

PLANCK'S DEMON CAUGHT BETWEEN GOOD SCIENCE AND BAD POLITICS

The Dilemmas of an Upright Man: Max Planck as Spokesman for German Science

J. L. Heilbron

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Reviewed by Kathryn M. Olesko

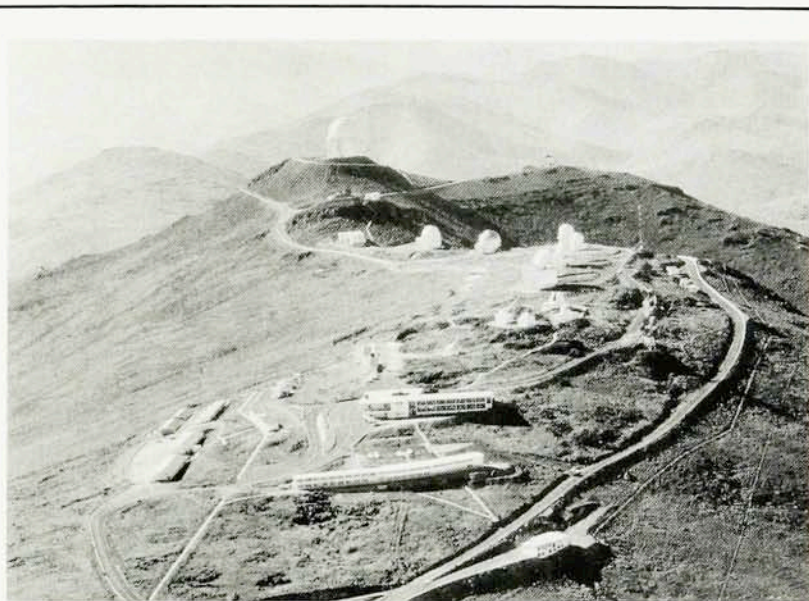
John Heilbron's study is a beautifully written and moving account of Max Planck's attempt in his nontechnical writings to probe, understand and resolve the scientific, ethical and political predicaments posed by the rapidly changing relation between science policy and German politics from the beginning of the century until the end of the Second World War. This was a period of sharp contrasts for physics, for Germany and for Planck.

The stability of the mechanical physics that Planck had tried to preserve was shaken by his own work on blackbody radiation. The unified and strong imperial Germany with which Planck identified so strongly evolved from an authoritarian into a democratic and then into a totalitarian state. As Planck assumed first a national and then an international role in science, his scientific and political world became increasingly dismal and paradoxically smaller. The man who had lived in Berlin's most beautiful suburb, Grunewald, hid in the woods and slept in haystacks in the mid-1940s, when he was over 80. The man who was happiest with his family had by the end of the Third Reich lost all four of his children, including a son killed in the First World War and another executed by the Nazis. The man who

equated unity—the unity of Germany, of science, of a world view—with stability and virtue lived the final 30 years of his life in a world that disintegrated around him.

The relation between science and politics in the Weimar Republic and the Third Reich has been explored before. Few studies, however, expose the contradictions and dilemmas faced by academics as well as this one. Heilbron's study of Planck both confirms and qualifies in important ways the received view of the "unpolitical Germans" who failed to protest

against the Third Reich. On the surface, as Heilbron argues, Planck too believed that science stood above politics and that mixing science and politics was "unnatural." But the evidence that Heilbron presents belies the conclusion that only these beliefs guided Planck's behavior. Of far greater importance was Planck's conscience—he had an "excess of scruples"—and what Heilbron identifies as Planck's dedication to preserving past traditions by adapting to present exigencies, a dedication that Heilbron claims Planck raised to the



European Southern Observatory at La Silla in the Atacama Desert, 600 km north of Santiago, Chile. The first telescope at La Silla was commissioned in 1968; numerous others followed, including a 3.6-m telescope in 1976. The above illustration appears in *Exploring the Southern Sky: A Pictorial Atlas from the European Southern Observatory (ESO)* by Svend Laustsen, Claus Madsen and Richard M. West (Springer-Verlag, New York, 1987; 274 pp; \$39.00 hc ISBN 0-387-17735-3). The book contains an astronomical feast of photographs, mostly of Southern Hemisphere objects, including about 90 color plates. Also included are photos of Comet Halley, best seen from the Southern Hemisphere, and of the comet West discovered, Comet West, which was spectacular in early 1976, as well as ESO photos of the recent naked-eye supernova in the Large Magellanic Cloud. The book concludes with a discussion of ESO's large telescope projects, the New Technology Telescope and the Very Large Telescope. (Photo reproduced courtesy of Springer-Verlag.)

