ANTJE MAJEWSKI
SILVER AND COPPER

Wu

Mr. Baynes, a Swede on a business trip, is flying with Lufthansa to San Francisco, where he wants to show plastic and artificial resin products to an important Japanese trading partner. On the way, he falls into conversation with an artist sitting next to him named Lotze, who is preparing for an exhibition in San Francisco. Baynes apologizes for not being familiar with Lotze's work – himself liking only the old cubists and abstractionists. But, Lotze retorts, that was the time of spiritual decadence, of the Jewish plutocracy. Baynes nods in agreement. Just before landing he tells the artist, quite suddenly, that he is a Jew and has been moving unrecognized within the highest Nazi circles. Baynes is no Swede; he is a German working for the German counter-intelligence. The plane is rocket-propelled. After the triumph of WWII, Germany and Japan divided the world, and San Francisco is now a part of the Japanese sector of the former USA. Hitler's successor, Reich Chancellor Martin Bormann, is planning now to subjugate Japan via Operation Dandelion, a surprise nuclear attack. Baynes' task is to inform the old Japanese General Tedeki (and thereby convince the Japanese people) to come into contact with the SS, who happen to be against the operation because of political reasons. General Tedeki realizes that if he wants to save Japan, he must collaborate with the worst part of German society.

In Philip K. Dick's *The Man in the High Castle*,[1] the Japanese, German Nazis, and the oppressed Americans are all reading an officially banned book, *The Grasshopper Lies Heavy*. Its author had received commands from the oracle I Ching to write it – and the I Ching doesn't lie. In this book, an alternative reality is described in which the Allies have won the war.

For a brief moment, the Japanese businessman – whose office serves as the undercover-address for the conspirational meeting between Baynes and General Tedeki – falls into an alternative reality in which the Japanese are treated like normal human beings, instead of *übermenschen*, a world in which no rickshaw taxis exist, and luckily for him, not a permanent state of reality. He had been staring too long at an oddly unfinished piece of silver jewelry, the first new artwork of conquered America,

1 Philip K. Dick, *The Man in the High Castle* (New York, 1962).

which was sold to him by an antique dealer who had discovered the swirly blob jewelry's inherent *Wu*.[2]

It is no coincidence that Philip K. Dick – whose confidence in a shared common reality declined rapidly – sketched this credible scenario in which the Nazis had had the atomic bomb in their hands and therefore had won the war. One can hardly imagine anything more threatening on the forked road of history. And this is one of the reasons why there is a never-ending debate about how it came to pass that the Nazis never had an atomic bomb.

The Circumstances

During the first years of the war, Germany's opponents, above all the British, had every reason to worry. As early as June 1939 an article about an energy-generating uranium machine was published by Sebastian Flügge, an assistant of Otto Hahn and Lise Meitner (who both had discovered nuclear fission). That same year, the German Army Ordnance founded the Uranium Club for the purpose of researching nuclear energy for military deployment. Among others, Germany's leading physicist Werner Heisenberg, as well as his brilliant assistant Carl Friedrich von Weizsäcker, pre-occupied themselves with the principles of a uranium machine that could produce energy, and worked also on the possibility of an atomic bomb. German troops seized Europe's only uranium mines in Joachimsthal, Czechoslovakia, and shortly thereafter the only heavy water plant in the world, the Norsk Hydro near Rjukan, Norway. Later the Belgian uranium alloy supply (of the Union Minière) was seized. Up until 1942, nuclear research in America and Germany had been running fairly parallel to one another, although because of the strict secrecy and censoring of scientific publications, they knew nothing about each other's progress. But then the Germans fell out of step, while the Americans continued to make great progress, for which there were many reasons.

