historically hardly paralleled dedication and responsibility of physicists to the great, dark, tangled, un-understood cause of a peaceful world" when they worked to shape the future not by rhetoric but by concrete action. Although Oppenheimer's personal flaws as well as his political convictions brought him trouble, such facts should not obscure his profound achievements: the bomb itself, which ultimately reined in national sovereignty by scaring the hell out of even the most belligerent nations and leaders, and a clearer understanding of how the human world might accommodate a scientific discovery with millennial implications. Similarly, Bethe's pronouncements reflected an uneasy conscience; but his laborious and fruitful efforts toward limiting the excesses of the nuclear arms race, which his great and well-earned scientific reputation supported, have earned him the right to put his conscience at ease. The example of these two men, which *In the Shadow of the Bomb* valuably examines, is one that scientists and nonscientists alike would do well to take to heart.

BOOKS: CHEMISTRY

Realm of the Rainbow

Thomas Lazar

Mastery of color. The radiant ultramarine of the sky in *Bacchus and Ariadne* (1523) is only one of the brilliant pigments that Titian used to make color the prime compositional element of his paintings.

CREDIT: ERICH LESSING/ART RESOURCE

Colors are part of our daily lives, yet color is not an easy concept to tackle. The phenomenon's many facets include the physical processes that generate differential spectral displays we may perceive as color, the neurophysiological events that form our perception, psychological effects, and aesthetics. Refraction, reflection, interference, and the perturbation of electron configurations produce photons of certain energy states that we perceive as color. But neurobiological research has shown that colors exist only in the brain. Nevertheless, they are biologically engrained in our minds, so we react to them in a blend of inborn and culturally modified ways. Red roses attract, but blue pasta repels.

Although the creation of color in the back of our heads by the brain's interpretation of differential arousal of retinal neurons may seem the most awesome aspect of the phenomenon, color perception is not an end in itself. It developed during evolution to enhance fitness. Colors provide a versatile means of communication. They are exploited by flowers to attract insects, by squids to display their moods, and by birds to attract mates. Many organisms perceive spectra we cannot see, but do they see color? Certainly not as humans do, with a psychological impact that artists have exploited for centuries. Through this impact, the subject of color extends well beyond science into the realms of art, literature, and culture. Any final judgment on colors must therefore be subjective.

Color
A Multidisciplinary Approach
by Heinrich Zollinger
Wiley-VCH, Weinheim, and Verlag Helvetica Chimica Acta, Zürich, 1999. 268 pp. $120, £70, DM198, EUR101.24, sFr176. ISBN 3-906390-18-7.

In *Color*, Heinrich Zollinger pays ample attention to all of the above aspects of the intriguing phenomenon. Zollinger, an emeritus professor at the Swiss Federal Institute of Technology in Zurich, developed a passion for the subject during his long career as a specialist on color and textile chemistry. He has also published papers on the naming of colors, and he even admits to having once spent more of a sabbatical at the Massachusetts Institute of Technology studying linguistics than teaching dye chemistry. Zollinger's inquisitive mind has led him to master an impressive array of topics and integrate contributions from disparate disciplines into an enjoyable account. His book provides a very balanced treatment of the spectrum between red and violet.

Zollinger's easy-to-grasp writing is accompanied by informative graphics and many high-quality reproductions of photographs and paintings. His descriptions and, often personal, interpretations of individual topics require no prior knowledge beyond a basic understanding of scientific concepts, one which readers of *Science* can be assumed to possess.

Specialists may wish that their particular fields were given more detailed treatments, but it is the breadth of the book's scope that makes *Color* so fascinating. Zollinger's account is itself a kaleidoscope of color. The chapters proceed in a logical order from the physics of light and the chemistry of colorants, through the biology of vision, to the culture of visual arts. Each, however, can be read independently, which makes it easy to dive into the text, wherever one is lured. After exploring Zollinger's varied perspectives, readers will look at the colorful world around them with increased awareness and appreciation.

The author is in the Department of Molecular Genetics, Max Planck Institute for Biophysical Chemistry, Am Fassberg, 37077 Goettingen, Germany. E-mail: tlazar@gwdg.de