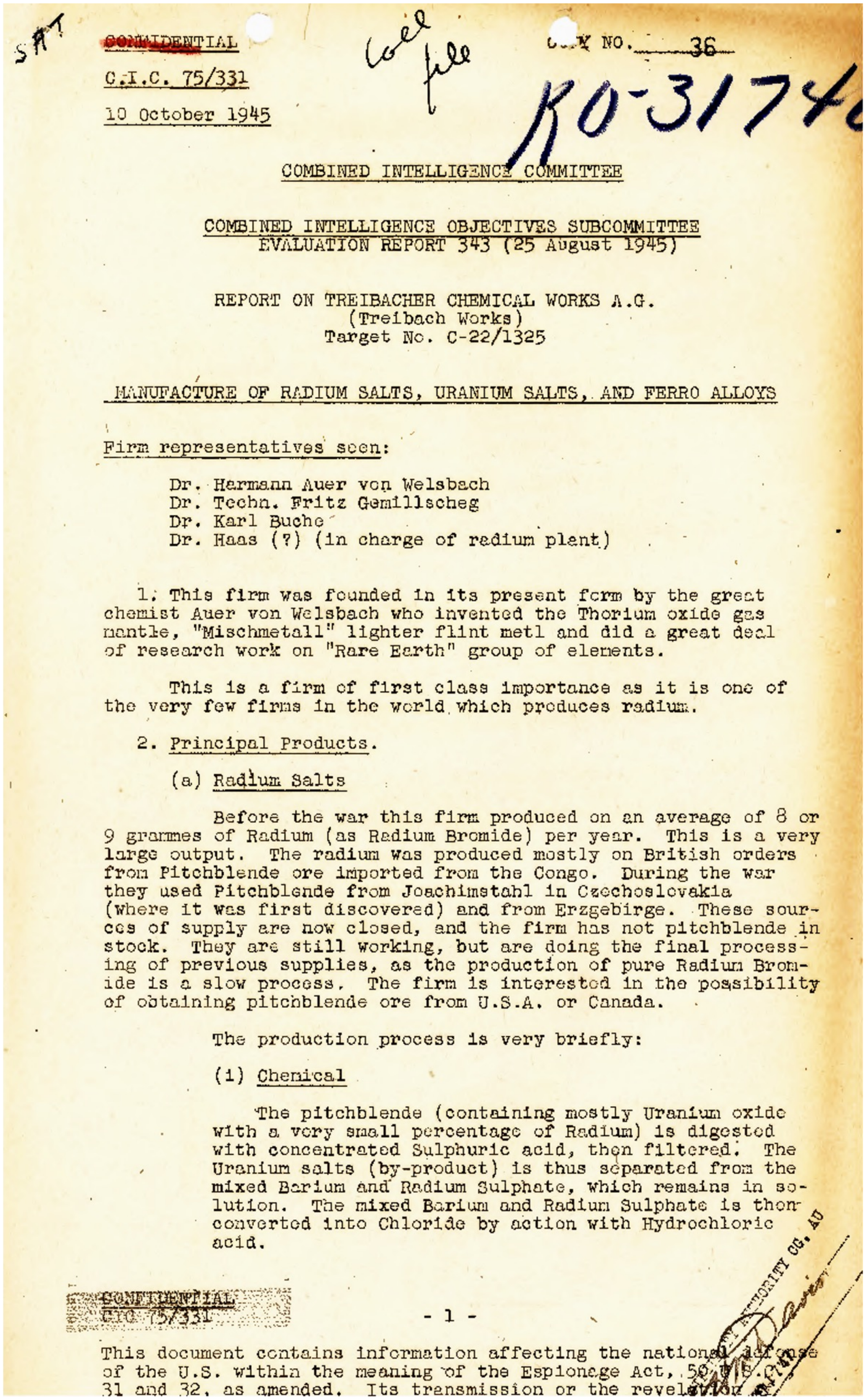
These are used chiefly in the ceramic industry. They are produced as a by-product of the production of Radium from Pitchblende (Pitchblende is really principally an Uranium ore.) [...]

Finally

It is considered that this firm is of first-class importance, with a very highly trained expert staff of chemists and chemical engineers and workpeople. Their most important product being radium and Mesothorium salts, with Uranium salts, lighter flint metal, salts of the "Rare Earth" metals, and Ferro alloys, as their less vitally important products.

Lt. Col. R. Bailey
Major M. W. H. Head

20 June 1945



SAT

~~CONFIDENTIAL~~ COPY NO. 36

Coll file

C.I.C. 75/331

10 October 1945

KO-3174

COMBINED INTELLIGENCE COMMITTEE

COMBINED INTELLIGENCE OBJECTIVES SUBCOMMITTEE
EVALUATION REPORT 343 (25 August 1945)

REPORT ON TREIBACHER CHEMICAL WORKS A.G.
(Treibach Works)
Target No. C-22/1325

MANUFACTURE OF RADIUM SALTS, URANIUM SALTS, AND FERRO ALLOYS

Firm representatives seen:

Dr. Harmann Auer von Welsbach
Dr. Techn. Fritz Gemillscheg
Dr. Karl Buche
Dr. Haas (?) (in charge of radium plant)

1. This firm was founded in its present form by the great chemist Auer von Welsbach who invented the Thorium oxide gas mantle, "Mischmetall" lighter flint metl and did a great deal of research work on "Rare Earth" group of elements.

This is a firm of first class importance as it is one of the very few firms in the world which produces radium.

2. Principal Products.

(a) Radium Salts

Before the war this firm produced on an average of 8 or 9 grammes of Radium (as Radium Bromide) per year. This is a very large output. The radium was produced mostly on British orders from Pitchblende ore imported from the Congo. During the war they used Pitchblende from Joachimstahl in Czechoslovakia (where it was first discovered) and from Erzgebirge. These sources of supply are now closed, and the firm has not pitchblende in stock. They are still working, but are doing the final processing of previous supplies, as the production of pure Radium Bromide is a slow process. The firm is interested in the possibility of obtaining pitchblende ore from U.S.A. or Canada.

The production process is very briefly:

(1) Chemical

The pitchblende (containing mostly Uranium oxide with a very small percentage of Radium) is digested with concentrated Sulphuric acid, then filtered. The Uranium salts (by-product) is thus separated from the mixed Barium and Radium Sulphate, which remains in solution. The mixed Barium and Radium Sulphate is then converted into Chloride by action with Hydrochloric acid.

CONFIDENTIAL
CIC 75/331

- 1 -

This document contains information affecting the national defense of the U.S. within the meaning of the Espionage Act, 50 U.S.C., 31 and 32, as amended. Its transmission or the revelation

Figure D.95: Report on Treibacher Chemical Works AG. 10 October 1945. [CIOS ER 343; AFHRA folder 119.0412-340 Nos. 340/347, IRIS 110766; AFHRA A1008 frames 0794–0797]

CONFIDENTIAL

(ii) Mechanical

By a long process of fractional crystallisation, the Barium chloride and Radium chloride are separated. An essential point about this process is that concentrates containing a high percentage of Radium are extremely dangerous. The employees who work with high concentrations of radium are only allowed to work 14 days continuously, and during the whole war were supplied with extra rations to increase their resistance. Their rations have now been cut to the normal civilian standard.

Firm possesses a stoc k of Radium Bromide, issued on loan to hospitals.

(b) Mesothorium Salts

This element is even more powerfully radioactive and more dangerous to handle than Radium. It is produced in small quantities.

(c) Uranium Salts

These are used chiefly in the ceramic industry. They are produced as a by-product of the production or Radium from Pitchblende (Pitchblende is really principally an Uranium ore.)

(d) "Mischmetall", Cerium metal, Cerium salts, salts of the "Rare Earth" metals, produced from the ore Monazite Sand. It is alloyed with 25% iron to produce the metal for lighter flints. From Monazite Sand, firm also produces the "Rare Earth" metals in pure form, i.e.: (i) Cerium metal for alloying with aluminium and Magnesium in certain light alloys. (ii) Cerium fluoride for use in searchlight arc carbons. (iii) Lanthanum salts for use in the optical glass industry. (iv) Salts of Lanthanum, Praseodymium and Neodymium etc. for chemical use.

Before the war, their supply of Monazite sand came from Brazil and Ceylon. These supplies were cut off during the war, and the firm had to use Monazite sand residues dumped on their site in the past, which contained only about 2% Cerium.

(e) Ferro alloys

Before the war, firm produced Ferro Tungsten, Ferro Molybdneum, and Ferro Vanadium. During the war, ores of Tungsten and Molybdenum were not available to this firm (Tungsten concentrates from Spain and Portugal were allotted to German firms, as this firm used to process Tungsten ore from China.)

During the war they concentrated on production of Ferro Vanadium, from the by-production frit from the Thomas steel process: this contains about 8% Vanadium.

Process is briefly:-

(i) Frit containing Vanadium is roasted in a rotary gas-fired furnace with Sodium Carbonate. This produces water soluble Sodijm Vanadate. The product is then filtered, and the Sodium Vanadate solution treated in large wooden vats with hot Hydrochloric acid, which precipitates Vanadium oxide. (The filtrate still contains 2% Vanadium, and is returned for roasting with Sodium Carbonate).

CONFIDENTIAL
OIC 75/331

- 2 -

Figure D.96: Report on Treibacher Chemical Works AG. 10 October 1945. [CIOS ER 343; AFHRA folder 119.0412-340 Nos. 340/347, IRIS 110766; AFHRA A1008 frames 0794–0797]

CONFIDENTIAL

The Vanadium oxide is converted to Ferro Vanadium by the Alumino thermic process at their works at Seebach near Villach.

The production of Ferro Vanadium has ceased, as the firm has no coal for their gas producer, which supplies gas to the rotary furnace.

Finally

It is considered that this firm is of first-class importance, with a very highly trained expert staff of chemists and chemical engineers and workpeople. Their most important product being radium and Mesotherium salts, with Uranium salts, lighter flint metal, salts of the "Rare Earth" metals, and Ferro alloys, as their less vitally important products.

Lt. Col. R. Bailey
Major M.W.H. Head

20 June 1945.

CONFIDENTIAL
DIC 757331

- 3 -

Figure D.97: Report on Treibacher Chemical Works AG. 10 October 1945. [CIOS ER 343; AFHRA folder 119.0412-340 Nos. 340/347, IRIS 110766; AFHRA A1008 frames 0794–0797]

Office Memorandum • UNITED STATES GOVERNMENT

TO : File DATE: 3 September 1946

FROM : H.S. Lowenhaupt

SUBJECT: Removal of uranium, Treibach Chemische Werke, Austria.

Correspondence, Eaton to Jannarone, 28 Aug. 1946 indicates that 8 tons of uranium salts at the Treibach Chemische Werke in the British Zone of Austria is to be removed by the British to the USA. The uranium was derived from Joachimsthal concentrates imported before the end of the war from Joachimsthal.

Lowenhaupt

Treibach Chemische Werke Aug.1946

Austria

I. Uranium Salts

It was desired to determine the exact quantity of uranium salts now held by Treibach and also whether it would be possible to remove the stock to the U.K.

Previous negotiations and queries had gone through Lt.Col.Boyd of the Mil. Gov. at Klagenfurt. It was found out however that he is now stationed in Vienna, with the Trade and Supply Branch of the Economics Division, A.C.A. He was contacted and also Col.Daw, Industry Branch, and Mr.G.G.Finch, Chemical Section. The latter holds up to date records of the firm's activities, in which it is stated that the present stock is 8.00 tons of uranium salts, mainly in bulk form, unpacked. The difference between 8.0 tons and the 8.2. tons mentioned in previous documents is thought to be due to a small quantity sent to a ceramics firm, possible in Italy.

On the question of removal, it was stated that throughout the firm had been most helpful and co-operative. Their raising of the question of payment for the mesothorium is said to be only normal business instincts. They are unlikely to raise the matter other than with the British element, especially if they can be given a firm assurance or concrete evidence, such as a credit payment to the Austrian National Bank, that H.M.G. intends to pay for the mesothorium. The authorities here consider that such concrete action before raising the matter of the purchase and removal of the uranium salts would ensure the success of that transaction.

With regard to the mechanics of the removal, it is thought that either wooden kegs to hold about 250 Kg. each or oil drums or carbide drums could be obtained. Two reasonable methods of transport are possible:-

(a) by train to Villach, Karlsruhe, etc. to Calais. A special truck and additional train guards could probably be obtained. This journey takes about 3½ days.

(b) by air from Klagenfurt. Owing to the state of the air strip in uncertain weather, September is the best month to carry out the air lift. Dakotas can land on this airfield. Alternative air transport would be from Vienna which would entail road transport of the material through the Russian zone.

It was tentatively arranged, that if, and when the decision to remove the material is taken, Mr.Finch would endeavour to obtain suitable containers, get the material packed and then inform us of the gross weight and number of packages. It was suggested that this should be known as Operation Spray.

Communications on the subject should be sent to Director, Economics Division, A.C.A.(B.E.), C.M.F.

II. Czechoslovak Claim

It is considered in Vienna that the Czech claim for 9223 Kg. uranium ore from Treibach was probably Russian inspired, and that the matter has now been dropped

III. Monazite Sands

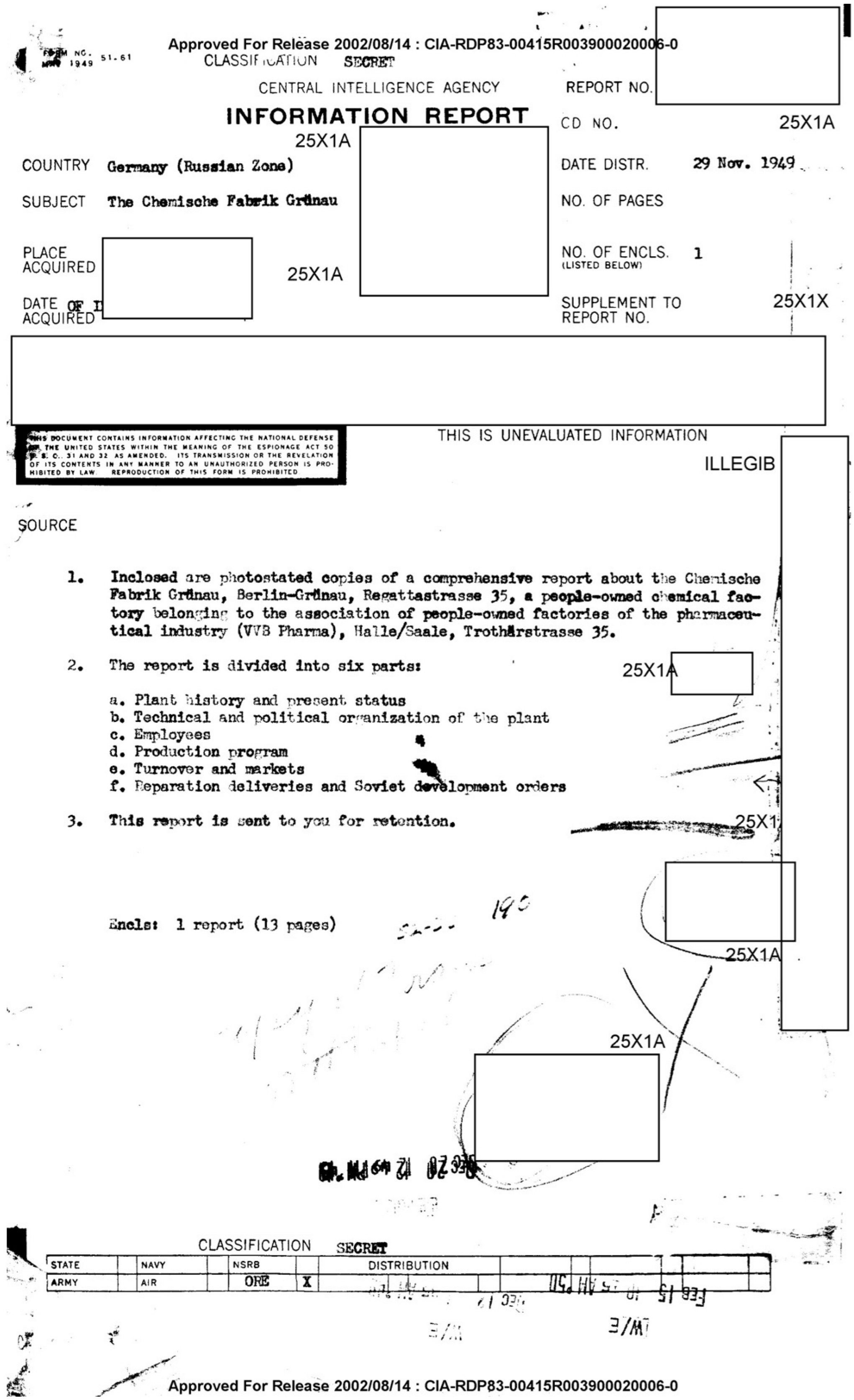
Treibach now want to restart manufacture of flints for which they require monazite sands, which they propose to get from the mouth of the Nile in Egypt. It is probable that /this

sand contains very little thorium. Econ. Div. would like to know whether there is any objection to the supply of monazite from that source. Treibach also used to obtain such sands from Africa(?) and Brazil.

NARA RG 77, Entry UD-22A, Box 174, Folder 10.70 Austria Misc

DECLASSIFIED Authority NND 917017

Figure D.98: H. S. Lowenhaupt. 3 September 1946. SUBJECT: Removal of uranium, Treibach Chemische Werke, Austria [NARA RG 77, Entry UD-22A, Box 174, Folder 10.70 Austria Misc].



FORM NO. 51-61 1949

CLASSIFICATION SECRET

CENTRAL INTELLIGENCE AGENCY

REPORT NO. [redacted]

INFORMATION REPORT

CD NO. 25X1A

25X1A [redacted]

COUNTRY Germany (Russian Zone)

DATE DISTR. 29 Nov. 1949

SUBJECT The Chemische Fabrik Grünau

NO. OF PAGES

PLACE ACQUIRED [redacted] 25X1A

NO. OF ENCLS. (LISTED BELOW) 1

DATE OF I[redacted] ACQUIRED

SUPPLEMENT TO REPORT NO. 25X1X

[redacted]

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE ACT 50 U. S. C., 31 AND 32 AS AMENDED. ITS TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW. REPRODUCTION OF THIS FORM IS PROHIBITED

THIS IS UNEVALUATED INFORMATION

ILLEGIB [redacted]

SOURCE

1. Inclosed are photostated copies of a comprehensive report about the Chemische Fabrik Grünau, Berlin-Grünau, Regattastrasse 35, a people-owned chemical factory belonging to the association of people-owned factories of the pharmaceutical industry (VVB Pharma), Halle/Saale, Trothärstrasse 35.