Naturally occurring uranium consists almost exclusively of unfissionable U238 and contains only traces of the isotope U235, which is fissionable when bombarded by a fast neutron, but difficult to isolate. With each fission of U235, neutrons are released, initiating a chain reaction to create an enormous, previously unimaginable explosive power. To separate isotopes, one can use a cyclotron; while there was no

1 In the *Tao Te Ching* of Lao-tse one finds in section 51: "Tao is made up of Wu. De cultivates itself in Wu. Things find their form in Wu. Influential power is fully realized in Wu." Further explained in section 50: "Qi wu si di." ("Wu – this unity of emptiness and fullness is the highest achievement in the world.").

such machine in Germany, 9 existed and 27 were under construction in America before the beginning of the war. Here, the relationship between science and industry was taken for granted. Although the Germans had appropriated Frédéric Joliot-Curie's unfinished cyclotron in Paris, they had had difficulties with the facilities. Other attempts by the research groups to separate isotopes continued to fail. They had grasped quite early that one could employ plutonium as an explosive, and the researchers around Heisenberg had informed the German Army Ordnance of such. Plutonium is not an element occurring in nature, but can be bred in nuclear reactors. U238 absorbs slow (thermal) neutrons and decays into the element 93 (neptunium, Np239), which after a short half-life decays consequently into the element 94 (plutonium, Pu239). For the reactor, one needs a moderator, a so-to-speak neutron-decelerator which consists at best of either graphite, or heavy water. Graphite was rejected by the German Army Ordnance because the requisite degree of purity would have been very expensive to produce, and they were counting on the expansion of the heavy water plant Norsk Hydro. Because of the British and Norwegian underground's adventurous sabotage of the plant, and finally its destruction by an American bomb squadron (in 1943), hundreds of liters of heavy water were still missing when needed for the last large-scale attempt at building a uranium machine. The attempts to build heavy water plants didn't succeed, partly because of lack of means and partly because the half-finished plants were bombed by the Allies. Furthermore, uranium was always in short supply, and while the production of pure uranium in America continued to rise, the research groups in Germany were forced to compete for the few available kilos. Research was not strictly organized through the military, as it was under General Groves in America, but instead divided between groups located in different places.[3]

Werner Heisenberg later said: "The physics of it is, as a matter of fact, very simple; it is an industrial problem. It would never have been possible for Germany at all to do anything on that scale. In some way, I am glad that it has not been possible because it would have been terrible for us all."[4] But what would have happened if big-industry means would have been employed?

In the winter of 1941, the German offensive in Russia had taken a turn towards the worse, and Fritz Todt, the Reich Minister for Arms and Munitions, had asked

3 One group was at the Kaiser-Wilhelm-Institut (Heisenberg, von Weizsäcker, Karl Wirtz, among others); one was at the Army research laboratory in Gottrow (under the direction of Kurt Diebner); the chemist Paul Harteck's experiments were held at the University of Hamburg; and eventually a special group of the Minister of the German Post Office was formed.

4 Heisenberg at Farm Hall, 1945. See Jeremy Bernstein, *Hitler's Uranium Club: The Secret Recordings at Farm Hall* (Woodbury, N.Y., and New York, 1996), p. 243.

Hitler to set priorities: one could no longer sustain the illusion of a peacetime economy. After Todt's death in a plane crash, Hitler surprisingly appointed the monumental architect Albert Speer as his successor. One should know at this point that even though Hitler had always dreamed of a "secret weapon," his only source of information about the nuclear project came to him "in a kind of sensationalist tabloid style" vis-à-vis his personal photographer, Heinrich Hoffmann.[5]

In the spring of 1942, based on the physicist's reports, the German Army Ordnance decided that nuclear energy would not be relevant to the war cause – still believing at this point that the war would be won without "wonder weapons" within one to two years.[6] On 26 February 1942, the nuclear researchers, including Heisenberg, gave lectures – which were made comprehensible for both the NS party representatives and the Reich Research Council and Economy – faithfully outlining the research and experimental progression: It was possible to build an atomic bomb, but it would be very expensive; and even with big-industry efforts, it could not be completed before 1944-45. As a result, the commander of the German Army Ordnance, Erich Schumann, handed over the project to the Reich Research Council so that he could turn his attention to Wernher von Braun's rocket research in Peenemünde. Nonetheless, Heisenberg and the research groups could still have tried to push efforts towards building an atomic bomb.

