Nature, Property, and Democracy in the Debate over Genetically Modified Organisms

John M. Meyer

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The Occasional Papers of the School of Social Science are versions of talks given at the School's weekly Thursday Seminar. At these seminars, Members present work-in-progress and then take questions. There is often lively conversation and debate, some of which will be included with the papers. We have chosen papers we thought would be of interest to a broad audience. Our aim is to capture some part of the cross-disciplinary conversations that are the mark of the School's programs. While Members are drawn from specific disciplines of the social sciences—anthropology, economics, sociology and political science—as well as history, philosophy, literature and law, the School encourages new approaches that arise from exposure to different forms of interpretation. The papers in this series differ widely in their topics, methods, and disciplines. Yet they concur in a broadly humanistic attempt to understand how, and under what conditions, the concepts that order experience in different cultures and societies are produced, and how they change.

John M. Meyer is Associate Professor in the Department of Government and Politics at Humboldt State University on California's North Coast, where he is also affiliated with the Environmental Science Program and the graduate program on "Environment and Community." He was a Member of the School of Social Science in 2004-2005, and participated in the School's theme seminar on "Interdisciplinarity and Its Objects." Trained as a political theorist, his primary interest is in normative argument arising from contemporary environmental concerns. He is the author of Political Nature: Environmentalism and the Interpretation of Western Thought (MIT Press, 2001), selected as a "Choice Outstanding Academic Book" for 2002. There he offers a critical exploration and reconstruction of the relationship between western conceptions of nature and politics – especially in the writings of Aristotle and Thomas Hobbes – and its importance to contemporary environmental politics. He has published in both academic journals and political magazines including Environmental Politics, Journal of Political Philosophy, Political Theory, Dissent, and The American Prospect. He has played a leading role in fostering a nascent community of political theorists probing environmental topics, organizing an annual workshop that has attracted scholars from several continents. At present he is at work on a book manuscript entitled "Environmentalism as Social Criticism."

Nature, Property, and Democracy in the Debate over Genetically Modified Organisms[1]

My academic interests lie at the intersection of environmental concern, environmental activism, and normative political theory. In this essay, I begin by sketching what I take to be a central challenge for those of us with such interests: the question of how to advance environmentalist argument given the contested status of its foundational concept of "Nature." I then turn to the practice of agricultural biotechnology and the development of genetically modified organisms—so-called GMOs—to develop some of the intuitions that guide my response to the first question in light of the debate over this rapidly expanding technology.

Perhaps even more in environmentalist arguments than other normative discourse, the character and status of "nature" has been central, yet frequently unexamined. If I were to assert to many academic audiences that the concept of nature is, in important senses, socially constructed, I suspect I would get nods of agreement–if not yawns. After all, critical reflection upon the normative, epistemological, and ontological status of "nature" has been central to many currents of thought in the humanities and social sciences over the past generation. But such reflection has only recently become central to environmental inquiry. In the past decade, it has emerged prominently in the work of environmental historians as well as moral, social, and political theorists.[2] It has also begun to bleed over into debate among environmental activists, as evidenced in a recent furor over an essay with the provocative title "The Death of Environmentalism."[3] These voices have been critical of the appeals to ideas of nature that have often been made in environmental argument, especially where these ideas are used to try to justify particular forms of political authority[4]

Other environmental thinkers, both inside and outside of the academy, have been deeply troubled by the emergence of critical discussions about "nature." These authors insist that to regard nature as a construction is, quite simply, a conceit of those unable or unwilling to temper their egos long enough to truly experience the reality of a more-than-human, natural world. More urgently, they insist that constructivist claims bolster the agenda of developers and industrialists who promote and profit from the exploitation of this non-human world.

Renowned poet and environmentalist Gary Snyder, for instance, confesses to "getting a bit grumpy about the dumb arguments being put forth by high-paid intellectual types in which they are trying to knock Nature, knock the people who value Nature, and still come out smelling smart and progressive." His anger is driven by the view that "[t]he attacks on Nature and wilderness from the ivory towers come at the right time to bolster the global developers, the resurgent timber companies, and those who would trash the Endangered Species Act."[5] One of the founders of conservation biology, Michael Soulé, has made similar claims, arguing that a constructivist view represents a "social siege of nature" that has served to justify a "physical siege" upon the land itself.[6]

The contention that critical intellectuals are not just complicit, but actually a leading force, in promoting the "physical siege" upon the land by industrialists is surely troubling. Even if we dismiss these particular claims as exaggerated, we cannot ignore the many other environmental writers who offer more tempered views in which the fear of losing the authority of "nature" as a foundation for environmentalist claims continues to loom large.

* * * * *

I want to take the basis of this fear seriously, while at the same time building upon my own earlier work–and that of others–which highlights the inherently political character of appeals to natural authority.[7] While continued critique of foundationalist claims about nature may retain intellectual appeal in some circles, it surely heightens the anxiety of many in the environmental community. By contrast, I want to explore what might be gained by reconstructing environmental social criticism in other ways. This shift from critique to reconstruction is central to my overall project and I hope to offer some indication of its value in this essay.

