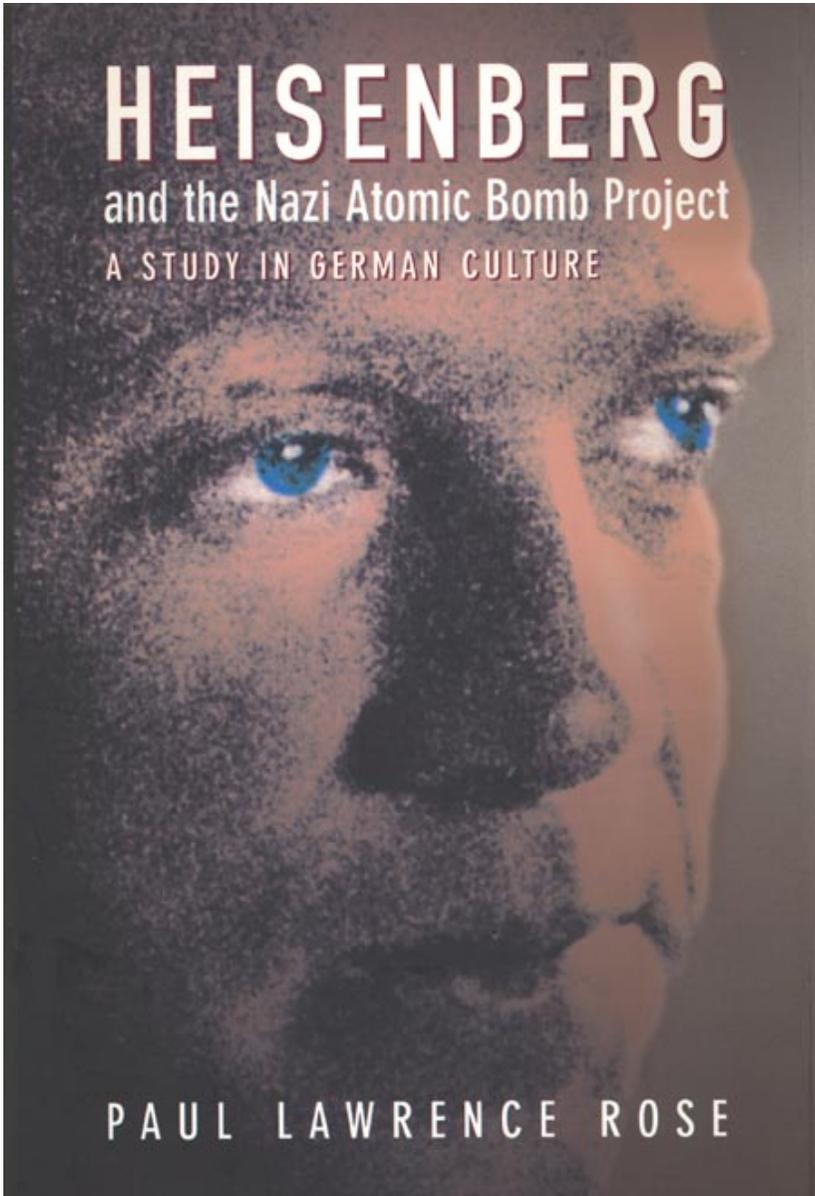


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Preface: Why Heisenberg?

Why Heisenberg? Werner Heisenberg (1901–76) is at once an emblem of twentieth-century physics and of the crisis of German culture and society during the Hitler period. Heisenberg's invention and development of matrix mechanics in 1925 in rivalry with Erwin Schrödinger's wave mechanics rescued traditional quantum theory from its various impasses and opened the way to the quantum mechanics that has dominated physical thinking in the last three-quarters of a century. This breakthrough, along with his formulation of the Uncertainty Principle in 1927, has assured Heisenberg a permanent place among the great physicists—an achievement recognized by the award of the Nobel Prize in 1933.

