

Biotechnology and Empire: The Global Power of Seeds and Science

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ABSTRACT

Following the cold war, interest has grown in the possible rise of new forms of imperial rule and in the likely role of science and technology in processes of global governance. In particular, just as the life sciences advanced the interests of bygone empires, so modern biotechnology is likely to support today's transboundary exercises of political, economic, and cultural power. Drawing on analyses of large-scale political and technological systems, this chapter suggests that contemporary biotechnology may be enrolled into empire-making by several different means, including bottom-up resistance, top-down ideological imposition, administrative standardization, and consensual constitutionalism. At present, biotechnology seems more likely to increase the power of metropolitan centers of science and technology than that of people at the periphery. Institutional innovations will be needed to bring global biosciences and biotechnologies under effective democratic control.

INTRODUCTION

Imperialism is back on the circuits of public debate, and it is back with a vengeance. Contributors to the twenty-first-century discourse of empire include historians and social theorists, political scientists and anthropologists, op-ed columnists and politicians in positions of power. Books about imperialism, many sporting the word "empire" in their titles, appeared by the dozen at the turn of the century.¹ Through them, and through endless journalistic commentaries,² the attention of much of the reading

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¹ Influential contributions include Michael Hardt and Antonio Negri, *Empire* (Cambridge, Mass., 2001); idem, *Multitude* (New York, 2004); David Harvey, *The New Imperialism* (Oxford, 2003); Chalmers Johnson, *Blowback: The Costs and Consequences of American Empire* (New York, 2000); Niall Ferguson, *Empire: How Britain Made the Modern World* (London, 2003); and idem, *Colossus: The Price of America's Empire* (New York, 2004); David Cannadine, *Ornamentalism: How the British Saw Their Empire* (Oxford, 2001); Catherine Hall, *Civilising Subjects: Colony and Metropole in the English Imagination* (Chicago, 2002); Linda Colley, *Captives: Britain, Empire, and the World, 1600–1850* (New York, 2003); Rashid Khalidi, *Resurrecting Empire: Western Footprints and America's Perilous Path in the Middle East* (New York, 2004); and Anne-Marie Slaughter, *A New World Order* (Princeton, 2004).

² For one widely discussed example, see Michael Ignatieff, "The American Empire: The Burden," *New York Times Magazine*, Jan. 5, 2003, 22. See also Charles S. Maier, "Forum: An American Empire?" *Harvard Magazine* 104 (Nov./Dec. 2002): 28–31. This is the topic of Maier's forthcoming book, *Among Empires: American Ascendancy and Its Predecessors*.

world has turned to a particular instance of imperial expansion: the post-cold war United States, driven by what many see as a runaway ambition to impose military dominance, ideological conformity, and cultural homogeneity on the rest of the world.³ It is as if a potential left implicit by Ronald Reagan's famous appellation for the Soviet Union—"the evil empire"—has come to fruition in George W. Bush's Manichaeon vision, which pits an actual, divinely blessed, "good" America against its "evil" enemies, the states that harbor terror. Global power struggles are recast as a fight to the finish between the imperial forces of light and of darkness. Presidential rhetoric reprises popular culture: George Lucas's hugely successful trilogy of intergalactic conflict, *Star Wars*,⁴ provided not only the template for dividing the world into two vast opposing armed camps but also the visual and metaphorical resources for reducing warfare between them to the starkness of black and white.

Empires, however, are patchier constructs than the simple dualisms of presidential imaginations, shaped by Hollywood imagery, would have us believe.⁵ Neither culturally nor normatively homogeneous, they invite analysis as spaces in which power is exercised through complex, often subterranean means. From the Roman imperium to the territories ruled by Britain at the height of its Victorian expansion, diversity rather than homogeneity has been the characteristic look of empire. Possibly the most successful empires have been those that allowed multiple divergences in language, religion, dress, diet, and customs to flourish, within an envelope held together by various consolidating moves that coordinated, but did not erase, difference. For insights into these processes, we may turn to scholars of colonialism and postcolonialism, who have pointed out the disparate moves made to differentiate, as well as integrate, the populations under the ruling regime's control. On the one hand were steps that clarified and firmed territorial boundaries, imposed common linguistic and educational standards, and produced shared categories to reason and rule with.⁶ On the other hand were strategies for preserving hierarchies of power, including rules of cohabitation allowing or disallowing mixing between the rulers and the ruled.⁷

Empires then were places of hybrid identities, with all the tensions for regularity

³ American progressives would like to detach what many see as the illegitimate path of unilateral militarism from the legitimate, indeed desirable, path of economic and social globalization driven by the "soft power" of culture and markets. See Joseph S. Nye, *Soft Power: The Means to Success in World Politics* (New York, 2004). Celebrations of America's role in leading the world to free-market democracy include Thomas L. Friedman, *The Lexus and the Olive Tree: Understanding Globalization* (New York, 1999).

⁴ Directed by George Lucas, the trilogy opened in 1977 with *Star Wars*, the film that gave its title to the series. It was succeeded by *The Empire Strikes Back* (1980) and *Return of the Jedi* (1983). Appearing in the waning years of the cold war, the films exercised a particular influence on Ronald Reagan, America's first Hollywood president. The idea of a satellite-based missile defense shield was initially broached in the Reagan era, and the project, which remained mired in conflict during his presidency, was nicknamed *Star Wars*.

⁵ On this theme, see Tony Judt, "Dreams of Empire," *New York Review of Books*, Nov. 4, 2004, 38–41.

⁶ On these points, see Benedict Anderson, *Imagined Communities*, 2nd ed., rev. and exp. (London, 1991); Sarah Radcliffe, "Imaging the State as Space: Territoriality and the Formation of the State in Ecuador," in *States of Imagination: Ethnographic Explorations of the Postcolonial States*, ed. Thomas Blom Hansen and Finn Stepputat (Durham, N.C., 2001), 123–45.