I am interested in examining what I take to be widespread and significant technologies, techniques, and structures of power that raise far-reaching environmental concerns. These might usefully be labeled "environmental *practices*," a term I have borrowed from the work of philosopher Andrew Light and political theorist Avner de-Shalit, though the meaning I attribute to it here is a bit different and more specific than their usage.[8]

Although the distinction is not iron-clad, what I have in mind are disparate practices–including agricultural biotechnology; the nascent field of environmental design of our built environment; the conflict over land tenure, management and ownership; the encompassing system of automobility–all of which are properly understood as integral to an array of environmental issues: climate change, wetland protection, biodiversity protection, toxic pollution, and so forth.

My contention is that attention to *practices* can be a productive basis for rethinking environmental argument, because it allows us to integrate normative concern with attention to actual mechanisms of power. This sort of integration is more difficult when focusing narrowly on particular issues. Because inquiry into these environmental practices is also on a scale below that of grand theorizing about such topics as modernity, capitalism, liberalism, or anthropocentrism, analysis is more likely to take into account the contingencies and judgments that create possibilities for social criticism and social change.

My focus here is on one practice, that of agricultural biotechnology, and in particular the development of so-called genetically modified organisms, or "GMOs." There is a host of potential concerns raised by this technological practice. Many of these might be construed as environmental and only some are open to empirical measurement or assessment.

These include (in the present and future development of biotechnology): unanticipated introduction of human allergens; challenges to important religious, cultural, and ethical values surrounding food; food safety risks; the creation of "superweeds" and other environmental risks from gene flow to non-engineered relatives of GMOs; threats to agricultural biodiversity; harm to other species (such as butterflies); impact on farmers and the farm economy; and threats to (as well as opportunities for) food availability to the hungry or malnourished.

Consistent with my attention to the practice of agricultural biotechnology itself, however, I am not going to have much to say about these particular issues. Except this: while in many cases the cause for serious concern is far from certain, I do not believe it can be cavalierly dismissed, as some industry proponents seek to do. My focus is upon the terms within which this new technology is contested. I will argue that shifting the terms of the GMO debate—from "nature" to "property"—is needed. These terms shape and constrain our understanding of what is at stake in the debate and so influence how and whether other issues are addressed.

Background on GMOs

A sea change is underway in the crops that farmers grow, and so in the food we eat. This is especially true in the post-industrial world, but increasingly so in the rest of the world as well. Transgenic plants and microorganisms have swiftly moved into the agricultural mainstream and animals seem not to be far behind.

The changes are taking place especially rapidly here in the U.S., which has been at the

forefront of both the development and utilization of this technology. Today, for example, approximately 70% of processed foods in the U.S. contain one or more GMO.[9] A bit of further illustration of the emergence of this technology can be seen in the following tables and charts, taken from a fact sheet of the Pew Initiative on Food and Biotechnology[10]:

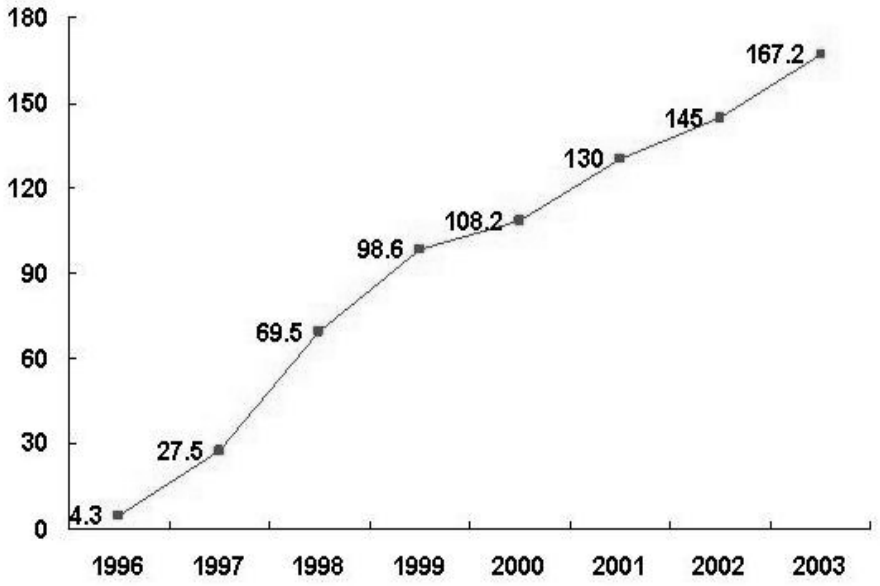

Illustration 1: Increase in Global Area of Biotechnology Crops--1996 to 2003.
Source: ISAAA Global Review of Transgenic Crops 2003.