At Speer's request, a further conference was held in Berlin on 4 June 1942. Participants included nuclear physicists, Speer himself, as well as generals and representatives of industry. After a series of lectures, Heisenberg – who had advanced to Director of the Kaiser-Wilhelm-Gesellschaft – limited his requests to new buildings, war-relevant raw materials, and an increase of the research budget by 40 000 RM. Heisenberg, a father of seven children, tried to protect himself from every possible eventuality.[7] Speer, however, accustomed to enormous dimensions, was resolved to the fact that the physicists had no confidence in their own project. Much later he remembered: "But their requests were so ridiculously low – a couple of million Marks – we came to the conclusion that they must have been still at a very early stage of development; apparently the physicists didn't want to put too much effort into it."[8]

5 Thomas Powers, *Heisenberg's War: The Secret History of the German Bomb* (New York, 1993), p. 151.

6 Mark Walker, *German National Socialism and the Quest for Nuclear Power. 1939-1949* (Cambridge, 1989), p. 49.

7 In an interview with Joseph J. Ermenc in 1967, Heisenberg said: "At this meeting held during the summer of '42, we hesitated very much to ask for too much money. [...] So we were very careful in speaking about atomic bombs. But we did say that they could be made. This we had to say, to be safe, in case the Americans would actually drop bombs; this was a possibility." Http://www.haigerloch.de/stadt/atomkeller/heisenberg.html.

8 Albert Speer, in: *Der Spiegel*, 3 July 1967.

Shortly thereafter, on 17 June 1942, the Americans, on the other hand, decided to go ahead with building the bomb; they withdrew the project from civil hands and transferred it to the Army Corps of Engineers. The Germans, in the end, spent less than one percent of the two billion dollars that the Americans had invested in the Manhattan Engineering District, later known as the Manhattan Project. While in the USA factories were seemingly stamped out of the ground, and up to 150 000 people were working on the project, in Germany not only the workers (as in other industries, one could have used forced labor), but also the physicists were missing: while many of the young scientists were drafted into military service, those who were Jewish were fired and driven into exile.

As of 1942 Heisenberg and von Weizsäcker concentrated on astrophysical fundamental research. The sole aim of the experimental physicists was building a uranium machine. Various research groups worked feverishly up until the last days of the war on producing a self-perpetuating chain reaction triggered by fission.[9] Because of the Allied air raids, the institutes had to be relocated. The last nearly successful experiment with the uranium machine B-VIII was conducted by Heisenberg in a cave near Haigerloch, just two months before most of the participating researchers were captured by the Allies.

Good Intentions

After the war, Heisenberg repeatedly mentioned how glad he was that the circumstances had taken the burden of building a bomb for Hitler off his shoulders. The science editor Paul Rosbaud opined later: "Heisenberg's statement, in 1946, that 'external circumstances' had relieved the German atomic experts from the need to take the difficult decision whether or not to produce atom bombs may be regarded as correct – if ignorance of how to do so is taken to be synonymous with 'external circumstances'."[10] Indeed, Heisenberg had never really carried out the basic calculations for the bomb. And possibly he had over-estimated the critical mass necessary of U235 (and/or plutonium) by several tons. In London, Otto Frisch and Rudolf Peierls had already made this calculation – the diffusion equation – as early as 1940.[11] The

9 In the USA Enrico Fermi had already succeeded on 2 December 1942.

10 Arnold Kramish, *The Griffin* (Boston, 1986), p.121.

11 The question of whether or not the calculations were incorrect (or simply not yet made), is confusingly complex. When Speer asked how big a bomb would have to be to destroy London, Heisenberg answered correctly: "as big as a pineapple," even though this estimate might have been based on incorrect assumptions. After the Americans dropped the bomb, Heisenberg was under the gun until he explained the basis of a bomb in a lecture given to other physicists a week later.

only delay for the experiments caused by Heisenberg lies in his insistence on using metal plates in the experiments to build a uranium machine, even though the experimental physicist Karl-Heinz Höcker had made clear in 1942 that metal cubes yielded more favorable results.[12]