⁷ Ann L. Stoler, *Carnal Knowledge and Imperial Power: Race and the Intimate in Colonial Rule* (Berkeley, 2002); idem, "Making Empire Respectable: The Politics of Race and Sexual Morality in 20th-Century Colonial Cultures," *American Ethnologist* 16 (1989): 634–60.

and order that hybridity entails.⁸ The wonder is that they nonetheless held and that similar formations may yet hold in other times and places. In this respect, empires can be seen as analogous to large technological systems, like electric power grids⁹ or civil aviation: so complex, heterogeneous, loosely pinned together, even jerry-built on close inspection that their stability is the thing that needs explanation. By contrast, as illustrated by the terrorist attacks of September 11, 2001, in the United States, mundane technological systems such as high-rise buildings, regarded as not seriously vulnerable to external threats, can reveal deep structural faults under unexpected attack.¹⁰

Viewing empires as social technologies, that is, as human-made assemblages that enable power to extend beyond its original spatial and cultural locations,¹¹ raises for us a critically important set of questions. What is the role of conventional technological systems, those built around material components such as guns, butter, and newspapers, in the production and maintenance of new forms of transnational rule? How, in particular, might the human capacity to instrumentalize nature influence the possibilities for politics in a globalizing world? Will the major technological revolutions of our time—in the life sciences, information and communication technologies, computers and weaponry, and most recently nanotechnology—favor emancipation or re-colonization? Will they make people around the world more or less connected, more or less free, more or less comfortable, and most important for our purposes, more or less democratic? Will the radically unequal distribution of wealth and privilege in the contemporary world reinscribe itself through technological means, continuing older forms of hegemony and dominance? If that danger exists even in principle, are there institutions or processes through which a global citizenry can assert the right to shape the technologies that may, if widely deployed, shore up global regimes of control?¹²

I approach these questions in this chapter through the lens of modern agricultural biotechnology. Still in its infancy more than three decades after its first experimental successes in western laboratories, so-called green biotechnology has rapidly become a global industry promising enormous benefits to the world's poor. Its proponents claim it has the capacity to overcome nature, making plants that can resist drought, ward off insects, and with the ability to produce micronutrients engineered into their

⁸ See, e.g., the account of collectors and collecting in the eighteenth-century British and French proto-empires, Maya Jasanoff, *Edge of Empire: Lives, Culture, and Conquest in the East, 1750–1850* (New York, 2005).

⁹ Thomas Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Baltimore, 1983).

¹⁰ 9/11 Commission, *Final Report of the Commission on Terrorist Attacks upon the United States* (New York, 2004).

¹¹ This way of thinking about empires is consistent with contemporary work in science and technology studies. See, in particular, Sheila Jasanoff, ed., *States of Knowledge: The Co-Production of Science and Social Order* (London, 2004); Bruno Latour, "Drawing Things Together," in *Representation in Scientific Practice*, ed. Michael Lynch and Steve Woolgar (Cambridge, Mass., 1990), 19–68. Richard Drayton adopts a similar perspective when he speaks of empire as "an ecological system," stressing the interconnections among politics, economy, and nature that define empires. See, particularly, Drayton, "Imperial Science and a Scientific Empire: Kew Gardens and the Uses of Nature, 1772–1903" (Ph.D. diss., Yale Univ., 1993).

¹² For an argument that such demands are already being expressed through a tacit and unwritten form of global constitution-making, see Sheila Jasanoff, "In a Constitutional Moment: Science and Social Order at the Millennium," in *Social Studies of Science and Technology: Looking Back, Ahead*, ed. Bernward Joerges and Helga Nowotny, *Yearbook of the Sociology of the Sciences* (Dordrecht, 2003), 155–80.

genes, even transcend the “normal” dividing line between food and pharmaceuticals. Biotechnology by some definitions is as old as “second nature,” the first successful prehistoric attempts by human societies to harness nature’s growth to serve their basic needs for food, fuel, clothing, and shelter. Under another definition, the one I use here, biotechnology is much newer. It is the name given to an array of manipulative techniques based on alterations of the cellular and subcellular structures of living things enabled by the 1953 discovery of the structure of DNA.¹³ These techniques include, most notably, not only genetic engineering, gene splicing, but also operations such as cell fusion and cell culturing carried out at levels of structure significantly smaller than the whole organism. How will these technological developments, heralding what some have called a second Green Revolution,¹⁴ affect flows of power and opportunities for self-determination around the world?

In looking for answers, I begin in effect with a typology of empire, based on the diverse ways in which the extension of imperial power has been conceptualized by analysts of large-scale political, as well as technological, systems. The life sciences, as much research has shown, have long been implicated in serving the designs of empire builders. Modern biotechnology, I suggest, can similarly be drawn into the service of possible imperial constructions, and I ask in what ways this particular global production system is likely to influence today’s transboundary exercises of political, economic, and cultural power. This analysis suggests that, without institutional innovations, biotechnology as currently governed may increase the power of metropolitan centers of science and technology in relation to people at the periphery. In conclusion, I reflect on the prospects for democratic governance of technological systems such as agricultural biotechnology that are centrally involved in contemporary processes of globalization.

IMPERIAL CONSTRUCTIONS

How are empires held together? Not, as I have suggested, through homogenized identities and uniform allegiances that make the residents of imperial territories carbon copies of one another. Clues may be found in those areas of the social sciences that occupy themselves with the stability of heterogeneous constructs, in such fields as international relations and law, science and technology studies, colonial and post-colonial history, and cultural anthropology. Work in all these domains suggests that the fabrication of empire proceeds not through any single grand gesture of unification, nor by a revolutionary process of mass struggle as suggested by two theorists of the Left, Michael Hardt and Antonio Negri,¹⁵ but through a series of contingent, overlapping, altogether human practices that build coherence and cohesion while staving off dispersal. As shown in Table 1, we can discern five distinct modes of imperial governance—that is, five mechanisms, not mutually exclusive, through which the unruly

¹³ Robert Bud, *The Uses of Life: A History of Biotechnology* (Cambridge, 1993).

¹⁴ The first Green Revolution was the introduction worldwide of high-yielding grain varieties pioneered by Nobel laureate Norman Borlaug and other plant biologists. Their work was sponsored in part by the Rockefeller Foundation. For accounts of the scientific and social dimensions of the Green Revolution, see Lily E. Kay, *The Molecular Vision of Life: Caltech, the Rockefeller Foundation, and the Rise of the New Biology* (New York, 1993); J. R. Anderson, R. W. Herdt, and G. M. Scobie, *Science and Food* (Washington, D.C., 1988); P. B. R. Hazell and C. Ramasamy, *The Green Revolution Reconsidered* (Baltimore, 1991).

¹⁵ Hardt and Negri, *Empire* (cit. n. 1).

Table 1. Modes of Imperial Governance

Empires of resistance	Emergent, agentless form of rule, constituted in possibly violent opposition between global ruling institutions and resisting citizens ("the multitude")
Empires of ideology and force	Communal norms and beliefs imposed through force, persuasion, surveillance, and sanctions
Empires of legibility	Communal standards imposed through administrative simplification and efficiency (Weberian) Communal standards achieved through classification, normalization, and erasure (Foucauldian)
Empires of identity	Imagined communities built through mass media, official representations, political and cultural symbols
Empires of law and constitutions	Rule of law under constitutional principles, enabling liberal individualism and free movement of goods and people

heterogeneity of empires can be made more orderly and therefore more tractable to rule.