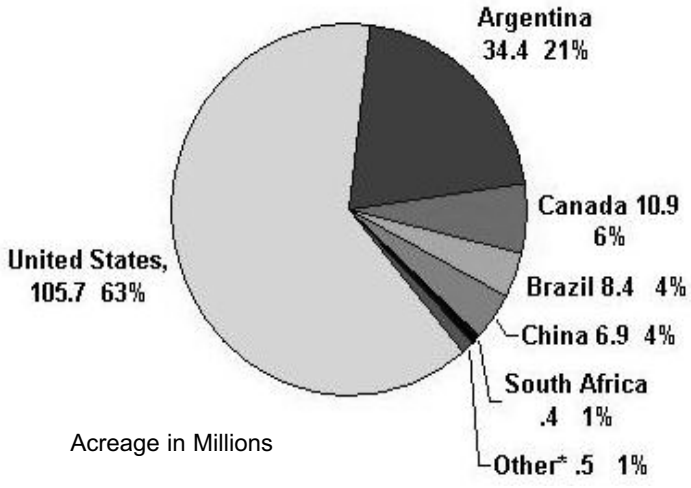

Illustration 2: Percent of Global Land Area Planted in Biotechnology Varieties by Country (2003 total global land area: 167.2 million acres)

* The following countries planted genetically modified crops totaling one percent of global GM crop production: Australia, Mexico, Romania, Bulgaria, Spain, Germany, Uruguay, Indonesia, India, Columbia, Honduras, and the Philippines. Differences between values shown and those calculated (from percent and total global acreage) are a likely consequence of rounding.

Source: International Service for the Acquisition of Agri-biotech Applications (ISAAA) Global Review of Transgenic Crops 2003.

Crop	2001 Total Acreage	2002 Total Acreage	2003 Total Acreage	2004 Total Acreage
Corn	75,800 (26%)	79,000 (34%)	79,066 (40%)	81,100 (45%)
Soybean	74,105 (68%)	72,993 (75%)	73,653 (81%)	74,724 (85%)
Cotton	15,499 (69%)	14,151 (71%)	13,924 (73%)	13,947 (76%)

Illustration 3: Major U.S. GM Crops (Total acreage in 1,000s)

Usually labeled "genetically modified organisms," the industry and techniques that create them are often termed "biotechnology." Yet neither is very accurate: organisms have been altered–that is, genetically modified—by farmers, breeders, scientists, and others–both intentionally and otherwise–for thousands of years, and in that sense the history of "biotechnology" is also far longer than current usage suggests.

What is new in our present generation is perhaps more accurately termed "genetic engineering," where this term refers to specific technologies that can allow for the combination of characteristics from distant life-forms–across the species barrier.[11] This creates a "transgenic" life form: potatoes with a soil bacterium gene, for instance. These techniques can also enable the genetic engineer to "turn on" or "turn off" the expression of particular genes.

That said, when I slip back into the more familiar but encompassing language of GMOs and biotechnology, I hope it will be understood that I am referring more narrowly to these recent innovations.

Role of Nature as Frame

Existing public discourse on GMOs tends to take place within a framework defined by the question of "naturalness." Critics in the environmental community and elsewhere frequently suggest that the problems with genetically engineered crops are a reflection of their *un*naturalness.

This argument first achieved a degree of prominence in the U.S. in opposition to a set of USDA proposed standards for the organic food industry in the late 1990s, which would have allowed genetically engineered foods to be labeled "organic." The characterization of genetically engineered foods as "Frankenfoods" reflects and reinforces the conviction that they are a monstrous human invention, hence unnatural. A Swiss farmer, for example, was quoted in *The New York Times* as saying that the biotechnology industry is "telling us that nature isn't good enough."[12] The position has also been evident in the imagery used by these opponents both in the U.S. and in Europe, a couple of examples of which I have included here:

Illustration 4: Protests in Europe against biotech crops include this touring inflatable tomato. Reprinted with permission of Friends of the Earth Europe.
Source: http://www.foeeurope.org/publications/2004/MONSTERTOMATOTOURREPORT.pdf.

Illustration 5: Photo by Eric Wagner at http://www.basetree.com/photos/reclaim-the-commons.html.

As many of you know or might have predicted, proponents of genetically engineered crops have often sought to dismiss the critics' charges by arguing that these food products are *no different* from non-genetically engineered foods–a tomato is a tomato is a tomato–thereby seeking to reassure a wary or uncertain consuming public.

Their claim is also reflected in the regulatory standard for genetically engineered crops in the U.S., where the Food and Drug Administration (FDA) presumes that they are the "substantial equivalent" of non-genetically engineered crops, unless it is demonstrated otherwise.

Yet–less predictably–promoters have also relied heavily upon a contrary claim that genetic engineering is, in fact, a process that creates an *unnatural* human invention, which has been necessary to justify their dramatically new, exclusive property right claims to these products as patentable subject matter. As a manager at one biotech firm explains it, a GMO:

> …has been created because of the inventiveness of a set of people… you need to be able to protect that invention.… Just because it's biological and self-reproducing doesn't to me make it any different from a piece of machinery that you manufacture from nuts and bolts and screws.[13]

Here, I wish to argue that the environmentalist emphasis upon the integrity of nature as a standard, and the critique leveled by authors like Snyder and Soulé, have been mirrored by the biotechnology industry in their legal defense of patent rights to the products they claim to have invented. Environmentalists and industry proponents often find themselves opposing each others' normative position, but both arguments rest upon a concept of nature as clear, fixed, and separate from human participation.

