The political life of an unpolitical man

Inner Exile: Recollections of a Life with Werner Heisenberg

Elizabeth Heisenberg

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Reviewed by Nevill Mott

Werner Heisenberg died in 1976. This book is the English translation of the German-language version published by his widow in 1980, under the title *Das Politische Leben eines Unpolitischen* (*The Political Life of an Unpolitical Man*). Her husband, as one of the few outstanding physicists who remained in Germany throughout the Hitler regime, has been the subject of much controversy. Why did he stay? Did he want to make an atom bomb for Hitler? Did he know how to do it?

Elizabeth Heisenberg tells a moving story. In every page comes through the horror of life under the Nazis and the utter wickedness of the regime. In 1933, when all Jews who could, and many others, were leaving, Heisenberg decided to stay, after talking to Max Planck, who advised, "Hold out until it has passed, form islands of stability and salvage things of value from the catastrophe." This he tried to do. The first thing to salvage was the right to teach modern physics. The movement for "German physics," in which modern theory was denounced as Jewish and the teachings of Albert Einstein were anathema, was supported, almost incredibly, by two Nobel prize winners, Philipp Lenard and Johannes Stark. Heisenberg was attacked as a "white Jew" who supported Einstein, and he fought back. Through a common relative he approached Heinrich Himmler, got himself investigated, and on this issue won.

In 1942, in the middle of the war, he accepted the directorship of the Kaiser Wilhelm Institute in Berlin, and became responsible for the modest German program to build a nuclear reactor. He was able to tell the authorities with complete honesty that wartime Germany did not have the resources to attempt a bomb. So in the second half of the war he was able to work in comparative peace.

Physics conference in Rome in the thirties. From left to right are Enrico Fermi, Peter Debye, Werner Heisenberg, Otto Stern and Niels Bohr. (Photo reprinted from *Inner Exile: Recollections of a Life with Werner Heisenberg.*)

During the war he managed to visit some of his old friends in occupied countries, including Niels Bohr in Copenhagen. It was from these visits that questions have arisen about his attitude toward the Nazi government. There are those who heard him say that he hoped Germany would win the war. His visit to Bohr was a catastrophe. According to this book, he wanted to drop hints to Bohr that Germany could never make a bomb, so that the Allies, he hoped, would not try. Bohr thought he was trying to find out what he knew, or get his absolution for working on a German bomb. Elizabeth Heisenberg explains all this by saying that we in the West can have no idea what it was like to live under the Nazi terror. Any remark of his suggesting he was a defeatist, or would not make a bomb if he could, might, if leaked, have led to arrest, and possibly death. Heisenberg had not remained in Germany to court martyrdom, but to save something for his country after the war.

From 1946 onward, as Germany's leading physicist, he had two disappointments. His efforts to bring scientists into government failed, and his scientific work, offering suggestions for

Nevill Mott met Heisenberg first in 1928 in Niels Bohr's institute. He is coauthor of an obituary of Heisenberg for the Royal Society of London.

a new unified field theory, was not generally accepted. He could not understand why "all the others" were not willing to cooperate. Wolfgang Pauli, who always spoke his mind, wrote finally, "You're free to go your own way, but I want nothing more to do with it." Heisenberg, as did Albert Einstein and Paul Dirac, spent the later parts of their careers seeking unsuccessfully the ultimate theory, thereby cutting themselves off from the mainstream of physics.

The book includes an introduction by Victor Weisskopf, who describes it as an important human document, as indeed it is. Heisenberg's experience shows, sadly, that all too often life involves the choice between two evils—in his case, to abandon the country he loved or to collaborate, to some extent, with evil. For this story of inner conflict the book could well be read outside the physics community.

Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields

J. Gluckheimer and P. Holmes
453 pp. Springer-Verlag, New York, 1983. $32.00

Until the mid-1970s most of the concepts and tools of dynamical systems were largely the exclusive province of pure mathematicians, although there were a number of applications, such as turbulence and feedback control, available to applied mathematicians and scientists. An explosion of applications has occurred in the past decade in many areas of the physical sciences (fluid flows, solidification of solids, defect formation, atmospherical science, laser physics, optical bistability and chaos, statistical mechanics and phase transitions, chemical reactions and nonlinear diffusion, combustion fronts, and others), biological sciences (genetic transference, embryology, ecological decay, population growth) and social sciences (organizational hierarchy, economical structure).

It cannot be overemphasized that in addition to its many applications, dynamical systems, bifurcations and chaos also provide common structures and common threads for many multidisciplinary endeavors.

In the past decade, widespread interest in dynamical systems, bifurcations, chaos and strange attractors arose in the science and engineering communities. This book is written for the members of these communities who may not have enough mathematical background for the research literature. The authors have not specified the presumed mathematical maturity of the readers; nonetheless I feel that the reader should have had at least a good first course in analysis (advanced calculus) and a solid course in differential equations with a fair amount of geometric interpretations. With these preparations, the authors take the reader through a detailed tour of a veritable garden of rapidly growing knowledge in nonlinear oscillations, dynamical systems, bifurcations and chaos. Of course some exotic and not directly applicable subjects are excluded or merely referenced. The authors exclude those proofs of theorems that do not directly illuminate their applications, and they do not always provide the sharpest or best results in all cases. Rather, they urge the readers to go directly to the literature. I appreciate this approach and consider it wise.

There are three approaches to the study of dynamical systems: the local, the global and the abstract theories. The local theory (also referred to as the