Soon after the end of the war, the rumor circulated that the German physicists, in contrast to the Americans, had refused to build the bomb by intentionally misleading the German army commanders.[13] Questionable evidence of this theory is a conversation between Werner Heisenberg and his friend and teacher Niels Bohr in Copenhagen, in September 1941, i.e. before Speer and the army commanders had decided against the bomb.[14] Carl Friedrich von Weizsäcker, with the help of his father, the diplomat Ernst von Weizsäcker, arranged for Heisenberg to give a paper at the German Scientific Institute (DWI) in occupied Copenhagen, from which Bohr and his colleagues demonstratively stayed away. Unfortunately it is impossible to reconstruct the private conversation – whose meaning is controversial – held between Niels Bohr and Werner Heisenberg when they went on a walk. After the war, Heisenberg explained that he had seen the possibility of all scientists making a pact to exaggerate the difficulties in building a bomb as a means of preventing their governments from doing so. That is what he had wanted to discuss with Bohr, and overall to see if he could do something for him. But at this point, Bohr had absolutely no contact to the American scientists, who, unbeknownst to the outside world, had already begun work on the atomic bomb. Moreover, there was no single existing German nuclear project, but rather competing groups of researchers. Heisenberg never would have managed to plot a conspiracy with all of the involved scientists, some of whom were National Socialists.[15]

12 See Walker, p. 99 and p. 167. Höcker and the study group in Gottrow eventually succeeded.

13 A harmless version was formulated in a memorandum, at Heisenberg's suggestion, by the Farm Hall internees on 8 August 1945: One was working only on a uranium machine, never on a bomb. The theory of the researcher's "resistance" was made known via the first important German book about the development of the atomic bomb: Robert Jungk's *Heller als Tausend Sonnen* (Stuttgart, 1956), which followed Samuel Goudsmit's *Alsos* (London, 1947). Robert Jungk later retracted his opinion and was outraged at "certain German scientists" who tried to clear their names through the "myth of passive resistance," which in the end they themselves believed. See Jungk's preface to Walker's *German National Socialism and the Quest for Nuclear Power*. Published more recently is the extensively researched, but journalistic work of Thomas Powers' *Heisenberg's War*. Here Powers tries to save Heisenberg's reputation. Michael Frayn's play *Kopenhagen* (London, 1998) is based on Powers' book. A rather venomously opposite stand is taken by Paul Lawrence Rose in his book *Heisenberg and the Nazi Atomic Bomb Project: A Study in German Culture* (Berkeley, 1998).

14 Recently Frayn's *Kopenhagen* generated a debate, which brought the heirs of Niels Bohr, in February 2002 – i.e. before the end of the required waiting period – to publish drafts of his letters to Heisenberg from 1957-1962 on the Internet. See http://www.nbi.dk/NBA/papers/introduction.html and http://www.nbi.dk/NBA/papers/docs/cover.html. A flood of articles and symposiums followed suit.

15 According to Powers, Heisenberg spoke with his colleagues Karl Wirtz, Carl Friedrich von Weizsäcker, Hans Daniel Jensen, and Friedrich Houtermans before making the trip. See *Heisenberg's War*, p. 113.

We can be certain that Heisenberg never told Bohr about his proposal; Bohr abruptly brought the conversation to an end as soon as he found out that Heisenberg was participating in researching nuclear energy for the sake of the war effort. That Heisenberg had asked him in the beginning to turn to the German ambassador Herr von Rinthe-Fink for protection, Bohr understood as a request for collaboration. Furthermore, Heisenberg had made clear that he believed in a German victory – at that time, not an uncommon thought for a German, given the early successes of the Russian campaign. In the drafts of an unsent letter to Heisenberg, Bohr struggled after the war with articulating his suspicions that he had come to him on official orders.[16] It is unlikely that Heisenberg was sent to spy on Bohr to find out what he knew about the American nuclear project; by doing so, he would possibly betray that of the Germans.[17] Thomas Powers stresses in his book *Heisenberg's War* that such treason was already in itself an act of sabotage.[18] Indeed, after having fled from Denmark in October 1943, Bohr was interrogated immediately by the British secret service and by General Groves personally, the military commander of the American Manhattan Project. Heisenberg was the most important German physicist, and Bohr the only witness for the Allies, who spoke with him during the war. Bohr confirmed their fear of the German nuclear project, of which nothing was known excepting the fact of its existence. The Americans, in turn, kept their secret so well, that up until the end of the war the Germans had no clue about it. Perhaps Heisenberg wanted – just as Bohr first suspected – to find out if Bohr knew anything about the American plans. He was afraid "that one day an atomic bomb would be dropped on Germany. The very idea of it troubled him constantly."[19]