Despite their contrasting normative stances, the industry concurs with environmentalists like Snyder and Soulé, in reifying–rather than problematizing–nature, at this point. By doing so they can maintain that genetically engineered organisms are non-natural human inventions, and so can qualify as patentable private property under the provisions of the U.S. law. It is in this way that they have secured so much power over the control and direction of the development of genetically engineered seeds.

Thus, framing the controversy over agricultural biotechnology as fundamentally a contest over the integrity or violation of nature has *both bolstered and obscured* the central role of property claims as a context and justification for this emergent practice. In this sense the frame that seems so intuitively attractive to many an environmentalist can prove self-defeating as a basis for their arguments. Instead of nature, it may be that property ought to be at the center of environmentalist critiques.

Property Rights and Human Inventions

We more clearly appreciate this if we examine the role for a concept of nature in delineating a dramatic expansion of private property through the enclosure of realms previously treated as common. The U.S. Patent Act grants a patent–a largely unrestricted private property right to one's idea (albeit for a fixed number of years)–to one who "invents or discovers" something "new and useful."

In the 1980 U.S. Supreme Court case *Diamond v. Chakrabarty* the Court ruled for the first time, by a slim 5-4 majority, that a life form can meet these standards–if it is genetically engineered.[14] The adoption of the Trade Related Intellectual Property Rights Agreement (TRIPs) as a part of the General Agreement on Tariffs and Trade (GATT) in 1994–now institutionalized in the World Trade Organization (WTO)–has greatly advanced the worldwide extension and enforcement of these rights-claims. While I am going to focus on the U.S. case here, it is with the understanding that it has established the precedent for global standards as well.

With this legal mechanism for the capture of private profit from genetic engineering in place, the floodgates for private industrial development were opened, and "a race to claim patent rights on genes and genetically modified animals and plants" was initiated.[15] Patent rights heavily influenced not only the pace, but also the direction of biotechnological research, since as one analyst put it, "much effort must be directed to ensure that work is patentable, otherwise it may have little commercial value."[16]

A deterministic view of technology, which could lead one to perceive biotechnological practice as inevitable and apolitical, is undermined when we highlight the centrality of these legal and political decisions for the pace and direction of research and development in this field.

Of course, farmers, plant breeders, as well as scientists have long been engaged in a process that produced new and useful innovations. But these innovations were never understood to qualify as the sort of human inventions that met the standards of the Patent Act.[17] Similarly, scientists had long been understood to have newly discovered useful principles of nature, which again were never patentable.

So, what changed with the creation of a genetically engineered organism? The Court explained it this way:

> …a new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that $E=mc^2$; nor could Newton have patented the law of gravity. Such discoveries are "manifestations of …nature, free to all men and reserved exclusively to none." …the relevant distinction was not between living and inanimate things, but between products of nature, whether living or not, and human-made inventions… *[Chakrabarty's] discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter.*[18]

The Court thus offered a radical conceptual provocation: that genetically engineered life-forms are the distinctive product of human labor–they are human inventions–and so they are patentable private property. For the first time, a life-*form* was conceptualized as a commodity that could be owned in the encompassing sense provided for by the Patent Act.

Bioethicist Leon Kass captured something distinctive about this new property right in an essay published shortly after the Court's decision. As he put it, "it is one thing to own *a* mule; it is another to own *mule*."[19] To own "mule" is to own all future organisms of that particular type. It would entail a right to exclude others from breeding female horses with male donkeys, or charge licensing fees to those who wish to. Illuminating though this is, however, mule is not a perfect analogy because it is not a self-reproducing life form.

Journalist Michael Pollan further illuminates the peculiarities of private property rights to genetically engineered seeds in his engaging description of the "Grower Guide" that accompanied a sack of Monsanto seed potatoes that he purchased:

> By "opening and using this product," the card stated, I was now licensed" to grow these potatoes, but only for a single generation; the crop I would water and tend and harvest was mine, yet also not mine. That is, the potatoes I will harvest come August are mine to eat or sell, but their genes remain the intellectual property of Monsanto, protected under numerous United States patents, including Nos. 5,196,525, 5,164,316, 5,322,938 and 5,352,605. Were I to save even one of them to plant next year–something I've routinely done with potatoes in the past–I would be breaking Federal law.[20]

What is the basis for this new private property right as defined by the Court? While the language of "usefulness" in the Patent Act might suggest that a sort of utilitarian calculus is invoked in the course of evaluating a patent claim, the patent office and the courts have consistently disavowed this role. Instead, as the Court makes clear, the most potent and relevant defense of this idea that a private property right should be extended to genetic engineers (or their employers) is rooted in the claim that genetically engineered life forms are the product of human labor and creativity–inventiveness–rather than "manifestations of… nature."

Physical Property, Intellectual Property, and Life Patents

The conviction that one has a right to something with which one has mixed one's (in this case, intellectual) labor is a notion that is highly politically and culturally salient in the U.S. and can readily be identified as having roots in the labor theory of property developed in the seventeenth century by John Locke.

