technologies for both military and commercial communication purposes.

At a transistor symposium in Murray Hill, New Jersey, in 1952, Bell Labs disclosed key materials breakthroughs that had been made in the fabrication of junction transistors. At about the same time, the US Air Force drafted Bell Labs' expertise to develop a network of early-warning radar stations. The cold-war arms race with the Soviet Union had begun, and the fledgling semiconductor industry was destined to be backed by the US government at a pace that was further accelerated by the launch of Sputnik and the subsequent space race with the Soviet Union.

Riordan and Hoddeson offer much insight into the personal workings of great scientists and inventors. Even as major breakthroughs were occurring in the 1950s, they recount, Bardeen, excluded from subsequent work by the increasingly touchy and difficult Shockley, had begun work on superconductivity, ultimately leaving to join Frederick Seitz at the University of Illinois in the summer of 1951. Further, Shockley himself became increasingly disenchanted with Bell Labs when he was passed over and Jim Fisk appointed as director of research. Shockley teamed up with fellow Caltech graduate Arnold Beckman to form Shockley Semiconductor Laboratory, in Palo Alto, California, in 1956. Shockley Semiconductor soon recruited such outstanding scientists as Gordon Moore and Robert Noyce. But even though Shockley thus proved himself again to be a prodigious recruiter of talent, he was unable to manage the creative talent he had brought together with Beckman's backing. A group of eight, led by Moore and Noyce, resigned in September 1957 to form their own company, backed by Fairchild Camera and Instruments.

Silicon Valley owes a significant portion of its genesis to Shockley Semiconductor, and Shockley has been referred to as the "Moses of Silicon Valley" by his longtime friend Seitz. But Shockley himself profited little from his efforts.

Crystal Fire provides a remarkable look into these highlights—and much more—of the story not only of one of the greatest inventions of the 20th century but of the birth of the information age. It is a must-read for every solid-state physicist, device engineer and materials scientist, as well as for those interested in the intimate coupling of fundamental science with application.

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The Truth of Science: Physical Theories and Reality

Roger G. Newton
Harvard U. P., Cambridge, Mass., 1997. 260 pp. $27.00 hc
ISBN 0-674-91092-3

Roger G. Newton is a theoretical physicist already well known for his highly technical, foundational work in quantum mechanical scattering theory. In *The Truth of Science*, he gives us an exemplary nontechnical but thoughtful and clear description of science and its relation to truth. It is intended for an educated general reader and requires no familiarity with the mathematical aspects of physics. This book should prove to be of interest to a wide audience, since the question of the truth and objectivity of science has recently been brought to the fore, even among scientists, by the so-called Science Wars.

This latter expression refers to an extensive and ongoing exchange of volleys between the "hard-science" and the "sociology-of-science" camps. These represent opposite ends of a spectrum: Members of the first group take the laws and theories of science to represent an objective and accurate picture of the world, while extremists in the second see the very form and content of science as a purely social construct. Recently, a minor skirmish even took place in the pages of PHYSICS TODAY (July 1996, page 11 and January 1997, page 11). Among the combatants in the larger campaign have been distinguished scientists (some Nobel laureates), historians and philosophers of science, and social constructivists. Unfortunately, the discussants have too often talked past each other, without taking proper cognizance of arguably valid points made by the other side. While neither extreme is wholly defensible, the real problem, it seems to me, is just where one should come down between these extremes. There certainly is an important issue here and the stakes are high: whether (1) science gives us reliable knowledge about the way the world actually is, or (2) simply offers us a plausible story about the way the world might be.

The Truth of Science opens with a preface and an introduction that address this question and, not unexpectedly, come down largely on side (1). Much of the rest of the book is presented as further brief for the scientists. It is a comprehensible, certainly technically correct and generally even-handed account of science—one almost universally subscribed to by the scientific community. Science comes across as an objective enterprise that discovers reliable laws and theories about nature, these converging toward truth. Are matters really so straightforward, though? While there are aspects of scientific practice (for example, the ever-increasing scope, accuracy and predictive power of our successful scientific theories) that support position (1) above, there are also other (external) factors (for example, the influence that social and even psychological elements have had on the structure of scientific theories) that lend credence to (2). This difference in outlook is what is at the heart of the Science Wars. While it is quite reasonable to position oneself between the extremes, there seems to be no objective set of criteria that will both command essentially universal assent and determine uniquely the proper location on the spectrum.

Roger Newton constructs an appealing case for a very positive and optimistic view of science on the basis of an often literate and nuanced examination of the history and content of scientific theories and of associated philosophical questions. His book is a useful addition to the general literature on the nature and goals of the scientific enterprise. He does make some conciliatory gestures toward the influence of external factors on science, but certainly not enough to bring into his fold those partial to a less sanguine view of science. Although I am inclined to give somewhat more weight to external factors than does Newton, I must say that he has made a good case for his view of science—perhaps about as good as one is going to find. One can only hope that continued, civil dialogue of the kind in this book will contribute to an accurate, widely accepted representation of science and of the type of knowledge it gives us, and, in the process, to an accommodation between polarizing views.

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Flash of the Cathode Rays: A History of J. J. Thomson's Electron

Per F. Dahl
IOP, Philadelphia, 1997. 526 pp. $49.50 hc ISBN 0-7503-0453-7

Per F. Dahl's *Flash of the Cathode Rays: A History of J. J. Thomson's Electron* is perhaps the first book-length monograph on the history of the electron to appear since David Anderson's *Discovery of the Electron* in 1964 (Princeton U. P., Van Nostrand). Dahl's book is