The vision of empire put forward by Hardt and Negri stands in a somewhat anomalous relation to the others in Table 1, partly because the empire they envision is a global formation lacking any particular sovereign at the head, and partly because of the authors' disregard for the micro-processes of agency and governance that have loomed large in the work of other theorists of national and imperial power.¹⁶ The empire whose emergence Hardt and Negri ambitiously prophesy is a revolutionary construct, propelled in part by the consolidation of a global multitude whose demands nation-states are no longer able to satisfy. Bottom-up political action in an inchoate field, mediated through the Internet, is seldom strategic or coordinated, but, through repeated, decentralized gestures, it can achieve something of the character of continuous mass protest. Hardt and Negri's account has drawn vigorous criticism for its lack of clarity, inattention to specifics, denial of agency, and leftist nostalgia for violence as a means of radical social change. At the same time, it provides a vision of uncoordinated, multicentric, populist, political, and normative action—propelled by ideas and beliefs—that is, in some ways, more appealing than the tight, and equally faceless, administrative networking of the world contemplated by some analysts.¹⁷ Something resembling the dynamics of the multitude, as we will see below, is not altogether absent in the contemporary global politics of biotechnology.

Turning to more conventional articulations of empire, those constituted by (or as) an identifiable sovereign state, we note that the processes and practices that sustain imperial rule do not have to be consensual or responsive to the popular will and that violence remains very much an instrument of top-down domination. This is clearest in the case of empires of ideology and force, such as the former Soviet Union and perhaps the American empire currently taking shape, in which adherence to a common

¹⁶ Contrast in this respect Hardt and Negri, *Multitude*, with Slaughter, *A New World Order*. (Both cit. n. 1.) See also Thomas N. Hale and Anne-Marie Slaughter, "Hardt and Negri's 'Multitude': The Worst of Both Worlds," *Open Democracy*, May 26, 2005, http://www.opendemocracy.net/globalization-vision_reflections/marx_2549.jsp.

¹⁷ Slaughter, *A New World Order* (cit. n. 1).

ideology (socialism and market capitalism, respectively) has been achieved through the forceful subordination of countervailing belief systems and forms of life. Technology, historically, played a central role in the effectuation of such extended ideological dominion: not only military technologies, though these were of course essential, but also technologies of surveillance, punishment, and mass communication. Built to control hybridity, such control technologies are themselves hybrid, marrying the hardware of computers or cameras, for instance, with social supports from law and administration, and increasingly the mass media.¹⁸ In this way, technologies of force shade into technologies of legibility and standardization, which are tools of imperial construction in their own right.

When we speak of standardization as a form of political control, we begin inevitably with Max Weber. Empires were, in the first instance, vast bureaucracies. They were administered domains, and their management called forth the production and diffusion of professionals of every stripe: scientists, engineers, surveyors, physicians, lawyers, linguists, archaeologists, and archivists, among others. Their task was to make government more efficient and rational, enable communication and exchange, and—in the more beneficent of imperial imaginations—extend the virtues of knowledge, reason, and productivity equally throughout the empire. Less clear in Weber's time, however, was the extent to which the imposition of administrative rule altered, or even created, the identities of the subjects being governed.

Michel Foucault's work on "governmentality" fills that gap, and it provides another indispensable starting point for understanding imperial standardizations today.¹⁹ Foucault represented governmentality as a specific form of rule that emerged with European modernity, coincident with the waning of absolute monarchical power and the rise of science. In this social order, the governors and the subjects to be governed became part of the same enterprise, linked through their allegiance to new truth regimes, grounded in technical disciplines (preeminently the human sciences) that provide the means for authoritatively characterizing both social bodies and social problems. Experts trained in professional discourses can identify populations and, through clinical work, their individual members as healthy or sick, sane or mad, normal or deviant, racially pure or impure, criminal or socially responsible. These definitions become essential, not only to those who exercise power to keep illness, insanity, deviance, racial commingling, and criminality at bay, but also to their subjects, who, as what the philosopher Ian Hacking has called "interactive kinds,"²⁰ come to see and recognize each other in terms of the dominant classification systems of their time and place. Bureaucracies fitted out with elaborate expert support systems develop norms and regulations based on the experts' classifying knowledge.²¹ Government (the project of the rulers) and mentality (the state of mind of the ruled) then fuse, as both begin to perceive the world in identical conceptual terms and reinforce each other's perceptual frames.

Governmentality, despite its pretensions of neatness, seldom divides the world into cleanly defined categories. It takes work of a special sort—specifically, boundary

¹⁸ Consider, for example, the U.S. military's practice of "embedding" journalists with ground forces during the conduct of the 2003 Iraq war.

¹⁹ Michel Foucault, "Governmentality," *Ideology and Consciousness* 6 (Summer 1986): 5–21.

²⁰ Ian Hacking, *The Social Construction of What?* (Cambridge, Mass., 1999).

²¹ Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (Cambridge, Mass., 1999); on the dynamics of bureaucratic expertise, see also Sheila Jasanoff, *The Fifth Branch: Science Advisers as Policymakers* (Cambridge, Mass., 1990).

work—to smooth out the messy spaces between classes and to create the appearance of sharp divisions, or bright lines as lawyers call them.²² In the process of classification, problematic hybrids and hard-to-fit entities or communities may be erased, either through forcible elimination or through administrative and symbolic moves, such as selective mapping or listing, that take the unclassifiable things out of the ruler's visual space. Thus, unproductive citizens may be cleared out of slums and city streets,²³ wildernesses replaced by planned forests, last names substituted for patronymics, and medieval streets overlaid with the familiar grid pattern of the surveyable and policeable modern city.²⁴ The political theorist James Scott refers to these simplifications as a process of creating legibility, a concept lying somewhere between Weberian administrative efficiency and Foucauldian governmentality. Modern statecraft, Scott argues, has consisted in the main of taking “exceptionally complex, illegible, and local social practices” and creating “a standard grid whereby it could be centrally recorded and monitored.”²⁵

While Scott and, to some extent, Foucault, stress the role of the state and its docile experts in making knowledge and order, others have asked (as indeed Foucault did in connection with the “mentality” component of governmentality) how subjects buy into the imperial projects of which they are part. James Morris's splendid popular account of the British Empire at what he calls the moment of its climax in 1897, the diamond jubilee of Queen Victoria,²⁶ provides one illustration on an imperial scale of the argument advanced by Benedict Anderson in his influential treatment of nationhood. A nation, Anderson suggested, is best regarded as “an imagined political community—and imagined as both inherently limited and sovereign.”²⁷ Characterizing what holds a nation, or, in Morris's case, an empire together then becomes a task for history and ethnography, for the definition orients our attention to the practices through which the state and its minions train the collective imagination of a national or imperial community. Morris's imperial moment called forth an unprecedented outpouring of celebration and circulation of people, goods, vessels, language, profits, and plants that criss-crossed the empire on which, famously, the sun never set. But what of the work that was needed to produce such a worldwide convergence? To see this, we need more disciplined histories.