Locke, of course, is well-known for identifying human labor as the basis for claiming a right to remove property from the commons. Arguing that I have property in my own person, and hence in my own labor, he famously argues that by mixing this labor with "unassisted nature," I make it mine. Here is the most relevant and famous passage from his chapter on property in the *Second Treatise of Government*:

> Whatsoever then he removes out of the State that Nature hath provided, and left it in, he hath mixed his *Labour* with, and joyned to it something that is his own, and thereby makes it his *Property*. It being by him removed from the common state Nature placed it in, it hath by this *labour* something annexed to it, that excludes the common right of other Men. For this *Labour* being the unquestionable Property of the Labourer, no man but he can have a right to what that is once joyned to, at least where there is enough, and as good left in common for others.[21]

Of course, looking just at this passage offers a very limited and de-contextualized view of Locke's political philosophy–or even his view of property. I do not wish to be understood as presenting it as an adequate or self-explanatory summary of Locke's position. Yet it is just this view that is most in evidence in the discussions of biotechnology that we are considering.

Locke's focus, of course, was on what we might specify as physical, or "real," property: the field I cultivate; the house I build; the apple I pick. It would appear that so long as I cultivate or build or pick with "unassisted nature," which he argues belongs to "Mankind in common," the result will be mine. Locke does introduce provisos into his theory that prohibit waste and ensure that "enough and as good" is left for others.

Scholarly interpreters of Locke have spilled a great deal of ink debating the status of these provisos both for the coherence of Locke's argument and for his understanding of their applicability in a world like ours, where money has become the primary means of exchange–a development that Locke only introduces later in his treatise.[22]

What is interesting, for my purposes, as a number of philosophical analyses of intellectual property rights have recently argued, is that if one uses Locke's theory to defend such an intellectual property right, the debate about the relevance of his provisos– focused as they are largely on conditions of physical scarcity–appears to be circumvented.

Thus, Locke's labor theory of property would appear to fit intellectual property rights more readily than physical ones. In such a case, I claim to ownership of the expression of an *idea*; a musical score, a novel, or an invention, which is very different than ownership of a physical manifestation of that idea–a CD recording, a paperback book, or a light bulb.

Because, as one philosopher of intellectual property puts it, "there is no physical component" to the idea, and because the creation of my labor does not seem to meaningfully limit the inventive possibilities of others, the status of Locke's provisos– and hence the debate surrounding them–does not appear to be relevant.[23]

I am not especially interested in the question of ownership in musical scores or inventions such as the light bulb today, but it is important to remember that ownership of life-forms–the species, germ-line, or strain of a microorganism, plant, or animal that has been genetically engineered–is argued (by the Court) to rest on essentially the same grounds.

Yet the patenting of the genetic engineer's products cannot circumvent concerns with physicality. As a former study director for the National Academy of Sciences observed, "We are incalculably far away from being able to create life *de novo*."[24] Moreover, the idea of a growing, self-reproducing life-form is not separable from its embodiment. Though the Court in *Diamond v. Chakrabarty* presupposes it, no coherent division between nature and invention is now possible.

Challenging the Lockean Divide

In the previous portion of this paper, I have argued that Locke's labor theory of property does not actually fit the conditions of patents for genetically engineered life forms, despite the presumptions of the defenders of GMOs. One might accept this argument without questioning the theory's applicability in other contexts. Yet I now want to briefly sketch the relevance of a broader challenge to the coherence of this Lockean divide between human labor and nature.

Locke did not just distinguish between human labor and "unassisted nature," he identified the latter empirically with America when and where it exists prior to European influences. "In the beginning," Locke asserts, "all the world was *America*."[25] To make such an assertion, however, he must turn a blind eye to all forms of American Indian land tenure and resource usage, conflating these with nature itself. As James Tully argues persuasively,

> The planning, coordination, skills, and activities involved in native hunting, gathering, trapping, fishing, and non-sedentary agriculture, which took thousands of years to develop and take a lifetime for each generation to acquire and pass on, are not counted as labour at all, except for the very last individual step (such as picking or killing), but are glossed as "unassisted nature" and "spontaneous provisions" when Locke makes his comparisons.[26]

The Lockean blindness to–or refusal to see–indigenous labor is also reflected in the contemporary GMO debate. Just as I have argued that it is mistaken to view GMOs as artificial human inventions, so we can see that it is equally mistaken to view non-GMO agriculture as natural.

While the Court contrasts Chakrabarty's supposed invention to other natural life-forms, for instance, there simply is no product of "unassisted nature" that would reasonably–or in many cases, even remotely–resemble the corn, wheat, soybeans, tomatoes, potatoes, or most other foods that we consume. These exist only because of a long history of cultivation, modification and (especially) selection by countless generations of farmers, responding to particularities of taste, culture, climate, pests, and other growing conditions. As one geneticist puts it, all agricultural seeds "come with knowledge attached."[27]

Thus, embedded within our contemporary regime of patent protection for GMOs is an untenable bifurcation of nature from artifice, where the patent claimants are *also* capturing and profiting from the history of human innovation and knowledge embedded in the seed they have engineered. Indeed, the genetic engineering innovation often pales by comparison to the

magnitude of what went before it.

