

Re-examining Heisenberg: Objections to Present Theses

Dennis V. Perepelitsa

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Such is the power of technology that a new invention can change the outcome of an armed conflict from bitter defeat to stunning victory. In the last days of the Hitler regime, there are anecdotes of the Fuhrer raving about the development of a *Wunderwaffe* - wonder weapon - that would bring Germany's enemies to its knees at their greatest hour. Indeed, the prospect of a nuclear weapon in Hitler's hands is frightening. London, Moscow and New York, instead of Hiroshima and Nagasaki, may no longer be standing. Such alternate universes are now the stuff of imaginative fiction, because the Third Reich was ultimately denied nuclear power, peaceful or destructive. Yet such is the development of technology that individual scientists can have a huge impact on its progress. To examine the reasons behind the failure of the German atomic bomb project, one must therefore examine the individuals leading it. Werner Heisenberg in particular played a key role, giving rise to two main types of speculation as to the reasons behind his failure. The first of these, called the *apologetic*

thesis, argues that Heisenberg and his colleagues were engaged in a conspiracy to deny nuclear weapons to the Fuhrer and would have stopped at nothing to safeguard the world from the atomic threat. The second, *polemic* thesis, implies that, the German physics community having being cleansed of undesirables under *Deutchse Physik*, Heisenberg and the ones that were left failed due to mass and gross professional incompetence. A closer reading of the sources, however, presents a middle ground reality of Heisenberg as a patriotic yet reticent scientist, and must struggle with the complication that many of Heisenberg's statements to his colleagues, masters and the victorious Allies are strange or simply to do not match up with this reality.

The answer to the first half of the question posed by historians, the moral integrity of Heisenberg's character, lies somewhere between the two extremes presented in the two familiar theses. The apologetic thesis presents Heisenberg and several close collaborators as "anti-Nazis" rising above the political landscape of their time, forming conspiratorial plots and preparing to do everything in their power to deny Hitler the bomb. Many sources dispute this glorified vision. As David Cassidy notes, Heisenberg and many others of his profession loyally showed up to receive their orders at the outbreak of war in 1939. Assured that they would keep their scientific positions, they set immediately to the research at hand. In the next few years, before the freeze of the publication of sensitive research papers by both the Axis and Allies powers, scientists in the United States and Europe were beginning to tackle the problem of nuclear fission. By 1941, Heisenberg knew nuclear fission, and the bomb in general, was a distinct possibility as an avenue of profitable research, and took steps to inform the

Nazi leadership of such in detailed and explicit terms¹. Long, technical papers, some of which were classified, appeared on the desks of several Generals, and Heisenberg began giving giving talks which “illustrated clearly and vividly the warlike aspects of nuclear power”² in front of influential crowds. If Heisenberg harbored an intense opposition to the rulers of his homeland, he certainly didn’t show it.

The worst excesses of the polemic thesis present Heisenberg’s and his coworkers’ involvement with the Third Reich government as on the same level as Nazi sympathizers. Yet this is also demonstrably false. It is not disputed that throughout the war Heisenberg showed a familiarity, willingness and ability to use Reich channels to benefit himself or his colleagues, but his means were often altruistic or worked against the Reich’s wishes. Cassidy notes how on several occasions Heisenberg used his influential status to attempt to grant exceptions for his Jewish (or otherwise suspect) coworkers, and even took the beleaguered Edwin Gora under his wing when politics froze the young student out of his discipline³. In addition, Much literature published after the war impeaches the Americans for construction of the bomb and notes, in contrast, how the allegedly peace-loving Germans spent the same temporal and theoretical capital designing new and better ways to generate energy. Heisenberg does not buy into any of this. In his own words at Farm Hall, shortly after the bomb was dropped, he responds to such an impeachment of Weizsäcker’s with “One can’t say that. One could equally say ‘That’s the quickest way of ending the war’.”⁴ Unlike

¹David Cassidy, *Uncertainty: The Life and Science of Werner Heisenberg* (San Francisco: W. H. Freeman, 1992), 437-9

²Cassidy, 445

³Cassidy, 431

⁴*Farm Hall Transcripts*, edited by Charles Frank (Berkeley: University of California Press, 1996),

Diebner, an actual Nazi sympathizer, Heisenberg reserved his judgment on the Americans, and looked forward during his time at Farm Hall to working with them as part of a greater collaboration in which Western Europe would take part. Considering all this, likening Heisenberg and his colleagues to the masters of the genocidal plague of Europe is absurd.