The plan of the International Pact of Scientists against the bomb – whether it existed back then or was incorporated into the facts later – is one much better credited to Carl Friedrich von Weizsäcker, with whom Heisenberg had arranged the meeting.[20] The "boundlessly ambitious"[21] student and friend of Heisenberg's had talked him into collaborating on the atomic bomb project in 1939, as a result of his absurd idea: "It was a dreamy wish that if I were one of the few persons who under-

16 Document 8 and 9; see also Document 10,http://www.nbi.dk/NBA/webpage.html.

17 Only Rose in *Heisenberg and the Nazi Atomic Bomb Project* argues that Ernst and Carl Friedrich von Weizsäcker had organized Heisenberg's lecture-trip, following hints of the American's nuclear project published in a newspaper in Stockholm. The goal of the trip would have been to pump Bohr for knowledge.

18 Powers, p. 115.

19 Such are the recollections of his wife, Elisabeth Heisenberg, in her book: *Das politische Leben eines Unpolitischen* (München, 1991), p. 79.

20 In Werner Heisenberg, *Der Teil und das Ganze – Gespräche im Umkreis der Atomphysik* (München, 1969), Heisenberg states that von Weizsäcker had requested that he speak to Bohr about the moral problem of the bomb. Von Weizsäcker in turn might have been pressed by Houtermans to act.

21 Horst Korsching, in: Bernstein, *Hitler's Uranium Club*, p. 105.

stood how one makes a bomb, then the top authorities, including Adolf Hitler, would be compelled to talk to me. Maybe I could bring Hitler around to the idea of conducting reasonable politics. [...] I'll speak with Hitler. I'll speak spontaneously with him to see what will come of it."[22] Luckily Hitler never met in person with the nuclear researchers: von Weizsäcker had discovered, as early as 1940, that the bomb was best constructed with plutonium. When he had presented his work to the German Army Ordnance, fortunately no one had paid attention to it.

After the defeat of Germany, her ten most important physicists were interned in a house of the British secret service called Farm Hall near Cambridge, where their conversations were monitored without their knowledge. One can read about how von Weizsäcker tried to convince the other researchers that they never actually wanted a bomb, in the Farm Hall Protocols,[23] which were first released to the public in 1992.

„Von Weizsäcker: If we had started this business soon enough we could have got[ten] somewhere. [...]

Karl Wirtz: The result would have been that we would have obliterated London but still would not have conquered the world, and then they would have dropped the bomb on us.

Von Weizsäcker: I don't think we ought to make excuses now because we did not succeed, but we must admit that we didn't want to succeed."[24]

The issue was not undisputed. A little later, Erich Bagge mentioned to Kurt Diebner: "I think it is absurd for von Weizsäcker to say he did not want the thing to succeed. That may be so in his case, but not for all of us."[25]

The Griffin

In Robert Jungk's *Heller als Tausend Sonnen* (Brighter than a Thousand Suns) – the first book to portray the German scientists as heroes of the resistance – a man rather suddenly appears, only to be never mentioned again: Paul Rosbaud. "The preferred meeting place for the heretical German research scientists was either the Berlin bureau or the humble home of the head of a leading scientific publishing house, Dr. Paul Rosbaud. [...] If in general someone can make the claim of having been the

22 Dieter Hoffmann, *Operation Epsilon. Die Farm-Hall-Protokolle oder Die Angst der Alliierten vor der deutschen Atombombe* (Berlin 1993), pp. 338 f. The conversation with von Weizsäcker was held by Dieter Hoffmann, Helmut Rechenberg, and Tilman Spengler in 1993.