The bifurcation between nature and artifice mistakenly characterizes non-genetically engineered agriculture as natural, thus ignoring human participation in the cultivation and transformation of seeds, agriculture, and landscapes. This bifurcation, moreover, mistakenly characterizes genetically engineered agriculture as artificial, thus ignoring the centrality of non-human participation and reproduction in the supposed human invention of genetically engineered seeds. To the extent that they leave this bifurcation uncontested–often for fear of weakening their own foundational appeals to nature–environmentalist critics will fail to challenge the heart of this regime.

Debating GMOs Today

There are intelligent, independent, and environmentally sensitive advocates of GMOs, and one of their most typical refrains is that we cannot dismiss the vast potential for engineered seeds to reduce pesticide and herbicide use as well as to alleviate world hunger and malnutrition.[28] They are often highly critical of the anti-GMO voices in the environmental community, contending that their familiar positions in favor of banning or even labeling GMOs play upon fear born of ignorance and stoked by naive Luddite and naturalist views.

Indeed, environmentalist claims can be problematic, especially if viewed out of context. An outright ban on GMOs, promoted by many environmentalists, can suggest that unnaturalness itself is the fundamental criterion being applied. Product labeling also can be motivated by this conviction. Alternately, labeling can be based upon a liberal conviction in favor of the sovereignty of consumer choice, rather than any concern about environmental risk.

To question GMOs, while avoiding the pitfalls of naturalism, requires a challenge to the privatized control and direction of biotechnology. At present, a public, deliberative process that might re-orient the ends of biotechnology is largely precluded by a corporate juggernaut that captures private property rights and profits for themselves.

The notion that biotechnology might alleviate world hunger and malnutrition, or reduce environmental risks from toxins, must also recognize that private incentives or profits are unlikely to be found here. So long as the ends of biotechnology are defined by those seeking to maximize these, whatever promise might be found in GMOs is unlikely to be realized. Philosopher Paul Thompson, for example, recently published a subtle and valuable essay entitled "The Environmental Ethics Case for Crop Biotechnology."[29] Yet his "case" turns out to be only that the technology is *capable* of being environmentally beneficial, not an argument that contemporary practice actually is–or is soon likely to become–so. In fact, the opposite seems to be the case. Here is a recent summary by the president of the Rockefeller Foundation, speaking to a likely less than receptive audience of the Monsanto Board of Directors:

> As plant research in the industrialized world has come to be dominated by private companies that closely guard their proprietary technologies, the process of innovation in the developing countries has slowed. Public-sector plant breeders do not know how to respond, and when they try, they are handicapped by the huge disparity in resources and negotiating power between themselves and the companies.[30]

Campaigns to ban or label GMOs might be viewed sympathetically, in this context, even by those of us who do not believe that such strategies are intellectually coherent. At the same time, by focusing resistance upon the private, corporate delineation of the ends of biotechnology, as well as upon the conceptual boundaries between nature and invention that have bolstered their power to do so, we might highlight the problems of biotechnological practice in an

ultimately more compelling manner.

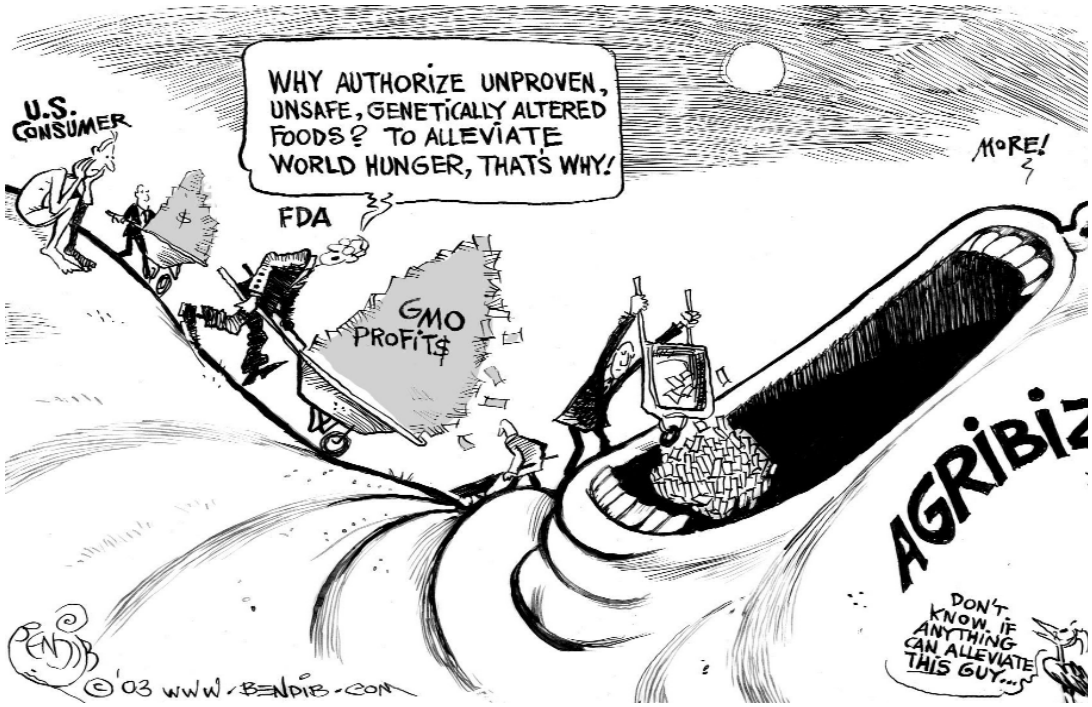

Illustration 6: Cartoon used with permission of the artist Khalil Bendib.
Source: www.bendib.com/newones/2004/july/small/7-20-GMOs-for-World-Hunger.jpg