2. The report is divided into six parts: 25X1A [redacted]

   a. Plant history and present status
   b. Technical and political organization of the plant
   c. Employees
   d. Production program
   e. Turnover and markets
   f. Reparation deliveries and Soviet development orders

3. This report is sent to you for retention. 25X1

[redacted] 25X1A

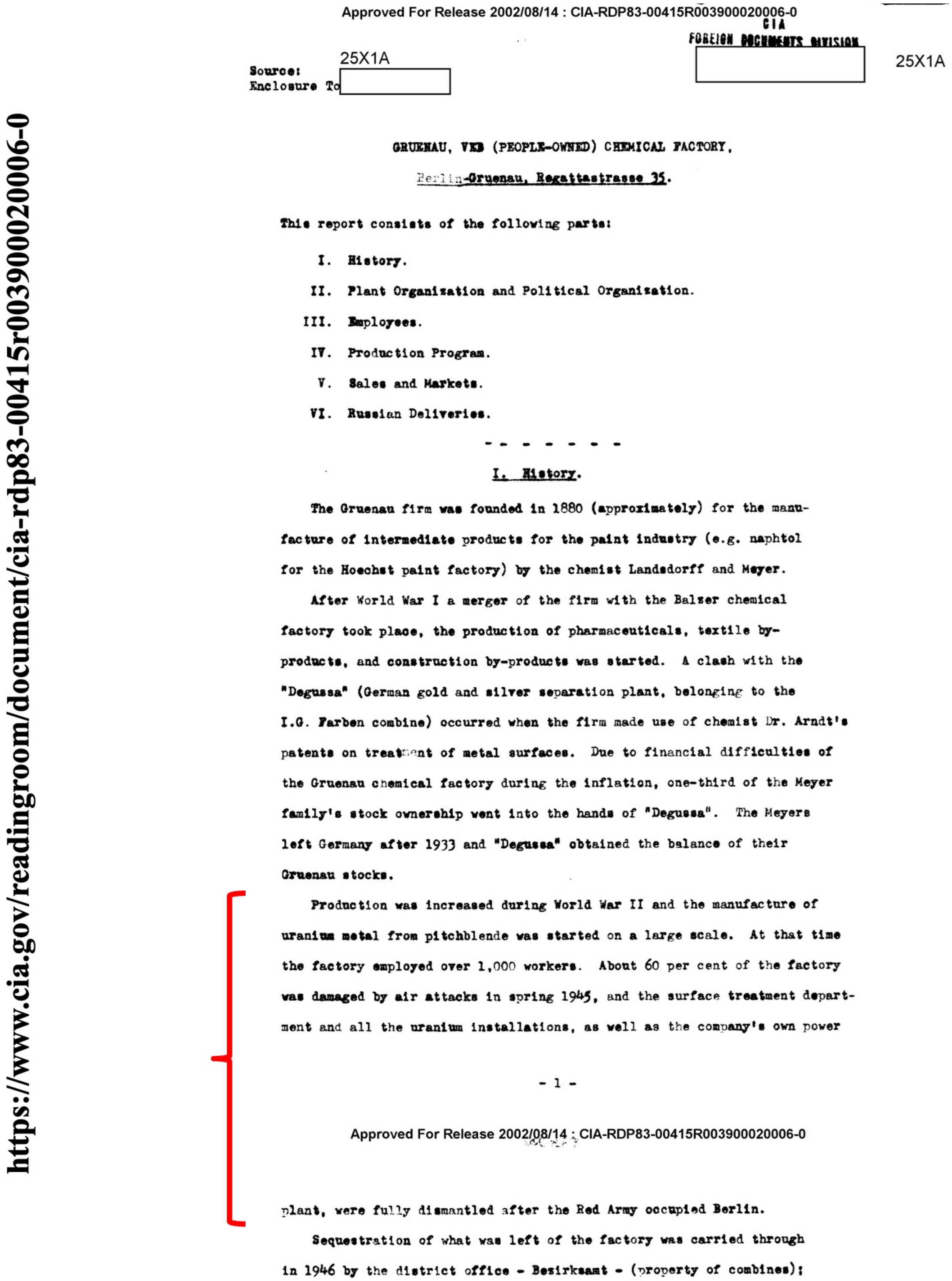
Encls: 1 report (13 pages)

25X1A [redacted]

CLASSIFICATION SECRET

STATE	NAVY	NSRB		DISTRIBUTION	
ARMY	AIR	ORE	X		

Figure D.99: CIA Information Report: The Chemische Fabrik Grünau. 29 November 1949 [https://www.cia.gov/readingroom/document/cia-rdp83-00415r003900020006-0]. "Production was increased during World War II and the manufacture of uranium metal from pitchblende was started on a large scale. At that time the factory employed over 1,000 workers. About 60 per cent of the factory was damaged by air attacks in spring 1945, and... all the uranium installations, as well as the company's own power plant, were fully dismantled after the Red Army occupied Berlin."



CIA
FOREIGN DOCUMENTS DIVISION

25X1A

Source:
Enclosure To

25X1A

GRUENAU, VEB (PEOPLE-OWNED) CHEMICAL FACTORY,

Berlin-Gruenau, Regattastrasse 35.

This report consists of the following parts:

I. History.

II. Plant Organization and Political Organization.

III. Employees.

IV. Production Program.

V. Sales and Markets.

VI. Russian Deliveries.

\- - - - - - -

I. History.

The Gruenau firm was founded in 1880 (approximately) for the manufacture of intermediate products for the paint industry (e.g. naphtol for the Hoechst paint factory) by the chemist Landsdorff and Meyer.

After World War I a merger of the firm with the Balzer chemical factory took place, the production of pharmaceuticals, textile by-products, and construction by-products was started. A clash with the "Degussa" (German gold and silver separation plant, belonging to the I.G. Farben combine) occurred when the firm made use of chemist Dr. Arndt's patents on treatment of metal surfaces. Due to financial difficulties of the Gruenau chemical factory during the inflation, one-third of the Meyer family's stock ownership went into the hands of "Degussa". The Meyers left Germany after 1933 and "Degussa" obtained the balance of their Gruenau stocks.

Production was increased during World War II and the manufacture of uranium metal from pitchblende was started on a large scale. At that time the factory employed over 1,000 workers. About 60 per cent of the factory was damaged by air attacks in spring 1945, and the surface treatment department and all the uranium installations, as well as the company's own power

\- 1 -

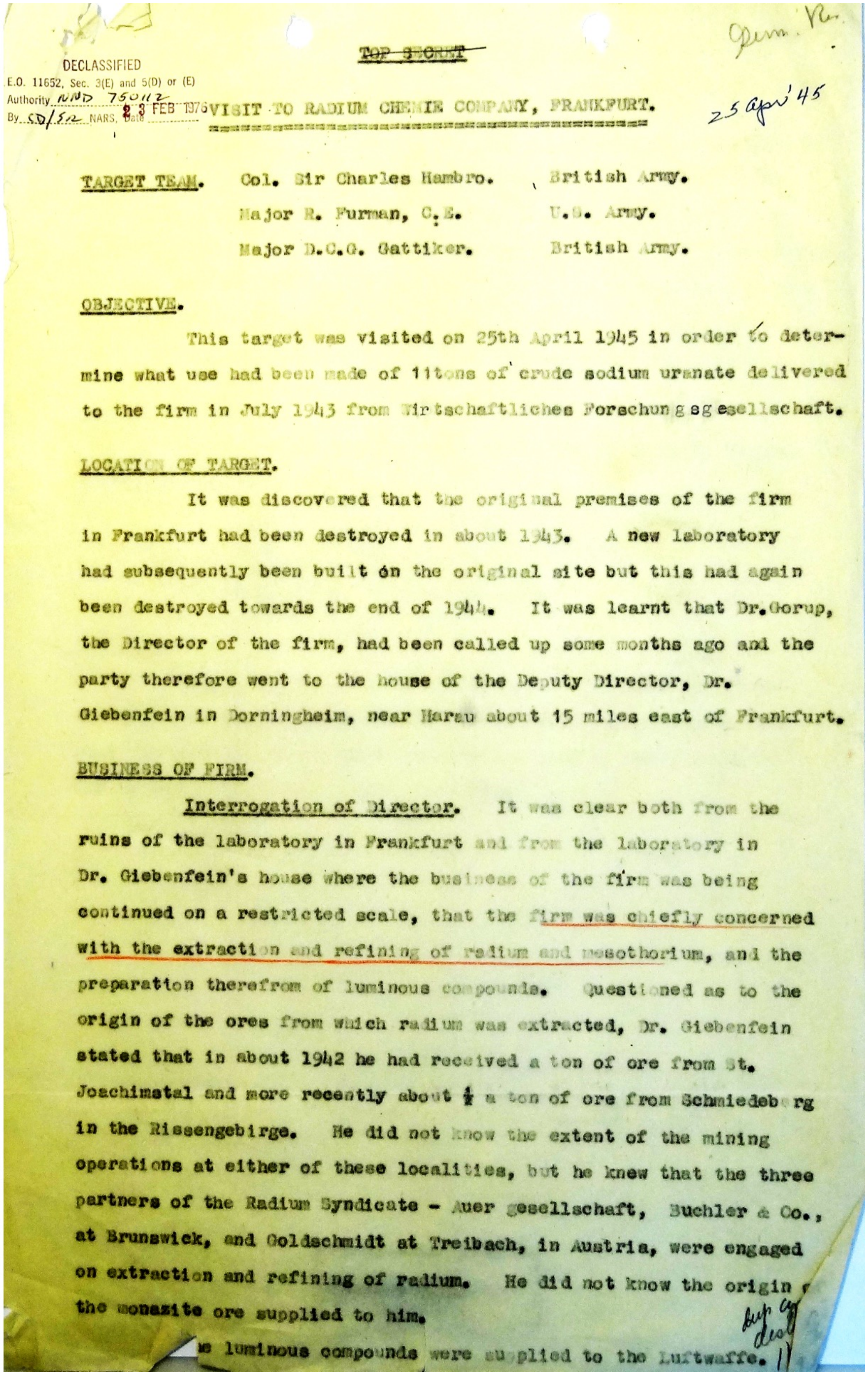
plant, were fully dismantled after the Red Army occupied Berlin.

Sequestration of what was left of the factory was carried through in 1946 by the district office - Bezirksamt - (property of combines);

https://www.cia.gov/readingroom/document/cia-rdp83-00415r003900020006-0

Figure D.100: CIA Information Report: The Chemische Fabrik Grünau. 29 November 1949 [https://www.cia.gov/readingroom/document/cia-rdp83-00415r003900020006-0]. "Production was increased during World War II and the manufacture of uranium metal from pitchblende was started on a large scale. At that time the factory employed over 1,000 workers. About 60 per cent of the factory was damaged by air attacks in spring 1945, and... all the uranium installations, as well as the company's own power plant, were fully dismantled after the Red Army occupied Berlin."

DECLASSIFIED
Authority NND 917017



Gem. Re.

~~TOP SECRET~~

DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
Authority NND 750112
By SD/SR NARS, Date 23 FEB 1976

VISIT TO RADIUM CHEMIE COMPANY, FRANKFURT.

25 Apr '45

TARGET TEAM. Col. Sir Charles Hambro. British Army.
Major R. Furman, C.E. U.S. Army.
Major D.C.G. Gattiker. British Army.

OBJECTIVE.

This target was visited on 25th April 1945 in order to determine what use had been made of 11 tons of crude sodium uranate delivered to the firm in July 1943 from Wirtschaftliches Forschungsgesellschaft.

LOCATION OF TARGET.

It was discovered that the original premises of the firm in Frankfurt had been destroyed in about 1943. A new laboratory had subsequently been built on the original site but this had again been destroyed towards the end of 1944. It was learnt that Dr. Gorup, the Director of the firm, had been called up some months ago and the party therefore went to the house of the Deputy Director, Dr. Giebenfein in Dorningheim, near Harau about 15 miles east of Frankfurt.

BUSINESS OF FIRM.

Interrogation of Director. It was clear both from the ruins of the laboratory in Frankfurt and from the laboratory in Dr. Giebenfein's house where the business of the firm was being continued on a restricted scale, that the firm was chiefly concerned with the extraction and refining of radium and mesothorium, and the preparation therefrom of luminous compounds. Questioned as to the origin of the ores from which radium was extracted, Dr. Giebenfein stated that in about 1942 he had received a ton of ore from St. Joachimstal and more recently about ½ a ton of ore from Schmiedeberg in the Riesengebirge. He did not know the extent of the mining operations at either of these localities, but he knew that the three partners of the Radium Syndicate - Auer Gesellschaft, Buchler & Co., at Brunswick, and Goldschmidt at Treibach, in Austria, were engaged on extraction and refining of radium. He did not know the origin of the monazite ore supplied to him.

[illegible]e luminous compounds were supplied to the Luftwaffe.

Figure D.101: David C. G. Gattiker. 25 April 1945. Visit to Radium Chemie Company, Frankfurt [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL]

NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL

-2-

After some hesitation, Dr. Giebenfein also admitted that he had stocks of about 11 tons of uranium compounds - chiefly sodium uranate and uranium carbonate. He said that these had been sent to him by Roges for purification directed at lowering the iron content, but owing to the destruction of the laboratories in Frankfurt he had not been able to do this.

A sample of the Schmiedeberg ore was taken for analysis.

REMOVAL OF STOCKS.

Two days later, under the supervision of Major A. Furman, the following stocks were removed:-

11 tons uranium products.

½ ton Schmiedeberg ore.

A few drums of monazite sand.

COMMENT.

The visit was of interest because it provided the first evidence that the mines at St. Joachimstal were being worked, and that the shortage of radium in Germany had made it worth while to try to exploit the Schmiedeberg deposits.

....

Major D.C.G.Gattiker.
British Army.

Figure D.102: David C. G. Gattiker. 25 April 1945. Visit to Radium Chemie Company, Frankfurt [NARA RG 77, Entry UD-22A, Box 165, Folder ALSOS MATERIAL]

TOP SECRET

This Document Consists of 1 Page S
No. ... of 1 Copies, Series B

3rd May, 1945

Cable from Perrin for Hambro

1. Contrary to expectations it appears that Wismar is in British hands. The stock of 80 tons of sodium salt held by Hoffman and Molzen there is the largest single quantity remaining in Germany.

2. In view of this and despite agreement not to collect more material would be grateful if you could discuss with Groves and let us know whether attempt should be made to get material away or destroy it by, for instance, dumping in river, or whether no action should be taken.

To: War Cabinet Offices
From: Joint Staff Mission
Washington, D.C.
May 3rd, 1945

~~TOP SECRET~~

IMMEDIATE

WEP 397

Following for Perrin from Jackson. Reference PEW 372.

1. As Hambro has not yet arrived, I have consulted Groves and Chadwick who suggest that every attempt be made to remove the material from Germany at the earliest possible moment. Dumping the material would presumably have the serious disadvantage that it would leave evidence for some time.

Figure D.103: Top: Michael Perrin to Charles Hambro, 3 May 1945. Bottom: Jackson to Michael Perrin, 3 May 1945 [NARA RG 77, Entry UD-22A, Box 163, Folder Australia].

DECLASSIFIED
Authority 917017

NARA RG 77, Entry UD-22A, Box 160, Folder APR 45–Dec. '45

SECRET

WAR DEPARTMENT
CLASSIFIED MESSAGE CENTER

INCOMING MESSAGE

TOP SECRET

TOP SECRET TOT

URGENT

From: U. S. Military Attache, London, England

To: War Department

Nr: 43679 8 May 1945

To MILID sr nr 43679 ICCO personal to Groves and Hambro from Welsh and Perrin TOP SECRET from Van Voorst.

Urgent message received from Calvert and Gattiker. They report 81 tons sodium salt were transferred from Wismar to Neustadt Glewe where there is also 60 tons oxide from Berlin. Neustadt Glewe is three miles beyond our zone.

Gattiker and Calvert request immediate instructions on choice of following action.

1. Leave alone.

2. Attempt to recover material.

3. Attempt to sabotage and start fire as cover.

Possibility (2) might be tried on excuse of recovery stolen material or by bluff.

Decision must be taken immediately and we see no chance of getting Chancellors opinion.

End

ACTION: Gen Groves

CM-IN-7258 (8 May 45) DTG: 081337Z ngr

G

TOP SECRET

Figure D.104: U.S. Military Attaché London to Leslie Groves. 8 May 1945 [NARA RG 77, Entry UD-22A, Box 160, Folder APR 45–Dec. '45].

NARA RG 77, Entry UD-22A, Box 163, Folder Australia

TOP SECRET

WAR DEPARTMENT
OFFICE OF THE ASSISTANT SECRETARY OF WAR
STRATEGIC SERVICES UNIT

(L-1424)
Date of Information: 4 May 1946
Evaluation: F-2

GERMANY (RUSSIAN ZONE) : MILITARY

Uranium Salts at Ludwigslust Used by Factory.

1. The stock of uranium salts stored at the Nord-Deutsches Lederwerk in Neustadt-Glewe near Ludwigslust has been almost entirely consumed by the factory, with the waste material flowing into the Elde River.

2. About a bagful of the material is said to remain. The stock had been kept in a loose condition in two storerooms.

Field Comment: This confirms previous information, forwarded to General Sibert on 24 April, which stated that no part of the material, whose true nature appeared to be unknown to both the Russians and the factory owner, had been removed; and that most of it had been consumed in the production of white glove leather and some horse harnesses.

TOP SECRET

WAR DEPARTMENT
OFFICE OF THE ASSISTANT SECRETARY OF WAR
STRATEGIC SERVICES UNIT

(L-1434)
Date of Information: 8 May 1946
Evaluation: C-2

GERMANY (RUSSIAN ZONE) : MILITARY

Ludwigslust Uranium Salts Stock Consumed.

The information below amplifies and supplements that contained in a report of 4 May 1946, and other earlier reports from the same source:

1. Confirmation has been made of earlier information that:

a. The stock of uranium salts (cadmium iodine, Cd I2) at the Nord - Deutsches Lederwerk in Neustadt-Glewe near Ludwigslust has been consumed, except for an infinitesimal balance.

b. Neither the factory employees nor the Russians knew the nature of the material and the latter did not requisition or remove any of the salt, which was used as tanning salt in the process of alum-tanning to produce chamois leather.

c. The resulting waste material went into the Elde River without any noticeable chemical reaction.

d. The salt was stored loosely in a cellar-like vault.

2. Only one type of salt was on hand; its origin and the method by which it was obtained were unknown. Dr. Elflein, the former manager of the factory and an ex-SS man, may have had this information. Nothing is known of him since his arrest by the Russians approvimately six months ago, but it appears that Elflein did not tell the Russians anything about the salt stock.

3. One remaining question is whether sample No. 2 of the salt, procured earlier, is identical with sample No. 1. Some dirt may have been mixed in with sample No. 2.

TOP SECRET

THIS DOCUMENT CONSIST... OF 1 PAGES
COPY NO. 3 OF 3 SERIES A

2 July 1946

SUBJECT: Material at Newstadt-Glewe.

TO: Lt. Colonel E. P. Dean, Office of the Military Attache, American Embassy, London, England.

1. In the last few weeks we have received several confirmative reports on the situation at Newstadt-Glewe as summarized in our Weekly Intelligence Summary No. 12.

2. All reaction to these reports is: Very nice, if true; however, the thing sounds too fantastic to be true. For example:

(a) Some of the material is known to have been shipped to Newstadt-Glewe in wooden casks. It is doubtful that it would be handled in sacks or bags, or that it would be stored loosely in the cellar, because of its weight and value.

(b) Why should such valuable material be used for tanning? So far as we can determine it has never been so used before. Possibly Elflein (or Elfrich) or his successor might have wanted to cover-up, to protect himself from the Russians or to keep them from getting the material.

(c) If use of this material was suddenly instituted, would it not be noted and noised about by factory employees? Would it not also result in a change in the properties of the leather?

(d) The information has come too easily, from too many different sources.

3. We would rather believe that the material was buried, or has or is being transferred elsewhere in the Russian zone or into the low countries.

4. Rather than accept the current story, we have asked for additional investigation, to determine if the information given is true, or whether it is designed to mislead.

5. Gattiker has also asked Welsh to redirect his attention toward Newstadt-Glewe.

For Colonel W. R. Shuler:

TOP SECRET

RICHARD H. FREE,
Lt. Col., Corps of Engineers.

TOP SECRET

THIS DOCUMENT ...NSISTS OF 1 PAGES
NO. 1 OF 1 SERIES A

9 July 1946

MEMORANDUM TO: FILE

FROM: H. S. Lowenhaupt

SUBJECT: Norddeutsche Lederwerke in Neustadt

The following is extracted from letter, Welch to Gattiker:

GERMANY (RUSSIAN ZONE)

SCIENTIFIC

NORDDEUTSCHE LEDERWERKE IN NEUSTADT

1. The double sentries on the Norddeutsche Lederwerke are no longer there. In the factory itself there are only a few Russian soldiers who operate snap controls among the workers to prevent the smuggling of leather out of the factory.

2. The uranium oxyde is still in the factory and is not specially guarded. In the opinion of the cashier HINRICH there may be from fifty to seventy tons. HINRICH thinks it is for use in tanning (GERBSTOFF). The present application of the material is not known, but the Russians appear to have no interest in it whatever and it is not thought that any has been or is being used or taken away.

3. Anyone working in the factory could enter the shed in which the salts lie. Source was himself offered work in the factory but could not accept as he had no local identity papers.

4. Some four weeks ago fifty per cent of the machines of the Lederwerke were loaded and shipped away. These machines stood on the railway station exposed to the weather since last year.

DECLASSIFIED
Authority NND 917017

H. S. LOWENHAUPT.

Figure D.105: Top Secret May–July 1946 reports about wartime uranium storage and usage at Neustadt-Glewe [NARA RG 77, Entry UD-22A, Box 163, Folder Australia].

NARA RG 77, Entry UD-22A, Box 163, Folder Australia

Germ Res.

Memorandum • UNITED STATES GOVERNMENT

SECRET

TO : Major F.J. Smith DATE: 1 October 1945

FROM : H.S. Lowenhaupt

SUBJECT: OCE Report "German supplies of uranium-bearing raw materials":

1. War production at Joachimsthal was 15 to 25 tons of U_3O_8 per year. This was the only war source of new ore.

2. An unidentified mine in Portugal was bought by the Germans but resulted in no significent production.

3. There is reported some 700 tons of proved ore bearing 2% or 14 tons of U_3O_8. Attempted production by the Germans apparently failed.

4. Small veins carrying silver and uranium minerals occur in association with iron deposits at Schmiedberg. They yielded 9 tons between 1927 and 1930.

