

Why Did Heisenberg go to Copenhagen?

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The following "article" is taken from a letter sent to J.J Solomon in response to his article in the October, 2002 issue of Physics and Society. It should be very interesting to those who have been following the controversy - in this journal and elsewhere - about the play Copenhagen.

... I suppose that in the meantime you will also have read my letter to APS News which was enclosed with my letter of 16 December. It was published in the February 2003 issue of that journal. In it I mentioned the remarkable fact that only two days after Heisenberg's famous, misunderstood conversation with Bohr in 1941 on the feasibility of atomic bombs, Heisenberg spent a very harmonious evening with Bohr in his home where they discussed physics, avoiding politics, Heisenberg played the piano and Bohr read a story to him. (This information was discovered recently in an hitherto unpublished letter written by Heisenberg to his wife while still in Copenhagen in 1941, and posted right after his return to Germany, probably in order to avoid censorship.) This indicates that Bohr, although upset by what he thought Heisenberg had been trying to tell him two days before, was not really angry at Heisenberg personally even though, as Bohr put it later in his unsent letters, they now belonged to two sides in mortal combat with each other. This lack of anger is also shown by the friendly tone of the "Bohr letters" in spite of Bohr's objection to what he had read in Robert Jungk's book, (wrongly) assuming that Heisenberg had agreed with everything that Jungk had written. Also Bohr's behavior towards Heisenberg after the war, the mutual visits of the Bohr and Heisenberg families in their homes, and their joint vacations in Greece or Southern Italy after the war, seem to confirm this.

But let me start with my comments to your article "Copenhagen in Europe: Why not the same debate as in the US?" They may come too late to be taken into account in its publication, but I mention them anyway. Your article is very serious and deserves serious comments.

On page 2 you say that Heisenberg's visit remains a mystery. I do not think that there is a mystery. It is rather clear from what Heisenberg and Weizsäcker said and wrote credibly about this visit that it was motivated by a mixture of considerations. By September of 1941 Heisenberg and Weizsäcker had understood that atomic bombs were technically feasible in principle, but in reality extremely difficult to make, by isotope separation as well as by producing in a reactor what was later called Plutonium. It would take years and could therefore not be completed while the war lasted. Nevertheless, in the long run the technical possibility of making atomic bombs existed. The technical capabilities of the US (still neutral at that time) were much greater than those of Germany. Roosevelt was not friendly towards Nazi Germany. Would it be conceivable that US scientists would produce a bomb finally to be dropped on Germany? Was it justifiable anyway that the international community of atomic scientists, so far engaged in peaceful basic research, now worked on such a dreadful weapon? Was there a way to avoid this? Wasn't it lastly up to the small international group of scientists which Bohr had led in the past two decades to decide whether or not these ghastly weapons were built? After all, their cooperation would be needed.

Weizsäcker suggested to Heisenberg that they should consult Bohr about these difficult questions. Niels Bohr was the recognized father figure of the atomic and nuclear physics community, his wisdom and integrity were respected internationally. Moreover, Heisenberg who

before the war had been in constant contact with his old friend and mentor Niels Bohr, had not seen him since the beginning of the war and was concerned about his well-being under German occupation. (Bohr acknowledges this motive in one of his unsent letters.) Of course, all these motivations would not have been sufficient for obtaining visa and travel clearance for a trip to occupied Denmark. But Weizsäcker, with the help of his father, was able to overcome these difficulties by having Heisenberg and himself invited to an astrophysics conference organized by the German Culture Institute in Copenhagen which was a propaganda outpost of the Cultural Division of the German Foreign Ministry in which Weizsäcker's father was the top civil servant (Staatssekretär). The rest of the story is rather well known although, as parts of the literature and also your article show, there are still many misunderstandings in the air. But if you go to the sources of information there is really no great mystery.

You think that there is a contradiction between Heisenberg's conjecture in September of 1941 that Germany might win the war, and Heisenberg's desire to get Bohr's opinion about potential steps by which the construction of atomic bombs could possibly be avoided. Why is that a contradiction? If Germany was about to win the war, wouldn't that be an even increased incentive for the Americans and British to try to make the bomb and use it against Germany, some time in the future? It seems to me that, independently of whether Heisenberg thought that Germany was going to win or going to lose the war, it is quite understandable that, facing all these troublesome questions, he sought the clandestine advice of his old friend.

Page 3: Rotblat did not leave the Manhattan Project after German defeat, as you write, but in 1944 when it became known to him in Los Alamos that Germany did not produce the bomb and when General Groves said in a private conversation that the bomb would be useful in dealing with the Russians after the war.

Page 3: You are right that Bohr didn't play an important role in the building of the atomic bombs, but he was definitely involved. He arrived at Los Alamos at the end of 1943 when the Manhattan Project was already well advanced but he still made some small but important contributions to the ignition mechanism for the Pu bomb. And he did not leave the Manhattan Project, as Rotblat did, when it became clear that Germany would not have the bomb. Bohr remained at Los Alamos as an adviser to Oppenheimer and General Groves until June 1945 when he left in order to return to liberated Denmark and to his Copenhagen institute. Thus, I don't think that Frayn distorts history when he mentions Bohr's involvement in the Manhattan Project. Of course, Bohr's motivations for working on the bomb were very honorable, and Frayn does not deny that.