So where did Heisenberg's loyalties lie? As Germany's position in the war became ever more tenuous in 1942, Mark Walker notes that Heisenberg and his men responded by increasing their activity to a frenetic pace⁵. Perhaps Heisenberg's time at Farm Hall offers us the best chance at understanding this part of the character of the great physicist. In the transcriptions thereof, Heisenberg and the other nine scientists, unaware that their conversations are being recorded, talk about German progress on the bomb, express their gratitude and relief at the toppling of the Hitler regime, and say some unflattering things about the Americans. That is, they behave like perfectly patriotic German nationals who did neither supported the Nazis nor plotted against them, but simply suffered under their rule. Even Weizsäcker himself has "always said that we had never had a conspiracy"⁶. Furthermore, while there are well-documented examples of Heisenberg having qualms with aspects of the Nazi regime (in particular with the raving and racist *Deutsche Physik* program), he behaved in every way like an archetypal German national: eager to help his people and his country achieve victory, convinced of the rightness of their cause, and generally condescending towards the

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⁵Mark Walker, *Nazi Science: Myth, Truth and the German Atomic Bomb* (New York: Plenum, 1995), 265-6

⁶Thomas Powers, *Heisenberg's War: The Secret History of the German Bomb* (Boston: Little, Brown, 1993), 115

enemy. Such an outlook is neither contemptible nor condemnable.

The other critical division in the two theses is how and to what extent Heisenberg and his colleagues stalled or killed entirely German efforts to obtain the atomic bomb. Again, the answer is not as vainglorious or villainous as popular belief might suggest, but rather lies somewhere in between. The apologetic thesis puts forth that Heisenberg in particular, and those close to him in general, took concerted, specific measures that can be deemed a conspiracy in order to kill the atomic bomb project. This is wishful thinking and unconscious misrepresentation at best, and deliberate illusion at worst. Thomas Powers proposes that Heisenberg and a select few individuals decided to keep themselves at the forefront of the nuclear project in Germany so that they could eliminate their fear of its success by taking active control of it. Yet Heisenberg himself was recruited to the group of colleagues only on the tenuous recommendation of his colleagues, because he was suffering from attacks on his “white Jewish”⁷ character throughout these years. As noted above, Weizsäcker always claimed that a conspiracy did not exist, and Heisenberg himself has stressed the objective nature of his professional advice to the Nazi leadership⁸, dashing, in effect, any implication that the scientists’ professional actions constituted any elaborate plan to deny Hitler the bomb. To echo Walker, any argument by the German physicists that they controlled the pace of the project at more than a handful of points is disingenuous.

Contrarily, the polemic thesis impeaches the intelligence of Heisenberg and his staff by claiming that only their professional incompetence kept the bomb from the

⁷Walker, 264

⁸Walker, 133

Fuhrer's all too eager hands. This is inflammatory nonsense. Cassidy stresses the volume and technical nature of Heisenberg's papers during the early years of the war, and, anecdotally, Heisenberg's wife recalls how the scientist tortured himself with the thought that failure to get the bomb would allow the Allies to use it first on the German people⁹. In this case, the Farm Hall transcripts again contain our best chance at attempting to understand Heisenberg's grasp of nuclear fission just at the conclusion of the war. It is notable that, upon being told of the August 7th, 1945 bombing of Hiroshima, Heisenberg and his colleagues spent much of the next few weeks discussing in detail the technical aspects of the bomb, even though they had never seen it or could have had any outside inspiration as to how it worked. In fact, Heisenberg soon gave a lecture in which he correctly guessed the central mechanism for activating the bomb once it was dropped!¹⁰ Mark Walker's argument that most insinuations against the Nobel Laureate's professional competence are nothing but Germanophobic hot air¹¹ ring true, and it is not necessary to consider them seriously.