5. Pitchblende has been produced in small amounts from lead silver veins at Freiberg.

6. Pitchblende has been produced in small amounts from nickel cobalt ores at Schneeberg.

7. There has been practically no production from French continental sources.

8. Our files carry considerable more detail on each of these points.

Henry S. Lowenhaupt

Figure D.106: H. S. Lowenhaupt to Francis J. Smith. 1 October 1945. SUBJECT: OCE Report "German supplies of uranium-bearing raw materials" [NARA RG 77, Entry UD-22A, Box 163, Folder Australia].

NARA RG 77, Entry UD-22A, Box 168, Folder 202.3-1 LONDON OFFICE: Combined Intell Rpts.

TOP SECRET

THIS DOCUMENT CONSISTS OF 8 PAGES
COPY NO. 3 OF 7 SERIES A

28 February 1946

MEMORANDUM for the period 17 January 1946 to 28 February 1946.

From: Washington Office of Joint TA Intelligence Section.

To: London Office.

RUSSIA

1. Ore Deposits: Alleged Russian activity in Czechoslovakia, Bulgaria, China, Manchuria, and elsewhere, tends to indicate that Russia has not yet discovered, or alternatively, not developed, any source of uranium within her own territory comparable to the deposits in Canada or the Congo. Neither Dr. Bain nor Dr. Davidson considers, on geological grounds, that a previous report concerning rich deposits in the Kolyma River Valley is likely to be true.

There is no doubt, however, that extensive geological surveying of Russian territory has been and is taking place and although there is nothing to suggest that such surveys are specifically directed towards finding radioactive minerals, it must be borne in mind that the possibility of rich deposits being found in the near future, either by design or by accident, cannot be excluded.

According to 'Foreign Commerce Weekly' (2.2.46) a discovery has been announced at Jabagai, in the Kazakhstan District, of large deposits of vanadium ore containing a high content of radioactive substances. So far we have not been able to locate this place on the map.

Reference is also made to these deposits in an article entitled "Metals of Kazakhstan" by N. Undasynov, which appeared in the 'Mining Journal', London, 24.11.45. This article states that there are millions of tons of excellent ore. We should be glad to have any information on this deposit and its exact location, which London can obtain.

2. Material Reserves: Assuming that no new rich deposits are discovered within the territory under their control, it is unlikely that Russia will be able to obtain more than the equivalent of 300 to 500 tons of oxide within the next five years. This takes into account known amounts of captured German stocks and assumes that methods will not be developed within that time for extracting uranium from very low-grade extensive deposits such as oil shales and asphalts.

3. Scientific Effort: Available evidence, although admittedly very slender, indicates that Russia is intent on devoting as much scientific effort as possible to mastering the uranium problem. It is of interest to note, however, perhaps, that emphasis appears to be directed towards Isotope separation and as yet there has been no reference to Plutonium production. Reference to interest in obtaining uranium with a 235 enriched content may indicate however that the Russians have in mind the possibility of constructing a pile using enriched material. This would enable them to use relatively impure graphite or ordinary instead of heavy water.

4. Recent Stalin Awards: It is difficult to deduce why these awards were made after a considerable lapse of time for relatively inferior work although this is in keeping with previous Soviet bureaucratic custom. It may have been either propaganda for domestic and foreign consumption to give the impression that the Russians were well versed in the subject, it may have been to stimulate other Russian scientists working on this subject, or it may have been for later work done by the recipients, the extent of which it was not wished to disclose.

TOP SECRET

5. 5. Activities and Location of Russian Scientists: An interesting report has been received from London giving a summary of interviews with Dr. Ashby, who was until recently scientific attaché to the Australian Legation in Moscow. Dr. Ashby had unusually wide facilities granted him for contacting Russian scientists, but being a biologist, he did not have much contact with scientists of interest to us. According to him Kapitza is still working in Moscow and he describes him as not being a very straight-forward man. From Kapitza's spontaneous outburst when he heard that the first atomic bomb had been dropped, saying that he had not expected it so soon and that he did not know that the Americans and British were so far ahead of Russia, two deductions can be made: one is that Kapitza was informed, although not accurately, of the work on which the Western Allies were engaged, and the other that at the time the bomb was dropped Russia was already working on the project but had not yet produced a bomb. On the other hand, since Stalin was informed officially about the bomb at Potsdam and since Kapitza has a seat on the Soviet Cabinet it is curious that he did not know.

Another point of interest is that the Russian scientists, generally, show no resentment that knowledge about the atomic bomb is being withheld from them since they fully appreciate that the Soviet Government would have withheld the information from us.

According to Dr. Ashby there are four first-class metallurgists, who might well be engaged on the atomic energy problem, working together in Sverdlovsk. Joffe is still in Leningrad.

6. Russian Atomic Energy Programme: With reference to the public statement attributed to Academician Jokel (reference our memorandum dated 17 January): We have been unable to trace anybody of this name. We presume the name may be a misprint for Joffé.

7. The general inference from available but very scanty evidence is that the Russians are only just beginning to study the problem but are straining every effort to master it.

GERMANY

1. German Scientists in Russia: Further information has been received, both from American and British sources, which indicates that the two main groups of scientists of interest to us are located some few miles apart on the eastern shore of the Black Sea somewhere between Suchum and Poti, probably in the neighborhood of Anakliya, but possibly nearer to Suchum. The preponderance of information indicates that Professor Gustav Hertz is engaged on the problem of Isotope separation; Professor Manfred von Ardenne is engaged on cyclotron and electron microscope design, and Professor Max Steenbeck on betatron design. Dr. Riehl is with the Hertz group and since he was previously in charge of uranium metal production at the Auergesellschaft, it is logical to assume that he would continue to have an interest in the same matter in his new location.

We note that London claims to have satisfactory contact with these men via Berlin. One of Dr. Hertz's sons, Helmuth Hertz, is at present in the U.S.A. in a P/W camp. Arrangements have been made to intercept his letters. One such letter from Johannes Hertz indicates his father to be on the Black Sea but the exact location is not given. We hope that before long his father will write to him.

2. The Production of Thorium and Uranium in Germany: Our attention has been drawn to a B.I.O.S. report on this subject by Dr. Roger Potvin. According to this report over six tons of thorium metal and over fourteen tons of uranium metal were produced by Germany up to the end of 1944. The quantity of uranium metal reported appears to be much larger than our previous estimates. We should be glad to receive comment on this figure from London. We are also interested to know what use the thorium metal was put to.

TOP SECRET

- 2 -

TOP SECRET

3. A list of promising young German physicists, prepared by Heisenberg, has been received from the London office.

BELGIUM

1. We note that London is being kept informed at a high level of any political events affecting our interest at this office.

2. We note also that London has not been able to obtain any evidence that recent trade union agitation in the Congo for nationalization of the deposits is officially inspired by a "third party" interest.

BULGARIA

1. Confirmation has been received by this office that the mine mentioned in our memorandum of 17 January is the well-known Goten Mine. We note that London is taking independent steps to ascertain, through a first-class source, fullest details concerning the activities here.

2. Promised samples of the alleged deposit located near the Black Sea cannot be obtained until the snows in the area melt.

3. We note that information recently received from London indicated vigorous activity in the Strelcha area where the Germans were known to have been prospecting in 1942 and 1943, and also activity in the old uranium mining area of Zlatitsa indicated by extensive road work and tunnel blasting between Etropole and Zlatitsa. We presume that London is watching these activities and will report further details that become available.

4. We are trying to obtain confirmation of the report received from London that an ore sample reputed to be from the Murgash Mountain area was flown to this country some months ago by an American officer for analysis. We shall investigate further however.

CZECHOSLOVAKIA

1. Joachimstal Mine: During the period under review various reports have been received at this office concerning activity at the Mine, both from American and British sources. Although many of these reports are conflicting, the preponderance of evidence suggests that there are at any rate a certain number of*technicians working in the Mine, that at least part of the ore is being shipped via Germany, presumably to Russia, that the Mine is closely guarded, and that all activities in relation to the Mine are shrouded in secrecy.

*Russian

A report that there is a secret agreement between the Russian and Czechoslovakian Governments allocating fifty per cent of the Mine's output to Russia has not been confirmed. Such an agreement should, however, not be excluded, having in mind Jan Masaryk's recent well-known utterance at the opening of the UNO Assembly. Careful examination of the transcript of his speech indicates that his statement should be regarded as a warning to the other nations and possibly as an indictment of those members of his Government with whom he is known to be out of sympathy, who may have been responsible for such an agreement. This would explain reports received that he was reprimanded by his Government for having made his statement.

The most recent report indicates that a new building is being constructed in the area which the Russians say is to be a Spa Centre, but which is believed to be intended for a new experimental laboratory.

A further significant point contained in the report recently received from London is that the French Ambassador was about to visit Joachimstal. This may indicate French supply interest.

We note that London is taking steps to have this whole matter elucidated on a high level.

TOP SECRET

- 3 -

DECLASSIFIED
Authority NND 917017

TOP SECRET

2. Heavy Water Plant at Wesser: A report has been received of an alleged heavy water plant at Wesser, 17 miles northeast of Parbudice, supposed to be operated by the Russians. Although this report seems unlikely, we would like London to investigate further if possible.

FRANCE

1. Professor Joliot: Information has been received that Professor Joliot is attempting to form a European scientific bloc to counteract the Anglo-American bloc. According to our information he did not receive a sympathetic hearing on the subject from Professor Scherrer when he approached him.

Whilst those who know Joliot most intimately do not believe that he would personally hand over to another power secrets and data of military value to his own country, it is distrubing to know that he has assistants working in his laboratory who are alleged not to be reliable in this respect.

London has been asked to investigate this matter further and also to obtain information about two Russian scientists, Landesburg and Nesmeyanoff, who are reported to be in Paris and have met Joliot on several occasions.

It is perhaps significant that when last in Moscow Joliot was not allowed to visit the Moscow Physics Institute on the pretext, believed to be false, that the Institute had been bombed.

2. Material Resources: A report has been received that Joliot has stated that France has 200 tons of uranium which was not discovered by the Germans. It is not clear whether this refers to stocks held by France prior to the outbreak of war, or whether it might be material which was sent from Belgium to France for safekeeping when the invasion of Belgium appeared imminent. According to other statements attributed to Joliot, deposits of autunite occur in Tonkin in French Indo-China, and French Africa is soon to be surveyed by twenty geologists using airplanes equipped with detecting devices.

FINLAND

A report attributed to Mr. Elias Erkks, a former Foreign Minister of Finland, states that there is an occurrence of uranium in northern Finland somewhere south of Rovaniemi. The deposits are alleged to have been found during the extensive prospecting for cobalt and copper. The occurence is supposed to be known only to Mr. Erkks and his collaborators and has not been revealed to the Germans, while they were in occupation, nor since to the Russians.

We recommend, on the grounds of secrecy, that no action be taken on this information for the time being.

According to a statement by Professor Lennart Siemons, there are no uranium deposits in Finland.

DENMARK

We note from a London report that a Russian Nuclear Physicist named Terletsky visited Copenhagen shortly before Christmas on the pretext of searching for scientific instruments stolen by the Germans. He was shown over the Bohr Institute but no other events of importance are recorded.

- 4 -

Figure D.107: W. R. Shuler and David C. G. Gattiker. 28 February 1946. Memorandum for the period 17 January 1946 to 28 February 1946 [NARA RG 77, Entry UD-22A, Box 168, Folder 202.3-1 LONDON OFFICE: Combined Intell Rpts.]

NARA RG 77, Entry UD-22A, Box 168, Folder 202.3-1 LONDON OFFICE: Combined Intell Rpts.

TOP SECRET

SWEDEN

1. Swedish Atomic Energy Committee: The names and photographs of the Committee are now available to both offices. We note that London considers the set-up of the Committee would point to its being very effective, and indeed, the best possible committee available in Sweden.

2. Cyclotron at Uppsala: We note that it is proposed to construct a new cyclotron at the Physical Chemistry Institute at Uppsala. The instrument is expected to be ready in about two years. At present Sweden possesses only one small cyclotron at Professor Siegbahn's Institute at Frescati, where, however, a larger one is to be built with State support, in addition to the projected one at Uppsala.

3. Swedish Patent Rights: Professor Joliot and another Frenchman, have made application for Swedish patent rights for a method of producing atomic energy.

4. Lise Meitner: Has now arrived in the U.S.A. and has started on her six months' course of lectures. She does not appear to have any information of specific interest to this office.

NORWAY

A Provisional Order in Council issued 7 December 1945 secured for the State all rights for prospecting and working of uranium ores and other metals of value to national defense.

CANADA

A recent report in the London Mining Journal suggests that deposits at Yellowknife are under development. We would appreciate confirmation from London.

AUSTRALIA

According to the Melbourne radio the Government of South Australia has granted a Commission the rights to mine ground near Adelaide where a survey showed it might be possible to extract four tons of uranium. According to a report appearing in the Mining Journal of 16 February 1946, p. 131, the world's largest uranium deposit has been found near Starthrope, Queensland. Samples sent to Britain are said to have yielded upwards of 3% uranium. We would appreciate London comment on both these statements.

NEW ZEALAND

The Department of Scientific and Industrial Research has announced the discovery of occurrences of uranium in New Zealand as a result of two years survey. The Uranothorite contains 11.5 per cent uranium and 60 per cent thorium. Monazite sands, known to contain thorium, have been found to contain uranium in small quantities.

BRITISH HONDURAS

Final chemical analysis of the samples received is not yet complete. The samples, however, show no trace of radioactivity and are believed to be manganese.

- 5 -

TOP SECRET

JAMAICA

The promised report from the independent investigator (reference our memorandum dated 17 January) has not yet come to hand.

INDIA

We note that the governing body of the Indian Council of Scientific and Industrial Research has set up a committee to explore the availability of raw materials in India capable of generating atomic energy and to suggest ways and means of harnessing them.

Another committee has been set up to undertake a systematic examination of radioactive substances found in different rock systems of India.

POLAND

We note that London will further investigate the report received by this office that a Russian-sponsored Atomic Research Institute has been started at Katowice.

YUGOSLAVIA

1. Our attention has been drawn to a new draft legislation which cancels existing mining concessions in this country and reserves for the State all prospecting rights and concessions for exploitation of ore and minerals. There is no specific reference to radioactive minerals.

2. According to information received from London, Professor Savitch (Reference our memorandum dated 7 December) an alleged nuclear physicist, is of no interest to us.

HUNGARY

A report has been received from an Hungarian national that there are uranium deposits in the neighborhood of Tsiza on the Danube. It is not known whether there is any truth in this report but since the deposits are believed to be unknown to any third party, it is recommended that no action be taken.

SWITZERLAND

Appropriation has been allocated for research in nuclear physics at Professor Scherrer's Institute and also to Professor Hanny (Lausanne); Professor Stueckelberg (Geneva), and Professor Huber (Basel).

Scherrer has taken advantage of a Russian claim to have discovered the negative proton to invite Kapitza, Frenkel or Landau to Zurich for scientific discussions.

CHINA

1. Black market activities: Confirmation of previously reported black market activities in uranium-oxide in Shanghai, has been obtained. Prices ranged between $60 and $75 per pound. A Russian by the name of Voinoff of Exportleb, a Russian trade organization, is buying all he can in 15 lb. lots.

- 6 -

TOP SECRET

We note that London will further investigate this matter through an independent source.

According to the latest U. S. report the material represents stocks imported before the war by Imperial Chemical Industries Ltd. and sold to the Asia Glass Company.

2. H. M. Representatives in Sinkiang

We note that London has been examining the question of briefing certain H. M. representatives in Sinkiang for the purpose of watching well-known deposits which lie across the western border of this province. The present time is, however, considered inopportune.

MANCHURIA

A report has been received by this office that members of the Russian Army are investigating a uranium deposit in the neighborhood of Haincheng. Confirmation of this report by the London office would be welcomed. According to Dr. Bain, the possibility of occurences in this area cannot be excluded on geological grounds.

NEW CALEDONIA

(Reference our memorandum dated 7 December): We note that London is taking steps to obtain the names and localities where radioactive deposits are alleged to occur.

MEXICO

1. Confirmation has been received of recently-introduced legislation which incorporates into the National Mineral Reserves all deposits of uranium, thorium, actinium, and other radioactive elements, as well as all mineral substances which may be found to contain these elements.

2. Newspaper articles state that a deposit of uranium at Placer de Guadalupe, near the port of Ojinaga, in the State of Chihuahua and reported occurrences in the States of Furango and Guerrero are being investigated by the Government.

ARGENTINA

1. By a decree dated 17 October 1945 the Government prohibits the export of uranium minerals.

2. According to Argentine sources existence of uranium has been confirmed in the Cordoba Hills. No large deposits are said to have been discovered and no commercial mining of the product has yet been attempted.

SPAIN

1. No further reports have been received either by this office or from London concerning alleged secret laboratories where work on atomic energy has been carried out.

2. An order by the Ministry of Industry and Commerce, published in the Boletin Official of October 5, 1945, provisionally reserves for the State the uranium deposits in the Provinces of Avila, Badajoz, Salamanca, Sevilla, Tolddo, and Zamora.

- 7 -

TOP SECRET

PORTUGAL

No further information of interest has been received either by this office or the London office.

MADAGASCAR

Prospecting for radioactive minerals continues to be reserved provisionally by the Administration, although other Provisional decrees concerning prospecting for other industrial minerals, have been repealed.

W. R. SHULER,
Colonel, Corps of Engineers.

D. C. G. GATTIKER.

DECLASSIFIED
Authority NND 917017

Figure D.108: W. R. Shuler and David C. G. Gattiker. 28 February 1946. Memorandum for the period 17 January 1946 to 28 February 1946 [NARA RG 77, Entry UD-22A, Box 168, Folder 202.3-1 LONDON OFFICE: Combined Intell Rpts.]

DECLASSIFIED
Authority NND917017

NARA RG 77, Entry UD-22A, Box 173, Folder 57.70. Poland Misc

STANDARD FORM NO. 64

Poland

Office Memorandum • UNITED STATES GOVERNMENT

TO : General Groves DATE: 21 August 1945

FROM : Major Smith

SUBJECT: Polish Radio Broadcast - 18 August 1945.

The following intercepted radio broadcast from Lublin, Poland, is of interest:

"At a conference in which Minister of Finance, Health and Education Debowski participated has taken place in which it was decided to raise a fund for atomic research. A committee for a fund for atomic research will be established shortly and this committee will consist of a delegate of the government and representatives of Polish science and communities.

The Lord Mayor of Warsaw appealed to the people of Warsaw to raise the fund. It has been reported that uranium has been found near Krzyzowka in Lower Silesia and also large quantities of uranium have been found in zinc blend. Layers of these are found in Silesia.

S-
SMITH

Figure D.109: Postwar report of uranium mines at Krzyzowa and elsewhere in Silesia that were likely worked during the war. It seems unlikely that a completely unexcavated underground deposit of uranium would have been spontaneously discovered immediately after the war, when there were already existing uranium mines plus higher priorities for postwar rebuilding. Francis J. Smith to Leslie Groves. 21 August 1945. SUBJECT: Polish Radio Broadcast—18 August 1945 [NARA RG 77, Entry UD-22A, Box 173, Folder 57.70. Poland Misc].

[There is significant evidence that during the war, Germany was actively mining uranium at multiple sites in Romania for the German nuclear weapons program. Hitler told Romanian Prime Minister Ion Antonescu about some of the results of that program in August 1944 (p. 4640).]

Bomba de la Hiroshima cu uraniu de Băiţa? Exploatarea de uraniu de la Băiţa stârneşte noi controverse. [Hiroshima bomb with uranium from Băiţa? Băiţa uranium mining stirs new controversies.] *BIHON Ştirile judeţului Bihor.* 30 January 2015. https://www.bihon.ro/stirile-judetului-bihor/bomba-de-la-hiroshima-cu-uraniu-de-baita-251058/

Un inginer silvic din Câmpani susţine că din uraniul de la Băiţa s-ar fi construit bombele nucleare de la Hiroshima şi Nagasaki.

Ioan Costea, autorul volumului lansat la finele anului trecut "Uraniul primelor bombe", a avut o copilărie marcată de poveştile rudelor despre invazia nemţilor în Apuseni. Omul susţine că în laboratoarele secrete ale SS-ului a fost prelucrat uraniul din Băiţa şi că pentru a fi transportat a fost construit viaductul peste Valea Luncoiului. Ioan Costea invocă rapoarte geologice care pomenesc de prospecţiuni făcute de nemţi. "Probabil ca au scos suficient pentru a face o bombă", spune Ioan Costea, în cartea sa. Autorul recunoaşte că volumul nu are caracter ştiinţific şi că e construit doar pe baza dovezilor, documentelor şi mărturiilor pe care a reuşit să le strângă. [...] "Tot căutând informaţii oficiale care să arate, aşa cum ar fi de aşteptat, că sovieticii au început exploatarea uraniului românesc, nu mică mi-a fost mirarea să descopar că Hitler a fost primul care a început exploatarea uraniului în munţii moţilor. Am aflat că naziştii lui Himmler au folosit o parte a acestui uraniu la construirea câtorva "arme atomice"...Cealaltă parte a uraniului moţilor a ajuns în posesia statului american. Din acest uraniu, dăruit de nazişti, americanii au făcut acele bombe pe care le-au slobozit asupra Japoniei".

