GENETICALLY MODIFIED FOODS:
DEBATING BIOTECHNOLOGY

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I. INTRODUCTION

Despite the fact that agricultural science is nothing new, "[f]ood biotechnology has become a locus of financial, legal, ethical, and aesthetic controversy" (p. 152). Humans have been genetically modifying crops and animals through selective breeding and other processes for thousands of years. Genetically modified ("GM") foods as we know them today, however, are produced using recombinant-DNA ("rDNA") technology, which *is* relatively new to the scene.[1] Indeed, GM plants and animals are no longer exclusively within the province of science fiction. With new technologies come new concerns, and GM foods have bred their share.

As lawyers, citizens, and consumers, food biotechnology is increasingly pervading our day-to-day lives. As attorneys, biotechnol-

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1. *See* Philip H. Abelson, *Biotechnology: An Overview*, 219 SCI. 611, 613 (1983).

ogy will soon appear in our legal practices (if it has not already), requiring expertise in regulatory law, intellectual property, licensing, and litigation. As informed citizens, we must consider the government's policy objectives with respect to so-called GM organisms. As consumers, we must realize that much of the food on the market is in some way genetically modified. We therefore must assess new technologies with open minds.

Genetically Modified Foods is an edited volume comprising thirty-seven short articles and transcribed speeches. These pieces are divided into the Prologue and ten sub-sections, ranging from "Religion" (pp. 109–30) to "Assessing Environmental Impacts" (pp. 323–42). Each section is prefaced by a brief editorial introduction. According to the editors, Michael Ruse and David Castle:

> We cannot address every issue in a reasonably sized collection such as this, nor do we pretend to. And indeed, let us stress, it is not our aim to give you any prepackaged answer to anything. Rather, we want to introduce you to some of the main issues and then to let you make up your own mind. We have our own opinions, but it is our aim here to let you come to your opinions, from your own reasoning, in the light of the pertinent information and understanding (pp. 24–25).

Indeed, *Genetically Modified Foods* does just that. Within the confines of an extremely manageable and readable volume, the editors have compiled a laudable introduction to the GM debate — no more, no less. If you are already schooled in the various arguments enshrouding food biotechnology, *Genetically Modified Foods* is unlikely to further your understanding. If you are new to the debate, however, this book will serve as a well-rounded introduction and jumping-off point.

Genetically Modified Foods is not perfect, but the overall quality of the volume is quite good. The editors' selections are occasionally redundant and some sections of the collection are left unbalanced, creating a decidedly pro-GM slant. Perhaps these shortcomings only help to make certain points clearer and to remind us to take all rhetorical arguments with a grain of salt. Although any presentation of the facts may be persuasive, the facts themselves must control in the end.

II. PROLOGUE

In *Genetically Modified Foods*, the "Prologue" (pp. 9–20) sets the tone for the remainder of the volume. The Prologue begins with a transcript of Prince Charles's 2000 Reith Lecture, entitled "A Royal View," in which he admonishes the technological preoccupation of his listeners. Prince Charles bemoans that "[t]he idea that the different parts of the natural world are connected through an intricate system of checks and balances which we disturb at our peril is all too easily dismissed as no longer relevant" (p. 13). An avid supporter of organic foods and agricultural methods,[2] he continues: "There is already plenty of evidence of just what can be achieved through applying more knowledge and fewer chemicals to diverse cropping systems" (p. 13). Reaching the peak of his fiery crescendo, Prince Charles concludes that "[o]nly by rediscovering the essential unity and order of the living and spiritual world . . . will we avoid the disintegration of our overall environment" (p. 15).

The Prince of Wales's comments are juxtaposed against a rejoinder by Professor Richard Dawkins, who states, "I wholeheartedly share [Prince Charles's] aim of long-term stewardship of our planet, with its diverse and complex biosphere" (p. 16). From that starting point, however, Dawkins diverges from the Prince's argument and voices support for biotechnology research. Dawkins points out that selective breeding is merely a less invasive variation on genetic manipulation and then notes the environmental dangers posed by our current forms of agriculture (p. 17). Arriving at a conclusion contrary to Prince Charles's, Dawkins declares: "We must use all our scientific artifice to protect [the future]" (p. 18).