23 Jeremy Bernstein, *Hitler's Uranium Club: The Secret Recordings at Farm Hall* (Woodbury, N.Y., and New York, 1996).

24 Ibid., pp. 131 f.

25 Ibid., p. 150. As mentioned earlier, Diebner and Bagge belonged to the research group of the German Army Ordnance.

soul of the passive resistance of the German scientists against Hitler, then it was this warm-hearted man".[26] These "heretical German nuclear researchers" might have included friends of Rosbaud such as Max von Laue or Friedrich ("Fritz" or "Fissel") Houtermans,[27] and even Walther Gerlach, but not von Weizsäcker or Heisenberg, both of whom he mistrusted. In 1944, when von Weizsäcker became professor at the Nazi's prestigious University of Strasbourg, Rosbaud warned his brother Hans in a letter: "The physicist is by far the most cunning and diplomatic. His father is the well-known Herr v. W. [...]. I recommend to you to restrict yourself to very objective things, and even there a certain reticence is desirable."[28] In conversation with Arnold Kramish in 1983, von Weizsäcker said: "I knew Rosbaud only a little. I had the impression that he did not trust me and therefore did not talk to me openly. Hence I was not informed about his activities during the war. I would certainly not have condemned those activities, even though I myself acted differently."[29] In 1941, while meeting with Heisenberg at his office, Rosbaud told him that he thought the Nazis were imbeciles. Heisenberg replied: "Maybe they don't know it [science], but they have the advantage of giving you money if the plan which you develop is large enough."[30] Two years later at an official reception given by Heisenberg, Rosbaud sat next to Heisenberg's wife Elisabeth, conversing freely with her. Heisenberg warned her with a look. "As the evening came to a close, and the guests had left, she asked him why he had given her such a troubled look: 'I think he is a spy,' replied Heisenberg, 'but I don't know for which side. It would be even more dangerous if he is spying for the Nazis.'"[31]

Paul Rosbaud had his doctorate in chemistry. He had "a soft voice with just a trace of an accent. In repose, he was melancholy. In speaking, animated. Humility was an outstanding characteristic. He was scrupulously moral in his dealings with others. He was always well tailored in a subdued way – and very British."[32] As scientific advisor for the Springer publishing house and editorial supervisor of the magazine *Metallurgie*, he knew all the important physicists and chemists. He must have been quite a social person, whose many personal friends included Max von Laue,

26 Jungk, *Heller als tausend Sonnen*, pp. 116 f.

27 In the epilogue to *Heller als tausend Sonnen*, Jungk writes that the first scientist with whom he spoke was Fritz Houtermans. The conversation stretched into the wee hours of the morning, and they drank coffee out of laboratory beakers. Jungk, who really wanted to write a novel, was convinced that nothing was more exciting than reality, which is definitely true in the case of Houtermans' life story. See pp. 402 ff.

28 Kramish, p. 116.

29 Ibid., p. 115.

30 Powers, p. 111.

31 Elisabeth Heisenberg remembers in an interview in 1988. Ibid, p. 111.

32 Esther Simpson remembers in: Kramish, p. 46.

Lise Meitner, and Otto Hahn. The latter two were working on attempts to bombard a uranium nucleus with slow neutrons in 1938, when the Austrian annexation jeopardized Lise Meitner, who was of Austrian-Jewish descent. Later Lise Meitner wrote Rosbaud: "I personally remember gratefully the last evening in Dahlem, when you went through my rooms with great friendly understanding and put all sorts of things into my trunks. Also I have not forgotten the shipment of books, which you so carefully selected."[33] After she had arrived in Stockholm with the help of Rosbaud and Otto Hahn, on 22 December 1938 Hahn told Rosbaud about the attempts to prove that new elements are formed when a slow neutron encounters a uranium atom. Hahn and his assistant Straßberg, however, had yet to grasp that they had discovered nuclear fission.[34] Rosbaud immediately tended to having the work published in the periodical *Naturwissenschaften*, through which the whole world gained access to their experiment. In exile, Lise Meitner received a carbon copy of the original manuscript from Hahn by post, the results of which she discussed with her nephew Otto Frisch, who was on Christmas holiday with her. Quickly they realized that Hahn had in fact discovered nuclear fission. Frisch then brought these findings to Niels Bohr, who was just about to embark on a voyage to Princeton, where he told Enrico Fermi, Edward Teller, and others about it. Wanting to see with their own eyes the green flashes of matter transforming into energy they rushed to their laboratories. Leo Szilard recollects: "We turned the switch and we saw the flashes. We watched them for a little while, and we switched everything off and went home. That night, there was very little doubt in my mind that the world was headed for grief."[35]

