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Book Reviews

Biotechnology: Assessing Social Impacts and Policy Implications, edited by David J. Webber, Greenwood Press, Westport, CT, 1990.

Perhaps the only sure thing about biotechnology is its definition (and even that is open to debate) as "any technique that uses living organisms or processes to make or modify products, to improve plants or animals, or to develop microorganisms" (p. xi). Beyond that very broad definition, the future of biotechnology is uncertain, in Frank Knight's sense of the word. That is, we simply cannot estimate the likelihood that a particular product will work, that a particular firm will be successful, or even if biotechnological goods will be suited to a given product-market. In the face of this uncertainty, it is not surprising that the potential social impacts of biotechnology are both unknown and highly contentious. For some, biotechnology is a societal promise—offering hopes of improved production capacity and disease resistance in agricultural, chemical, medical, and other fields. For others, it is a public threat, raising the specter of environmental catastrophe and economic dislocation.

Most of the chapters in this edited book review the historical evolution of biotechnological debates in public forums and argue that the outcomes of the debates will critically shape the future of biotechnology. This aspect of the book is reasonably successful. Three main issues emerge: the potential for impacts on many sectors; the complex and unstable sets of interests arguing for and against biotechnological goods; and the importance of the outcome of the arguments in determining commercial success.

The commercialization of biotechnological goods obviously will affect the profitability of the firms developing and marketing them. Beyond this, however, the biotechnological products will influence universities, communities, other commercial organizations, and consumers who use the products. Charles Johnson and Robin Moore report a survey of technology transfer practices at 16 American universities, concluding that universities will realize the potential for biotechnology technical transfer only if they develop appropriate faculty incentives to do applied research and provide professional staff to assist in the transfer. Similarly, Mack Shelley, William Woodman, Brian Reichel, and Paul Lasley report a study of community economic development based on technology transfer from Iowa universities, in which they find that universities are torn between traditional research and teaching demands and new demands for applied development relevant to local industry.

Many commercial and consumer sectors are likely to be affected by biotechnological developments. William Lacy, Lawrence Busch, and William Cole examine agricultural cooperatives, arguing that they may lose position relative to multinational agrichemical and food-processing firms, owing to the corpo-

rations' stronger linkages with research and political institutions throughout the world. Beverly Fleisher argues that the commercial and consumer distribution of benefits from agricultural biotechnology will be determined by a complex mix of industrial and policy issues. Relevant industrial issues include the availability of complementary and substitute products, while policy influences include the strength of patents, regulations, liability, and insurance laws. Robert Dixon argues that the future of commercial biotechnological products in developing countries depends on networks among universities, corporations, and government agencies.

With such far-reaching effects, biotechnological development stirs strong passions. Paul Thompson and Thomas Wiegele outline the views held by various interest groups. Lined up in strong favor of biotechnological goods are public and private researchers, who argue that the goods present low risk and high reward, and so seek research subsidies and light regulation. Strongly opposed are several public-interest groups and organized religious groups which, fearing unintended environmental and economic consequences, hope to block development. Wiegele draws on C.P. Snow's notion of the "two cultures" of natural sciences versus the humanities to typify the debate. Somewhere in the middle are environmentalists, who tend to favor tight regulation. Thompson predicts that the extreme groups will cancel each other, leading to adoption of government risk-assessment policies. This will be supported by industry, he expects, as long as the regulatory entanglements are reasonably low.

With the many interests affected and many groups attempting to influence the outcome, the social arena is an important one. William Browne and Larry Hamm argue convincingly that any technology "rolls on" only when supporters possess strong economic incentives and when they generate strong political incentives to accompany adoption. Brown and Hamm report the case of bovine somatotropin (bST), in which the firms involved in its commercialization underestimated their political task, focusing only on technical and marketing dimensions of commercialization. Used to increase milk production, bST was approved for test-marketing by the FDA and received strong initial demand from dairies during the mid 1980s. Following consumer complaints in California, however, five national chains banned test-marked bST milk from their stores and demand for bST from dairies declined.