Conclusion

Shifting from a framework in which naturalness is at the core of debate over biotechnology to one that sees property regimes as central is, I have argued, both valuable and important. One reason that this is so is because the latter frame has more intellectual coherence and integrity. But I hope to have also indicated how it can allow for a more effective challenge to the present system of control and direction of this technology. This challenge promises to be more salient to a wider constituency, in the third world as well as the first.[31] It would not eliminate temptations to hubris, however; nor, in itself, would it resolve the plethora of issues surrounding health, culture, and environmental risks that I noted at the outset. A challenge based on property rather than nature also cannot determine specific policy prescriptions to be adopted. Yet (even at this late stage) it has the potential to slow the pace–and alter the direction–of technological development. In this way it could create a terrain that is more conducive to public deliberation and precaution, and so to more adequate consideration of these vital issues.

ENDNOTES

1 Portions of this talk are drawn from my article: John M. Meyer, "Rights to Life? On Nature, Property and Biotechnology," *Journal of Political Philosophy* 8, no. 2 (2000).

2 For a diverse sampling, see: Jane Bennett and William Chaloupka, eds., *In the Nature of Things: Language, Politics, and the Environment* (Minneapolis: University of Minnesota Press, 1993); Andrew Biro, "Towards a Denaturalized Ecological Politics," *Polity* 35, no. 2 (2002/03); J. Baird Callicott and Michael P. Nelson, eds., *The Great New Wilderness Debate* (Athens: University of Georgia Press, 1998); William Chaloupka, " Jagged Terrain: Cronon, Soulé, and the Struggle over Nature and Deconstruction in Environmental Theory," *Strategies: Journal of Theory, Culture & Politics* 13, no. 1 (2000); William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," in *Uncommon Ground: Toward Reinventing Nature* (New York: W.W. Norton, 1995); Robyn Eckersley, "Ecocentric Discourses: Problems and Future Prospects for Nature Advocacy," in *Debating the Earth: The Environmental Politics Reader*, ed. John S Dryzek and David Schlosberg (Oxford: Oxford University Press, 2005); Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy*, trans. Catherine Porter (Cambridge: Harvard University Press, 2004); John M. Meyer, *Political Nature: Environmentalism and the Interpretation of Western Thought* (Cambridge: MIT Press, 2001); Kate Soper, *What Is Nature? Culture, Politics and the Non-Human* (London: Blackwell, 1995).

3 Michael Shellenberger and Ted Nordhaus, *The Death of Environmentalism: Global Warming Politics in a Post-Environmental World*, 2004; available from: http://www.thebreakthrough.org/images/Death_of_Environmentalism.pdf. I discuss the connection of Shellenberger and Nordhaus' polemic to the academic debate about the social construction of nature in: John M. Meyer, "Does Environmentalism Have a Future?" *Dissent*, Spring 2005.

4 Critics, as we will see, often maintain that constructivist arguments posit the non-human bio-physical world *itself* as a purely social construction. Yet this untenable position is a straw-man: while some seem to have asserted it, the far more common and considered claim is that our *conception* of nature is a construction.

5 Gary Snyder, "Nature as seen from Kitkitdizze is no Social Construction." *Whole Earth*, Winter 1998: 22.

6 Michael E. Soulé and Gary Lease, eds., *Reinventing Nature? Responses to Postmodern Deconstruction* (Washington, D.C.: Island Press, 1995), 146.

7 John M. Meyer, *Political Nature: Environmentalism and the Interpretation of Western Thought*; see also sources cited in footnote 1.

8 C.f., Andrew Light and Avner de-Shalit, eds., *Moral and Political Reasoning in Environmental Practice* (Cambridge: MIT Press, 2003).

9 ""This Food Contains GM Ingredients": Useful or Useless Info?" *AgBioTech Buzz* 2, no. 8 (2002). http://pewagbiotech.org/buzz/printfull.php3?IssueID=15

10 Pew Initiative on Food and Biotechnology, "Fact Sheet: Genetically Modified Crops in the United States," (2004). http://pewagbiotech.org/resources/factsheets/display.php3?FactsheetID=2

11 Although the genetic engineer need not cross the species barrier; indeed, Chakrabarty's celebrated oil-consuming bacterium (a multiplasmid pseudomonad) did not. See: A.M. Chakrabarty, "Patenting of Life-Forms: From a Concept to Reality," in *Who Owns Life?* ed. David Magnus, Arthur Caplan, and Glenn McGee (Amherst, New York: Prometheus Books, 2002), 19.

12 Michael Specter, "Europe, Bucking Trend in U.S., Blocks Genetically Altered Food," *The New York Times*, July 20 1998.