Anderson, his own imagination challenged by the unlikely agglomerate of the

²² On the processes of boundary work in the sciences, see Thomas F. Gieryn, *Cultural Boundaries of Science: Credibility on the Line* (Chicago, 1999). On boundary work within government agencies, see Jasanoff, *The Fifth Branch* (cit. n. 21), 14, 234–6.

²³ Damian Collins and Nicholas Bromley, “Private Needs and Public Space: Politics, Poverty, and Anti-Panhandling By-Laws in Canadian Cities,” in *New Perspectives on the Public-Private Divide*, ed. Law Commission of Canada (Vancouver, 2003), 40–67. Under India's prime minister Indira Gandhi, in close association with her son Sanjay Gandhi, the slogan *garibi hatao* (eradicate poverty) became equated with a program of forcible slum clearance—in other words, eradicating not poverty but the visibly poor.

²⁴ Laid out on modern lines in the 1950s by the French-Swiss architect Le Corbusier, at the behest of Prime Minister Jawaharlal Nehru, the city of Chandigarh, the capital of Punjab and Haryana, accommodates a degree of traffic surveillance that I have not encountered in other Indian cities. Just over a hundred years before Chandigarh was inaugurated, Baron Georges-Eugène Haussmann substantially rebuilt Paris for Napoleon III, razing many old districts and replacing winding streets with broad boulevards so that the state could better control potential revolutionaries.

²⁵ James C. Scott, *Seeing Like State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, 1998), 2.

²⁶ James Morris, *Pax Britannica: The Climax of an Empire* (London, 1979).

²⁷ Anderson, *Imagined Communities* (cit. n. 6), 6.

Indonesian nation-state, stressed the role of structuring élites, in particular the unifying work of the print media and, in an elaboration of his original argument, also of the state-sponsored census, map, and museum. Whereas Anderson looks primarily to the public spaces and instruments of national identity-making, Ann Stoler, the feminist anthropologist, provides a Foucauldian account of the intrusions into private life undertaken by colonial regimes for the sake of creating and maintaining relations of dominance. In the Dutch East Indian colonies, she argues, carefully constructed rules governing sexual relations among Europeans and between whites and natives preserved necessary demarcations between the governors and the governed. For both Anderson and Stoler, making empires is an active, creative, and dynamic process of ordering, centering on producing and, especially for Stoler, reproducing a vision of the thing being made.

The emergence of the European Union (EU) as an autonomous political force in the late twentieth century illustrates one more modality of imperial construction, based on constitutional principles and the rule of law, and designed to further the free flow of goods and services in an open market. The EU's tightening integration through successive treaties, the admission of ten new member states in May 2004, and the signing of a constitution in Rome on October 29 of the same year marked the production of a new kind of empire, but one founded on the democratic consent of its citizens.²⁸ Declining turnout in EU parliamentary elections, widespread popular disenchantment with Brussels, and the stinging rejection of the EU constitution in French and Dutch referenda in 2005 all indicate that constitutionalism on such a scale carries huge risks of alienation along with the promise of enhanced economic and political integration. What matters for our discussion, however, is the very availability of a constitutional process, with all of its positive connotations for democracy, in creating the EU's supranational authority; even the fact of electoral rejection may be seen, at one level, as validating the idea of a common European project. We will return below to the implications of the constitutional model of imperialism for governing biotechnology globally.

BIOLOGY IN THE SERVICE OF EMPIRE

As if echoing the explosion of historical and political writing about empire, there has been an explosion of writing on the uses of science in the cause of imperial expansion, with the scientific management of nature commanding center stage. Colonial historians have observed that the human and biological sciences came into their own to serve imperial needs from the eighteenth century onward, in much the same way that Scott's twentieth-century planning states used engineering and social sciences to achieve legibility. Anthropology, botany, ecology, geography, linguistics, and even early forensic sciences have deep colonial roots: to rule effectively, occupying governments had to map their territories, classify populations into identifiable groups, and catalog flora, fauna, languages, and cultural practices.²⁹

Making things grow, often under unfavorable natural conditions in nonnative habi-

²⁸ The ten new members met the so-called Copenhagen criteria, according to which they had to "be a stable democracy, respecting human rights, the rule of law, and the protection of minorities; have a functioning market economy; and adopt the common rules, standards and policies that make up the body of EU law." See <http://europa.eu.int/comm/enlargement/enlargement.htm> (accessed Nov. 2004).

²⁹ On colonial histories of the human and natural sciences, see Bernard S. Cohn, *Colonialism and Its Forms of Knowledge* (Princeton, 1996); Matthew H. Edney, *Mapping an Empire: The Geographic*

tats, gave a push to imperial ecology, conservation biology, and agricultural science.³⁰ Sometimes the motives were crassly extractive and exploitative, as in the harvesting of wild rubber in King Leopold II's Belgian Congo, where violence and force were the notorious instruments of colonial rule.³¹ Elsewhere, colonists heedlessly harvested tropical timber or took commercially useful plants such as cinchona (from which quinine is derived) or breadfruit for cultivation in new territories.³² Sometimes otherwise well-intentioned migrations had disastrous results. For instance, rabbits transported to Australia for hunting became an uncontrollable pest, as Morris colorfully records.³³ Yet more altruistic motives also prevailed. Richard Grove traces the roots of western environmentalism to early modern European encounters with tropical islands.³⁴ As self-contained and containable spaces, these islands appealed to voyagers' Edenic and Romantic sensibilities, as well as to their protective instincts. Lush islands brought to life idyllic conceptions of the gardens of paradise; at the same time, in those bounded preserves, travelers could easily observe the destructive effects of resource depletion and environmental degradation. The island of Mauritius, in Grove's account, became the site of some of the world's earliest systematic efforts at nature conservation and scientific forest management. These practices, in turn, provided practical models for conservation efforts in India and elsewhere from the 1830s onward.³⁵