A forestry engineer from Câmpani claims that uranium from Băiţa was used to build the nuclear bombs of Hiroshima and Nagasaki.

Ioan Costea, author of the book *Uranium of the First Bombs*, published at the end of last year, had a childhood marked by stories from relatives about the German invasion of the Apuseni mountains. The man claims that uranium from Baita was processed in secret SS laboratories and that the viaduct across the Luncoiului Valley was built to transport it. Ioan Costea cites geological reports mentioning prospecting by the Germans. "They probably dug up enough to make a bomb," says Ioan Costea in his book. The author admits that the volume is not scientific and is built solely on the evidence, documents and testimonies he has managed to collect. [...] "Still searching for official information showing, as might be expected, that the Soviets had begun mining Romanian uranium, I was not a little surprised to discover that Hitler was the first to begin mining uranium in the mountains. I found out that Himmler's Nazis used part of this uranium to build some "atomic weapons"... The other part of the mountains' uranium came into the possession of the American state. From this uranium, given to them by the Nazis, the Americans made those bombs they dropped on Japan."

Sabina Paşca fosta soţie a unuia dintre primarii de Arieşeni şi-a amintit că în a doua decadă a anilor'30: "Oamenii din Arieşeni mergeau la lucru la Băiţa Plai cu caii, pe la Colibiţa, pe un drum de picior" şi că exploatau "un fel de praf de puşcă, care-i mai scump decât aurul. O mâna de praf de puşcă de la Băiţa face cât patru mâini de aur". Gheorge Trifon şi-a amintit că în 1995 a fost plătit de un ofiţer rus să întocmească o reţea de 100/100 m pentru detectarea uraniului pe versantul Râului Arieş – Muntele Biharia. "Iţi pot spune cu certitudine că atât harta, cât şi aparatura erau nemteşti", a subliniat omul. [...]

"În această carte arăt că naziştii au dus uraniu din România, în special din zona Băiţa (Biharia) dar am aflat recent că şi din Cheia (Rimetea), de la Cataractele Lotrului şi din Ciudanoviţa–Caransebeş. Din aceste locuri, nemţii le spuneau localnicilor că duceau orice altceva decât uraniu: molibden, cuarţ, piatră de construcţie, aur, cupru etc.Interesant este ca Biharia a deţinut şi încă mai deţine faimosul uraninit (un oxid de uraniu, pechblenda). Se ştie că ruşii, care aveau la finele anului 1944 numai 1 kg de uraniu, au ridicat cu japca din Germania, în perioada apr–iulie 1945, cca 400 tone de uraninit. Să amintim pe scurt şi uraniul ridicat de americani, care, la rândul lor, au golit de uraniu toată partea Germaniei care le-a revenit. Să ţinem seama şi de faptul ca nemţii au transportat cât au putut uraniu din estul spre vestul Germaniei, spre zona americană a Germaniei, pentru a se pune bine cu americanii. Nu pretind că tot uraninitul din Germania, dus de americani, ruşi şi poate şi britanici sau francezi, ar fi provenit din România (putea fi din Cehia, Congo belgian sau din Germania). Important este că cel mai mult uraninit a fost din România şi consider că suntem îndreptăţiţi să aflăm odata cu valoarea exporturilor neplătite şi numele articolelor exportate în perioada nazistă.

Sabina Paşca, the ex-wife of one of the mayors of Arieşeni, recalled that in the second decade of the 1930s: "The people of Arieşeni used to go to work at Băiţa Plai with their horses, on the Colibiţa footpath" and that they mined "a kind of gunpowder, which is more expensive than gold. A handful of gunpowder from Băiţa is worth four hands of gold." Gheorge Trifon recalled that in 1995 he was paid by a Russian officer to draw up a 100/100 m grid for detecting uranium on the Arieş River–Biharia Mountain slope. "I can tell you with certainty that both the map and the equipment were German," the man stressed. [...]

"In this book I show that the Nazis took uranium from Romania, especially from the Băiţa (Biharia) area, but I have recently learned also from Cheia (Rimetea), from Cataractele Lotrului and from Ciudanoviţa–Caransebeş. From these places, the Germans used to tell the locals that they were carrying anything other than uranium: molybdenum, quartz, building stone, gold, copper, etc. Interestingly, Biharia had and still has the famous uraninite (an oxide of uranium, pitchblende). It is known that the Russians, who had only 1 kg of uranium at the end of 1944, collected about 400 tonnes of uraninite from Germany in April–July 1945. Let's also briefly mention the uranium collected by the Americans, who in turn emptied the entire part of Germany that was theirs. Let's also bear in mind that the Germans transported as much uranium as they could from East to West Germany, to the American part of Germany, in order to get in good with the Americans. I'm not claiming that all the uranium in Germany, carried by the Americans, Russians and maybe the British or French, would have come from Romania (it could have come from the Czech Republic, Belgian Congo or Germany). What is important is that most of the uraninite was from Romania, and I think we are entitled to know along with the value of the unpaid exports the names of the items exported during the Nazi period."

Andrei Dicu and Sorin Dumitrescu. 2019. Bomba atomică ruso-americană, hrănită din uraniul românesc [Russian-American Atomic Bombs, Fed by Romanian Uranium]. *Taifasuri* 748. http://taifasuri.ro/index.php/taifasuri/mozaic/17838-bomba-atomica-ruso-americana-hranita-din-uraniul-romanesc-nr748-sapt19-25-sept-2019

Aurul şi metalele preţioase din Munţii Apuseni au făcut deliciul multor subiecte de presă. Există, însă, un zăcământ incomparabil mai valoros şi "mai" strategic decât aurul sau cuprul. Uraniul, un metal extrem de preţios, mai ales în producerea bombelor atomice, ne-a stat în palmă, până când, ca de obicei, au venit alţii să se hrănească din valorile noastre.	Gold and precious metals in the Apuseni Mountains have been the subject of much media coverage. But there is an incomparably more valuable and strategic deposit than gold or copper. Uranium, an extremely precious metal, especially in the production of atomic bombs, sat in the palm of our hands until, as usual, others came to feed on our resources.
La început a fost Hitler...	First it was Hitler...
Primul care a scris despre acest subiect a fost Ioan Costea, un moţ care, inginer silvic fiind, a lucrat în pădurile şi în păşunile a şase comune (Horea, Albac, Scărişoara, Beliş, Vadu Moţilor şi Gârda), unde, printre altele, a scormonit rămăşiţele rezistenţei anticomuniste a legionarilor şi a partizanilor care au luptat împotriva noii orânduiri. Tot căutând prin munţi după informaţii care să arate că ruşii au început exploatarea uraniului românesc imediat după 23 august 1944, oricum măcar înainte de 1949, când a fost detonată prima bombă nucleară sovietică, nu mică i-a fost mirarea să descopere că, de fapt, Hitler a fost primul care a început exploatarea uraniului, în Munţii Apuseni. [...] Şi aceste exploatări au fost taman în Munţii Apuseni, mai exact în Biharia, la Ştei-Băiţa. Se pare că zăcămintele de uraniu de aici au fost descoperite de aviatorii nemţi care, prin 1938–1939, survolând perimetrul, au observat o scădere de presiune şi o developare bizară a filmelor, fapt care i-a determinat pe germani să facă o cercetare geologică a zonei, cu aparatură modernă, astfel că au instalat 40 de sonde în acea arie.	The first to write on this subject was Ioan Costea, a Moor who, being a forestry engineer, worked in the forests and pastures of six communes (Horea, Albac, Scărişoara, Beliş, Vadu Moţilor and Gârda), where, among other things, he excavated the remains of the anti-communist resistance of the legionaries and partisans who fought against the new order. While searching the mountains for information showing that the Russians had started exploiting Romanian uranium immediately after 23 August 1944, at least before 1949, when the first Soviet nuclear bomb was detonated, he was not a little surprised to discover that it was in fact Hitler who was the first to start exploiting uranium in the Apuseni Mountains. [...] And those mines were in the Apuseni Mountains, in Biharia, at Ştei-Băiţa. It seems that the uranium deposits here were discovered by German aviators who, around 1938–1939, flying over the perimeter, noticed a drop in pressure and a bizarre development of the films, which led the Germans to carry out a geological survey of the area with modern equipment, so they installed 40 probes in the area.

"Un praf de puşcă mai scump ca aurul"

Mulţi dintre localnici povesteau că au luat parte la aceste măsurători, de la care s-au obţinut informaţii că aparatura şi hărţile erau nemţeşti şi că, odată ajunşi în zona Biharia, toate aparatele s-au ars din pricina concentraţiei mari de uraniu. Ce exploatau nemţii? După mărturia unui sătean, "un fel de praf de puşcă, probabil mai scump ca aurul, iar o mână cu praf de puşcă de Băiţa făcea cât patru mâini cu aur". Uraniul care a fost obţinut din acele exploatări a fost ambalat în caserole de plumb, pentru a preveni iradierea, care au fost transportate la Brad. Acolo erau preluate de serviciul SS şi expediate la laboratoarele din Germania. Pentru a înlesni transportul la scară industrială, nemţii au construit tronsoane noi ale drumului Avram Iancu-Bulzeşti-Baia de Criş şi au finalizat o parte a căii ferate Brad–Deva, o megastructură dotată cu viaducte şi cu tunele impecabile. După invazia sovietică, lucrurile s-au schimbat. În august 1949, când a fost detonată, oficial, prima bombă atomică rusească, întreprinderea Sovrom, sovieto-română, Rom-Kuartit a început exploatarea uraniului. Potrivit istoricului Dan Silviu Boerescu, spionajul şi prospecţiunile ruşilor au început înainte de 23 august 1944 şi au fost urmate de exploatările din zona Băiţa-Arieşeni, Vidra şi probabil din Valea Ierii, iar cel puţin o parte din uraniul provenit din Munţii Apuseni a fost folosit la fabricarea primei bombe atomice sovietice. [...]

"Gunpowder more expensive than gold"

Many of the locals told how they had taken part in these measurements, from which information was obtained that the equipment and maps were German and that, once they arrived in the Biharia area, all the equipment had burned up because of the high concentration of uranium. What were the Germans exploiting? According to one villager, "a kind of gunpowder, probably more expensive than gold, and a handful of Biita gunpowder was as much as four hands of gold." The uranium that was obtained from those mines was packed in lead casseroles to prevent irradiation, which were transported to Brad. There they were picked up by the SS service and shipped to laboratories in Germany. To facilitate transport on an industrial scale, the Germans built new sections of the Avram Iancu-Bulzeşti-Baia de Criş road and completed part of the Brad–Deva railway, a megastructure with viaducts and impeccable tunnels. After the Soviet invasion, things changed. In August 1949, when the first Russian atomic bomb was officially detonated, the Soviet-Romanian enterprise Sovrom, Rom-Kuartit, began mining uranium. According to historian Dan Silviu Boerescu, Russian spying and prospecting began before 23 August 1944 and was followed by mining in the Băiţa-Arieşeni, Vidra and probably in the Ierii Valley, and at least some of the uranium from the Apuseni Mountains was used to make the first Soviet atomic bomb. [...]

Pavel Sudoplatov, unul dintre adjuncţii lui Beria (fost lider comunist care a intrat în conflict cu Stalin şi a fost asasinat) şi un fel de Himmler al ruşilor, a scris în cartea sa, "Misiuni speciale", că liderul sovietic era la fel de ahtiat ca şi Hitler în privinţa construirii bombei atomice. KGB-ul a aflat despre exploatarea uraniului din Ţara Moţilor de la comuniştii evrei care prestaseră muncă silnică, sub supravegherea trupelor germane aflate în România. Sudoplatov vorbeşte despre munţii noştri, dar şi despre exploatările care au avut loc la Bukovo, în Bulgaria. Se pare că după ce Germania a pierdut războiul, echipele de misiuni speciale ruseşti şi americane, antrenate în tot ceea ce înseamnă uraniu şi intitulate ALSOS, au găsit la nazişti cantităţi uriaşe de "combustibil", care era deja apt pentru utilizare.

Pavel Sudoplatov, one of Beria's deputies (a former Communist leader who clashed with Stalin and was assassinated) and a sort of Himmler of the Russians, wrote in his book, *Special Missions*, that the Soviet leader was as eager as Hitler to build the atomic bomb. The KGB had learned about uranium mining in the Mote Country from Jewish Communists who had been doing forced labour under the supervision of German troops in Romania. Sudoplatov talks about our mountains, but also about mining in Bukovo in Bulgaria. It seems that after Germany lost the war, Russian and American special mission teams, trained in all things uranium and called ALSOS, found huge quantities of "fuel" with the Nazis, which was already fit for use.

Gheorghe Banciu, Ovidiu Banciu, Liviu Suciu, and Constantin Cosma. 2012. Mining Activities in the Superior Basin of Crişul Negru River. *Ecoterra—Journal of Environmental Research and Protection* 33:1–6.

Short history of mining activities in the area. From the subsoil of this region man has exploited many mineral resources such as: gold, silver, iron, copper, lead, zinc, molybdenum, bismuth, wolfram, nickel, cobalt, pyrite, limestone, marble, building face stones and uranium since the Middle Ages. In the beginning, gold and silver has been extracted by the local population. Around 1600, iron compounds have been also extracted, and after 1700, mining activities have increased including the exploitation of lead and zinc. In 1880, 7000 kg of copper, 1567 kg of silver, 5300 kg of lead have been extracted from Băiţa-Bihor area. Around 1890, important molybdenum and bismuth ores have been identified. During the First World War, the extraction of molybdenum has been taken over by a German company as this compound was used in for making cannons. Since 1935, the molybdenum mine was exploited by different Romanian companies. The most intense mining activities concerning non-ferrous mineral resources extraction have been carried out from 1960 until around the early 1990s[...]

Uranium ore mining (1949–1999). Uranium ore geological prospection has been carried out independently in three phases by Romanian geologists (in 1930s), German teams (1943–1944) and by the Soviets (1945–1960), the last two phases being determined by the geopolitical situation of our country at that time. From the Romanian scholars who brought their contribution to the identification of the presence of uranium ores in this region, we can mention professor of geology Popescu-Voinesti, and geologist Dan Giusca who identified and collected uranium bearing minerals from this region, but were not successful in delimiting the exact location of the ore.

[See also: Adina Popescu and Iulian Ghervas. 2009. *Copiii Uraniului* [*Children of Uranium*]. Libra Film. https://www.youtube.com/watch?v=oqb7GjleO4E]

Figure D.110: Modern aerial photos of an open-pit mine at Băiţa-Plai, Romania, from which uranium was extracted by the Germans during World War II and by the Soviets after the war [Google Earth, courtesy of Gernot Eilers].

WAR DEPARTMENT
CLASSIFIED MESSAGE CENTER
INCOMING CLASSIFIED MESSAGE

TOP SECRET

TOP SECRET PIE
PRIORITY
PARAPHRASE NOT REQUIRED PER EXCEPTION PARAGRAPH 44g AR 380-5

From: US Military Attache, Bern, Switzerland

To: War Department

Nr: 58 9 September 1945

Msg 58 TOPSECRET sgd Legge. To MILID Wash DC

Horia Hulubei internationally known physicist and until recently rector of University of Bucharest taken by Russians to Moscow. source states Hulubei working on atomic bomb. Source Sec of Roumanian Legation eval B2. More complete report follows.

End

MIS checking + maj osborne is checking also regarding report
no record of this physicist
AER

ACTION: Gen Bissell

INFO: Gen Arnold
Gen Hull
Gen Groves
C of S

CM-IN-7799 (10 Sep 45) DTG: 091330 blw

14 September 1945

The following information was received from MIS -

HULUBEI, Horia

Rumanian scientiest - field, Chemistry

Discovered a new element "Moldavium"
Studied and did research work in Paris.
Appointed Dean of Bucharest University in 1941.
In 1944 visited as president of board of Resitza Works (armaments)
President of Finnish-Rumanian Society
Has the following decorations -
Crown of Rumania
German Eagle with stars
Reported to be pro-Nazi

NARA RG 77, Entry UD-22A,
Box 160, Folder Apr 45—Dec. '45

Figure D.111: Horia Hulubei was a Romanian nuclear scientist who worked in the Soviet nuclear weapons program after the war. During the war he and Romania supported the Third Reich—what exactly did he work on during that time? Did the Resitza Works do any nuclear-related work? [NARA RG 77, Entry UD-22A, Box 160, Folder APR 45–Dec. '45]

Uranium and thorium removed from Germany by the United States and Soviet Union [translated and adapted from Nagel 2016, pp. 543–547]

Taken by United States

Garmisch: uranium
Haigerloch: 1.5 tons uranium metal
Oolen (Belgium): 80 tons uranium ore
Stadtilm: 10 tons uranium oxide
Stassfurt (Kalischacht): uranium ore for Auer 1100–1200 tons
WiFo Leopoldshall (near Calbe): ?? tons uranium ore
Toulouse: 30 tons uranium ore
U-234 submarine: 560 kg uranium oxide (enriched?)

Announced total taken by United States:
Approximately 1200 tons uranium, mostly unprocessed ore

Taken by Soviet Union

Berlin (Auer): uranium oxide
Berlin (KWI Ph): 250 kg uranium metal, 3 tons uranium oxide
Berlin (Schering): 1500 kg thorium oxalate, 50 kg thorotrast
Berlin (Toran): 30 kg mesothorium
Berlin-Grunau (Auer/Degussa): 100 kg uranium products
Goldberg (Mecklenburg): 70 tons? uranium compounds, stored by Roges in Hoffmann and Malzew warehouse
Johanngeorgenstadt (mine): uranium oxide
Kummersdorf (Gottow): 3.5 tons uranium oxide
Landsberg/Warthe: uranium oxide
Neustadt-Glewe (Mecklenburg): 100 tons uranium oxide, stored by Roges in Hoffmann and Molzen warehouse
Oranienburg (Auer): 100 tons uranium oxide, Monazit 1340 tons
Radebeul (Heyden): 300 kg thorium products, 100 kg monazite sand
Schneeberg (mine): uranium oxide
Wien: 560 kg U-Metall 24 kg uranium oxide
Zeuthen/Miersdorf (Reichspost): APS uranium oxide

Announced total taken by Soviet Union
Approximately 300 tons uranium
(not counting vastly more which was extracted from the mines 1945–1989)
Approximately 1340 tons of thorium, mostly unprocessed ore

[These estimates are based on numbers in various individual reports that have been released by the United States and Russia. There may well have been significant amounts of uranium or thorium that were not covered in those reports but that were removed by the United States, Russia, United Kingdom, or France. It is also possible that Germany concealed or disposed of significant amounts, or sent them to other countries.

Some of the seized uranium is still being analyzed. See for example ACS 2021.]

NARA RG 77, Entry UD-22A, Box 169, Folder 32.42.B Germ Captured Materials Uran

STANDARD FORM NO. 64

TOP SECRET

THIS DOCUMENT CONSISTS OF 1 PAGE(S)
NO. 3 OF 4 COPIES, SERIES A

Office Memorandum • UNITED STATES GOVERNMENT

TO :Major General L. R. Groves

FROM :Captain A. E. Britt

SUBJECT:Captured Material

DATE: 9 May 1945

The following material in the amounts as indicated below, has been captured in the European Theatre of Operations:-

1108 tons - in the form of oxide, sodium uranite, and other unidentified compounds of Uranium

141 tons - Sodium salt and oxide not yet under our control

4½ tons - Metal

31½ tons - Heavy water

Further details on the above are indicated on the attached work sheet.