But in that same year Hitler came to power, and though Heisenberg might well have preferred not to think about him, Hitler opened the door to a *crise de conscience* for German physicists, as well as for the rest of the German cultural elite: Should we stay on (some asked themselves) and keep quiet, waiting for the storm to pass? Or was open protest, accompanied or not by actual political resistance, a viable alternative? Or again, was the only proper course of action to pack up and leave Germany and resist from outside? Heisenberg made a firm decision, reaffirmed during the six years before the outbreak of the Second World War in 1939, to stay on. The extent to which he agreed or disagreed politically with the Nazi regime has been a matter of bitter controversy for the last sixty years. But the point on which recrimination—and apology too—have focused has been Heisenberg's participation in the Nazi atomic bomb project. And here there is indeed massive uncertainty and disputation. On the purely scientific and technical side, did Heisenberg understand accurately how an atomic bomb would work and how to make it? And from the political and ethical point of view, did Heisenberg recognize the moral problem of becoming involved in the bomb project at all, let alone actually producing one for Hitler's use?

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 his work as chief physicist for the Nazi atomic bomb project from 1939 to 1945. Unsurprisingly, this has been countered on many fronts by less sympathetic American and British critics. The present book attempts to penetrate Heisenberg's mask to reconstruct his thinking and sensibility, and his conceptions of politics, morality, and duty. It will try to explain how his purely scientific work on the project must be set firmly in the German cultural climate and social context in which he always saw himself firmly situated. As Heisenberg himself avowed, he was above all a German. 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. Some may also find distasteful the recurrent moral judgments passed on Heisenberg, and ask what I—or anyone else—would have done if placed in Heisenberg's position in Nazi Germany. Who made me a judge over Heisenberg? But this is to mistake the proper role of the historian, which is to reconstruct the historical truth, and then, in cases where moral judgment is clearly required, to judge as fairly as one may, either by implicit suggestion and shaping of the material, or by more open statement where the conceptual and analytical elements are often obscured or misunderstood. This role does not require the historian personally to be a moral paragon or blameless. Consequently, the truth of any historical or moral portrait of Heisenberg cannot be discredited merely by stating that the historian needs to have been in Heisenberg's shoes before being able to judge. Certainly, any historian should be able to think himself or herself by an effort of historical imagination into Heisenberg's predicament, but that sort of empathetic understanding is something quite different from sympathetic abstention from moral judgments. The only real test of the historical truth of the present reconstruction is whether it makes better sense of the central problems 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.

This book began as a chapter in an intended book of essays that would explore the mentality and sensibility of a selection of German cultural figures who found themselves facing what one might have thought to be moral dilemmas during the Hitler years. These figures included Furtwängler, Heidegger, Heisenberg, Riefenstahl, and Jünger, among others. I had originally expected the Heisenberg chapter to be straightforward. It turned out otherwise, and the resolution of the difficulties of the case—stemming from both its scientific and its moral obscurities—have taken me nearly fourteen years to resolve. During this period, which was spent in Australia, Israel, Canada, and the United States, I was able to become more familiar with German patterns of thought and behavior through detailed work on such major cultural emblems as Kant, Fichte, Wagner, and Thomas Mann, as well as a range of lesser-known antisemitic thinkers. This increasing familiarity has convinced me of the difference and alienness—in a word, uniqueness—of German life and thought in recent centuries, and of the enduring nature of what one might call the “deep culture” of Germany. Readers are free to accept or reject my characterizations, but I hope that in neither case will they accuse me of unthinkingly preaching a crude view of German “national character,” whatever that term may mean. I also hope they will not dismiss out of hand the central thrust of the book: It is only by understanding Heisenberg in his specifically *German* context that we are likely to come to a true knowledge of his political and moral behavior and attitudes, as well as his scientific activity, during the Nazi era. In insisting on this German context, I believe I am being historically true to Heisenberg’s own perception and priorities, for he saw himself in the end as a German more than even as a physicist.