Colonial enterprise also laid the basis for western ideologies of development. Along with concerns for the moral and religious education of the strangers they went to live among, the rulers of empires exhibited a compelling desire to improve the new territories under their command. British engineers laid roads and railways, built irrigation systems, and left indelible architectural imprints throughout India. Just as pervasive was Britain's (and in other regions, France's) engagement with botany and agriculture. Already in the early nineteenth century, a coalition of professional scientists and administrators had converted the Royal Botanic Gardens at Kew into a publicly run center of knowledge for the productive management of nature.³⁶ Problems of sugar cane cultivation in the West Indies led to the formation of the Imperial Department of Agriculture at the end of the nineteenth century. A source of scientific expertise for West Indian sugar cane growers, the department also became, under the leadership of Joseph Chamberlain, the Liberal secretary of state for the colonies, a breeding ground for early discourses of development.³⁷ Like enlightened estate managers back home,

Construction of British India, 1765–1843 (Chicago, 1997); Kavita Philip, *Civilizing Natures: Race, Resources, and Modernity in Colonial South India* (New Brunswick, N.J., 2004). On the colonial origins of fingerprinting, see Simon A. Cole, *Suspect Identities* (Cambridge, Mass., 2001), 60–96.

³⁰ John MacKenzie, ed., *Imperialism and the Natural World* (Manchester, 1990); S. Ravi Rajan, ed., *Imperialism, Ecology, and Politics: Perspectives on the Ecological Legacy of Imperialism* (Delhi, 1996); Peder Anker, *Imperial Ecology: Environmental Order in the British Empire, 1895–1945* (Cambridge, Mass., 2001).

³¹ Adam Hochschild, *King Leopold's Ghost* (New York, 1999).

³² See, e.g., Kavita Philip, "Imperial Science Rescues a Tree: Global Botanic Networks, Local Knowledge, and the Transcontinental Transplantation of Cinchona," *Environment and History* 1 (1995): 173–200; Richard Drayton, *Nature's Government: Science, Imperial Britain, and the Improvement of the World* (New Haven, 2000), 206–11.

³³ Morris, *Pax Britannica* (cit. n. 26), 77–8.

³⁴ Richard H. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens, and the Origins of Environmentalism, 1600–1860* (Cambridge, 1995).

³⁵ *Ibid.*, 9–10, 168–263.

³⁶ Drayton, *Nature's Government* (cit. n. 32).

³⁷ William K. Storey, "Plants, Power, and Development: Founding the Imperial Department of Agriculture for the West Indies, 1880–1914," in Jasanoff, *States of Knowledge* (cit. n. 11), 109–30.

those entrusted with the welfare of colonial “properties” felt a need to ameliorate the conditions of life for the local poor. Promoting development abroad, they also thought, would transform the colonies into more advantageous trading partners, thereby producing useful returns for domestic constituencies. Improving agricultural production was a favored route to achieving these goals, although access to metropolitan knowledge remained stratified, with native farmers, in many cases, continuing to cultivate their lands without the benefits of modern science.³⁸

The first half of the twentieth century cast the imperial project of biology in a darker light as the improvers’ attention turned toward standardization for control, and broadened to include humans in addition to plants and animals. The enthusiasm of progressive social reformers for eugenics at the turn of the century led to decades of discrimination in the United States, including the exclusionary Immigration Act of 1924, numerous state sterilization laws, and *Buck v. Bell*, the infamous 1927 Supreme Court decision upholding the sterilization of a Virginia woman, Carrie Buck, on the ground that “[t]hree generations of imbeciles are enough.”³⁹ The eugenicists’ concern for selective breeding and race purity was carried to pathological extremes in the Nazi period, when millions of humans deemed undesirable by German race theorists—Jews, gays, Gypsies—were uprooted and eliminated throughout the Third Reich. For the sociologist Zygmunt Bauman, these atrocities were the natural descendants of the same enlightenment ideals that had led Frederick the Great of Prussia to exclaim, “It annoys me to see how much trouble is taken to cultivate pineapples, bananas and other exotic plants in this rough climate, when so little care is given to the human race.”⁴⁰ The modern “gardening state,” Bauman argues, turned Frederick’s metaphor into crude reality by ruthlessly weeding out everything that its planners saw as standing in the way of reason, order, and progress.

In spite of these midcentury turmoils and disruptions, the alliance between biology and power has only grown more intimate and pervasive in subsequent decades. Foucault saw biopower and biopolitics as essential technologies with which modern states must control their populations—by assuming responsibility for the health, safety, and stability of citizens’ collective lives.⁴¹ Central to the exercise of biopower, then, is the state’s ability to characterize human bodies and behavior in ways that rationalize and, in democratic societies, publicly justify that state’s policies. Increasingly, the state asserts itself under the umbrella of epidemiology: as the master diagnostician of ills that threaten groups of people in society. The polarizing debates on gay marriage before and during the 2004 U.S. presidential campaign may be seen in this light as part of a more general discourse on sexuality and the family, with competing political factions claiming citizens’ allegiance by defining what counts as deviance in sexual behavior and family mores. In the culturally heterogeneous United States, as in Stoler’s East Indian colonies, the rules of sexual conduct serve as powerful instruments for building social cohesion, by decreeing who falls inside and who outside the accepted forms of domestic order.

Today as before, moreover, biopower extends into all of life on the planet, not only the lives of humans but also the natural worlds with which humans live in close sym-

³⁸ William K. Storey, *Science and Power in Colonial Mauritius* (Rochester, N.Y., 1997).

³⁹ Justice Oliver Wendell Holmes Jr., an enthusiast for eugenics, wrote the majority opinion in *Buck v. Bell*, 274 US 200 (1927).

⁴⁰ Zygmunt Bauman, *Modernity and Ambivalence* (Ithaca, 1991), 27.

⁴¹ Michel Foucault, *The History of Sexuality*, vol. 1, *An Introduction* (New York, 1978).

biosis. Sick and failing plants, no less than sick and failing people, fall within the biopolitical imagination of the neoliberal state and its corporate partners, whose innovative capacity is as essential to underwriting state action as is the capacity of expert professionals to define and apply the technical criteria of governmentality.⁴² Governing *bodies*, after all, proceeds not only through exclusion, or weeding out, but also through therapeutic processes of making whole and bringing the previously sick back into the community of viable beings. The ordering state is most powerful when it is at the same time, demonstrably, a healing state, and such a state engages science for therapeutic, as well as diagnostic, ends. Let us return, then, to agricultural biotechnology as a field of contemporary biopower that continues the historical partnership of the life sciences with the state and, in so doing, intersects with each of the modes of empire-building described above.