CABLE INFORMATION ON MATERIAL

TOP SECRET

THIS DOCUMENT CONSISTS OF 1 PAGE(S)
NO. 3 OF 3 COPIES, SERIES A

	DATE	DESCRIPTION: AMOUNT	TYPE	LOCATION	DISPOSITION
T/S	17 APRIL	✓ 2 TONS substantial	oxide Beryllium	STADTILM ✓ 50°47'N 11°05'E	FURMAN ARRANGED SHIPMENT (Shipped to Heidelberg for further shipment) FURMAN ARRANGED SHIPMENT.
T/S	22 APRIL	✓1100 TONS	800 Tons, sodium uranate 125 Tons, various unmarketable and Ferro-uranium	oolan, near stassfurt ✓✗ 51°51'N 11°35'E	shipped to Hildesheim, Later to be shipped to U.K. 3 special trains. 1st shipment left Hildesheim by train on 7 May.
T/S	24 April	✓6 TONS	?	Riedel De Haen ✓	Picking up.
T/S	2 MAY	35 bbls 30 or more tons.	D_2O	HARZ mts ✗	Secured.
T/S	7 may	✓4½ Tons 1½ Tons	metal in Cubes 2"x2" D_2O	PARIS PARIS	OAK Ridge OAK Ridge
T/S	8 May	81 Tons 60 Tons	Sodium salt oxide	Neustadt Glewe " from Berlin	not yet picked up " did not get

Figure D.112: A. E. Britt to Leslie R. Groves. 9 May 1945. SUBJECT: Captured Material [NARA RG 77, Entry UD-22A, Box 169, Folder 32.42.B Germ Captured Materials Uran].

NARA RG 77, Entry UD-22A, Box 163, Folder Australia

T[illegible] I.

BASIC MATERIALS KNOWN TO HAVE BEEN ACQUIRED BY GERMANY DURING THE WAR.

Country of Origin.	Crude Sodium Uranate ~50% U_3O_8.	Refined Products ~80% U_3O_8.	Ore Concentrates 60% U_3O_8.	Crude Ore 10% U_3O_8.	Residues. 1% U_3O_8.	Metal.	Total as equivalent U_3O_8.	Grand Total as equivalent U_3O_8.
Belgium.	992	458	-	-	-	-	862	
Czechoslovakia.	-	49	48	20	3000	-	100	962
Germany.	-	-	0.5	-	-	-	0.25	
TOTAL	992	507	48.5	20	3000			

TABLE II.

STATUS AND LOCATION OF ABOVE MATERIALS (OR THEIR PRODUCTS) AT 1st JUNE 1945.

Status.	Firm.	Town.	Crude Sodium Uranate ~50% U_3O_8.	Refined Products ~80% U_3O_8.	Ore Concentrates 60% U_3O_8.	Crude Ore 10% U_3O_8.	Residues 1% U_3O_8.	Metal.	Total as equivalent U_3O_8.	GrandTotal as equivalent U_3O_8.
CATEGORY 1. Material in British and U.S. zones of occupation in Germany.	W. de Boer & Co.	Wittingen.	-	1.1	-	-	-	-	1	25
	Buchler & Co.	Brunswick.	1	-	15	-	-	-	9½	
	Krupps.	Essen.	-	18	-	-	-	-	14½	
CATEGORY 2. Material in Russian zones of occupation or Russian spheres of influence in Germany, Austria and Czechoslovakia.	Norddeutsche Lederwerk.	Neustadt-Glewe.	-	133	-	-	-	-	196	162
	Chem. Werk.	Treibach.	-	-	15	-	-	-	9	
	Mine works.	St. Joachimstal.	-	-	3	20	3000	-	33½	
	Hereswaffenamts.	Berlin.	-	11.5	-	-	-	-	9	
	K.W.I. für Physik.	Berlin.	-	-	-	-	-	3	3	
	Stahlwerk Röchling Buderus.	[illegible]furt.	-	1.5	-	-	-	-	1	
CATEGORY 3. Material seized and removed by British and U.S. Forces.	Union Miniere.	Oolen.	91x	-	-	-	-	-	45	681
	Wirtschaftliche Forschungsgesellschaft.	Stassfurt.	864	233	-	-	-	-	618	
	Radium Chemie.	Frankfurt a/M.	11	-	0.5	-	-	-	6	
	Riedel u Hahn.	Hannover.	-	6	-	-	-	-	5	
	K.W.I. für Physik.	Stadtilm.	-	8	-	-	-	-	6	
	-ditto-	Haigerloch.	-	-	-	-	-	1.5	1½	
CATEGORY 4. Material believed destroyed by bombing 12.43 and 3.45.	Auergesellschaft.	Berlin.	-	78	15	-	-	-	71½	71
CATEGORY 5. Material sought but not found.	Deutsche Gold u Silberscheideanstalt.	Frankfurt a/M.	25	0(14)*	-	-	-	-	12(24)	12(24)
		TOTAL	992	490	48.5	20	3000	4.5		951

x Actually the equivalent in refined products was seized.

* It is convenient here to assume that the whole of the 14 tons of refined products held by this firm were used for making the 8 tons of compressed oxide blocks and 4½ tons metals known to have been made for K.W.I. fur Physik.

Figure D.113: Table I: Basic Materials Known to Have Been Acquired by Germany During the War. Table II: Status and Location of Above Materials (or Their Products) at 1st June 1945 [NARA RG 77, Entry UD-22A, Box 163, Folder Australia].

STANDARD FORM NO. 64

SECRET

Em. Adv. Com

Office Memorandum • UNITED STATES GOVERNMENT

TO : Major General L. R. Groves DATE: 14 June 1945

FROM : Major F. J. Smith

SUBJECT: Captured Material

1. Lt. Warner landed in New York City last night. He is accompanying the shipment of captured material comprising approximately 31 tons of heavy water which is stored in 39 metal drums and 70 wooden barrels. He also has 10 cases of 6 cubic foot content each of U powder and cubes, 2 cases of 12 cubic foot content each of U powder and cubes, and 60 cases of ½ cubic foot content each of U powder and cubes. The shipment is aboard the freighter James B. Richardson which will dock and unload at Pier 17, East River, New York City, at 9:30 this morning. Arrangements have been made with Major Kelley's office to have trucks available to transport the material to the Madison Square Area warehouse at E. 73d St., NYC.

2. The British on a previous occasion had requested us to turn over the heavy water to them. If you desire to turn over this material to the British I would like to know so that I can make arrangements with Major Kelley to transship the material.

S.
SMITH

3) Major Vance will store material in U.S. Govt Warehouse, Middlesex N.J.

4) Major Traynor will make arrangements for testing of heavy water and will submit recommendations for its proper disposal.

5) Will keep you advised of all further proceedings.

S

SECRET

DECLASSIFIED
Authority NND 917017

12:25 p.m.
16 June 1945 Lt. Warner called Major Smith from New York City.

Gave following description of shipment he accompanied to States:

- 39 steel drums, 1000 lbs. each, containing liquid. Heavy water
- 159 wooden kegs, 125 lbs. each, containing yellow powder. " "
- 37 small boxes measuring 12" square by 6" depth, containing metal plates. U plates
- 81 small boxes of approximately same size containing black bricks. U
- 6 steel drums containing yellow powder. U
- 2 large boxes about the size of a desk, containing instruments. 3 ft. x 6 ft.
- 2 long boxes, 12" x 12" x 8 feet, containing instruments.
- 1 box about 4 foot square containing jug.
- 18 crates of assorted sizes containing material unknown to Lt. Warner. Average size of crate with 6 foot cubic content.

Above weights are estimated only.

TOP SECRET CONSISTS OF ______ PAGES
COPY NO. ______ OF ______ SERIES

DECLARATION OF TRUST

I do hereby declare that the contents of the following listed containers now located in the Perry Warehouse, Boundbrook, New Jersey, are the property of the Combined Development Trust and further that these containers are held in my name purely as a matter of security. I certify that I have no right or interest in these containers or their contents or in the warehouse receipt.

39 steel drums, 1000 lbs. each
159 wooden kegs, 125 lbs. each
37 small boxes, 12" square with 6" depth
81 small boxes, 12" square with 6" depth (approx.)
6 steel drums
2 large boxes, 3' x 6'
2 long boxes, 12" x 12" x 8'
1 box, 4' square
16 crates of assorted sizes, avrg. size 6' cubic content

W.A.C. ______ F.J.S. ______
Witness Major, A. U. S.

Witnessed 20 Jun '45 Dated 20 Jun '45

NARA RG 77, Entry UD-22A, Box 169, Folder 32.42.B Germ Captured Materials Uran

Figure D.114: Francis J. Smith to Leslie R. Groves. 14–20 June 1945. SUBJECT: Captured Material [NARA RG 77, Entry UD-22A, Box 169, Folder 32.42.B Germ Captured Materials Uran].

DECLASSIFIED
Authority NND 941017

NARA RG 77, Entry UD-22A, Box 169, Folder 32.32. Germ. Incl. TA

SECRET

THIS DOCUMENT CONSISTS OF ..1.... PAGE(S)
NO .3.... OF ..3.. COPIES, SERIES .A...

11 April 1946

Subject: Professor Smyth and Uranium Oxide in Germany

To: Lt. Col. E. P. Dean, Office of Military Attache, American Embassy, London, England

1. Reference is made to letter on above subject dated 15 March 1946.

2. Dr. C. P. Smyth was interviewed by Mr. Lowenhaupt of this office at Princeton, New Jersey, on 2 April 1946. Dr. Smyth after consulting his records stated that he had observed uranium in tonnage lots at the following places in Germany:

a. Three to five tons at Bad Tolz in the custody of Dr. Fritz Rehbein. Sent to U.S.

b. Approximately six tons at Riedel de Haen, A. G. in Seelze bei Hannover.

c. A large amount at Stassfurt which Dr. Smyth had observed the British removing. Sent to U.S.

d. Three tons of raw concentrated ore and four tons of ammonium uranate of Katanga origin at the Büchler Chemische Fabrik in Boersum between Brauschweig and the Hartz, near the northern edge of the Hartz.

e. An undetermined amount at the Auergesellschaft plant at Treibach near Klagenfirth. (Hearsay)

3. Although at the time he was unable to uncover any hidden caches, Dr. Smyth stated that he suspected the presence of fair amounts of uranium at:

a. Kirchner's Physikalische Institute von Köln at Kochelberg 2, Garmisch Partenkirchen. Sent to U.S.

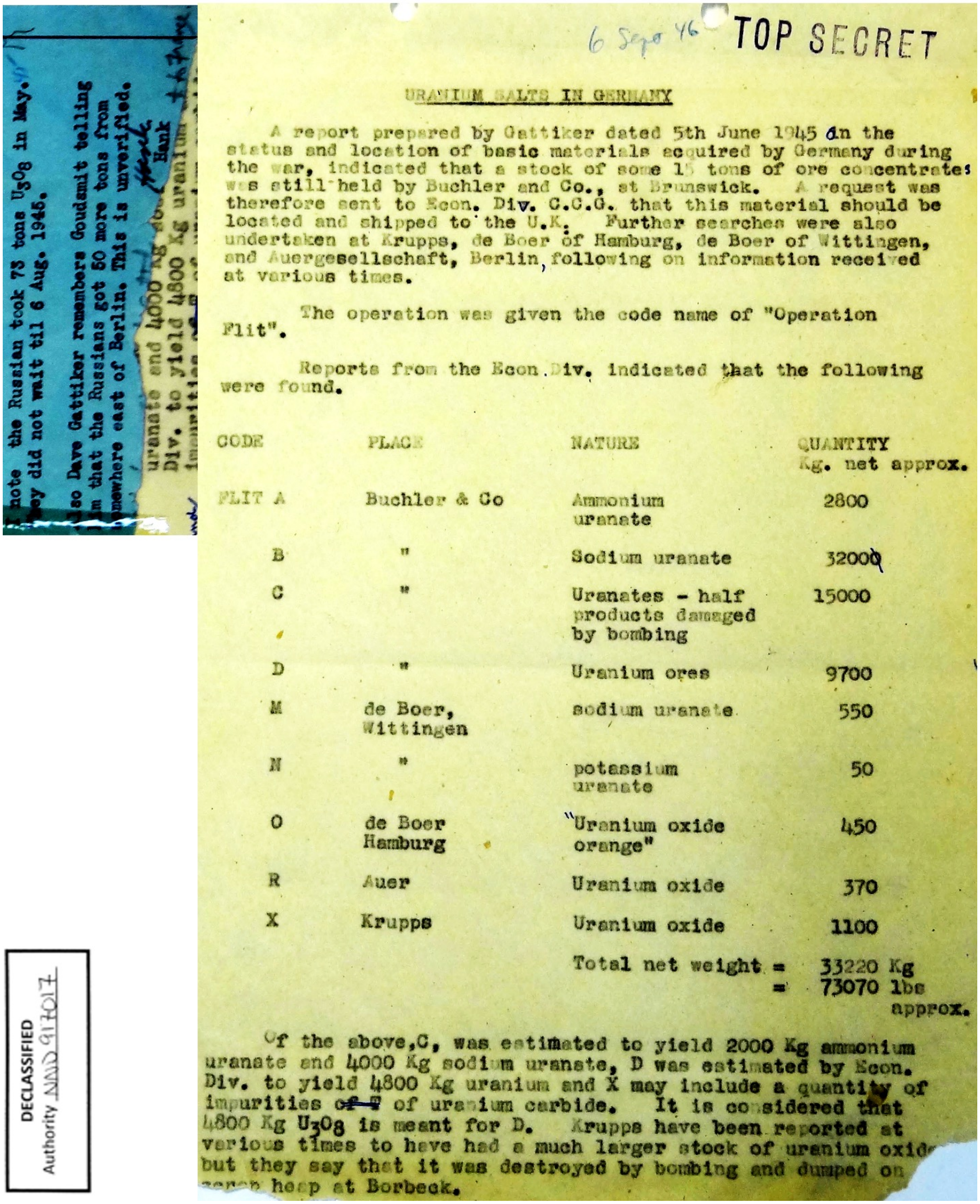
b. Zweitte Physikalische Institute Vien at Thumersbach across Lake Szell from Szell am Zee. Russians got while in Vienna

4. Dr. Smyth further stated that the presence of uranium in the above places had been reported by him to the military authorities of the Alsos Mission, and that it had been their responsibility to remove the uranium.

W. R. SHULER,
Colonel, Corps of Engineers.

Figure D.115: W. R. Shuler to E. P. Dean. 11 April 1946. Subject: Professor Smyth and Uranium Oxide in Germany. This highly incomplete list illustrates the variety of places that processed, stored, and used uranium during the war, as well as the various Allied groups that stumbled across some of those after the war [NARA RG 77, Entry UD-22A, Box 169, Folder 32.32. Germ. Ind. TA].

NARA RG 77, Entry UD-22A, Box 169, Folder 32.32 Germ. Ind. TA



note the Russian took 73 tons U_3O_8 in May. They did not wait til 6 Aug. 1945.

Also Dave Gattiker remembers Goudsmit telling him that the Russians got 50 more tons from somewhere east of Berlin. This is unverified.

Hank

6 Sept 46 TOP SECRET

URANIUM SALTS IN GERMANY

A report prepared by Gattiker dated 5th June 1945 on the status and location of basic materials acquired by Germany during the war, indicated that a stock of some 15 tons of ore concentrates was still held by Buchler and Co., at Brunswick. A request was therefore sent to Econ. Div. C.C.G. that this material should be located and shipped to the U.K. Further searches were also undertaken at Krupps, de Boer of Hamburg, de Boer of Wittingen, and Auergesellschaft, Berlin, following on information received at various times.

The operation was given the code name of "Operation Flit".

Reports from the Econ. Div. indicated that the following were found.

CODE	PLACE	NATURE	QUANTITY Kg. net approx.
FLIT A	Buchler & Co	Ammonium uranate	2800
B	"	Sodium uranate	3200
C	"	Uranates - half products damaged by bombing	15000
D	"	Uranium ores	9700
M	de Boer, Wittingen	sodium uranate	550
N	"	potassium uranate	50
O	de Boer Hamburg	"Uranium oxide orange"	450
R	Auer	Uranium oxide	370
X	Krupps	Uranium oxide	1100
		Total net weight =	33220 Kg
		=	73070 lbs approx.

Of the above, C, was estimated to yield 2000 Kg ammonium uranate and 4000 Kg sodium uranate, D was estimated by Econ. Div. to yield 4800 Kg uranium and X may include a quantity of impurities ~~of T~~ of uranium carbide. It is considered that 4800 Kg U_3O_8 is meant for D. Krupps have been reported at various times to have had a much larger stock of uranium oxide but they say that it was destroyed by bombing and dumped on scrap heap at Borbeck.

DECLASSIFIED
Authority NND 917017

Figure D.116: Uranium Salts in Germany. 6 September 1946 [NARA RG 77, Entry UD-22A, Box 169, Folder 32.32. Germ. Ind. TA].

NARA RG 77, Entry UD-22A, Box 169, Folder 32.32 Germ. Ind. TA

TOP SECRET

-2-

Air transport of the material in the above table was arranged to Bassingbourne aerodrome, whence the material was taken by road to Harwell.

Much of the material was badly packed in barrels not sufficiently strong for the weight of material they contained. Hence many burst or were broken during the several handlings they received. Repacking at Bassingbourne has probably resulted in the mixing of some of the lots.

The net and gross weights and identifying letters are not clearly marked on all the packages. An approximate estimate has been made of the net quantities held at Harwell as follows:

CODE	NUMBER OF PACKAGES	NET CONTENTS lbs.
A/B	114	15,000
C	75	34,800
D	54	19,800
M	11	1,400
N	1	100
O	7	1,300
R	2	800
X	23	2,300
	TOTAL =	75,500 lbs.
	=	33.7 tons

In view of the fact that these figures are estimated from a visual inspection only, the agreement with the Econ. Div. report of 73,070 lbs. is considered reasonable.

It is estimated that the 75,500 lbs represents approximately an amount of 45,500 lbs. or 20 tons of U_3O_8, of which 18 tons came from Buchler and Co. According to Gattiker's table an amount of 25 tons was outstanding between de Boer of Wittingen, Buchler and Krupps, of which 14½ tons was credited to Krupps. It is known that Krupps did not receive the full quantity which they were empowered to order but the bulk of their supply according to records came from de Boer of Hamburg. Since Buchler was one of the three firms authorised to handle uranium, it is probable that later they were handling the Krupp order, particularly as Krupp wanted the uranium as U_3O_8 while the de Boer stocks seem to have been sodium and potassium salts. On the other hand the Buchler stocks may have belonged to Auer or to Chemische Fabrik Grunau or to Hoffman and Molsen, all of whom were subject to

Figure D.117: Uranium Salts in Germany. 6 September 1946 [NARA RG 77, Entry UD-22A, Box 169, Folder 32.32. Germ. Ind. TA].

TOP SECRET

-3-

bombing and who sent their stocks away for safe storing. It is believed that the latter two firms stored their stocks at Neustadt-Glewe. Whatever the explanation of Buchler's excess stock it is certain that they were very unwilling to disclose its presence.

Gattiker's report further suggests that 71 tons U_3O_8 equivalent were held by Auergesellschaft at Oranienburg and Berlin. A recent interrogation of Dr. Ihwe of Auer yielded the information that about 23 tons U_3O_8 equivalent were at Oranienburg in May 1945, and that some 50 tons belonging to the H.W.A. were stored in the Berlin factory. This latter was removed by the Russians in May 1945. Gattiker's report credits the H.W.A. with 9 tons U_3O_8 hence there is an amount of (71+9) - (23+50) = 7 tons unaccounted for. This maybe part of Buchler's stock.

The Oranienburg works have apparently been completely stripped by the Russians, even to the extent of removing the entire wreckage from the part of the factory which housed the uranium salts. A small quantity of only 800 lbs. U_3O_8 has been discovered at the Berlin works and evacuated as Flit R.

The U.S. authorities have also located a quantity of approximately 7-9 tons of ammonium uranate and yellow oxide at Degussa, Frankfurt-a-Maine. They propose to evacuate this material to the U.K. to be added to the stocks at Harwell. The total stock comprising the Colen material formerly at Broome Manor, Operation Flit material and the Degussa stock will then be evacuated together to the U.S. With respect to this lot, Gattiker's report states Degussa should have a stock of 25 tons of crude sodium uranate (50% U_3O_8 equivalent) and possibly 14 tons of refined products, which latter he assumes to have been used to make compressed oxide blocks and metal for the K.W.I fuer Physik. When Degussa was visited by an Alsos party in May-June 1945 no stocks were found. He also assumes that the crude salt stocks had been evacuated to Buchler or to the evacuation works of Auer. Thus the present find represents approximately either one half or one quarter of the possible Degussa stocks depending on whether the refined products are assumed to have been used to supply the K.W.I. fuer Physik demand or not.

A further quantity of between 200 and 1000 lbs of probably U_3O_8 is held at Halstead Place and is to be removed to Harwell at some future date. This material probably came either from Krupp's Widia Fabrik or else from Gebruder Borchers at Goslar, who were cooperating with Krupps in the production of uranium carbide and metal.