. . .

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 company have benefited too long from grace of various sorts.

PROLOGUE

The Heisenberg Problem

Deception and Self-Deception

We do not know where Heisenberg stands on the question, whether the German scientists could not, or could and would not, work on the making of atom bombs.

RUDOLF PEIERLS, 1971

Investigation of the technical sides of the atomic bomb problem—for example, of the so-called critical size—was, however, not undertaken.

WERNER HEISENBERG, 1946–47

In the upshot the German scientists were spared the decision as to whether or not they should aim at producing atomic bombs.

HEISENBERG, 1946

Dr. Hahn, Dr. von Laue and I falsified the mathematics in order to avoid the development of the atom bomb by German scientists.

HEISENBERG, 1970

The whole story of “a kind of confrontation” [with Bohr in 1947] . . . is a typical Heisenberg fabrication—maybe a bit brighter than a thousand others, but like them all a product of his Blut und Boden guilt complex, which he rationalizes that quickly that the stories become for him the truth. . . . Pitiful, in a man of his mental stature.

RONALD FRASER (BRITISH SCIENTIFIC INTELLIGENCE OFFICER WHO AIDED HEISENBERG’S REINTEGRATION INTO THE EUROPEAN SCIENTIFIC COMMUNITY AFTER THE WAR)

Dear Professor Einstein,

As a representative Nobel Prizewinner, would you make the generalization that Nobel Prizewinners “do not lie”? Mr. Waldemar Kaempffert makes precisely this statement [in defending Heisenberg against the accusations of S. Goudsmit’s book ALSOS].

HENRY SCHUMAN (PUBLISHER OF ALSOS), 11 NOVEMBER 1947

Dear Mr. Schuman,

Concerning Nobel Prizewinners, Mr. Kaempffert could only rightly say: One does not get the Nobel Prize for lying, but this does not exclude that some of the fortunates may lie under the pressure of certain situations.

ALBERT EINSTEIN, 17 NOVEMBER 1947

Werner Heisenberg's involvement in the Nazi atomic energy project from 1939 to 1945 is shrouded in mystery and confusion, some of it created perhaps intentionally, some of it the result of Western incomprehension of German mentality and patterns of mental and social behavior.¹ Why did Heisenberg, as the chief physicist of the project, not produce a design for an atomic bomb? How could Heisenberg, by his own admission, not have calculated the critical mass of U₂₃₅ required for a bomb? Why did a civilized man like Heisenberg, so esteemed by his fellow Western scientists such as Niels Bohr, consent to work for Hitler on a project of such frightening consequences? Why did Heisenberg, again by his own admission, never make a "moral decision" on whether or not to build a bomb for Hitler? What indeed was a "moral decision" in Heisenberg's view? These questions involve issues bearing not merely on technical scientific matters, but also on less tangible problems of morality and politics.

Along with these mixed scientific/moral puzzles there also stands an array of purely moral and political riddles: Why did Heisenberg, who refused to join the Nazi Party, nevertheless choose to remain in Germany and so lend his prestige to the Nazi regime? Why did he, despite his aversion to Nazi antisemitism and his defense of "Jewish physics," justify Nazi war victories to his colleagues in occupied Denmark and Holland? Why, after the war, was he so oblivious to the offense he gave Western friends by his rationalizations of the Nazi regime?

To date these questions have received largely contradictory and unsatisfactory answers, rooted in a failure, for the most part, to understand Heisenberg's actions, thoughts, and personality in the relevant cultural and scientific contexts. What appears to a reader of Western sensibility and outlook to be almost nonsensical in Heisenberg's political statements becomes clear and comprehensible when put into a "German" context—for example, Heisenberg's claim never to have made a "moral decision" about the bomb when, in Western terms, participation itself in Hitler's war effort was a moral decision. At the same time, Heisenberg's omission of a calculation of the critical mass of a bomb—and any physicist in charge of a bomb project surely would have had to make such a fundamental calculation at the outset—becomes understandable only when viewed in the scientific context of German nuclear theorizing in 1939–40.