PLANTS FOR THE PLANET: THE EMPIRES OF BIOTECHNOLOGY

Apart from occasional radical social misfits such as the so-called Unabomber, Theodore Kaczynski,⁴³ few any longer question the vital role of science and technology in human development. Even opponents of particular technological projects—large dams,⁴⁴ for example, or genetically modified (GM) foods⁴⁵—rarely dismiss technology outright; rather they favor smaller, more transparent, or more locally governable technological systems. The question that preoccupies students of science and technology, then, is not whether, but how, to integrate innovation into people's lives so as to make a positive difference. Years of research in the social psychology of risk perception⁴⁶ and public understanding of science⁴⁷ have established that popular fear or rejection of new technology often rests, at bottom, on an uneasiness about the ways in which technology is managed or, more accurately, governed. What do these observations imply for an industry with global ambitions, like agricultural biotechnology? How, more specifically, does biotechnology contribute to ways of political world-making beyond the nation-state, and what implications do the engagements between biotechnology and global politics have for democratic governance?

In reaching for answers, it is useful to think of biotechnology operating politically in several different registers. It is, of course, most plainly a material technology: it makes new instruments for warding off harm and disorder, such as plants that resist insects, weeds, or drought, and it redesigns pieces of nature, such as genes, to perform new tasks in new environments. In this respect, biotechnology is, concurrently, a

⁴² For an account of the changing social contract among science, state, and industry with respect to the life sciences, see Sheila Jasanoff, *Designs on Nature: Science and Democracy in Europe and the United States* (Princeton, 2005).

⁴³ Theodore Kaczynski, a mathematician educated at Harvard and the University of Michigan, conducted a single-handed letter-bombing campaign against representatives of various industries from his cabin in Montana between 1978 and 1996. These attacks killed three people and injured many others. He was caught when his brother recognized as his work a long letter he had sent to the *New York Times*. See Kaczynski, *The Unabomber Manifesto: Industrial Society and Its Future* (Berkeley, 1995).

⁴⁴ Sanjeev Khagram, *Dams and Development: Transnational Struggles for Water and Power* (Ithaca, N.Y., 2004).

⁴⁵ On transatlantic divisions over genetically modified crops and food, see Thomas Bernauer, *Genes, Trade, and Regulation: The Seeds of Conflict in Food Biotechnology* (Princeton, 2003).

⁴⁶ See, e.g., Paul Slovic, *The Perception of Risk* (London, 2000).

⁴⁷ Brian Wynne, "Public Understanding of Science," in *The Handbook of Science and Technology Studies*, ed. Sheila Jasanoff, James C Petersen, Trevor Pinch, and G. E. Markle (Thousand Oaks, Calif., 1995), 361–88.

metaphysical device; it brings new entities into the world and through that process re-orders our sense of rightness in both nature and society.⁴⁸ At the same time, biotechnology is a discourse: to some, of progress and improvement, beneficence and utility; to others, of risk, invasiveness, and domination from afar. Proponents of agricultural biotechnology tell particular stories about a world in which plant genetic modification is possible, and these stories carry political and cultural weight. Lastly, biotechnology is an institution of governance; it shapes forms of social life by influencing how people choose to, or are able to, live with the products of bio-industry. Each of these registers, as we see below, has been activated in the global politics of biotechnology.

The Resisting Multitude

In May 2004, a scientific journal reported that German researchers were keeping secret the locations of some thirty sites planted with GM corn for fear that anti-GM activists would destroy the crops, as they previously had elsewhere in Germany.⁴⁹ Failure to disclose these locations was contrary to the EU Directive 2001/18, which requires GM crop sites to be publicly registered. Noncompliance with European law in traditionally law-abiding Germany may have been newsworthy, but the threat to GM crops was anything but novel. From the late 1990s onward, attacks on field trial sites began evolving into a form of international protest that seemed to epitomize Hardt and Negri's thesis about an emerging, assertive, global multitude: in Britain, hundreds of demonstrators dressed in decontamination suits uprooted GM plants in test fields in 1999; in India and Brazil, farmers' unions organized similar protests; in France, José Bové, the charismatic head of the radical Confédération Paysanne (Peasant Confederation), became a folk hero by orchestrating the destruction of thousands of GM plants, as well as a partially built McDonald's outlet, in 1999. His subsequent trial, fine, and terms of imprisonment left him and his supporters undaunted, indeed ready to resume battle as much as five years after their initial transgressions.

Field trial sites were not the only theater of protest against GM agriculture. Antiglobalization activists early identified biotechnology as a symbol of the environmental, economic, and cultural homogenization they wished to resist. Demonstrations against Monsanto and GM corn (or maize), together with evocations of risks to nontarget species such as the monarch butterfly, were part of the repertoire of street protest during the Third Ministerial Conference of the World Trade Organization (WTO) in Seattle in 1999. In this and similar episodes, representatives of a loosely networked global citizenry asserted their right to debate technological futures in terms other than those conventionally used by nation-states and their expert advisers: the formal discourses of law, molecular biology, economics, risk assessment, and bioethics. At stake was who had power to determine how much global harmonization there should be and which scientific, technological, and economic innovations should be allowed to diffuse throughout the world. Those opting for more local, bottom-up visions won a salient victory when Monsanto decided, under rising public pressure, to withdraw its plans to develop sterile seed technology, through use of the so-called

⁴⁸ For an elaboration of this argument, see Sheila Jasanoff, "In the Democracies of DNA: Ontological Uncertainty and Political Order in Three States," *New Genetics and Society* 24(3) (2005): 139–55.

⁴⁹ Ned Stafford, "Uproar over German GM Corn," *The Scientist*, May 17, 2004, <http://www.the-scientist.com/article/display/22179/> (accessed Jan. 2006).

Terminator gene;⁵⁰ later, citing a drop in global demand, the company also announced that it would put on hold its plans to market genetically modified Roundup Ready wheat.⁵¹

Ideology and Enforcement

Not everyone saw the antiglobalization movement as the promising vanguard of planetary resistance against an outmoded, corporate-dominated, neoliberal world order. Using the classical ordering machinery of science and the law, proponents of agricultural biotechnology sought to promote their visions of social and technological progress, stifling opposition and dissent.