SUMMARY AND CONCLUSION

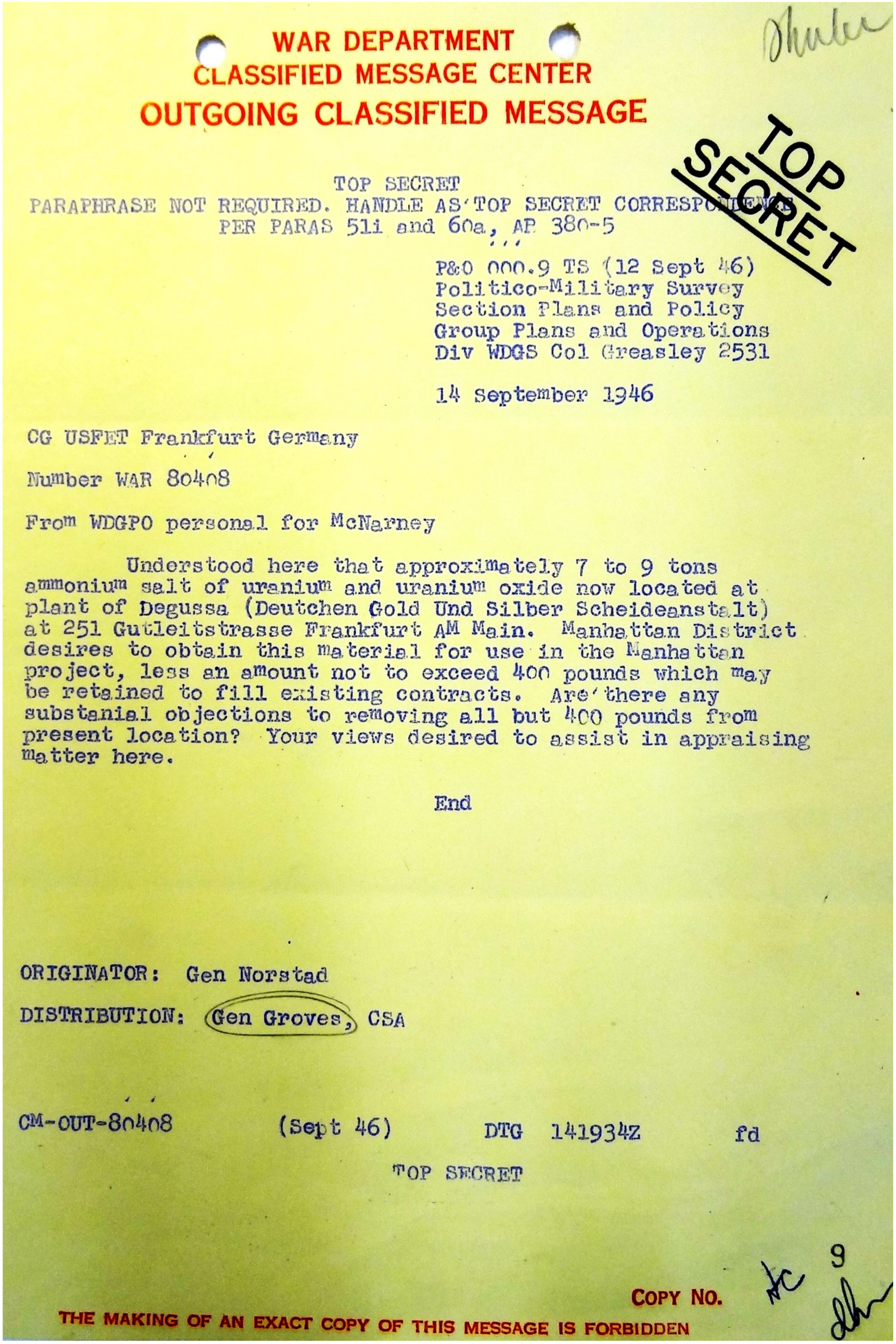
A quantity of approximately 75,500 lbs. of Uranium oxide and salts has been removed from the British Zone of Germany to Harwell. This is equivalent to approximately 20 tons U_3O_8 It is recommended that the bulk of the material be repacked in secure containers, and weighed, before shipping to the U.S. A further 7-9 tons from the U.S. zone is being added to this quantity making a total of some 26 tons U_3O_8 equivalent, or approximately 34 tons of various products.

6th September 1946.

A.O.B.

Figure D.118: Uranium Salts in Germany. 6 September 1946 [NARA RG 77, Entry UD-22A, Box 169, Folder 32.32. Germ. Ind. TA].

DECLASSIFIED
Authority NND 917017



Shuler

WAR DEPARTMENT
CLASSIFIED MESSAGE CENTER
OUTGOING CLASSIFIED MESSAGE

TOP SECRET

TOP SECRET
PARAPHRASE NOT REQUIRED. HANDLE AS TOP SECRET CORRESPONDENCE
PER PARAS 51i and 60a, AR 380-5

P&O 000.9 TS (12 Sept 46)
Politico-Military Survey
Section Plans and Policy
Group Plans and Operations
Div WDGS Col Greasley 2531

14 September 1946

CG USFET Frankfurt Germany

Number WAR 80408

From WDGPO personal for McNarney

Understood here that approximately 7 to 9 tons ammonium salt of uranium and uranium oxide now located at plant of Degussa (Deutchen Gold Und Silber Scheideanstalt) at 251 Gutleitstrasse Frankfurt AM Main. Manhattan District desires to obtain this material for use in the Manhattan project, less an amount not to exceed 400 pounds which may be retained to fill existing contracts. Are there any substanial objections to removing all but 400 pounds from present location? Your views desired to assist in appraising matter here.

End

ORIGINATOR: Gen Norstad

DISTRIBUTION: Gen Groves, CSA

CM-OUT-80408 (Sept 46) DTG 141934Z fd

TOP SECRET

COPY NO. 9

THE MAKING OF AN EXACT COPY OF THIS MESSAGE IS FORBIDDEN

NARA RG 77, Entry UD-22A, Box 160, Folder 205.4 Cables Outgoing, Top Secret

Figure D.119: Lauris Norstad. 14 September 1946 [NARA RG 77, Entry UD-22A, Box 160, Folder 205.4 Cables Outgoing, Top Secret].

Summary

URANIUM EVACUATED FROM THE E.T.O.

SECRET

1cy of 1

17 Apr 45 8 tons U-oxide removed from Stadtilm. Probably sent to England.

27 Apr 45 11 tons U-salts from Radium Chemie Co., Frankfurt removed by Maj. Furman, U.S.Army(ALSOS). No indication of where removed to.

7 May 45 4½ tons metal cubes from Paris sent to Oak Ridge.

21 May 45 1097 tons U-products arrived in U.K. evacuated from Stassfurt. This was shipped to the U.S. the last 190 tons leaving England 26 Jan 46.

13 June 45 Lt. Warner arrived N.Y. with U-powder and cubes (est. 1500 lbs.)

5 Apr 46 About 6 tons arrived N.Y.C. on Hagerstown Victory. Origin - 5 tons from Bad Tolz and Munich; 1½ tons from Garmisch. Was U-oxide.

Sometime in '46 33.7 tons U-salts were evacuated by the British to Harwell. This had been picked up them from 4 German concerns, Buchler , de Boer, Auer and Krupps. It was supposed to be shipped eventually to the U.S. along with about 12 tons U-oxide which were evacuated from Degussa, Frankfurt am Main, to Britain in Oct. '46.

On 1 & 2 Oct 44 there were removed to England from Oolen, Belgium 46.6 tons of refined U. made out of 79 tons sent back by the Germans to Oolen, its origin, from the U stock captured by them at Le Havre. Another 70 tons of this the French managed to get away to the south of France. Of this Alsos located 30 tons and shipped it to the U.S. via Marseilles. It arrived here 9 Nov 44.

ako 3-10-43

SECRET

Figure D.120: Uranium Evacuated from the E.T.O. Undated but probably Oct.–Dec. 1946 [NARA RG 77, Entry UD-22A, Box 169, Folder 32.42.B Germ Captured Materials Uran].

Michael Howard. 2010 *Otherwise Occupied*, pp. 156–158.

[September 1946, British-occupied zone of Germany:]

One night I was called in the early hours on one of the two telephones by my bed, and a codeword was muttered conspiratorially in my ear. It meant absolutely nothing to me; I had simply not been briefed in advance. It was the GSO2 at HQ T-Force, and he had no option but to identify himself, and to explain to me 'in clear' what the operation consisted of. There were said to be eleven thousand kilos of highly refined uranium ore lying in a loose pile in the cellars of Krupp's Widia Works at Essen (whose main business was in carbide steels). A quadripartite team including four Russians was due to be visiting the site in a couple of days and it was vitally important that there should be no trace of the uranium remaining by the time they arrived, or they would be entitled to make a bid for it. How on earth had it been left sitting there so long?

Nothing for it but to get straight on the phone to Fred Bonney at B Detachment at Heisingen, not five miles from Krupp's Widia Works, and tell him the story in clear. He set to work immediately, and they rustled up from somewhere enough empty steel three-inch mortar bomb boxes, with a handle at each end, which limited the contents to a weight of this dense material that required no more than two men to lift. The entire heap, every scrap, was boxed and loaded onto a ten-ton Mack truck and delivered to me by early afternoon at Kamen. The springs of the truck bore the gross weight of the uranium plus the mortar-bomb boxes surprisingly well. I collared the Mess corporal, Corporal Weatherall, and told him to draw a Sten gun and a couple of magazines, sit on the load, take it up to the RAF at Bückeburg, '...and if any bastard tries to take it away from you, shoot him. And get a receipt.' Which he did, from a squadron leader, for 11,000 kilos.

The material was almost certainly 'yellowcake', a form of triuranium octoxide[...]

About six months later a captain in the Special Investigation Branch (SIB) asked to come and see me. The RAF had weighed the bomb boxes for their own purposes before flying them over to England, but the net weight of the contents was never established until the boxes reached their final destination, when it was found to be 6,000 kilos. It was meant to have been 11,000. Where were the missing 5,000 kilos? 'Search me,' I said. The SIB spent quite a while nosing round, and the only conclusion they could reach was that there had never been 11,000 kilos at Krupp's Widia Works in the first place. As there was no weighing equipment accessible to where the material had been dumped, it had been an estimate, and an inaccurate one. Or had someone in Krupp's been squirreling away a couple of kilos at a time for sixteen months, and had it since crossed the border of Magdeburg [into the Soviet-occupied zone of Germany] in quantities which would go in a haversack? It was a conclusion they shied away from. The pile had appeared undisturbed.

[Michael Howard (British, 1926–2018) was an intelligence officer in the British T-Force, which investigated and removed vast amounts of technology from Germany after the war. This incident that he recounted is important because it demonstrated that:

- Nations other than just the United States and the Soviet Union removed tons of uranium from German territory after the war. (In this case it was the United Kingdom, but perhaps France or maybe even other countries did as well.)

- The discovery and removal of this stockpile of uranium does not appear to be mentioned in official documents that have been released. If Howard had not described it in his memoirs before he died, the public would still be entirely unaware of this incident. What other discoveries of uranium or other aspects of the German nuclear program also remain unreleased to the public?

- As late as at least September 1946, there were large stashes of German uranium that had not already been discovered and removed by Allied forces. Perhaps there were other stockpiles of German uranium (e.g., in underground facilities) that Allied forces continued to overlook, and that remain hidden to this day.

- Uranium was at facilities that had not been believed to be part of the German nuclear program. Why was highly refined uranium oxide at Krupp? Did Krupp (which had extensive expertise with metallurgy) play an important role in the German nuclear program, for example by fabricating uranium metal components for reactors or bombs? Or was the uranium simply dumped there as a hiding place near the end of the war?]

National Intelligence Survey (NIS) 26 (U.S.S.R.), Chapter VII, Section 73 (Atomic Energy). 1955. CIA. https://www.cia.gov/readingroom/docs/DOC_0000198124.pdf https://www.cia.gov/readingroom/document/0000198124 [This report demonstrates that most of the uranium mined for the postwar Soviet nuclear weapons program came from regions that were under German control during World War II. This report explicitly states that several of those uranium sources were exploited by Germany during the war. There is independent evidence that a number of the other sources listed here were also used by Germany during the war. Thus wartime Germany had access to an enormous amount of uranium from these regions—plus the Congolese high-grade uranium ore that Germany obtained from Belgium. Moe Berg's notes (pp. 5097–5109) reference a 1951 version of this report that I have not been able to obtain.]

1. Uranium Supply

Current internal mining operations provide about one third of the estimated annual uranium production available to the USSR. The remaining two thirds are obtained from Germany, Czechoslovakia, Bulgaria, Romania, Poland, and China. Of these latter sources, Germany and Czechoslovakia are outstanding in that they provide almost 90 per cent of the total produced outside the USSR. [...]

a. USSR Sources [...]

b. German Sources

(1) Ore deposits—Deposits in the Soviet Zone of Germany are at present the most productive source of uranium being exploited by the Soviets. It is estimated that this source provided about 50 per cent of the estimated total Soviet uranium production in 1954. Uranium mining operations in eastern Germany were begun by the Soviets in October 1946. At first, they were confined to the Erzgebirge, in Saxony, around the towns of Johanngeorgenstadt, Oberschlema, Niederschlema, Schneeberg, Aue, Annaberg, Marienberg, Schwarzenberg, Freiberg, and Dresden. The operations have continually expanded and in 1954 the area around Auerbach, Oelanitz, Bergen, and Schmiedeberg (East Germany) and Thuringia (near Gera, Ronnebourg, and Sorge Settendorf where large quantities of low-grade ore are mined. Prospecting operations have been conducted in all possible areas. Uranium of all qualities has been mined—a fairly large amount of high-grade ore and very great amounts of low-grade ore. The greatest portion of uranium shipped from Germany is in the form of so called high-grade ore with an average U-metal content of about 1.50 per cent (obtained by hand and machine sorting).

Based upon the present extent of operation, it is estimated that uranium production in Germany will continue at the present level for at least three or four more years before gradually declining.

(2) Operations—Soviet uranium mining operations in Germany are under the control of a Soviet-German company called "Wismut S. D. A. G.". Wismut, formed in June 1947, is headed by MVD Major General Alexei Matveyevich Bogatov. Subordinate units of Wismut are called "Objekts" and, as a rule, are organized for a specific purpose: some are mining combines controlling a number of mine shafts within a local area; some are mine development projects which build facilities, sink new shafts, extend drifts, etc.; some are concentrating plants; some are engaged in making machinery and tools.

Wismut has opened and developed approximately 400 shafts in Germany since operations began in 1946. The individual shafts, or mines, are too numerous to list in this text, but the main mining objects are as follows:

"Objekt"	Headquarters
1	Johanngeorgenstadt
2	Oberschlema
6	Auerbach
7	Bärenstein
9	Aue
90	Gera
96	Dresden

Wismut has mined solely for uranium. Until recently, there was no attempt made to utilize the silver, cobalt, bismuth, nickel, and other ores which were mined along with uranium ore; these other ores were all thrown on huge waste piles.

Mining methods which are fairly standard for working hard rock vein-type deposits are used by Wismut. Some of the ore is suitable for direct shipment to the USSR, but a great deal of the materials is of such low grade that this is impracticable. This latter material must be concentrated to a grade of at least 1 per cent or more uranium metal before being shipped. Wismut has, at present, eight concentrating plants which process low-grade ore. These plants are: Object 31, and Langenfeld; Object 32, at Tannenbergsthal; Factory 95 of Object 96, at Gittersee/Dresden; Factory 96 of Object 96, at Freital/Dresden; Object 98, at Johanngeorgenstadt; Factory 99 of Object 2, at Oberschlema; Object 100, at Aue; and Object 101, at Zwickau/Crossen.

About 150,000 workers are employed by Wismut; at least 90 per cent of them Germans. Because production has increased steadily through the years, it is believed that Wismut is currently producing at its peak. Production will probably continue at the present level for the next three or four years before declining slowly.

c. Czechoslovakian Sources

(1) Ore deposits—The uranium deposits in Czechoslovakia are important source of Soviet uranium. The present output is about 10 per cent of the total estimated production by the USSR in 1954. Unlike East Germany and the other Satellites, mining and supervision is performed by the Czechs. The Soviets are continuing to make great efforts to increase this output and have initiated extensive prospecting and development programs. Prospecting operations have extended throughout Czechoslovakia.

The Soviets took over the uranium mines in Czechoslovakia before September 1945. At that time, a secret agreement was made between the Soviet Government and the Czech Prime Minister Fierlinger whereby the Soviet Government would supervise the exploitation of the Bohemian uranium mines and take the entire output, returning to Czechoslovakia part or all of the recovered radium. Operations were started in the old uranium mines of Jachymov, located on the Czech side of the Erzgebirge. The exploitation was soon extended to the surrounding area and now includes the towns of Vejprty, Abertamy, Potucky, Seify, Bozi Dar, Dürnberg, Maria Sorg, Werlsgrün, and many more. As a result of very intensive exploration programs, new uranium mining areas at Pribram, Horni-Slavkov, Marianske Lazne, Drmoul, Trutnov, and a number of smaller areas have been opened up in Czechoslovakia.

(2) Operations–The uranium mining operations in Czechoslovakia are directly under the control of "The Jachymov Mines National Corporation". That organization, at least at the higher levels, is jointly administered. The Soviets, however, have virtually complete control of the corporation as most of the Czech officials were chosen on a basis of their cooperation with the USSR and communist

party membership. The individual mining areas are under the control of separate enterprises called "Inspectorates". The following are the known Inspectorates with their area of operation:

Inspectorates I and II are located in the area around Jachymov. These are the second most important producer. The principal mines in Inspectorates I and II are the Bratrstvi, Rovnost 1 and 2, Svornost, Joseph, Elias 1 and 2, Marianska, Eduard, Bohumil, Barbara, Eva, and Klavno.

Inspectorate VI is located at Horni Slavkov. At present, this Inspectorate is the largest producer in Czechoslovakia. The principal mines in this inspectorate are Prokop, Barbora, Svatopluk, Lesnice, Zdar Buh, Mines 9, 10, 11, 12, 14, 15, 16, 18, and 19.

Inspectorate K-2 is located at Pribram. It produced a small amount of ore.

The Inspectorate X at Trutnov is still in production. Probably mostly low-grade material is handled here from sedimentary deposits.

Other inspectorates about which little is known and which are probably small producers are the Inspectorate at Marianske Lazne and the Inspectorate at Zvolen.

The method of mining and handling the ore in Czechoslovakia is nearly the same as in Germany. Much of the higher grade ore is sent to the Vykmanov and Njedek collection and shipping depot where it is crushed, sampled, blended, and packed for shipment to the USSR. The low-grade ore is sent to concentrating plants located at the Bratrstvi and the Elias mines in Jachymov. All these plants utilize a mechanical concentration method only. At the present time, there appears to be no chemical concentration plant in operation by the Jachymov Mines National Corporation. The mechanical processing method used is similar to that followed by Wismut. The grade of the concentrate is between 1 and 2 per cent uranium metal. As development and production increase, other concentrating plants may be established in the Norni Slavkov and Pribram areas.

It is estimated that between 15,000 and 25,000 persons are engaged in uranium mining operations in Czechoslovakia. A significant portion of the laborers are Czech political prisoners.

d. Bulgarian sources

(1) Ore deposits—The uranium deposits in Bulgaria are of minor importance and, in 1954, produced approximately 5 per cent of the estimated total uranium obtained by the USSR in that year. The deposits being exploited at this time are composed mostly of secondary uranium minerals which occur mainly as thin coatings along fissures or are disseminated throughout brecciated zones. A certain amount of deep mining may now be taking place from the primary minerals.

The most important uranium deposit in Bulgaria is located in the old lead mining area of Goten Peak, near the monastery of Buhovo, northeast of Sofia. In late 1945, the Soviets continued the former German exploitation of this area. Later exploitation of other areas, such as those in the vicinity of Strelcha and Ihtiman, was begun. Prospecting operations and mining are also underway at a number of other locations.

(2) Operations—The uranium mining operations in Bulgaria are administered by the Soviet-Bulgarian Mining Company. Most of the ore now being produced is low grade and is concentrated before being shipped to the USSR. There is only one well-known ore concentrating plant in Bulgaria which is located at the site of the Buhovo mine. The ore is chemically concentrated, using an acid lead. Some of the ore is reported to be hand-sorted and does not require further concentration before being sent to the USSR, but it is believed that most of it is quite low grade and is first concentrated by the Buhovo plant. The concentrate produced probably contains over 1 per cent

uranium. It is estimated that between 6,000 and 10,000 persons are engaged in uranium mining operations in Bulgaria.

e. Polish Sources

(1) Ore deposits—The uranium deposits in Lower Silesia in Poland are of minor importance as a Soviet source of uranium, and constituted approximately 1 per cent of the total produced by the Soviets in 1954.