We must, however, beware of separating the cultural and scientific contexts in this way. Although such a separation may be essential for an initial analysis, it obscures a crucial aspect of the Heisenberg problem: the peculiar interaction of German moral and cultural contexts with purely technical, scientific issues. In

1. The sources of the introductory quotations are as follows: The quotation from R. Peierls is from "Atomic Germans," *New York Review of Books*, 1 July 1971, pp. 23–24, reviewing Heisenberg's *Physics and Beyond*. The Heisenberg quotations of 1946–47 are from GWH, C V, 30 and 32, and GWH, B, 416 f., discussed below in chap. 1. The 1970 quotation is from a letter to Ruth Anshen (see chap. 2). R. Fraser made his comment in a letter to D. Irving, 27 August 1966 (in IMF 32; see below, chap. 21). The Einstein-Schuman correspondence is in the Einstein Archives, Jewish National and University Library, Hebrew University of Jerusalem; I am grateful to the curator, Ze'ev Rosenkranz, for providing copies.

other words, understanding why Heisenberg did not produce a bomb for Hitler requires a knowledge not only of his atomic theories, but also of his general mentality, particularly his conception of duty to the state and his visions of science and the role of the scientist.

It could be said that many of these questions might just as validly be put to the Allied scientists who were engaged on the Los Alamos bomb project, that there is nothing specifically “German” about the Heisenberg case. Though it is true that for many of the Allied scientists the atomic bomb represented an entanglement of scientific and moral issues, most were willing to work on the bomb because they believed in the rightfulness of the Allied cause. To claim a symmetry here with the German scientists, therefore, raises serious problems; symmetry would require that Heisenberg also believed in the rightfulness of his own country’s aggressive war. As it happens, it seems that he did, but then how is that to be squared with his non-Nazi attitudes? If, on the other hand, he did not think that Germany’s cause was just, why should he have served the state as a scientist? One might say that patriotism motivated the Allied and German scientists alike. But then the problem arises as to whether the horrors of the Nazi regime should have precluded patriotic loyalty of the kind claimed by any normal state. A simple comparison of the German project to the Allied one, therefore, soon raises very complicated issues requiring explanations grounded in the peculiarities of German mentality.

Sometimes these peculiarities verge on the bizarre, the absurd, and even the comical, as readers of the Farm Hall transcripts will know. One of the most curious of these peculiarities is the German capacity for self-delusion (oft remarked by German authors), a trait exemplified to an astonishing degree in Heisenberg himself. Indeed, if we are to unravel the Heisenberg case fully, it is essential to appreciate the degree to which this culturally conditioned mental trait has informed German life since at least the nineteenth century, rising to a climax in the Nazi and post-Nazi eras. Many skeptical non-Germans have long been suspicious of German efforts at deception through half-truths and falsifications, and it is certainly tempting for a Western analyst to dismiss several of Heisenberg’s statements as simple lies.² But that is to miss the essence of the matter. Heisenberg was so apt and quick to rationalize not only his own behavior, but the situation around him, that it is not immediately clear just how much he was deluding himself as opposed to trying only to mislead others.

This sort of ambivalence is indeed a general problem for historians of the Nazi period; one comes across so many seemingly absurd cases where obvious Nazis or fellow travelers deny their complicity, even to the point of claiming to be resisters, that it is difficult to know how far they were consciously lying and how far resort-

2. For a recent investigation of the “lies” of another German figure, see G. Sereny, *Albert Speer: His Battle with Truth* (New York, 1995), though the author seems to underrate the opportunism in Speer’s deception and self-deception, as well as accepting too readily that Speer ever really wanted to know the “truth.” See now D. van der Vat, *The Good Nazi* (Boston, 1997).

ing to ingrained behavioral traits developed to evade moral and civic responsibility. This resourcefulness in self-exculpation and rationalization is too complex to be written off simply as “lying” (though in the end, one is usually forced to conclude, it was just that).