Immediately Leo Szilard recognized the possibility that the new discovery would help the Nazis, and in fact, shortly thereafter the Uranium Club was founded in Berlin. Paul Rosbaud found out about the top-secret organization through a friend just one day later; news which he then passed on to the English scientist R. S. Hutton, who happened to be in Berlin at that time. Hutton, in turn, brought the message to England, where it was not officially registered, however. In the same year Rosbaud was solicited to spy for the British SIS (Secret Intelligence Service) under the code-name "The Griffin," and report regularly to R. V. Jones (of the MI6), and Eric Welsh, a mole at a Norwegian paint manufacturer near Norsk Hydro, from where he led the sabotaging operation. Moreover he collaborated with both the French underground and the Norwegian secret service. Arnold Kramish, who wrote about

33 Kramish, p. 49.

34 Though Enrico Fermi had been bombarding uranium with neutrons, he too was unable to explain the results of his experiments in 1934.

35 Powers, p. 54.

Rosbaud's life and espionage activities in *The Griffin*,[36] believes him to be the author of the legendary Oslo Report, which informed the British secret service about Peenemünde and the secret weapons of the National Socialists.

The British secret service encoded instructions to their spy via the BBC. As of 1939, Rosbaud himself sent books he had edited to Lise Meitner, for example, in which the printed texts contained complicated encoded messages, which she then forwarded on to the SIS in England. Many of the books were simply available in bookstores. "He could rarely do anything with the first editions of books, because the authors had too much control over the text. However, with later editions the publisher's editor had more freedom to rewrite and update the text."[37] Messages were also transmitted through the Norwegian student Sverre Bergh, whom Rosbaud was able to give a report on the most recent developments in Peenemünde at their very first meeting in a beer tent in Berlin's Tiergarten. He described the frequency of the tests, the facilities, and roughly lined out a V-2. In any case, his report – like the Oslo Report – was not taken seriously by the SIS. One suspected him more of being a double agent rather than believe his improbable reports about missiles, unconfirmed by any other side.

It is odd that Rosbaud was never detected, not even once suspected, despite being so reckless in both speech and behavior. He even smuggled himself and his girlfriend Ruth Lange into a concentration camp in Wuhlheide near Berlin in order to sneak food to his brother-in-law Georg Benjamin. "When copper was called in for armaments, Paul cornered his own supply. He would ask visitors for their small change and then bury it in his garden. When traveling alone in a railroad compartment, he unscrewed the copper fixtures and threw them from the moving train. The post office instructed people to use the correct denominations of stamps to save paper. Paul would post letters not requiring a return address with blocks of the lowest denomination stamps he could find."[38]

Very soon after the meeting on 4 June 1942 between the physicists and Speer, Rosbaud was informed about it. "After a Physical Society meeting one evening a few days later, some scientists gathered at a café on the Ku'damm and professed their relief at not having to build the bomb. Rosbaud listened silently, but he needed to drink to steel himself. Finally, he burst out, 'Nonsense! If you knew how to build it, you'd present it to your Führer on a silver platter!' Stunned by Rosbaud's uncharacteristic outburst, the gathering broke up – everyone scared, some thinking that

36 Arnold Kramish, *The Griffin* (Boston, 1986).
37 Ragnar Winsnes cited in: ibid., p. 225.
38 Ibid., pp. 214-215.

Rosbaud's exclamation might be a provocation."[39] On 10 June 1942 he visited the nuclear physicist Victor Goldschmidt in Oslo, reporting, among other things, about this meeting and its conclusions: No German atomic bomb would be built. Shortly thereafter, Heisenberg's student Hans Daniel Jensen came to Oslo to hold a colloquium, whose participants were nearly all in cahoots with the Norwegian underground. He too confirmed that the Germans were incapable of building an atomic bomb, but were still interested in heavy water because they were trying to build a nuclear reactor.[40] Eric Welsh now had reports from two different sources. He requested confirmation from Rosbaud, which arrived in the summer of 1943. The SIS assured the British government that the German nuclear program "was no longer a cause for serious anxieties."[41]