Falling at opposite ends of the spectrum, these arguments by Prince Charles and Richard Dawkins aptly frame and offer a tremendous introduction to the present debate over GM foods. Both individuals choose to argue at a high level of abstraction, contemplating the value of a technology or even science as a whole. Although much of the present debate is conducted at this level, just as often the discussion begins with a very specific technology. The book turns next to this type of debate.

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2. *See* Nigel Blundell, *How Does HRH's Garden Grow?*, DAILY TELEGRAPH (London), Jan. 11, 2003, at 1.

III. GOLDEN RICE

Much of the recent GM controversy has focused on so-called "golden rice."[3] Golden rice refers generally to rice that has been genetically modified to produce Vitamin A, which lends the rice its "golden" hue (p. 29). In theory, golden rice will help alleviate the prevalence of Vitamin A deficiencies in developing nations (p. 42). For reasons ranging from environmental impact to fears of corporate monopolization, however, the long-term usage of golden rice is uncertain.

In "Part 1. Biotechnology Case Study: Golden Rice" (pp. 29–64), the editors offer seven pieces discussing and debating the merits of golden rice. Although the arguments presented in these pieces rapidly become redundant, it is apparent that the editors wish to display just how entangled the debate over even a single technology can be. Further, each author presents the debate from a different perspective (e.g. as scientist, as lobbyist, as politician), thereby demonstrating how difficult it is for alternate views to agree on common terminology or valid modes of argumentation.[4]

After a brief discussion of the politicking that has highlighted biotechnology's history, we are introduced to the technology of golden rice by Professor Mary Lou Guerinot (pp. 41–44). Guerinot objectively explains the purposes of golden rice and the technology underlying the innovation in plain English and concludes that "[o]ne can only hope that this application of plant genetic engineering to ameliorate human misery without regard to short-term profit will restore this technology to political acceptability" (p. 44). These comments are followed by a highly scientific article (pp. 45–51) explaining the innovation more precisely. This latter piece is a bit inaccessible for those without a background in the sciences, but it nonetheless offers a more detailed explanation of the technology that has bred such widespread debate.

Despite an auspicious start, this section rapidly degenerates into a simple mud-slinging contest. The section continues with a battle between Greenpeace and certain inventors and supporters of golden rice, in which both sides completely ignore each other's arguments. In their statements, both Greenpeace and Professor Vandana Shiva point out that golden rice could not possibly provide an individual with the recommended daily allowance of Vitamin A (pp. 53, 59). They contend that, as a result, golden rice is a "hoax" and will even "aggravate" the

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3. J. Madeleine Nash, *Grains of Hope*, TIME, July 31, 2000, at 38 (discussing the technology and early criticism concerning genetically engineered golden rice).

4. This issue is discussed at length in "Part 2. Ethics in Agriculture" (pp. 65–108), and particularly in Marc A. Saner, "Real and Metaphorical Moral Limits in the Biotech Debate" (pp. 77–79).

prevalence of Vitamin A deficiency in developing nations (pp. 53, 59). In response, Ingo Potrykus, a co-inventor of golden rice, and Rockefeller Foundation President Gordon Conway explain that any supplementation of Vitamin A will help and that there is "no reason" not to proceed with the project (pp. 56, 64). Although they are not particularly enlightening, these heated exchanges illustrate the battle surrounding this technology.

IV. ETHICS IN AGRICULTURE

In "Part 2. Ethics in Agriculture" (pp. 65–108), the editors offer four pieces addressing the ethical debate from a fairly abstract level. The editors comment that "we wish to avoid a laundry list of ethical positions as much as we wish to avoid any single ethical position" (p. 66). Indeed, rather than offering ethical arguments at all, three of the four pieces consider merely *how* the debate should properly be framed so that no voices are ignored or otherwise drowned out.