Rather, a third path of inactivity and inertia must be considered. Perhaps the bomb was never built simply because of reticence or delay from Heisenberg. As Cassidy notes, everything was in place for a German project rivaling the scope of the Allies as early as 1941¹², while Fermi and his enemy team of collaborators across the Atlantic were still behind in the race. Perhaps this was not exploited because of Heisenberg's general reluctance and failure to engage the issue with his superiors.

⁹Cassidy, 438

¹⁰Walker, 224-5

¹¹Walker, 261

¹²Cassidy, 429

The distinction between this argument and the apologetic and polemic theses is that it is one of inactivity - neither conscious direct action or flailing incompetence availed the physicist as much as simple inaction. Stalling and delaying were safe choices for Heisenberg. At Farm Hall, his surprise at the progress of the Allied bomb effort is notable. If Heisenberg thought that the German nation was not in danger from the threat of Allied atomic weapons, any reticence to build one was therefore conscionable. Furthermore, when questioned by his Nazi overlords in 1941 if any plans to build the bomb would yield fruit before armistice, Heisenberg, who, like the rest of the country, thought the war would be over by Christmas, could with a clean conscience answer in the negative. These two instances of self-delusion caused German physicists to never engage such a project full speed, and attempts to explain this phenomenon by appeals to the scientists' incompetence or mythical spy-like heroism are misplaced.

However, many details of those years as presented by Heisenberg seem to have contradictory or conflicting evidence supporting them, especially as later rendered by the physicist himself. In fact, in his correspondence with the Allies, his Nazi overlords, and his colleagues, there are issues on which Heisenberg is inconsistent and disingenuous. Chief among his attempts at communicating with the Allies is, of course, Heisenberg's notorious visit to Copenhagen to call on Bohr in 1941. Bohr's drafted letters are the best thing we have on his side of the subject not only because (unlike his German counterpart) they agree in content at every revision and represent the writings committed to paper of a man who has had more than a decade to consider his words. Bohr's presentation of that fateful evening is blunter and more down to earth than any account Heisenberg ever gives. Heisenberg expressed his hopes for a

quick German victory and informed Bohr that although he was working on the bomb for the Nazis, he had reservations on the issue. Apparently Heisenberg failed to gauge his old friend's reaction to these cutting words, and his taking Bohr's silence "as an expression of shock . . . is quite a peculiar misunderstanding."¹³ Powers enumerates Heisenberg's blunders, but ends with the critical point that this series of events later led the Allies to think that the Germans were working on a bomb¹⁴. But as Bohr notes, he was "completely cut off" from Allied contact¹⁵, and it was not until 1943, after the Manhattan project was well underway, that Bohr served as that particular vector of information¹⁶. In this light, the purpose of Heisenberg's visit is unclear, and his post-war statements are either inconsistent or incomplete. As Cathryn Carson notes, there has been no direct confrontation of the issue, and with the scientist's death, there never will be¹⁷.

Heisenberg also misled his financial and political backers. In his influential two-part report to the German military leadership in 1940, Heisenberg seems to steer his financiers towards funding fission energy research by dangling the possible promise of an atomic bomb¹⁸. Indeed, at many points throughout the war, when Heisenberg is being questioned as to how much funding his team can use and what results can be

¹³Niels Bohr, Documents regarding the 1941 meeting in Copenhagen between Niels Bohr and Werner Heisenberg, available online at the Niels Bohr Archive website: <http://www.nbi.dk/NBA/webpage.html>, 1

¹⁴Powers, 127

¹⁵Bohr, 7

¹⁶Bohr, 9

¹⁷Cathryn Carson, *Particle Physics and Cultural Politics: Werner Heisenberg and the shaping of a role for the physicist in postwar West Germany* (Ph.D. dissertation, Harvard University, 1995), 252

¹⁸Cassidy, 425-6

expected, he gives the most conservative estimate possible. Thomas Powers makes a good case that Heisenberg alone served to dampen the enthusiasm of Albert Speer, possibly the one official who could enact a level of funding comparable to the Allied effort, away from an industrial-scale atomic bomb project¹⁹.