But the information that passed through Scandinavia to reach England was not shared with the American secret service, ever since it had been made clear that the Americans had excluded the British from their nuclear program. Two of the last messages that reached America directly came from Fritz Houtermans, a Nazi opponent, who one year later (working independently of von Weizsäcker) had discovered plutonium and had started to build a breeder reactor in a special group formed by the Minister of the German Post Office. In April 1941, he personally relayed the message to the physicist Fritz Reiche that Germany was conducting further research on the atomic bomb, even if Heisenberg had tried as much as possible to delay the work. Consequently, he implored the Americans to hurry up.[42] In the late spring of 1942 Leo Szilard received a telegram from Houtermans, which has since disappeared, probably purporting that preparations had already begun, that Heisenberg was in charge, and that he had come to the conclusion that an atomic chain reaction would be more appropriate than isotope separation. Fearful of the German bomb, Szilard (the author of Einstein's letter to President Roosevelt) was the driving force behind the American program. Like Heisenberg and Bohr, Szilard too had read H. G. Wells' astonishing science-fiction novel *The World Set Free* (1914), which anticipated the use of "atomic" energy for peace as well as war purposes.[43] In Wells' book, after a period of prosperity, and as a result of the unlimited sources of energy, nuclear war breaks out in 1958 in Europe. "Atomic bombs" – which Wells invents for the first time – destroy its cities, reducing them to a radioactive desert. Perhaps the first part stayed in Heisenberg's mind – Szilard, in any case, had visions of a destroyed Europe

39 Ibid., p. 129.
40 See also: Powers, *Heisenberg's War*, pp. 160 ff.
41 Kramish, p. 132.
42 Powers, p.107.
43 Powers, p.51.

in his mind's eye, as he urgently wrote letters and memoranda, among others to the Director of the Metallurgical Institute in Chicago, Arthur Compton. In a letter to Washington, Compton reported his fearful revelations: "We have become convinced that there is real danger of bombardment by the Germans within the next few months using bombs designed to spread radioactive material in lethal qualities. Apparently reliable information has reached us to the effect that the Germans have succeeded in making the chain reaction work."[44]

On the way home from his trip to Norway, Paul Rosbaud had intended to visit Niels Bohr in Copenhagen, but received no permission to make a stopover. On 3 July 1942, he wrote to Bohr: "It would have been very important for me to see you again in order to discuss several questions that probably interest you as much as myself."[45] Only one week came between the final decision against the German atomic bomb and Rosbaud's visit to Norway, and yet another week later, on 17 June, the Americans initiated the Manhattan Project. If Rosbaud had been able to visit Bohr, Bohr would have trusted him – Lise Meitner could have vouched for him.

Before Bohr fled Denmark, he received yet another German visitor: Hans Daniel Jensen arrived in the summer of 1942 bearing the news that he was on his way to Norway in order to achieve an augmentation of the deliverable quantity of heavy water; he was quick to mention, however, that the Germans were only interested in a uranium machine. Expressly because of his openness, Bohr regarded him with suspicion.

Regardless of what Heisenberg was thinking as he visited Bohr in the autumn of 1941 – if Rosbaud could have visited him, it would have been at that point in time a fact that the German atomic bomb project was no longer in existence. And even if none of Rosbaud's numerous later reports were relayed from the British on to the American secret service – Bohr would have been the only ambassador whom both General Groves and the physicists would have believed. In the autumn of 1942, the Manhattan Project certainly would have not been put out of commission, but the participating scientists might not have hurried themselves so. The USA would have won the war against Japan, too, before being ready to drop the bomb.

Translated by April Lamm

44 Ibid., p. 162, see also p. 203. The scientists of the Metallurgical Laboratory in Chicago believed therein that an attack with radioactive dust was imminent and hence evacuated their families.

45 Kramish, p.131.