ing Consumption and *The Politics of Domestic Consumption* are fitting guide books for any historian of technology contemplating just such a venture.

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Refiguring Life: Metaphors of Twentieth-Century Biology. By Evelyn Fox Keller. New York: Columbia University Press, 1995. Pp. xix+134; bibliography, index. $20.00 (cloth).

Molecular biology has attracted historical attention in recent years, prompted perhaps by the Human Genome Project, the rise of the biotechnology industry, or the exuberant participant-histories of the 1970s and 1980s. A satisfactory explanation of this scientific field and its cultural and political moorings has yet to appear but much new work is on the way.

Evelyn Fox Keller's volume fills a special niche. It provides a broad overview of the uses of metaphor in scientific descriptions of the organism and the gene, and it connects molecular biology to a wide range of other technologically driven fields, including systems engineering and computing. The book consists of three essays that Keller delivered in the June 1993 Wellek Library Lectures in Critical Theory at the University of California at Irvine. There are very few footnotes; a brief bibliography is included.

Keller first explores how the concept of gene action has evolved from the turn of the century to the present. She considers the productivity of T. H. Morgan's interpretation of gene action, suggesting that the autonomous, powerful gene imagined by Morgan and his coworkers permitted them to frame important and solvable problems. By ignoring development, they could focus on phenomena that could be more easily tracked. Comparing A. H. Sturtevant's linear construction of development to Richard Goldschmidt's conception of development as a complicated system, she proposes that Sturtevant's ideas—which in effect subsumed development under genetics—had tremendous appeal because of their simplicity. The organism seemed to simply unfold from the genes, and even development itself was genetically controlled. But gradually, over the last two or three decades, this construction of the gene and gene action has begun to unravel. The cytoplasm—traditionally gendered female—has attracted new attention, and the idea of "gene action" has been replaced by "gene activation." Keller attributes this shift to many causes, including new technologies for manipulating DNA, shifts in gender relations, and historical relations between Germany and the United States.

In her second essay, Keller compares Maxwell's Demon to Darwin's Being to Schroedinger's code script—his term for DNA. She points out that the informational and directive gene was, for Schroedinger and others, a solution to a paradox. This paradox was the apparent ability of life to violate the second law of thermodynamics. Though he did not use the imagery itself, Schroedinger made DNA the equivalent of Maxwell's Demon or of the Archimedian point from which the world could be moved. The ability of life to violate physical laws was a consequence of the information contained in the chromosomes, he proposed, for the chromosomes in effect concentrated order. Here Keller excavates an important piece of the tangled relationship between physics and molecular biology. For some 19th-century physicists, Maxwell's Demon was a technologically sophisticated being—a pointsman on a railway, a strategist sitting at his telegraph wires—an intelligent being capable of influencing individual molecules. The mechanical nature of the Demon was important to them—it was a machine; similarly, for Schroedinger, DNA had machine-like properties. It combined the skills of architect and builder, containing a complete plan for the execution of the body. This is rich material with the potential for further work.

Finally, Keller considers the relationships between postwar systems engineers, cyberscientists, and molecular biologists. She first promises to explore the computer's impact on biological representations of the organism but then goes on to do several other things instead. She shows that those attempting to build purposeful behavior into machines, such as systems analysts and engineers building warheads, drew on a notion of the animal as complex feedback mechanism. In the same period, meanwhile, molecular biologists saw the organism as a simple machine. It was as though each group borrowed the unwanted allusions of the other—engineers were interested in a machine that was an intelligent organism functioning in a nonreductionistic system, and molecular biologists were interested in a model of the organism as a simple machine that could be reduced to molecular information.

This is a provocative book that raises important questions. Keller has a remarkable ability to make broad connections and work on (uncomfortable) boundaries, so her methods can be vexing to the historian. She cannot possibly support some of her claims, and she sometimes attributes massive technological and intellectual changes to shifts in metaphor. She knows this is narrow and simple—she says so in her introduction—but she seems to be experimenting. Read in this light, the book has much to offer. It does not present a sustained historical argument, but it does elucidate crucial problems that such an argument would need to explore.

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East Asian Science: Tradition and Beyond. Edited by Hashimoto Keizô, Catherine Jami, and Lowell Skar. Osaka, Japan: Kansai University Press, 1995. Pp. 546.

This volume contains sixty-five of the more than one hundred presentations at the Seventh International Conference on the History of Science in East Asia, held in Kyoto in 1993. This series of conferences started in 1982 as the International Conferences on the History of Science in China. In 1990 its scope was broadened to the history of science, technology, and medicine in East Asia.

The content of this volume reflects a steady growth of interest in studies of East Asian science and technology but also a growing awareness of shared historical traditions and contemporary concerns in the larger East Asian area. Most research reports trace and analyze the development of techniques and concepts in premodern Chinese science, medicine, and technology. They are concerned with understanding these techniques and concepts in the shared language and perspective of modern—i.e., Western—scientific thinking. In the same vein, the historical contact points between traditional Chinese science and Western science are explored. Panel 1, "Comparisons and Exchanges between East Asian and Western Science," and section II.5, "China, Japan, and the West: Early Modern Encounters," contain many fascinating vignettes.

New and significant trends emerge also. A growing number of papers emphasize the value and internal consistency of traditional Chinese and East Asian thinking and its persistence especially in medicine. Other contributions focus on the exchange between China, Korea, and Japan before and during their 19th-century meeting with Western science, medicine, and technology. An entire section is devoted to "The Future of Technology in East Asia." Not surprisingly, this section is marked by optimism about the potential of East Asian cultures to respond, on their own terms, to the challenges of economic acceleration.

Excellent scholarly research papers of interest to readers of *Technology and Culture* can be found in sections II.1 ("Approaches to Non-textual Objects") and II.3 ("Modern and Quantitative Analyses of Traditional Disciplines"). A comprehensive analysis of "The Origins of Swords in Northeastern Japan" (Yoshida, T., et al.) traces