At the February 2000 annual meeting of the American Association for the Advancement of Science, Senator Christopher “Kit” Bond, Republican from Missouri, Monsanto’s home state, was openly dismissive of the Seattle protest. He represented it as a struggle between scientific expertise and the misguided, if exuberant, ignorance of youth: “The scientific debate is not being controlled by Ph.D.s but apparently by young people with a proclivity for street theater. . . . It’s coming to the point that scientists are going to have to get dressed up as corncocks to get the attention of the media.”⁵² At the same meeting, Madeleine Albright, President Clinton’s secretary of state, also cast the conflict as one between reason and unreason. “But science,” she said, “does not support the ‘Frankenfood’ fears of some, particularly outside the United States, that biotech foods or other products will harm human health.”⁵³ Both speakers, from different political parties, enlisted science as their ally in defending biotechnology against its critics. This invocation of scientific authority in support of technological innovation is a marker of America’s commitment to a particular ideology of technoscientific progress.⁵⁴

A look across the ocean at contemporaneous UK debates on biotechnology helps bring into relief the ideological dimensions of the American position. The term “Frankenfood” was widely used in the British tabloid press to reflect and, some said, reinforce public anxieties. But concerns were not restricted to the media and the ignorant public. The British scientific community had all along expressed greater uncertainty about the safety of GM crops than its American counterpart, particularly with respect to the environmental consequences of commercial use.⁵⁵ These doubts led British experts to reject the official U.S. position that the process of genetic

⁵⁰ The Terminator gene would have disabled grain seeds from sprouting in consecutive years. Farmers who had routinely planted seed stored from the previous year’s harvest would then have been forced to buy new seed each year. The coalition that forced Monsanto to abandon this technology, at least for a time, included both indigenous organizations and the influential Rockefeller Foundation. Jasanoff, “In a Constitutional Moment” (cit. n. 12), 171.

⁵¹ Roundup is a popular weed killer marketed by Monsanto, and Roundup Ready plants are genetically modified to withstand the use of that product. Many observers thought Monsanto’s decision was motivated by opposition to GM crops in Europe and Japan. See “GM Wheat Put on Hold,” *NewScientist.com* news service, May 11, 2004, <http://www.newscientist.com/article.ns?id=dn4977/>.

⁵² Senator Christopher Bond, Annual Meeting, American Association for the Advancement of Science, Washington, D.C., Feb. 23, 2000.

⁵³ Secretary of State Madeleine Albright, Annual Meeting, American Association for the Advancement of Science, Washington, D.C., Feb. 21, 2000.

⁵⁴ Jasanoff, *Designs on Nature* (cit. n. 42), chap. 4.

⁵⁵ *Ibid.*, chap. 2.

modification carries no special risks; all that matters for regulatory purposes is the end product. Scientific and public opinion in Britain united behind a more cautious approach, demanding more experimentation—for example, through farm-scale trials⁵⁶—before authorizing the commercialization of GM crops. As doubts intensified, Tony Blair's government decided on a highly unusual three-pronged review of the science, economics, and public acceptability of these products to reevaluate the case for their introduction.⁵⁷ The immediate outcome of this process was a decision to approve the commercialization of only one variety of GM corn, at least to start. Thus, while American neoliberalism treated biotechnology as just another stream of products, adequately controlled by the market except for assessments of their safety to human health and the environment, Britain's more cautious and communitarian political culture granted the public some say in deciding which products they wanted to allow into the market.

Whereas consultative procedures such as Britain's GM debate and referenda in countries such as Denmark and Switzerland sought to defuse public opposition, elsewhere legal sanctions were employed to beat down what biotechnology promoters saw as unacceptable acts of intransigence. Thus, demonstrators such as José Bové who destroyed GM crops were prosecuted for damaging property in several countries. At the international level, the United States brought a case against the EU at the WTO for imposing an allegedly illegal moratorium on the importation of GM crops and foods. Foundational to the U.S. case was the argument that there were no good scientific reasons for keeping these products off the European market, and that the moratorium therefore amounted to illegal protectionism.⁵⁸

Intellectual property law, too, has been invoked in safeguarding the investments made by multinationals such as Monsanto in GM crops. Particularly interesting were the prosecutions brought against farmers in the United States and Canada who were found to be growing GM crops patented by Monsanto without a license. In the best known of these cases, a seventy-three-year-old Saskatchewan farmer named Percy Schmeiser was sued for growing genetically modified Roundup Ready canola, which he claimed had blown into his fields from neighboring farms. A 5-4 decision of the Supreme Court of Canada upheld Monsanto's patent infringement claim, saying that Schmeiser's unlicensed use of seed containing Monsanto's patented gene was sufficient to constitute infringement.⁵⁹ In a Solomonic turn, though, the Court awarded no damages to Monsanto, on the ground that Schmeiser had not benefited economically from his unlawful act; equally, Schmeiser was not required to pay Monsanto's court costs. The case warned GM crop producers that, under Canadian law, they would have a difficult time collecting damages for patent infringement; at the same time, they could be subject to potentially unlimited liability if their seeds accidentally contaminated, and thus damaged, the products of certified GM-free organic farms.

⁵⁶ Agriculture and Environment Biotechnology Commission, *Crops on Trial*, Sept. 2001.

⁵⁷ The most unprecedented feature of this process was a nationwide public consultation known as *GM Nation?* See <http://www.gmnation.org.uk>.

⁵⁸ For details of the case, as well as an argument against the U.S. positions on science and risk assessment, see David Winickoff, Sheila Jasanoff, Lawrence Busch et al., "Adjudicating the GM Food Wars: Science, Risk, and Democracy in World Trade Law," *Yale Journal of International Law* 30 (2005): 81–123.

⁵⁹ *Monsanto Canada Inc. v. Schmeiser*, [2004] 1 S.C.R. 902, 2004 SCC 34.

Legibility

Advertisements for agricultural biotechnology frequently show fields of grain laid out in neat parallel lines, illustrating both the fertility and the increased control that genetic modification can allegedly deliver. One could hardly find more compelling images of the “legibility” described by Scott. Intrusive weeds, barren patches, unruly growth have all been eliminated in favor of healthy, predictable, quantifiable yields—achieved through the precision of genetic control. However, just as the midcentury grand planners’ dreams of legibility were achieved at a cost, so legibility in modern GM agriculture demands unseen labors of standardization, and consequent elimination of ambiguity, to achieve its surface regularity. Four dimensions of standardization are worth noting: ontologies, epistemologies, socio-ecologies, and forms of life. All four maintain traditional relations of power between center and periphery, and all can be illustrated through the case of “golden rice,” the poster crop for a new generation of nutrient-enriched GM crops to feed the developing world.⁶⁰ The name was given to a strain of rice bioengineered to produce beta-carotene, which colors the grain a pale gold; when ingested, it converts to vitamin A in the body and protects consumers against vitamin deficiency leading to possible blindness.