Soviet uranium mining operations were initiated in Poland in April 1947, but intensive development did not really begin until early 1948. The initial development was in the Kowary area (the old Schmiedeberg area exploited by the Germans) where uranium was produced before the war, and activities have spread to areas around Jelena Gora (Hirschberg), Miedzianka (Kupferberg), Kamienna Gora (Landeshut), Walbrzch (Waldenburg), Stronie Slaskie (Seitenberg), etc. Exploration is also underway in other areas, but Kowary still seems to be the main producing area.

The uranium deposits in Poland are small fissure veins consisting, in some cases, of martitic iron ore with associated pitchblende. Other veins contain barite and dolomite with some uranium minerals. The extent of the mineralization appears to be somewhat limited but the thoroughness with which the Soviets exploit the deposits, regardless of cost, may produce a small quantity for several years. The quality of the ore produced is not definitely known but is assumed to be the same as that produced in East Germany.

(2) Operations—The Soviet uranium mining operations in Poland are similar to those in East Germany. Concentrating plants are believed to be operating at Miedzianka and Ogorzelec (Dittersbach). The type of process used in these plants is not definitely known, although it is reported that the plant near Ogorzelec uses a mechanical separation process.

The uranium mining operations in Poland are administered by the Lower Silesian Mines, Kowary. This is believed to be a cover organization similar to Wismut, in East Germany, on a much smaller scale. It is estimated that from 6,000 to 10,000 workers are engaged in the uranium mining activities in Poland.

f. Romanian Sources

(1) Ore deposits—The uranium deposits of Romania constitute approximately 2 per cent of the total produced by the Soviets in 1954.

Soviet uranium mining operations were initiated in Romania in late 1952. Mining is presently being carried out in the Baia de Cris/W to Baita region and probably also at Baia Sprie, Baia Mare, Turnu Severin and the Galati areas.

The uranium deposits in Romania are small fissure veins of polymetallic minerals with associated pitchblende. The quality of the ore produced is not known. Probably some of it is hand sorted to a minimum grade of 1 or 2 per cent uranium before being shipped to the USSR.

(2) Operations—The Soviet uranium mining operations in Romania are probably similar to those in other satellite countries, although no information is available on the existence of any concentration plants.

The uranium mining operations in Romania are administered by the Sovrumquartz Company. This is believed to be a cover organization similar to Wismut, in East Germany. It is estimated that some 10,000 workers are engaged in the uranium mining activities in Romania.

Alwin Urff, deputy technical plant manager of the Asse nuclear disposal site in Germany. Hasso Ziegler. Die "Konzertsäle" von Asse sind strahlensicher: Endlagerung radioaktiver Abfallprodukte in 500-Meter tiefen Abbaukammern. *Hannoversche Allgemeine Zeitung.* 29 July 1974.

Wolfenbüttel.—Zehn starke Scheinwerfer tauchen das Betriebsgelände des vor zehn Jahren stillgelegten Salzbergwerks Asse bei Wolfenbüttel—rund acht Kilometer vor der Grenze zur DDR gelegen—des Nachts in taghelles Licht. Die Polizei fährt das abgelegene Bergwerk zwei- bis dreimal pro Nacht an und kontrolliert, ob es besondere Vorkommnisse gibt. Außerdem steht eine telefonische Direktleitung zur Polizei Wolfenbüttel zur Verfügung, um sofort Alarm schlagen zu können. Die Sicherheitsvorkehrungen dienen dem Schutz vor der "verbannten Materie", wie die volkstümliche Umschreibung für die radioaktiven Abfälle lautet, die—zentral für die ganze Bundesrepublik—seit 1967 in dem ehemaligen Salzbergwerk in Tiefen bis zu 750 Metern als "Endlagerung" deponiert werden. [...]

Das ehemalige Salzbergwerk Asse bot im übrigen, als es 1965 von der Bundesregierung für 750 000 Mark von den vorherigen Eigentümern gekauft wurde, ideale Voraussetzungen, um die radioaktiven Abfälle aus der ganzen Bundesrepublik für die nächsten Jahrzehnte deponieren zu können. Von 1908 bis zu seiner Stillegung 1964 waren rund vier Millionen Kubikmeter Salz abgebaut worden, die wiederum rund 130 leergebliebene Abbaukammern hinterließen—in der Größe von durchweg 60 Metern Länge, 40 Metern Breite und 15 Metern Höhe. Knapp die Hälfte dieser leeren, weißglitzernden "Konzertsäle" gelten als geeignet für die Einlagerung radioaktiver Abfälle, ein Volumen mithin von 1,5 Millionen Kubikmetern—genug für Jahrzehnte. [...]

Wolfenbüttel.—Ten powerful headlights illuminate the site of the Asse salt mine near Wolfenbüttel, which was shut down ten years ago, and is located about eight kilometers from the border of East Germany. The police drive to the remote mine two or three times a night and check whether there are any unusual occurrences. In addition, a direct telephone line to the Wolfenbüttel police is available, to be able to respond immediately. The precautionary measures are designed to protect against the "banished matter," as is the national description of radioactive waste, for which the former salt mine at depths up to 750 meters has been the central "final disposal" for the whole of West Germany since 1967. [...]

The former Salzberg mine Asse, when bought in 1965 by the federal government for 750,000 Deutschmarks from the previous owners, was the ideal requirement for the disposal of radioactive waste from all of West Germany for the next decades. Between 1908 and its closure in 1964, around four million cubic meters of salt had been mined, which in turn left behind around 130 empty mining chambers—in the size of 60 meters long, 40 meters wide, and 15 meters high. Just half of these empty white glittering concert halls are considered suitable for the storage of radioactive waste, a volume of 1.5 million cubic meters—enough for decades. [...]

Für die hochaktiven Abfälle schließlich, die frühestens ab 1976 in der Bundesrepublik anfallen und dann in Asse eingelagert werden sollen (vornehmlich die Rückstände aus wiederaufbereiten Spaltprodukten, zum Beispiel Brennstäbe), laufen noch umfangreiche Vorarbeiten. Es ist daran gedacht, sie—zuvor zu Glas verschmolzen—in Spezialkammern (Bohrlöcher) in fünfzehnhundert Meter Tiefe zu versenken.

Extensive preparatory work is still going on for the highly radioactive waste, which will accumulate at the earliest from 1976 onwards in West Germany and be stored in Asse (mainly the residues from reprocessed fission products, for example reactor fuel rods). It is thought to sink them—vitrified beforehand—in special chambers (drill holes) to a depth of fifteen hundred meters.

Über die gelegentlich auftauchenden Hiobsbotschaften befragt, die dann und wann über die vermeintlich gefährliche Lagerung der radioaktiven Abfälle auftauchen, konnte Alwin Urff, Bergingenieur und stellvertretender Betriebsleiter in Asse, im übrigen nur den Kopf schütteln: “Hier im Berg kann jedenfalls nichts mehr passieren. Als wir 1967 mit der Einlagerung begannen, hat unsere Gesellschaft als erstes radioaktive Abfälle aus dem letzten Krieg versenkt, jene Uranabfälle, die bei der Vorbereitung der deutschen Atombombe anfielen. Die mußten wir nämlich aus Betonbunkern in der Nähe von München herausholen, wo sie seinerzeit deponiert worden waren, weil man damals ja nicht wußte, wo in drei Teufels Namen man das Zeug denn lassen sollte...”

Asked about the occasional bad news that appears every now and then regarding the supposedly dangerous storage of radioactive waste, Alwin Urff, mining engineer and deputy technical plant manager in Asse, only shook his head: “Here in the mine nothing can happen anyway. When we began storage in 1967, our company first sank radioactive waste from the last war, that uranium waste which arose in the preparation of the German atomic bomb. Specifically we had to get that out of concrete bunkers near Munich, where it had been deposited at the time, because back then one did not know where the devil one should leave the stuff...”

Rainer Karlsch. 2013. Die Abteilung Atomphysik der PTR in Ronneburg und das deutsche Uranprojekt. *PTB-Mitteilungen* 123:1:73–81.

Den Fassbegleitkarten dieser ersten, versuchsweisen Einlagerung radioaktiver Abfälle in der Schachtanlage Asse II—die vom 4. April bis zum 4. Juli 1967 dauerte und zur Einlagerung von 1722 Fässern in die Kammer 4 auf der 750-m-Sohle führte—ist lediglich zu entnehmen, dass sämtliche Fässer aus Karlsruhe kamen [57].

[57] Mitteilung von Dr. Gernot Eilers vom Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 8.1.2013

From the identification cards accompanying this first experimental emplacement of radioactive waste in the Asse II mine—which lasted from 4 April to 4 July 1967 and led to the emplacement of 1722 drums in chamber 4 on the 750 m level—it can only be inferred that all the drums came from Karlsruhe [57].

[57] Communication from Dr. Gernot Eilers of the Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety, 8 January 2013

[As evidence that dangerous radioactive waste could be safely stored in the salt mine, Alwin Urff said that the "radioactive uranium waste" from the "preparation of the German atomic bomb" during the war had been safely stored since 1967. He seemed to be in a position to have detailed and accurate knowledge about that waste, and his statement included several key points:

- Urff's statement appears to demonstrate that there was a considerable amount of wartime radioactive uranium waste, since it filled multiple concrete bunkers before it was moved to Asse. (What was the actual location of the storage bunkers?) According to Asse's own records, that particular batch of waste fills 1722 drums.

- Urff's statement also seems to indicate that the wartime waste was quite radioactive, since he was using it as an example that strongly radioactive modern waste could also be safely stored at Asse. He explicitly called the waste both "radioactive" and "uranium waste."

- Urff's statement appears to indicate that all of that particular batch of atomic bomb waste was stored at Asse, which lends strength to his argument about the safety of storage at Asse, and also corresponds to the 1967 date that radioactive waste storage began at Asse. Nonetheless, there is the possibility that he simply meant that his company safely "sank" the bomb waste someplace in 1967, not necessarily all at Asse. Some nuclear waste was even disposed of at sea in the 1960s.

- Contrary to how Urff's quote was interpreted by many later articles, he did not say that all of the nuclear waste stored in the Asse complex came from the war. 1722 barrels were deposited in April–July 1967, and postwar radioactive waste has been deposited ever since. Erroneously and without any foundation, some later articles attributed over 126,000 barrels of radioactive waste in Asse to the wartime program [e.g., https://www.dailymail.co.uk/news/article-2014146/Nazi-nuclear-waste-Hitlers-secret-A-bomb-programme-mine.html].

Was the waste from a bomb program, or merely a nuclear research program? Large amounts of uranium in various chemical states from the research program were found at locations around Germany and removed by the United States, United Kingdom, and Soviet Union. Why was it so important to bury this particular "radioactive uranium waste"? The waste could have been any (or some combination) of the following:

- Natural (unenriched) uranium in common wartime forms, such as uranium ore, uranium oxide, or uranium metal. That would not be any more radioactive than natural uranium ore from the ground, or any different from all of the uranium materials that were left for Allied forces to find. Moreover, it would be potentially useful material for the postwar nuclear program and not technically waste. Thus this possibility does not seem very likely. However, it may have been desired to simply get rid of any remaining uranium from wartime work, no matter how relatively benign the uranium and the work may have been.

- Chemically toxic and/or corrosive compounds of uranium, such as uranium hexafluoride. But significant quantities of such compounds were stored and found elsewhere in Germany. Why was this waste handled differently, if that is all it was?

- Depleted uranium from which ^{235}U has been extracted. That would be no more radioactive that natural uranium, which was freely stockpiled at Stassfurt and elsewhere without such special handling, and would not seem to serve Urff's example that the wartime waste was quite radioactive and yet had been safely "sunk." On the other hand, if the waste were depleted uranium, that would reveal how much enriched uranium had been produced, and it might have been desirable to hide that evidence in order to cover up the traces of an advanced nuclear program.

- Irradiated uranium that had been in a functioning fission reactor or electronuclear breeder. Such irradiated uranium would have been highly radioactive early on, although that radioactivity would fall off over time. Irradiated uranium would best fit the example that Urff was trying to make, although it may or may not have been what he was actually referring to.

- ^{233}U, ^{235}U (enriched to any degree), ^{237}Np, or ^{239}Pu that was produced but buried to cover up evidence of an advanced nuclear program.

How did Urff know that was indeed "radioactive uranium waste" from the "preparation of the German atomic bomb" during the war? What did he (and others at Asse) do during the war?

In 2013, paragraph 57b of the German Atomic Energy Act was amended to the effect that the radioactive waste stored in the Asse II mine must be retrieved before the mine is decommissioned. The current timetable assumes that retrieval will begin in 2033. Before being prepared for interim and final storage elsewhere, all waste must be examined in order to characterize its composition. If the wartime waste can be distinguished from the later waste, what will be learned from it?]

D.4 Enrichment of Uranium-235

[Only 0.72% of natural uranium is ^{235}U, the fissile isotope. In order to achieve high concentrations of ^{235}U for a fission bomb, it is necessary to enrich or separate ^{235}U from the other uranium isotopes. Currently available documents demonstrate that during the war, Germany developed several different methods of enrichment at least to the level of successful laboratory prototypes, and quite possibly on a large industrial scale:

D.4.1. Production of uranium hexafluoride for uranium-235 enrichment. I.G. Farben and other German-speaking research facilities developed, tested, and mass-produced uranium hexafluoride (UF_6), the preferred uranium compound for use in most enrichment approaches (p. 3496).

D.4.2. Uranium-235 enrichment via centrifugation. Konrad Beyerle (German, 1900–1979), Wilhelm Groth (German, 1904–1977), Werner Holtz (German, 1908–?), Werner Schwietzke (German, 1910–1987), and many others worked in teams that developed gas centrifuges to enrich uranium-235. Centrifugation proved so superior to the U.S.'s enrichment methods that the German gas centrifuge designs are now the worldwide standard for uranium enrichment (p. 3512).

D.4.3. Uranium-235 enrichment via electromagnetic separation. Manfred von Ardenne (German, 1907–1997), Heinz Ewald (German, 1914–1992), Wolfgang Paul (German, 1913–1993), Wilhelm Walcher (German, 1910–2005), and many others worked in teams that developed electromagnetic separators to enrich ^{235}U (p. 3588). These electromagnetic separators were comparable to the Manhattan Project's calutrons. Manfred von Ardenne's work was well funded during the war, and he became a central figure in the Soviet nuclear weapons program after the war.

D.4.4. Uranium-235 enrichment via gaseous diffusion. Gustav Hertz (German, 1887–1975), Erika Cremer (German, 1900–1996), Rudolf Fleischmann (German, 1903–2002), and others developed gaseous diffusion methods suitable for enriching ^{235}U that were comparable to the Manhattan Project's gaseous diffusion technology (p. 3652). Hertz's secret wartime work was deemed so important by the German government that he was allowed to live and work in relative comfort throughout the war despite his Jewish ancestry. After the war, he played a vital role in the Soviet nuclear weapons program. Erich Bagge (German, 1912–1996) invented and successfully demonstrated a unique uranium enrichment device called an isotope sluice, which was essentially an alternative method of gaseous diffusion separation (p. 3685).

D.4.5. Uranium-235 enrichment via photochemical processes. Stanisław Mrozowski (Polish, 1902–1999), K. Zuber (Swiss, 19??–19??), Werner Kuhn, Hans Martin, K. H. Eldau, Paul Harteck, and others developed photochemical methods of isotope separation, demonstrated them with elements such as mercury, and worked to apply them to uranium (p. 3698). It is currently unclear how far that work progressed during the war, but it became the basis of postwar laser isotope separation. (Section C.3 covers early work toward lasers in the German-speaking world).

D.4.6. Possible locations of uranium enrichment facilities. If Germany scaled up any of these proven enrichment methods in order to produce uranium-235 for nuclear weapons, it would have distributed that production capability among a number of small underground locations for protection against Allied bombing. The leading industrialist Adolf Schneider actually confirmed in 1944 that Germany was doing precisely that (p. 4440). Archival documents mention dozens of highly suspicious sites that might have been used for that purpose and that still have not been properly investigated (p. 3704).]

D.4.1 Production of Uranium Hexafluoride for Uranium-235 Enrichment

[Usually uranium is converted into the gaseous compound uranium hexafluoride (UF_6) for enrichment. (Uranium tetrachloride, UCl_4, is generally preferred for electromagnetic separation.) UF_6 is highly corrosive to most materials except nickel. German reports captured by the U.S. Alsos Mission demonstrate that at least as early as 1940, the German program was fully aware of this information and capable of producing UF_6, and that much of that production capability was at I.G. Farben. Unless otherwise noted, text for G-series captured German nuclear reports cited here consists of the English-language abstracts prepared by U.S. scientists who studied the German reports.]

G-32. Wilhelm Groth and Paul Harteck. Corrosion Experiments on Two Alloys (Steel and Light Metal Alloys) with UF_6. 12 May 1940. [See p. 3498.]

Investigations were undertaken in a quartz vessel with very pure UF_6. 10 grams of UF_6 was sublimed into the vessel and the samples were exposed for 14 hours at 100^{o}C. [...] Same test setup but at 350^{o}C. [...] Corrosion of steel is excessive. Light metal, however, can be used in installations operating below 250^{o}C. For high temperature use nickel is the only suitable material.

G-33. Wilhelm Groth and Paul Harteck. Status of Work on Separating ^{235}U und ^{238}U. Stand der Arbeiten zur Trennung der Isotope ^{235}U und ^{238}U. 1940. [See pp. 3499–3501.]

Corrosion tests were made with UF_6 at 100 and 150^{o}C on monel, nickel, brass, copper, aluminum, silver, iron, and various commercial alloys. Results tabulated. Nickel only material suitable for high temperature use. On the basis of tests made with xenon the U isotopes can quite probably be separated by thermal diffusion using a double jacketed tube with a separating length of 10 m.

Developed method for checking concentration of ^{235}U. When ^{235}U is enriched, ^{234}U is also enriched. The alpha emission of ^{234}U is therefore a measure of ^{235}U concentration.

FIAT 1171. *An Instrument for the Measurement of the Radio-Active Content of Moving Gases.*

G-28. Rudolf Fleischmann. Some Constants and Properties of UF_6. Ueber einige Konstanten und Eigenschaften von UF_6. 1940. [See pp. 3502–3505.]

UF_6, the only U compound which is gaseous at room temperature, is of essential importance for isotope separation. Unfortunately there is no complete theory of the separation process, from which the separation can be calculated from measurable constants of the substance to be separated. The theories of Waldmann and of Furry, Jones, and Onsager deal with the plane case but are qualitatively applicable to the cylindrical case. They permit the calculation of the proper size of the apparatus, when a few constants of the gas employed in the separation are known, particularly the coefficient of viscosity η, the density ρ, and the vapor pressure p as a function of the temperature. [These quantities were measured and reported.] Investigations with UF_6 are complicated by its affinity for water and its corrosive properties, but operation of a small experimental system shows that separation can probably be carried out nevertheless.

G-157. Paul Harteck and Wilhelm Groth (Institut für Phys. Chemie, Hamburg); Erich Noack and Walter Kwasnik (I.G. Farben Leverkusen). Herstellung von Uranhexafluorid im Halbtechnischen Masstab. Untersuchung der Legierungsfähigkeit von metallischem Uran. 11 June 1942. [See pp. 3506–3507.]

Description of usual laboratory method of making UF_6 from metallic U using Cl as catalyst. Kwasnik developed process whereby uranium oxide is carried through a rotating inclined nickel tube heated to 650^{o}C through which a stream of fluorine gas is passed. The UF_6 thus formed is frozen by CO_2 in containers. About 500 grams UF_6 thus produced per hour. The UF_6 to be frozen in large crystalline block to reduce amount of adsorption of other gases. Method of transport and handling of UF_6. Projected improvements of Kwasnik process. Possibility of using U ores directly instead of first purifying U. Costs 22–51 RM/kg. Experiments planned with U alloys of nickel, silicon, and chromium.

5.12.40
G 32

This document has been declassified by authority of issuing installation. Letter dated ______ Noted by ______

UNCLASSIFIED

WO-21589

Korrosionsversuche an zwei eingesandten Metallegierungen (Stahllegierung und Leichtmetallegierung) mit Uranhexafluorid.