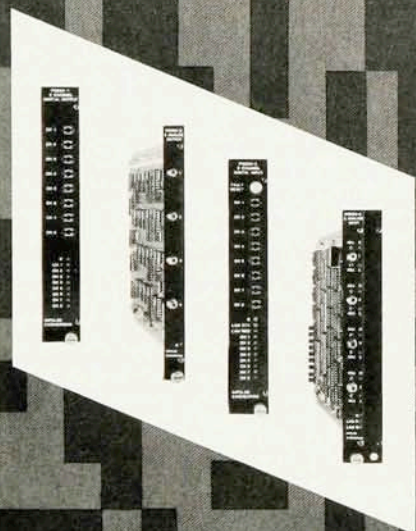
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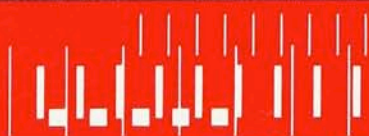
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level of a "duty."

Heilbron believes that this dedication defined Planck as a conservative. But one could also argue that Planck was in part a classical liberal, fashioned like John Stuart Mill. Like Mill, Planck supported the education of women and eschewed universal suffrage. Most importantly, Planck, like Mill, did not adopt Immanuel Kant's categorical imperative as a guide to action, as Heilbron believes that Albert Einstein did. Instead, Planck was guided by an "obligation of conscience." He worked from within the Third Reich, did not speak out against the regime, and did not resign or emigrate. One could act, Planck believed, prior to acquiring full knowledge of circumstances and their outcomes. So although he did not like working with the Nazis, he did so on occasion for what he saw as the higher good of either preserving elements of German life as he knew it or alleviating the suffering of his colleagues. Planck was in this sense guided by a liberal utilitarian ideal. To have left Germany would have meant abandoning these ideals of conscience. In short, Planck, like Mill, believed that under certain circumstances, the ends justified the means.

Heilbron leaves open the question of whether Planck's ideals ennobled or betrayed him. It is easy to read Planck's story as a tragedy. But his sense of duty and responsibility was not as excessive as, say, that of Julien Sorel in Stendhal's *Le Rouge et le Noir*. Sorel's sense of duty was selfish; Planck's, more altruistic. The sense of duty that kept Planck active as he grew older was directed at helping the helpless, a point that is reinforced by the metaphors Heilbron uses to describe Planck's actions: doctor, captain, chaplain. Yet one could also read Planck's story as a success. From his strategic institutional positions he created of himself a malleable symbolic image. The Nazis viewed him as a safe German patriot, and in 1938 the much anticipated institute of physics for the Kaiser Wilhelm Gesellschaft was named the Max-Planck-Institut für Physik. But in 1946 when the British needed a name for the new scientific organization in their zone of occupation in Germany, they chose Planck's to demonstrate that it was not aligned with the Third Reich. The persistence of his image and what it stood for is testimony to the delicate balance he struck between ideals and reality, between thought and action.

This book was originally written as the introduction to a German edition of Planck's essays that grew out of the

Inventory of Sources for Twentieth Century Physics, a project that Heilbron directs at the Office for the History of Science and Technology at Berkeley. Heilbron's book is a testament to the use that can be made of large-scale bibliographical projects. The recent issuance of a paperback edition will greatly facilitate assigning it in class, where it deserves to be read, discussed and debated by students of science, ethics and German history.

Modern Techniques of Surface Science

D. P. Woodruff and
T. A. Delchar

Cambridge U. P., New York,
1986. 453 pp. \$89.50 hc
ISBN 0-521-30602-7

It is quite difficult to find a subfield of condensed matter physics that has had a greater emphasis on the development of techniques than surface physics during the 1970s and early 1980s. In fact this trend began in the early 1960s with the introduction of a commercial version of a low-energy electron diffraction apparatus by the vacuum division of Varian Associates, already then a successful manufacturer of nuclear magnetic resonance and electron spin resonance research apparatus. Thus began a somewhat slow but steadily accelerating increase in the employment of a multitude of techniques in a single ultra-high-vacuum chamber to perform more and more detailed studies of surfaces. Today it is normal to do at least three or four uhv measurements in a single chamber. The reason for there being so many techniques is twofold:

▷ To keep most surfaces atomically intact on a submonolayer scale one must make, characterize and study the surface without exposing it to pressures higher than the uhv range—around 10^{-13} atmospheres.

▷ To derive several complementary results on a single surface it is most reliable to make several measurements *in situ*.

Clearly there has been a need for an authoritative monograph text on the proper utilization of the many uhv surface techniques now available. In fact, this field is so broad that it is commonly called surface science rather than surface physics. *Modern Techniques of Surface Science* is designed to fill such a role, and it does a good job. It follows a succession of similar monographs in recent years: *Fundamentals of Surface and Thin Film Analysis* by L. C. Feldman and