Finally, Heisenberg sent mixed messages to his colleagues. As Powers notes, on more than one occasion the scientist directed an interested party away from nuclear fission. In 1941, he describes to a colleague how a few kilograms are enough to achieve critical mass in an atomic weapon²⁰ then after four more years of research gives the extremely misleading figure of a ton while at Farm Hall, which is immediately questioned by his colleagues. Heisenberg changes the subject²¹. This seemingly minor detail can be interpreted in two ways. Perhaps Heisenberg was attempting to stress the industrial scale needed to produce a working nuclear bomb, and therefore shifting the blame for failure to construct one on to external circumstance. Certainly, the hypothetical method by which the Americans might have extracted that much uranium ore - two hundred thousand individuals with mass spectrometers - is a feat that would not have been possible in Germany under the constraints of war. Thus the realization of the American bomb effort is not the fault of the leader of the parallel German effort. On the other hand, perhaps Heisenberg's intent was to underline just how much the Americans must have toiled to put such a fearsome and costly weapon together. Weizsäcker defends Heisenberg on this point, causing the already suffering

¹⁹Powers, 146-9

²⁰Powers, 134

²¹Farm Hall, 73

Hahn to leave the room²². Intuitively, a failure to complete an undesirable task can be recast as a moral success, and it is possible the great scientist wanted, in this case, to be remembered as the one who did *not* give atomic weapons to the children of National Socialism.

What follows next is well-known history. The Americans at Los Alamos, using gaseous diffusion as their method of separating out ^{238}U from ^{235}U built three atomic weapons - one to test in the deserts of New Mexico, and two to bring the Japanese Empire to its knees. Like their German counterparts, the scientists' next several years were a period of soul-searching and questioning. Had Werner Heisenberg and his colleagues arrived at the same fateful point that Americans must have, they would have had to choose between construction of the atomic bomb and resignation. But they never did, and Heisenberg is the reason why. Neither blindly obedient to the Third Reich nor conspiratorial, Heisenberg patriotically and sensibly served his country. Competent yet non-engaging, he proceeded calmly along the path that the uranium nucleus opened up for him, and looked forward to a time when he could reach beyond the confining walls of Third Reich German science. Though there still are and always will be unanswered questions about that tumultuous time, there is no doubt that letting Hitler have the atomic bomb would have had unfathomably horrific consequences internationally. It is perhaps humanizing to note that, in contrast to Hitler's frenetic, frantic and boastful conduct as Fuhrer, Heisenberg, the man who can be most honored (or blamed) for denying such a weapon to the tyrant did it with a mechanism of quiet patriotism and humility regarding his work.

²²Walker, 231

References

- Carson, Cathryn. 1995. *Particle Physics and Cultural Politics: Werner Heisenberg and the shaping of a role for the physicist in postwar West Germany*. Ph.D. dissertation, Harvard University.
- Cassidy, David. 1992. *Uncertainty: The Life and Science of Werner Heisenberg*. San Francisco: W.H. Freeman.
- Documents regarding the 1941 meeting in Copenhagen between Niels Bohr and Werner Heisenberg. Released 6 February 2002. Available on-line at the Niels Bohr Archive website: <http://www.nbi.dk/NBA/webpage.html>
- Frank, Charles, ed. 1993. *Farm Hall Transcripts*. Berkeley: University of California Press.
- Powers, Thomas. 1993. *Heisenberg's War: The Secret History of the German Bomb*. Boston: Little, Brown.
- Walker, Mark. 1995. *Nazi Science: Myth, Truth and the Atomic Bomb*. New York: Plenum.