It is true that Churchill, after his conversation with Bohr, suspected Bohr and was afraid that Bohr might give secrets to the Russians, and even considered having him detained. But that never happened. Bohr was never excluded from Los Alamos, as you suggest. From there he made another trip to London in March of 1945 in a second futile attempt to persuade Churchill to accept international control of nuclear energy. This time Churchill did not even receive him. Bohr returned to the US and wrote another memorandum to Roosevelt, but Roosevelt died before he could read it.

I do not think you are completely right when you say that the scientists had no influence on the use of the bomb. Oppenheimer and Fermi, among others, recommended the use of the bomb on Japan, and Oppenheimer gave detailed instructions as to the optimum height of explosion, the

necessary weather conditions etc. But I agree that in 1945 only the president of the US could have stopped the use of the bomb.

Page 4: The first paragraph contains several inaccuracies. The names of the Nazi physicists and Nobel Prize winners were Stark and Lenard, not Leonard. Himmler's father and Heisenberg's father as well as grandfather had been teachers at classical high schools (Humanistisches Gymnasium), not at elementary schools. (Heisenberg's father later became a well-known university professor of Byzantine philology.) It is not correct that Heisenberg "led" the German nuclear program. He was not in charge, he was just the most prominent of the participants. Later he became the leader of one of several groups involved which competed with each other for the scarce resources of natural uranium and heavy water available. The official leaders of the program were, at first, in Army Ordnance then in the Reichsforschungsrat under Prof. Abraham Esau. Finally the program came under the leadership of Prof. Gerlach in his capacity as "Beauftragter des Reichsmarschalls (Göring) für die Kernphysik". Gerlach was Heisenberg's "boss" in the program. Before the war Heisenberg had been a reserve soldier in the Mountain Infantry (Gebirgsjäger). At the beginning of the war in 1939 he was drafted but, to his surprise, not to the Mountain Infantry where he had already served one year before as a soldier during the Sudeten crisis, but to Army Ordnance. The scientists of Army Ordnance had heard about nuclear fission. A group of physicists and chemists, including Otto Hahn, Bothe, Gerlach and others, but not Heisenberg, had been assembled by them to discuss whether the recently discovered fission of uranium could have military applications which could become significant during the war. Heisenberg was assigned to that group and given the task to make a theoretical study of the problem. It was not at his own initiative. But it is true that Heisenberg did not refuse. Weizsäcker had explained to him the advantages of taking part in this project: Exemption from real military service for himself and for his young collaborators, funds for doing interesting physics, participation in a project of potential great military and economic significance which would give them, as technical advisers, some influence on its applications which Weizsäcker hoped to use in a peaceful sense. As mentioned below, Weizsäcker admitted later that this was a terrible delusion.

I don't think it is correct to say that Heisenberg did not see any problems in Hitler's victory. He just thought, looking at the situation in September of 1941, that it might be unavoidable. Incidentally, Einstein thought the same at that time. According to the memoirs of Katia Mann, wife of Thomas Mann who, living next door to Einstein in Princeton in 1941, was acquainted with him, Einstein believed that the Germans would easily beat the Russians, as they had done in the First World War. It is true, however, that Heisenberg thought that a domination of Europe by Stalin would be an even greater evil than a domination by Hitler. At that time, Auschwitz was not yet known but Stalin's concentration camps and massacres were. Even Anthony Eden, British Foreign Minister, was doubtful on June 22, 1941, when Hitler invaded the Soviet Union, until then Hitler's ally in the division of Poland and the cessation of the Baltic States, and of parts of Czechoslovakia and Rumania to the Soviet Union, whether Britain should support Stalin. After all, British volunteers had just fought alongside Finnish troops in the Winter War against the Soviet Union. Eden abhorred Stalin as much as Hitler. Churchill had to use his authority as Prime Minister to order support of the Soviet Union. But even Churchill seems to have compared Stalin to the Devil. I remember having read that Churchill said that if Hitler had invaded Hell he, Churchill, would have gladly supported the master of Hell, the Devil. Thus, anti-Stalinist feelings were not restricted to Germany in the 1930s and 1940s, and for quite some time it was an open question for many people in Europe, also in France, whether Hitler or Stalin were the

greater evil. Heisenberg certainly detested the Nazi system under which he felt forced to live. He saw great problems in a potential victory of Hitler but he also saw great problems for Germany following its defeat. Like many conservative Germans, he would have preferred a moderate peace treaty between the allies and a new non-Nazi German government, sparing Germany the painful consequences of unconditional, total defeat. You must remember that the resurrection of Germany after defeat was not foreseeable at all. To be expected was the dismemberment of Germany and the execution of the Morgenthau plan.

Regarding the rescue of the Danish Jews, it is now known that it was the German official Duckwitz who warned the Danish underground in 1943 of the imminent deportation of the Danish Jews. Bohr was informed and fled to Sweden in a small boat. After the war Duckwitz became German ambassador to Denmark.

