sphere during the decade following World War II, this book analyzes the development of a new scientific pursuit within the context of military sponsorship.

DeVorkin first takes up the means by which rocket research was organized in America after World War II. Having secured boxcarloads of V-2 parts, the US military sought to determine their use and purpose, in part by a series of test firings of the captured wonder weapons. The army's goal was to learn the basics of missile operations, but the V-2 also presented an opportunity for scientists to send instruments farther aloft than ever before: a chance for important atmospheric and astronomical observations to be accomplished. For its part, the army recognized that some experimental data on ionospheric conditions would be of prime importance for rocket development, but chose not to arbitrate disputes over the details of instruments to be carried aloft. Out of this situation, DeVorkin shows, came two central institutions: the White Sands rocket base in New Mexico, the main site for research launches during the V-2 period, and the V-2 Rocket Panel (later the Upper Atmosphere Rocket Research Panel), created for presenting to the army a coordinated program of experiments using the rockets. As DeVorkin demonstrates, the V-2 Panel served as organizing forum and advocacy body for rocket-based research, and it became the framework underlying the new science.

In the book's second section, DeVorkin turns to the astronomical and atmospheric research carried out by the most important groups in the field. By their ability to lift instruments above most of the atmosphere and into its unexplored upper regions, research rockets presented a new research tool for studies of astronomy and meteorology—but not, DeVorkin argues, for astronomers and meteorologists. Physicists from other areas migrated into the field, bringing their instruments and skills with them. In studies of the Sun's x-ray and extreme ultraviolet spectra, in the mapping of the Earth's upper atmosphere and in cosmic-ray studies, these rocket experimenters remained a distinct group with marginal relationships to established research fields, although they exchanged data and methods with outsiders. They competed among themselves and were defined by their military affiliations, their connections to the V-2 Panel and their willingness to build instruments that would function within the constraints of sounding (research) rocket flights. These constraints discouraged established researchers in other fields. A rocket-borne experiment promised astronomers, for example, only a few minutes at most of spinning (if not tumbling) flight as a seldom-used guidance system attempted to focus an instrument on the Sun, followed by the rocket's midair explosion and crash back to Earth: perhaps the furthest thing imaginable from an observatory's methodical, long-term viewing program.

DeVorkin's point here, which he proves in this exhaustively researched and lavishly illustrated volume, is that this research program required not only new practices but new practitioners as well. The military brought both into being by providing the researchers with the essential financial and institutional framework for their work; in effect, then, it "created" space science. This book is an important contribution to the historical study of postwar American science.

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Taming the Atom: The Emergence of the Visible Microworld

Hans Christian von Baeyer
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In this profound and delightful book, von Baeyer wrestles with two fundamental questions: What does it mean for us to "see" an atom, and what happens to our notions of reality when we do?

He begins his approach to these questions—as any exposition of the atom must—with the Greek philosophers, and with Democritus in particular. In this early section of the book, von Baeyer's unique approach to science writing becomes evident. Along with the usual description of the basic philosophies, he talks about the modern Greek ten-drachma coin. This coin has a classic head of Democritus on one side, a sketch of an atom on the other. In musing over this unusual form of recognition, von Baeyer notes the serious aspect and wrinkled brow of the man portrayed on the coin and contrasts it with Democritus's nickname, "the laughing philosopher." Not to worry, though: The atom on the reverse side has three electrons in it. It is lithium, the primary element used in the treatment of depression. It is this kind of attention to small but fascinating details that makes this book such an interesting read.

The history of late 19th and early 20th century atomism is the next subject, particularly the argument about whether the atoms are real or whether nature merely behaves "as if" (what a marvelous pair of weasel words!) matter is made that way. This discussion terminates with a series of chapters dedicated to the modern ways of seeing the atom—David Wineland's photographs of individual atoms at the National Institute of Standards and Technology and the efforts of many people to develop the scanning probe microscope that has become standard equipment in so many laboratories. The sight of a single atom in Wineland's apparatus, particularly watching it blink on and off as its electrons moved in and out of metastable states, clearly affected von Baeyer deeply. It was the excitement of seeing the sight, the culmination of an age-old quest, that inspired this book. He manages to convey a great deal of this excitement to the reader.

But where does this insight lead us? Will the ability to isolate and visualize individual atoms really change the way we look at the world, or is it merely a technical trick? Von Baeyer argues for the former option. Some of his arguments will be familiar to physicists—he talks at length, for example, about the new atomic standards for length and time as well as modern attempts to replace the kilogram with a standard based on the mass of individual atoms.

But he doesn't stop with the technology of the atom. He argues cogently that our ability to look at individual atoms may provide a way to overcome the severe problems physicists have always had interpreting quantum mechanics—the problem of so-called quantum weirdness. He gives as good an explanation of the planned "quantum eraser" experiment as I have seen and argues that it will have as profound an effect on our perception of the atom as did John Bell's theorem and the experiments it spawned. He closes with the fervent wish that we will soon bring the atom back into the world of human intuition.

On this last subject, I must disagree with my friend and colleague. When and if these new experiments are done, I believe they will simply confirm what most of us fear: that in quantum mechanics we have found a region of the universe where the human brain is simply unable to be comfortable.

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