13 William Tucker, Manager for Technology Transfer at DNA Plant Technology, Oakland, CA; quoted in Fred Powledge, "Who Owns Rice and Beans?" *BioScience* 45 (1995): 442.

14 *Diamond v. Chakrabarty*, 447 U.S. 303 (1980). For historical accounts, see: Daniel J. Kevles, "Ananda Chakrabarty Wins a Patent: Biotechnology, Law, and Society, 1972-1980," *Historical Studies in the Physical and Biological Sciences* 25, no. 1 (1994); Chakrabarty, "Patenting of Life-Forms: From a Concept to Reality."

15 "Who Owns That Gene? Agbiotech and Intellectual Property," *AgBioTech Buzz* 3, no. 1 (2003). http://pewagbiotech.org/buzz/printfull.php3?IssueID=19

16 Andrew J. Hacking, *Economic Aspects of Biotechnology* (Cambridge: Cambridge University Press, 1986), 43-44.

17 More limited rights for plant breeders were adopted by the U.S. Congress in the twentieth century: the Plant Protection Act of 1930 and the Plant Variety Protection Act of 1970. The first applied to asexually reproducing plants, the latter to sexually reproducing varieties. While these laws parallel the Patent Act to some extent, their existence also highlights the differences between these forms of property and those defined by the Patent Act.

18 *Diamond v. Chakrabarty*. Emphasis added.

19 Leon Kass, "Patenting Life," *Commentary* (1981): 57.

20 Michael Pollan, "Fried, Mashed or Zapped with DNA?" *The New York Times Magazine*, October 25 1998, 47.

21 John Locke, *Second Treatise* in *Two Treatises of Government*, ed. Peter Laslett (Cambridge: Cambridge University Press, 1988), chapter five, section 27, 288.

22 For two of the most relevant — and contrasting — interpretations of the qualifications upon property rights that Locke may have offered, see: C. B. MacPherson, *The Political Theory of Possessive Individualism: Hobbes to Locke* (Oxford: Oxford University Press, 1962), 203-220.; James Tully, *A Discourse on Property: John Locke and His Adversaries* (Cambridge: Cambridge University Press, 1980), and James Tully, *An Approach to Political Philosophy: Locke in Contexts* (Cambridge: Cambridge University Press, 1993), chapter 3.

23 Justin Hughes, "The Philosophy of Intellectual Property," in *Intellectual Property: Moral, Legal, and International Dilemmas*, ed. Adam D. Moore (Lanham: Rowman and Littlefield, 1997), 117; also James W. Child, "The Moral Foundations of Intangible Property," in *Intellectual Property: Moral, Legal, and International Dilemmas*, ed. Adam D. Moore (Lanham: Rowman and Littlefield, 1997). Seana Shiffrin offers a provocative reinterpretation of Locke that seeks to undermine this argument by challenging the presumption that Locke would view the expression of ideas as the sort of thing that requires private appropriation from the common. See: Seana Valentine Shiffrin, "Lockean Arguments for Private Intellectual Property," in *New Essays in the Legal and Political Theory of Property*, ed. Stephen R. Munzer (Cambridge: Cambridge University Press, 2001). As with the discussion of Locke's provisos, however, my interest here is less in getting Locke "right" on this point than in assessing the arguments deployed in contemporary debate.

24 Key Dismukes, former Study Director for the Committee on Vision of the National Academy of Sciences; quoted in Jeremy Rifkin, *The Biotech Century: Harnessing the Gene and Remaking*

the World (NY: Tarcher/Putnam, 1998), 46. Thoughtful observers sympathetic to life patents have also acknowledged this point. For example: "DNA technology… does not now, or in the foreseeable future, involve the *de novo* creation of organisms from raw chemical components, only their modification…" Jack Wilson, "Patenting Organisms: Intellectual Property Law Meets Biology," in *Who Owns Life?* ed. David Magnus, Arthur Caplan, and Glenn McGee (Amherst, New York: Prometheus Books, 2002), 40.

25 Locke, *Second Treatise,* chapter 5, section 49, 301.

26 James Tully, "Rediscovering America: The Two Treatises and Aboriginal Rights," in *An Approach to Political Philosophy: Locke in Contexts* (Cambridge: Cambridge University Press, 1993), 156.

27 Ruth McNally quoted in Lisa Sykes, "Plant Rights," *Geographical Magazine*, May 1997, 12.

28 E.g., Jimmy Carter, "Biotechnology Can Defeat Famine," *New Perspectives Quarterly* 21, no. 4 (2004).

29 Paul B. Thompson, "The Environmental Ethics Case for Crop Biotechnology: Putting Science Back into Environmental Practice," in *Moral and Political Reasoning in Environmental Practice*, ed. Andrew Light and Avner De-Shalit (Cambridge: MIT Press, 2003).

30 Gordon Conway, "Genetically Modified Crops: Risks and Promise," *Conservation Ecology* 4, no. 1 (2000): 2. http://www.consecol.org/vol4/iss1/art2

31 Indeed, third world challenges to GMOs seem to have been consistently more focused upon these questions.