Page 5: Regarding "Weizsäcker's self-aggrandizing propaganda" I must repeat that both Heisenberg and Weizsäcker wrote long letters to Jungk (in Weizsäcker's case 19 pages of criticism, if I remember correctly) which Jungk did not take into account when he prepared the Danish and English editions of his book. He just published the laudatory part of Heisenberg's letter, giving the wrong impression that Heisenberg had agreed with everything Jungk had written.

Weizsäcker never said that the "German nuclear scientists kept their hands as clean as possible", as you suggest. In fact, as mentioned above, Weizsäcker did express a sense of guilt when he repeatedly said that he took a grave risk which he should never have taken when as a young man of 27 he decided to study the possibility of bomb making in the naive assumption that Hitler would be forced to listen to him when he, Weizsäcker, knew how to make these bombs. He hoped that he could then convince Hitler that the potential existence of the bomb had made the institution of war obsolete and that Hitler should adopt peaceful policies. He realized later that this idea was a terrible mistake because the Nazis in their brutality would never have listened to political advice given by technical experts. Therefore, he and Heisenberg were extremely happy when Heisenberg's work showed that nuclear weapons were not feasible for many years to come and when the project was dropped. Neither he nor Heisenberg ever said that they did not work on the bomb for moral or ethical reasons. The moral question never came up because the project was ended for technical reasons.

Your quotation that "History will record that the peaceful development of the uranium engine was made by the Germans under the Hitler regime, whereas the Americans and the English developed this ghastly weapon of war" is what Weizsäcker said at Farm Hall before the German scientists knew that the Americans had also built reactors. At that time they assumed that the Americans had concentrated on making a bomb from separated U 235 while in Germany they had devoted their efforts to building a reactor for power production from natural uranium and heavy water.

Neither Heisenberg nor Weizsäcker ever denied the horrors of the Nazi regime and they would not have been even remotely inclined to suggest, as you do on page 6, that "one could forget or forgive what were Hitler's crimes and intentions." You are quite right, on the other hand, that Heisenberg, very probably, would not have been able to prevent the building of an atom bomb for Hitler if that would have been technically feasible with the resources available in Germany during the war. Even if he would have accepted "martyrdom" there would have been other physicists and engineers who would have done it. That is, I repeat, why Heisenberg was so

relieved when he found out that the technical difficulties appeared to be insurmountable. He did not make any attempt to overcome them by proposing a crash program but was quite happy to resign to a relatively small reactor project, devoting part of his time to the study of cosmic rays, S matrix theory and philosophical questions. He did not have to make efforts to prevent work on atomic weapons because there was no risk that such work could succeed. He never claimed after the war that this was so due to his "sabotage". On the contrary, he always said that he and his German colleagues had been extremely lucky that the ethical question never came up for them. Heisenberg also said and wrote that the ethical situation of his American colleagues was quite different because they were working for a good cause against the evil Nazi system. Again, it was Robert Jungk who did not report correctly what Heisenberg and Weizsäcker had told him.

On page 7 you give, I think, a correct description of why Heisenberg did not emigrate before the war. Like his older colleagues Max Planck and Max von Laue he stayed in Germany to save as much as he could of German science and culture against the destructive influence of the Nazis. Just as Bohr was a Danish patriot, Heisenberg was a German patriot. He was not a nationalist because nationalists consider their own nation superior to other nations, and Heisenberg, as a member of the international family of physicists and with his friends in so many nations, many of them Jews, was immune to nationalism.

You might ask: If that is so, how can one explain Heisenberg's remark during a lunch-time conversation at Bohr's institute in 1941? He is reported to have regretted German occupation of Denmark, Norway, Belgium and the Netherlands but regarding the Eastern European countries to have expressed the view that they are known to be unable to rule themselves. Møller replied: "So far we only learned that Germany is unable to rule itself!" One has to remember that the view expressed by Heisenberg here on the countries of Eastern Europe had been the general view in Germany, and perhaps elsewhere, for centuries. Since the end of the 18th century and up to 1918, just about two decades before Heisenberg's visit to Copenhagen in 1941, Poland had been divided between Russia, Austria and Prussia. The Baltic states had been part of the empire of the Czar. Czechoslovakia, Hungary and parts of Yugoslavia and Rumania belonged to the Habsburg Empire. Before 1795 the position of the Polish king was very weak, and so was the Polish parliament. Any nobleman could veto its decisions. Between the wars, in the 1920s and 1930s, Poland was governed by the dictatorial regime of Pilsudski, and Hungary by that of Admiral Horthy. Yugoslavia and Rumania did not have democratic governments either. When, in July 1915, during the general discussion of German war aims, 191 liberal and moderate German scientists and scholars, among them Max Planck and Albert Einstein, signed a petition against German annexations in the West, arguing that the incorporation or affiliation of politically independent populations or of populations used to independence was to be rejected, they left open the road to territorial expansion in the East. Thus, Heisenberg's remark had nothing to do with approving of Hitler's aggressive policies, it was just a historical reminder based on a view that had been generally held, at least in Germany, for a very long time.

In any case, I agree with the last sentence of your paper: There is still room for another excellent play.

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