Among these, Professor Paul Thompson points out that the "[d]ebate over agricultural biotechnology is, in [a] sense, a surrogate for debate over technological progress itself" (p. 69). This thought emphasizes the relevance of the Prince Charles-Richard Dawkins debate to specific GM food technologies. David Magnus and Arthur Caplin disagree with this notion, and insist that the GM debate has merely the "appearance of being a pro- and antiscience battle" (p. 81).

Unlike the previous pieces, which merely framed the ethical debate,[5] the last article by Professor Gary Comstock (pp. 88–107) follows a standard approach of applied ethics to arrive at an allegedly ethical conclusion. Although he appears to presuppose his conclusion at times, Comstock's analysis is the most rigorous of those included by the editors. Perhaps inevitably, he arrives at the conclusion that GM foods are ethically justified, using secular concerns to outweigh sectarian impulses. This conclusion, however, is bolstered by Comstock's admission that, although once a firm opponent of food biotechnology, he has changed his mind over time. The remainder of his article is devoted to an interesting and well-written discussion of the "precautionary principle," whereby humans justifiably prefer that which they know to that which they do not (pp. 101–03). As a result, he argues, "[o]ur precautionary response . . . may well lead in the short term, at least, to the rejection of GM technology" (p. 101). Although he finds this tendency to be natural, Comstock is disappointed that a worthwhile technology may be sacrificed as the result.

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5. "At its core, the debate about [GM organisms] is a debate about what values count and what framework they should be counted in" (p. 87).

V. RELIGION

A particularly sensitive aspect of the GM debate concerns religion. Simply put, some people "believe that their religion forbids consumption of foods produced through rDNA technology."[6] It was this issue that Judge Kollar-Kotelly was forced to consider for the D.C. District in *Alliance for Bio-Integrity v. Shalala*[7] in 2000. Plaintiffs in this case "have argued that the [FDA's decision not to require GM labeling] unconstitutionally violates their right to free exercise of religion by allowing unlabeled genetically engineered foods on the market."[8] The Court concluded that even if the plaintiffs in this case "meet the . . . requirement that their beliefs are sincerely held and can demonstrate an 'honest conviction' desiring to avoid genetically engineered foods,"[9] neither their Free Exercise nor Religious Freedom Restoration Act claim could stand.[10] Despite this decision, however, the religious dispute is far from settled.

"Part 3. Religion" (pp. 109–31) is the least balanced of the sections in *Genetically Modified Foods*. Although each author addresses religious objections to GM foods, each concludes that agricultural biotechnology is a necessary social good. Pope John Paul II expresses hope that through proper use of technology, humans can take full advantage of what God has created. Joe Perry, an Anglican, writes that God would not disfavor GM foods, so long as the environment is carefully preserved. Both of these arguments are well-written, but each presupposes the good of science.

The last piece in this section is particularly interesting and was commissioned exclusively for this volume. In "Genetically Modified Food and Jewish Law (Halakhah)" (pp. 123–29), Rabbi Carl Feit discusses how the laws of the Torah and the Talmud might apply to GM foods. Rabbi Feit begins with the premise that "all scientific activity, like the rest of human conduct, must also conform to the highest of God's moral and ethical teachings" (p. 124). He then proceeds to explain various prohibitions of Jewish law and how GM foods fit into the structure of Jewish ethical thought. Quietly, he concludes that agricultural biotechnology is an area of great concern, "requiring a delicate balance between bold enterprise and humble awareness of the finitude of human vision. . . ." (p. 129).

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6. Alliance for Bio-Integrity v. Shalala, 116 F. Supp. 2d 166, 170 (D.D.C. 2000).
7. *Id.*
8. *Id.* at 179.
9. *Id.* at 180.
10. *Id.* at 179–81.

VI. LABELING

On May 29, 1992, the FDA published *Statement of Policy: Foods Derived from New Plant Varieties*.[11] The Statement of Policy announced that GM foods were "generally recognized as safe," and also indicated that rDNA modification was not a material fact under the Federal Food, Drug and Cosmetic Act.[12] As a result, labeling of GM foods was not required.[13] Immediately thereafter, the GM controversy flared.