In the Heisenberg case, the instinct for self-delusion produced in the space of two nights in August 1945 a fully elaborated myth of the German project, embodying both scientific and political elements. This myth became immediately the actual “truth” for all concerned. For those who believe a myth, it is, after all, the truth, and we might be able to understand the Heisenberg case better if we look at it in terms of self-delusion rather than outright lying. Still, the case is more complicated than that, for combined with self-delusion, there was also present an intention (even if sometimes barely conscious) to mislead outsiders. This capacity for self-contradiction—an ability to hold incompatible views and attitudes in separate compartments of the mind and not allow them to emerge into an open clash of contradictions—is deeply characteristic of German culture and is one of the most potent sources of confusion for non-Germans approaching German culture.

Much of what follows will seem extraordinary, both for its reconstruction of Heisenberg’s fundamental misunderstandings of the scientific principles of an atomic bomb, and for its depiction of the selective amnesia that has gripped German scientists for the last fifty years. Nevertheless it is, I believe, a truer picture of Heisenberg’s understanding of the atomic bomb than has so far been available, in that it applies conceptual approaches developed in the course of analyzing German cultural and thought patterns, especially those that structured the German antisemitic mentality and sensibility of the modern period since Kant. At the same time, since the problem of Heisenberg’s perception of the atomic bomb is ultimately a scientific one, the bulk of the book seeks to re-create in terms accessible to the general reader those technical arguments and concepts through which the German physicists of the war years understood the atomic bomb problem. After the war, the correct scientific theory of the bomb seemed so obvious to Heisenberg that he was unable to conceive how he could ever have been so mistaken during the war (just as after the Allied victory it was nearly impossible for many Germans to understand how they could ever have believed in the desirability of a Nazi victory). When the mechanics and dynamics of this mental illusion, or self-deception, are exposed, then much of what seems incomprehensible—both scientifically and morally—about Heisenberg’s participation in the atomic bomb project no longer seems quite so bewildering.

. . .

Part I of this book (chapters 1–3) presents a critical survey of Heisenberg’s own version of the history of the German atomic bomb project, combined with an account of how the version was elaborated by German scientists and various historians, and subjected to fierce criticism by mainly Allied scientists. The confused state of the primary and secondary literature, as well as the intrinsic difficulty of

the subject, requires an analysis of some intricacy and complexity, which may seem tediously detailed but which, it is hoped, may help to strip away the various layers of deception and confusion that have accreted around the subject since 1945, and are now feeding what has become an endless and often sterile controversy.

Part II (chapters 4–14) is devoted to a largely technical investigation of German thinking about the nature of an atomic bomb during the period of the war. It is argued that Heisenberg failed to understand the practical scientific principle of an atomic bomb until 14 August 1945. His various conceptions of a bomb from December 1939 until 14 August 1945 were all flawed, impossible, and chimerical. Evidence is drawn from numerous unpublished and previously uncited German official and private documents.

Having established Heisenberg's essential ignorance of the scientific principle of an atomic bomb, this book turns in part III (chapters 15–21) to questions that can be answered only in the context of Heisenberg's "German" mentality. Why did Heisenberg—and, one might say, the other German scientists too—work on this dangerous and amoral Nazi atomic project when it seemed in 1939–40 that it might have a serious chance of success? Would Heisenberg have built a bomb had he indeed known how to do so between 1939 and 1945? Why did Heisenberg remain in Germany, despite the urgings of his American friends to leave in 1938–39? Which elements in Nazi Germany did he find congenial, which unacceptable? Why, finally, did he feel the necessity of constructing a version of events that was historically false and morally corrupt?