Max Planck

The Dilemmas of an Upright Man. Max Planck as Spokesman for German Science. J. L. HEILBRON. University of California Press, Berkeley, 1986. xiv, 238 pp. + plates.

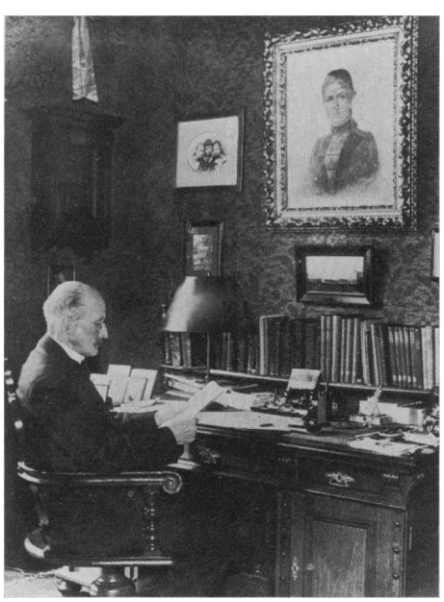
Max Planck is best known for his derivation of an equation describing the distribution of energy emitted by heated "black bodies." The derivation required (it was shown) the notion of energy quanta, a prime impetus to the quantum revolution and a prime constituent of its resolution, quantum mechanics. Planck's fame as perceived instigator of, and participant in, the revolution—combined with his personal stature, temperament, and connections—rendered him early a leading spokesman for German science and a leading administrator of its institutions. Heilbron's thoroughly researched and delightfully written account of the public Planck provides significant insights into this sometimes enigmatic figure and the dilemmas he faced.

Planck's lifetime (1858–1947) spanned the entire second and third reichs in Germany, the republican interlude of the '20's, both world wars, and the preparatory years of the present Federal Republic. He was involved in virtually every public controversy over science and every science-policy issue of his era. Heilbron shows that the key to Planck's responses lay not without but deep within his being. A descendant of pastors and professors, Planck was born into a rising Prussia that would soon unify the empire and bring Germany to the pinnacle of scientific and industrial power. He came of age just as Germany reached that pinnacle, and he easily identified the unity of self and of science with that of his state. Political unity did not survive the Great War, nor did intellectual unity survive the centrifugal forces of this century. Only Planck's ingrained personal integrity and devotion to duty remained to him, forming the leitmotiv of his life's work and, paradoxically, the source of some of his own dilemmas.

Planck was, of course, foremost a scientist, and his foremost public concern was the defense of his realist, deterministic conception of science against an increasingly subjective and irrational attitude of the public toward science. Heilbron nicely traces Planck's evolving resolution (on his own terms) of the "tension" between the supposed transcendent truth of science and the human qualities of its practitioners. While this occurred in concert with the changing cultural situation of German physics, it increasingly revealed Planck's implicit religious position.

Planck's ultimate dilemma arrived with the Third Reich. As an administrator, he felt forced to choose between two evils: working with the regime in order to gain concessions for science, while compromising on other matters; or openly opposing the regime and thereby inviting a total loss of support. Planck, by temperament, chose the first alternative and took upon himself the burden of "saving and salvaging" what he could. Did the upright man make the right decision? Should he have been, or long remained, in such a situation? In the end, of course, not even a man of Planck's stature and authority could avert the murderous perversion of morality and "duty" by his countrymen; nor could he avert the tragedy that befell many of his colleagues, his science, and, finally, himself. How do Planck's experiences, reactions and development compare with those of other scientists and Germans of his generation? What lessons can we learn from them? Heilbron's sympathetic, yet critical, case study does not answer all these difficult questions, but it does give us a nearly unique view of this fundamentally private figure. It deserves careful reading and reflection.

DAVID C. CASSIDY
Albert Einstein Papers,
Boston University,
Boston, MA 02215



Left. "Planck at work under portraits of his first wife, née Marie Merck, and their four children." [From *The Dilemmas of an Upright Man*; courtesy of Niels Bohr Library, American Institute of Physics, New York]
Above. "Planck loaded with the honors of office, 1933. The man on the right, from whom Planck has averted his head, is Wilhelm Frick, Nazi minister of the interior, who designed the law that dismissed Jews from the civil service." [From *The Dilemmas of an Upright Man*; courtesy of Max-Planck-Gesellschaft, Berlin]

Atmospheric Chemistry

The Photochemistry of Atmospheres. Earth, the Other Planets, and Comets. JOEL S. LEVINE, Ed. Academic Press, Orlando, FL, 1985. xxiv, 518 pp., illus. $79.50.

In *The Photochemistry of Atmospheres*, Joel Levine has selected topics and authors so as to show the reader how the scientific study of atmospheres is unified–from paleoatmosphere through contemporary clean and dirty air to the outer reaches of Earth's atmosphere and the atmospheres of other bodies in the solar system. A rich variety of exotic and familiar chemicals is involved, both in gaseous and condensed phases. It is seen that application of principles and data from fundamental photochemistry and chemical kinetics is permitting rapid and systematic progress in understanding how atmospheres work.

The book consists of nine chapters. The opening chapter, by Levine, reviews theories and constraints from geology bearing on the composition and evolution of the paleoatmosphere and presents photochemical model calculations. Before the advent of atmospheric oxygen and the attendant ozone it is thought that far more ultraviolet sunlight penetrated to Earth's surface. This commonly accepted view implies that ultraviolet-sensitive life forms were not viable except under water or mud until O_2 and O_3 concentrations rose to levels adequate to block ultraviolet radiation. The possibility that another ultraviolet-absorbing gas could have served to block the radiation is not discussed. A chapter on the stratosphere by R. P. Turco treats the natural ozone layer and its photochemistry more completely. It