"Part IV. Labeling" (pp. 131–47) addresses the argument that GM foods should be labeled as such when marketed for public consumption. Similar to Part III, this section is unbalanced. Rather than presenting arguments both for and against labeling requirements, the editors have chosen to include only anti-labeling rhetoric. Nevertheless, the theories offered, under which labeling would be pointless or even counterproductive, are well-developed and rather interesting.

The section begins with a humorous look at the "Franken-" prefix (pp. 133–34), written by New York Times columnist William Safire. Although the content of Safire's piece, explaining the various usages of the "Franken-" prefix and highlighting the coined term "Franken-food," adds little to the GM food debate, the various ways in which "Franken-" has been appended to "seeds," "veggies," "fish," "pigs," and "chicken" (p. 134) highlights the public relations nightmare that a GM label could start. Each subsequent piece in this section builds on this theme.

In "Biotech Foods: Right to Know What?" (pp. 135–41), Peter Spencer points out that any distinction between GM and non-GM foods "turns on an assumption that the biotech process poses risks not created by the more traditional, or classical, methods of breeding. But this simply is not supportable by current scientific understanding" (p. 137). Spencer allows some wiggle room for labeling where allergies and other considerations may cause reason for concern, but he reaches the obvious conclusion: "Unless the information is truly useful to consumers, there's no sense requiring it on a label" (p. 141). This conclusion does not do justice to Spencer's otherwise well-crafted analysis, as it is simply a logical proposition that both sides of the debate would agree to. Where the sides disagree is whether or not labeling is truly useful to consumers. Despite this weak conclusion, Spencer's thoughts are well-received.

Professor Alan McHughen then argues that GM labeling would be manipulable and, at times, deceiving (pp. 142–47). Like Spencer's,

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11. 57 Fed. Reg. 22,984 (May 29, 1992).

12. *See id.* at 22,989–91. For the full act, see 21 U.S.C. §§ 301–399 (2003).

13. *See id.* at 22,991 ("Ultimately, it is the food producer who is responsible for assuring safety.").

McHughen's argument is also well-developed. According to McHughen, "[i]n a recent survey, only 40 percent of respondents in the United Kingdom recognized that non-GM tomatoes contain genes" (p. 143). Humorous as this statistic may sound, it highlights a legitimate problem with GM labeling. Frankly, it may confuse consumers more than it helps. McHughen proceeds to develop this point at some length. Similarly, McHughen notes the difficulties of enforcing a GM-free labeling regime (pp. 144–45). In particular, he envisions consumers of GM-free products being misled: "they are still consuming at least small amounts of GM ingredients" (p. 145). Finally, McHughen concludes that "[o]rdinary customers who don't have strong feelings one way or another are paying higher prices for the labeling bureaucracy, whether they buy foods labeled GM or not" (p. 147).

VII. LAW

Genetically Modified Foods only offers a brief smattering of legal analysis, condensed into "Part 5. Law" (pp. 149–98), but this is not necessarily a poor choice. Each of the three pieces in this section offers a survey of GM-relevant legal practice. In turn, the authors address intellectual property rights, business strategy, and international law.

Intellectual property is discussed first. Although gene patents are quite common these days,[14] GM foods require unique intellectual property considerations. Professor Jack Wilson offers an impressively succinct review of the intellectual property protections available to GM plants, including patents, technology use agreements, and so-called "genetic use restriction technologies" (pp. 152–57). From that base point, Wilson proceeds to address the intellectual property concerns endemic to GM foods, including issues arising from the privatization of food supplies (pp. 157–61). Throughout his discussion, Wilson is clear and concise in his language, identifying each salient issue and then proceeding onward.

Professor E. Richard Gold continues the intellectual property discussion, shifting gears to the uses of biotechnological intellectual property (pp. 163–81). Gold develops two models for using intellectual property — the "fortress model" and the "branding model" — and addresses each in turn (pp. 164–72, 172–76). Unfortunately, his argument fails to account for intellectual property's value in the latter model. Instead, Gold's "branding model" is not a model of intellectual

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14. For a terrific introduction to gene patenting, see Richard J. Warburg et al., *Patentability and Maximum Protection of Intellectual Property in Proteomics and Genomics*, 4 PHARMACOGENOMICS 81 (2003).

property strategy at all, but rather an explanation of the benefits to be reaped from public cooperation. Although his argument suffers as a result, his ideas are nonetheless intriguing and generally well-presented.