To succeed, therefore, a good must be perceived as safe by regulators, the scientific community, and consumers. In the regulatory arena, Fred Kuchler, John McClelland, and Susan Offut review the history of food safety debate regarding pasteurization of milk processing, use of the growth hormone DES in beef production, and finding of pesticides in milk. They find that both too much and too little regulation may create problems. While Kuchler et al. do not suggest where the balance may lie for biotechnological goods, Richard Sherlock and Amal Kawar argue that regulation of biotechnological dairy products should be limited to labeling requirements, rather than severe pre-

commercialization testing. The Sherlock and Kawar argument relies on the assumption that individual consumers are able to make informed choices regarding both what they are willing to spend on goods and how much risk they are willing to incur in the process. This assumption is contentious. Referring to the Kuchler et al. study, for instance, one questions whether individuals would be able to assess the risk of eating beef containing DES, which is linked with a form of cancer, without independent testing of the hormone.

Christopher Plein nicely sums up the historical evolution of policy concerns, arguing that the concern started with ethics in the 1960s, moved to safety in the 1970s, and progressed to economic opportunities and impacts in the 1980s. Plein illustrates the evolution with the hypothetical example of policy issues concerning a genetically engineered mouse. "In the 1960s the [policy] question of the mouse would have centered on whether in theory such an accomplishment could and ought to be done. In the late 1970s the question would have focused on the implications if the mouse escaped from the laboratory. In the 1980s the question of who owns the patent on the mouse takes center stage" (p. 165). Plein, like Thompson and the other writers in this book, believes that the widespread commercial development of biotechnological goods is inevitable. "In the 1990s", he states, "it is likely that the focus of the debate will be on who will build the better [mouse] and where" (p. 165).

To a much lesser extent than its historical review, the book predicts the future path of issues and offers guidance to policy makers at various levels of government who are attempting to influence the debate on who will build the better mouse. To this second end, the book is more successful at raising questions than at posing even tentative answers. In fairness, even tentative answers are subject to high uncertainty in this field. One wishes, though, that the authors had been more willing to go further out on predictive and prescriptive limbs.

Much of the prospective analysis is limited to noting that there is little policy coordination at the federal level, let alone across local, state, and national jurisdictions, and then calling for increased coordination. David Webber points out that knowledge about the social impacts of biotechnology tends to be produced in reaction to legislative concern, rather than leading the concern. Morris Bosin calls on policy makers to be responsible and far-sighted, noting that "Policy makers must be sufficiently comprehensive in their outlook to see the overall linkages between external forces which may be driving their policy decisions regarding responsibility, their own personal and institutional frames of reference, and the outcomes that result (p. 179)". Unfortunately, the authors of this book provide little assistance in achieving this end.

Where the book could usefully have devoted more attention is to the interface between economic incentives and social policy. Several chapters touch on this issue briefly, but much more time could have been spent attempting to answer questions such as the following: Who has the strongest incentives to

develop and commercialize biotechnological products? Possible actors include established pharmaceutical and agrichemical firms, new biotechnology firms, and universities in the United States and throughout the world. Do any of the players with strong incentives have the social skills and political ties that will be needed to guide the rolling-on of biotechnology innovations in the United States and throughout the world? If we identify such ties, we can reasonably predict some aspects of biotechnological evolution. Lacking such knowledge, we can do little more than record the evolution as it unfolds.

A third critical question, again largely unanswered in the book, is the influence of proprietary rights on biotechnological developments. Fleisher notes that patent and other proprietary laws will influence the distribution of the value of biotechnological products. Perhaps more importantly, though, such laws will influence the willingness of firms and other organizations to develop and commercialize goods and their ability to compete in domestic and international arenas. Johnson and Moore touch on this issue in their chapter on technology transfer from universities, noting that the biotechnology research environment was significantly altered by the 1980 U.S. Supreme Court ruling that new life forms could sometimes be considered inventions and thus be entitled to patent protection. Nonetheless, a chapter devoted to the current state of proprietary law and suggestions for appropriate changes would have strengthened the book.

Because it avoids posing answers to most questions, the book offers few prescriptions for future action. As a review, however, it provides a useful base for both academic researchers and policy practitioners who wish to understand the social history of biotechnology. Whether one considers the possible repetition of biotechnological social history a doom or a desirable outcome, such understanding is important.

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