Die früheren Korrosionsversuche wurden im anorganischen Laboratorium der I.G.Farben in Leverkusen von Dr.N o a c k und seinen Mitarbeitern ausgeführt.
Für die jetzigen Korrosionsversuche an den uns übersandten Metallproben,denen wir als Vergleichsmetall Reinnickel zufügten,wurde in Hamburg eine Apparatur entwickelt,die die Korrosionsversuche unter Verwendung von Bodensteinschen Membranventilen aus Nickel unter völlig sauberen Bedingungen ohne Hähne,Schliffverbindungen oder anderen störenden Dichtungsmitteln ermöglichten.
Die verwendete Apparatur ist schematisch auf der beigefügten Zeichnung dargestellt.
Das Uranhexafluorid,das uns von Herrn Dr. Noack geliefert und bis zur Verwendung bei einer Temperatur von − 78°C bewahrt wurde,befindet sich in dem Gefäss A aus Quarz,das mit einem Zerschlageventil versehen ist.Als Zerschlagekörper wurde ein in Quarz vollkommen eingeschlossenes Eisenstück verwendet,das magnetisch betätigt werden konnte.An der Stelle B konnte das Quarzgefäss A abgeschmolzen werden,nachdem das Hexafluorid in die eigentliche Apparatur sublimiert worden war.Dies bestand aus zwei Quarzausfriergefässen C und D, einem Bodensteinschen Quarzspiralmanometer E,dem Bodensteinschen Membranventil aus Nickel F,das mit Hilfe eines aussen gedichteten Schliffes mit der Quarzapparatur verbunden war und dem Korrosionsgefäss G aus reinem Nickel von etwa 1,5 lt Inhalt.Nachdem die ganze Apparatur sorgfältig evakuiert war, konnte sie von der Pumpleitung an der Stelle H abgeschmolzen werden.

− 2 −

Die Sublimation des Uranhexafluorids in die Apparatur gestaltete sich sehr einfach,da der Stoff bei 0°C einen Dampfdruck von etwa 25 mm Hg hat,während die Temperatur eines Kältebades von − 78°C(Kohlensäure − Aceton) oder − 183°C (flüssiger Sauerstoff) der Dampfdruck praktisch null ist. −

Das Hexafluorid,das über meherere Monate aufbewahrt worden war und gelegentlich kürzere Zeit auch Zimmertemperatur angenommen hatte,bestand dennoch im Wesentlichen aus sehr reinen weissen Kristallen.Mit Hilfe der beiden Ausfriergefässe C und D unter dauernder Kontrolle durch das Spiralmanometer, wurde eine mehrmalige Umsublimation vorgenommen,wodurch eine völlige Reinigung von den letzten Spuren von Verunreinigung erzielt wurde.Es ist bemerkenswert,dass das Uranhexafluorid, sobald es mit Glas oder etwas Hahnfett in Berührung kommt, sich ausserordentlich stark zersetzt.Ausserdem wurde festgestellt,dass nach den Korrosionsversuchen das wieder in ein Ausfriergefäss sublimierte Hexafluorid,das nun Spuren von Zersetzungsprodukten enthielt,auch das Quarz angriff,sodass dieses oberflächlich abblätterte.
Die ersten Korrosionsversuche wurden bei einer Temperatur von etwa 100°C ausgeführt,nachdem eine Menge von etwa 10 g Hexafluorid,entsprechend etwa 700 ccm von Atmosphärendruck bei 0°C , in das Korrosionsgefäss sublimiert worden und das Membranventil geschlossen worden war.Das Ergebnis dieses Versuches,dessen Dauer 14 Stunden betrug,zeigt die Tabelle I.

Tabelle I

Leicht	Gewicht vor Vers.	Gewicht nach Vers.	Differenz	Differenz bezogen aus 10cm² Oberfläche (Vergleichswerte mit d.früheren Korros.Vers.)
Leichtmetall	3.252_5 g	$3{,}253_7$ g	$0{,}001_2$	
Stahl	$10{,}535_5$ "	$10{,}538_0$ "	$0{,}002_5$	
Nickel(z.Vergl.)	$2{,}514_5$ "	$2{,}514_5$ "	0	

Die Oberfläche der untersuchten Metalle betrug etwa 10 cm² .
Ein weiterer Versuch wurde bei etwa 350°C gemacht.Zu diesem Zweck wurde unter dem Korrosionsgefäss eine Asbestpappe und eine Messingplatte angebracht und das ganze Gefäss in Schlakkenwolle eingehüllt.Die Heizung erfolgte duch durch zwei starke

− 3 −

Bunsenbrenner;die Temperatur wurde mit einem kleinen,eng an der Oberfläche anliegenden Quecksilberthermometer etwas oberhalb der unteren Grundfläche gemessen.Um das Membranventil, dessen Membrane auf den Nickelkörper warm aufgesetzt und dann von aussen weich verlötet war,vor der hohen Temperatur zu schützen,war zwischen diesem und dem Korrosionsgefäss eine Kupferspirale angelötet,durch die Wasser geleitet wurde,sodass die Temperatur des Ventiles unter 70°C liegt.Dieser Versuch,der ebenfalls 14 Stunden dauerte,hatte folgendes Ergebnis:

Tabelle II

	Gewicht vor Vers.	Gewicht nach Vers.	Differenz	Differenz bezogen aus 10cm² Oberfläche (Vergleichswerte mit den früheren Korrosionsversuchen)
Leichtmetall	$3{,}253_7$	$3{,}280_4$	$0{,}026_7$	
Stahl	$10{,}538_0$	$10{,}570_1$	$0{,}032_1$ $(0{,}079_5)$	
Nickel (z.Vergl.)	$2{,}514_5$	$2{,}521_5$	$0{,}017_0$	

Während das Aussehen des Nickels und der Leichtmetallegierung nach dem ersten Versuch unverändert war,zeigten alle drei Metalle nach dem Versuch bei hoher Temperatur einen Beschlag. Dieser war beim Nickel am geringsten und vollkommen gleichmässig über die gesamte Oberfläche verteilt.Auch die Leichtmetallegierung war von einem dünnen gleichmässigen Belag bedeckt.Diese beiden Belege liessen sich durch trockenes Abwischen nicht entfernen.Der Stahl dagegen war sehr stark angegriffen,sodass das gebildete Metallsalz teilweise abfiel. Dieses Salz wurde besonders gewogen.Der beim Stahl in Klammern hinzugefügte Wert der Gewichtsdifferenzen vor und nach dem Versuch,ist die Summe der Zunahme der Probe selbst und des abgefallenen Salzes.Sowohl das Leixhtmetall als auch das Nikkel wurden nach der Wägung mit trockenem Filtrierpapier gereinigt,ohne dass dadurch eine Gewichtsänderung eintrat.
Es ist auffällig,dass die Korrosion des Stahles an einem Ende stärker ist als am anderen.Dieser Teil befand sich während

− 4 −

des Versuches in der Nähe des Gefässbodens,wo die Temperatur naturgemäss höher war als am oberen Ende;sie betrug hier wahrscheinlich megr als 350°C.
Zusammenfassend ist zu sagen,dass,wie schon die früheren Versuche zeigten,das Nickel weitaus am beständigsten gegen Uranhexafluorid ist und für Versuche bei höheren Temperaturen allein in Betracht kommt.Das Leichtmetall wird bei der hohen Temperatur um ein Mehrfaches stärker angegriffen;bei etwa 100°C ist die Beständigkeit aber recht gut,sodass z.B.für Zu- und Ableitungen,durch die das Gas nur bei Zimmertemperatur strömt,auch dieses Metall verwendbar sein dürfte,wahrscheinlich sogar auch für Trennrohre ,falls man sich mit einer Heiztemperatur des Trennrohres von 250°C begnügt.Am schlechtesten eignet sich der Stahl,der wohl unter keinen Umständen in Betracht kommen dürfte.
Die Verwendbarkeit der eingesandten Metallproben ergibt sich aus einem Vergleich der jetzigen mit den früher ausgeführten Korrosionsversuchen an Nickel,Monel,V2A,V4A,Messing,Kupfer, Aluminium,Silber,Eisen.(Siehe unseren Bericht vom 5.Juni1940)
Es ist allerdings zu berücksichtigen,dass die Gewichtsdifferenzen von der Stärke der trockenen Reinigung der korrodierten Proben abhängt,wodurch z.B. im Falle des Nickels eine bessere Uebereinstimmung der beiden Versuchsergebnisse erzielt werden könnte.
Die untersuchten Proben sind beigefügt.

Figure D.121: Production and testing of uranium hexafluoride in 1940 [G-32].

~~SECRET~~ – 5.6.40

2.

~~CAUTION RESTRICTED DATA~~

~~This document contains restricted data as defined in the Atomic Energy Act of [illegible] which affects the National [illegible] of the United States. Its transmittal or the disclosure of its contents in any manner to an unauthorized person is prohibited and may result in severe penalties under applicable Federal Laws.~~

UNCLASSIFIED

(196)

G-33 (Ref. No. 196)

Copy 1

This document has been declassified by authority of issuing installation. Letter dated 6-1-50 Noted by [illegible]

Stand der Arbeiten zur Trennung der Isotope ^{235}U und ^{238}U.

von W. G r o t h und P. H a r t e c k in Hamburg.

WO-21590

Die Vorarbeiten zur Trennung der Uranisotope ^{235}U und ^{238}U sind in zwei Richtungen aufgenommen worden. Die eine betraf das Aufsuchen eines Stoffes, der vom Uranhexafluorid nur mässig angegriffen wird; das zweite Problem bestand in der weiteren Ausarbeitung des Trennrohrverfahrens von Clusius und Dickel für die speziellen Erfordernisse, die bei der Trennung der Uranisotope im gasförmigen Uranhexafluorid auftreten.

I. Korrosionsversuche.

Diese Frage wurde durch die freundliche Mitarbeit der I.G. Farben Industrie A.G., insbesondere der Herren Dr. Noack und Dr. Kwasnick gelöst. Es wurde das Verhalten der folgenden Metalle gegen Uranhexafluorid untersucht: Monel, Nickel, Silverin, V2A, V4A, Messing, Kupfer, Aluminium, Silber und Eisen. Die Oberfläche der untersuchten Proben betrug 10 cm^2. Die Korrosionsversuche wurden bei 100°C, 150°C und neuerdings auch bei 360°C durchgeführt, ohne dass mit steigender Temperatur eine wesentliche Korrosionszunahme festgestellt werden konnte. Die Ergebnisse der Versuche sind in den folgenden Tabellen dargestellt

~~SECRET~~ UNCLASSIFIED

~~SECRET~~

Verhalten von verschiedenen Metallen gegenüber Uranhexafluorid.

Prüfzeit : 1 Stunde
Temperatur: 100°
Oberfläche der Proben: 10 cm^2.

Untersuchtes Material	Aussehen der Proben	Gewichtsänderung
Monel	blank, kaum verändert	+ 0,0034 g
Nickel	" " "	+ 0,0052 g
V2A	" " "	+ 0,0072 g
V4A	" " "	+ 0,0056 g
Messing	geringer weisser Belag	+ 0,0088 g
Kupfer	teils blank, teils mit schwarzem Belag bedeckt	+ 0,0126 g
Aluminium	teilweise korrodiert	+ 0,0112 g
Silber	graugrüner festhaftender Belag	+ 0,0312 g
Eisen	sehr stark korrodiert und mit dickem Belag belegt	+ 0,7508 g

Prüfzeit : 1 Stunde
Temperatur: 150°
Oberfläche der Proben: 10 cm^2.

Untersuchtes Material	Aussehen der Proben	Gewichtsänderung
Monel	blank, kaum verändert	0,0032 g
Nickel	" " "	+ 0,0046 g
V2A	" " "	+ 0,0052 g
V4A	" " "	+ 0,0044 g
Messing	geringer Belag	+ 0,0086 g
Kupfer	geringer Belag	+ 0,0112 g
Aluminium	teilweise korrodiert	+ 0,0198 g
Silber	graugrüner festhaftender Belag	+ 0,0306 g
Eisen	sehr stark korrodiert und mit dickem Belag bedeckt	+ 0,1540 g

3.

~~SECRET~~

Verhalten von verschiedenen Metallen gegenüber Uranhexafluorid .

Prüfzeit : 7 Tage
Temperatur : 150°C
Oberfläche der Proben: 10 cm^2

Untersuchtes Material	Aussehen der Proben	Gewichtsänderung
Nickel	blank	+ 0,0104
Silverin Probe 1	fast blank	+ 0,0102
Silverin Probe 2	fast blank	+ 0,0139
Silverin Probe 3	fast blank	+ 0,0112
V4A	fast blank, jedoch mehr angegriffen als Silverin	+ 0,0219
V2A	schwarzgrauer Ueberzug	+ 0,0360
Monel	grauer Ueberzug	+ 0,0303

Prüfzeit : 7 Tage
Temperatur : 360°
Oberfläche der Proben: 10 cm^2.

Untersuchtes Material:	Aussehen der Proben:	Gewichtsänderung: Probe 1:	Probe 2:
Nickel	grüner, festhaftender Belag. An feuchter Luft blättert der Belag in kurzer Zeit ab.	+ 0,0036	+ 0,0008
Silverin	graugrüner, dicker, schlecht haftender Belag.	– 0,0918	– 0,0800
Monel	graugrüner, dicker, schlecht haftender Belag.	– 0,0812	– 0,0905.

Figure D.122: Production and testing of uranium hexafluoride in 1940 [G-33].

4. ~~SECRET~~

Die Gewichtsänderungen sind so zustande gekommen, dass der schlecht haftende Belag, der sich in allen Fällen bei der Einwirkung des Hexafluorids auf Metallen bildet, entfernt wurde, sodass die Gewichtzunahme ein Mass für die Angreifbarkeit des Metalles durch Uranhexafluorid ist.

Von den untersuchten Metallen erwies sich das Nickel, vor allem in den Dauerversuchen über 7 Tage bei 360°C, der in Aussicht genommenen Versuchstemperatur, als allen Metallen weitaus überlegen. Es wird vom Uranhexafluorid oberflächlich leicht angegriffen. Dabei ensteht ein grüner, festhaftender Belag, der das Nickel vor weiterer Korrosion schützt. Es ist deshalb anzunehmen, dass reines Nickel auch bei Dauerversuchen beständig sein wird, sodass die Materialfrage für die Versuchsanordnung damit gelöst zu sein scheint.

Zwei Trennrohre aus reinem Nickel von 2m bzw. 8m Länge sind seit längerer Zeit in Auftrag gegeben, aber infolge der Schwierigkeit der Materialbeschaffung nach wie vor in Arbeit. Als Ein-und Auslassventile sind Bodensteinsche Membranventile aus reinem Nickel vorgesehen.

II. Ausarbeitung des Trennrohrverfahrens von Clusius und Dickel.

Trennrohrversuche sind, ausser von Clusius und Dickel[1], von Fleischmann in Heidelberg[2], in den Vereinigten Staaten[3] und von uns in Hamburg[4] durchgeführt worden. Für unsere Arbeitrichtung ist charakteristisch, dass wir als Analysenmethode zum Nachweis der Verschiebung des Isotopenverhältnisses die Wärmeleitfähigkeitsmethode entwickelt und so weit verfeinert haben, dass bei Proben von 1 cbcm von Atmosphärendruck eine Verschiebung des Atomgewichtes um 0,01 % leicht nachgewiesen werden kann.[4]

~~SECRET~~ 68

4.

Trennversuche mit Xenon.

T_{max}	373	419	633	633
T_{min}	313	333	403	293
$T_{mitt.}$	343	376	518	463
$\Delta T = T_{max} - T_{min}$	60	86	230	340
$\Delta T \times T_{mitt.}$ +	20000	32400	119000	158000
$\Delta T : T_{mitt.}$ +	0·175	0·228	0·444	0·732
A.G.$_{leicht}$ - A.G.$_{norm.}$	0·06	0·09	0·46	0·56
$(\Delta T \times T_{mitt})$: Δ At.G	~ 66	~ 72	~ 54	~ 56
$(\Delta T : T_{mitt})$: Δ AG	~ 58	~ 50	~19	~13

Atomg. norm. – Atomg. leicht

Zusammenfassend kann gesagt werden, dass bei Verwendung eines dampfgeheizten Doppelmantelrohres und einer mässigen Trennlänge (etwa 10 m) ein Effekt zu erwarten ist, der den gestellten Anforderungen genügt; die angereicherten Isotopen können bei geeigneter Dimensionierung wahrscheinlich in Mengen gewonnen werden, die für die vorliegenden Zwecke ausreichend sind.

NB. Atomgewichte der Xenonisotope.
124 (0·094 %)
126 0·088 %
128 1·91 %
129 26·23 %
130 4·06 %
131 21·18 %
132 26·98 %
134 10·55 %
136 8·95 %

6·19
114
235
349
352

~~SECRET~~ 68

-5-

Wir benutzten im Zusammenhang mit den vorliegenden Aufgaben als Versuchsgas im wesentlichen Xenon. Das Xenon besitzt die folgenden 9 Isotope: 124(0,094%), 126(0,088%), 128(1,91%), 129(26,23%), 130(4,06%), 131(21,18%), 132(26,98%), 134(10,55%), 136(8,95%), und kommt mit seinem mitleren Atomgewicht von 131,3 dem Uranhexafluorid (Atomgewicht 349 bzw. 352) relativ nahe. Die Erfahrungen dagegen, die von anderen Autoren und von uns an leichteren Gasen (Krypton, Metan, Stickstoff, Neon usw.) gemacht wurden, können nur unter grösseren Vorbehalten auf das Uranhexafluorid übertragen werden.

Zur Zeit sind für die Trennung in der Gasphase 2 Arten von Trennrohren in Verwendung. Die einen, wozu auch die ersten von Clusius und Dickel angegebenen gehören, besitzen einen in einem vertikalen Glasrohr zentrisch gespannten, elektrisch geheizten Draht, wobei das Glasrohr meistens aussen wassergekühlt wird. Der Durchmesser des Drahtes beträgt wenige $^1/10$mm, der des Glasrohres, je nach der verwendeten Drahttemperatur und der Dichte des untersuchten Gases, zwischen 5 und 20 mm. Die zweite Art der Trennrohre besteht aus 2 konzentrischen Rohren aus Glas oder Metall, von denen das eine entweder durch einen axial ausgespannten Draht, durch eine Leuchtgasflamme oder – wie es bei unseren Versuchen, bei denen das innere Rohr geheizt wurde, der Fall war – durch den Dampf einer siedenden Flüssigkeit geheizt werden kann. Im letzten Fall ist eine weitgehende Temperaturkonstanz gewährleistet. Das Aussenrohr wurde bei unseren Versuchen teils luft-, teils wassergekühlt. Bei allen Tennrohren ist es bekanntlich günstig, in Abständen von 15 bis 20cm Strömungswiderstände einzubauen, die eine zu weite Ausbreitung von unerwünschten (turbulenten) Strömungsformen verhindern sollen.

~~SECRET~~

– 6 –

4) Unseren ersten Trennversuche führten wir mit zwei drahtgeheizten Anordnungen von 2 m und 5,5 m Länge aus. Die Drahtdurchmesser waren 0,2 mm, die Glasrohre hatten einen inneren Durchmesser von 5 mm. Wir gingen dann zu Trennrohren über, die aus zwei konzentrischen Glasröhren bestehen und verwendeten Apparaturen von 2 m und 8 m Länge. Der äussere Durchmesser der inneren Rohre betrug 17 mm, der lichte Durchmesser der äusseren Rohre 23 mm, sodass ein Wandabstand von 3 mm entstand, alle 15 cm wurden Glasscheibchen eingebaut, die gleichzeitig als Strömungswiderstände und zur Zentrierung der Rohre dienten. Die Heizung erfolgte in diesem Falle entweder mit Wasserdampf oder mit dem Dampf von siedendem Tetrachloräthan (Siedepunkt 146°C). Ausserdem haben wir eine Versuchsanordnung aus zwei konzentrischen Eisenrohren aufgestellt, deren Formen der bestellten Nickelapparatur gleicht. Die Höhe der Eisenapparatur beträgt allerdings nur 2 m, während die der endgültigen Nickelapparatur etwa 8 m betragen soll. (Eine Skizze der Eisenapparatur liegt bei.) Die Heizung erfolgte in diesem Falle durch den Dampf von siedendem Quecksilber (360°C). Das äussere Rohr wurde teils luftgekühlt, wobeo es sich auf etwa 130°C erwärmte, teils durch eine Wasserkühlung auf 20°C gehalten.

Die durchgeführten Versuche ermöglichen es, die einzelnen interessierenden Grössen, wie Wirkungsgrad, Trenndauer und getrennte Menge in Abhängigkeit von der Rohrlänge, dem Temperaturunterschied und der Art der Trennrohre (Draht- oder Dampfheizung) anzugeben.

Wir möchten vorwegnehmen, dass unsere Ergebnisse in einigen Punkten von denen von Clusius und Dickel abweichen, möchten jedoch darauf hinweisen, dass Neon und Xenon ein verschiedenes Verhalten zeigen, falls die Anziehungskräfte zwischen den Molekülen eine wesentliche Rolle spielen – eine Frage, die zur Zeit noch nicht

Figure D.123: Production and testing of uranium hexafluoride in 1940 [G-33].