In the last article in this section, Professor Keith Culver considers whether international law has kept pace with the potential for harms caused by GM organisms (pp. 182–98). In particular, Culver discusses a hypothetical escape of GM salmon and how the resultant environmental damage would be redressed under current international treaties and protocols. The picture he paints is grim, and the penalties he envisions are harsh (including international criminal sanctions). Culver deals with his hypothetical worst-case (or worse yet, average-case) scenario logically, identifying all the possible consequences and modes of correction. Difficult legal issues such as these are only the tip of the iceberg generated by GM technologies.

VIII. POTPOURRI

The last five sub-headings in *Genetically Modified Foods* comprise a sampling of more specific considerations within the GM debate. None of these sections are comprehensive, but instead each offers a mere taste of a broader issue. As outlined above, aside from moral or religious concerns, the primary focus of the GM debate is on the safety of new technologies, both with respect to consumers and the environment. "Part 6. Food Safety and Substantial Equivalence" (pp. 199–218), "Part 7. Risk Assessment and Public Perception" (pp. 219–47), "Part 8. Precautionary Principle and Genetically Modified Foods" (pp. 249–97), and "Part 10. Assessing Environmental Impacts" (pp. 299–321) each discuss various aspects of the safety of GM organisms. Although each piece in these sections makes its own contribution to the overall base of knowledge, these readings can grow a bit tedious and do not merit discussion at length.[15]

Unlike the other categories within this last portion of the book, "Part 9. Developing Countries" (pp. 299–321) looks to the effects of GM foods not on the environment or humanity generally but on developing nations in particular. Even assuming environmental and human safety, these pieces urge, one must consider whether the widespread adoption of GM technologies by developing countries will

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15. I would direct your attention, however, to the piece "Precaution Without Principle" by Henry I. Miller and Gregory Conko (pp. 292–97). This brief essay offers a scathing critique of the uses and abuses of the "precautionary principle." In particular, the authors note the potential for greater catastrophe as a result of exercising "precaution" in implementing a solution (p. 293). Directing harsh attacks at "bullies" and "a small, vocal, violent group of radicals," Miller and Conko sound the rallying cry of freedom and conclude, "[w]e should no longer allow extremists to dictate the terms of the debate" (p. 296).

be a boon or a bane in the long run. Over the course of three well-written pieces, the issues of sustainable agriculture, public-private partnerships, and intellectual property rights are discussed at length. Although products such as golden rice are still in their developmental stages, these debates need to be conducted now, and *Genetically Modified Foods* offers a tremendous introduction to these issues.

IX. CONCLUDING REMARKS

As readers struggle to determine their own positions in this debate, they may find themselves disturbed by the poor quality of many of the arguments presented in *Genetically Modified Foods*. Just as Dawkins reproached the Prince of Wales to argue more intelligently, one could similarly admonish a number of the authors included here. It is easy to declare something "unnatural" or "safe," but until rationales for such conclusions are thoroughly explored, the arguments will amount to little more than *ad hominem* and other surface attacks.

Despite these complaints, however, Ruse and Castle attempt to present a thorough and balanced introduction to the debate over GM foods. Even when the arguments made are without support, it is necessary to recognize that such arguments exist in order that they may be either supported or disproved in the future. *Genetically Modified Foods* is a good start, but an informed conclusion would require a greater understanding than this collection imparts. One might wish to consider further readings in each of the sub-areas presented.[16]

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16. For example, on safety, consider GENETICALLY MODIFIED FOODS: SAFETY ISSUES (Karl-Heinz Engel et al. eds., 1995). On labeling, consider Karen A. Goldman, *Labeling of Genetically Modified Foods: Legal and Scientific Issues*, 12 GEO. INT'L ENVTL. L. REV. 717 (2000). On environmental concerns, consider Alex Kozinski, *Gore Wars*, 100 MICH. L. REV. 1742 (2002).