For the products of GM agriculture to locate themselves securely in global markets, there has to be broad agreement on what these entities actually *are*. This ontological question may seem straightforward at first—proponents of golden rice, for instance, claim that it is nothing more than a more nutritious plant variety—but food crops straddle too many categorical boundaries for their identity in the political domain to be anything but hybrid. There are, to begin with, regulatory classifications. Should a crop engineered to produce ingredients of medicinal value be considered a food or a drug? Even if such issues can be settled by formal administrative definitions, the North-South debate surrounding GM crops shows how difficult it is to achieve ontological closure around a commodity that is at once a natural kind (a plant with specific genes and traits) and a social kind (a product of particular economic and political orderings, and a potential reorganizer of society).⁶¹

How one should know the properties of GM crops is similarly open to question. U.S. authorities have insisted that the only proper basis on which to evaluate the impacts of these novel entities is through science-based risk assessment. Yet, as the dispute between the United States and Europe at the WTO graphically illustrates, vast disagreements persist about the epistemological status of risk assessment. Is it a “science” at all, in the sense of being a well-demarcated, uncontroversial, paradigmatic (in a Kuhnian sense) method of representing the world; or is it instead a patently political and culturally constructed instrument for managing the uncertainties that

⁶⁰ Sheila Jasanoff, “Let Them Eat Cake: GM Foods and the Democratic Imagination,” in *Science and Citizens*, ed. Melissa Leach, Ian Scoones, and Brian Wynne (London, 2005), 183–98.

⁶¹ Such ontological hybridity is taken as part of the order of things in the work of many science studies scholars. See, in particular, Michel Callon, “Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay,” in *Power, Action, and Belief: A New Sociology of Knowledge?* ed. John Law (London, 1986), 196–233; Bruno Latour, *We Have Never Been Modern* (Cambridge, Mass., 1993). Hybrids complicate the clean separation that philosophers such as Ian Hacking have sought to draw between natural (“indifferent”) and social (“interactive”) kinds. Hacking, *The Social Construction of What?* (cit. n. 20).

inevitably accompany large projects of reconfiguring nature or society?⁶² To accept producers' contention that crops such as golden rice are "safe," one has to buy the former, not the latter, characterization. If, however, risk assessment is an expression of political culture by other means, then one should not be surprised if that form of analysis does not travel friction-free across political and cultural boundaries.⁶³

GM crops are developed in the laboratory, usually in science-rich Western nations, tested in the field, and transported thence for commercial propagation in both naturally and socially variable environments. Monsanto, in this respect, is like the Kew Gardens of the nineteenth century: a metropolitan "center of calculation"⁶⁴ from which standardized products flow out to take root in the world's economic and political peripheries. Key to sustaining this mode of production is the assumption that socio-ecologies are as standard as the crops grown within them—put differently, that social and ecological circumstances at the periphery are not so radically different from those at the metropolitan center as to defeat the project of global technology transfer. Yet accidents occurring even within the boundaries of single nation-states show that transfers from the laboratory to the field can bring unpleasant surprises. For example, in one costly U.S. episode, ProdiGene, a GM corn variety containing an insulin precursor, trypsin,⁶⁵ was planted in an unmarked field in rural Iowa. The manufacturer agreed with the U.S. Department of Agriculture, which approved the field trials, that the field would be quarantined the following year so as to remove any volunteer plants.⁶⁶ In fact, the fields were not properly isolated and an undetermined quantity of the GM crop was harvested along with about 500,000 bushels of soybeans during the following season. Similar failures resulting from unforeseen couplings of technology, environment, and human behavior are all the more probable when transfers occur across disparate cultures of farming and of hazard control.

Expanding on this point, it has become clear that complex technological systems are forms of life, uniting human and nonhuman components in a common purposive framework, as much as they are targeted attempts to improve upon aspects of human life by physical or biological means. Thus, transportation systems do not only move people about from place to place. They remake social structures and self-understandings. A car culture, for example, gives rise to different visions, and valuations, of time, distance, autonomy, community, environmental quality, and the cost of life than a culture dependent chiefly on bicycles or public transportation does. Similarly, industrial agriculture is organized and managed on different principles from small family farms; the two systems of production rest on different economic, social, and technological infrastructures, and their impacts on human solidarity and on the environment are correspondingly divergent. Conventional risk assessment methods take little or no account of the social and ethical ramifications of technological systems, including the threats they pose to long-settled patterns of living. This blindness to technology's disruption of established forms of life, underwritten by the allegedly scientific power of

⁶² Winickoff et al., "Adjudicating the GM Food Wars" (cit. n. 58)

⁶³ See Jasanoff, *Designs on Nature* (cit. n. 42), on the relationship of risk assessment to political culture.

⁶⁴ Latour, "Drawing Things Together" (cit. n. 11), 19–68.

⁶⁵ Bill Hord, "The Road Back: Prodigene and Other Biotech Companies Are Moving Ahead in an Environment of Increasing Fear of Crop Contamination," *Omaha World Herald*, Jan. 19, 2003, 1(d).

⁶⁶ "Volunteer" plants are those that emerge spontaneously, usually from a previous season's growth, in places where they were not intentionally planted.

risk assessment, has fueled much of the criticism of agricultural biotechnology in the global South.⁶⁷

Identity and Community

Empires, no less than nation-states, engender and depend on feelings of belonging. Devices for producing imperial imagined communities have included, besides the grand, polarizing, ideological discourses of the cold war, mundane practices such as performing national celebrations,⁶⁸ teaching a common language, training administrative and judicial élites, and building infrastructures for commerce and communication. Science and technology, we have seen, have long served as agents of imperial governmentality, helping to produce the mission consciousness and the associated forms of knowledge and skill that serve as instruments for extending power. Modern biotechnology, similarly, provides a discourse of development that continues colonial traditions, although the agents, recipients, and specific mechanisms of the development project have been partially reconfigured in modern times.

The discovery of Africa as a site for biotechnological development, through the propagation of crops such as golden rice, offers perhaps the clearest illustration. In the rhetoric of development specialists, and the scientific and industrial institutions that serve them, Africa is represented through tropes of crisis and charity that render the continent's condition as dire and the offers of scientific and technological solutions as salvatory.⁶⁹ In one instructive example, Gordon Conway, former president of the Rockefeller Foundation, and a colleague wrote an article in the prestigious journal *Science* on biotechnology's capacity to help Africans. Though presented as scientific, the article merged the empiricist register of science with a narrative register that was little short of missionary. At the center of the discussion was a fictional African housewife, "Mrs. Namurunda," who the authors said was not a real person but "a composite of situations existing in Africa."⁷⁰ The story begins with Mrs. Namurunda, a farmer and single mother, eking out a hard-scrabble existence on fields infested with every form of insect blight, under adverse conditions of drought and soil degradation. It ends with scientific biotechnology solving her problems, enabling her to turn a profit and secure a brighter, better educated, more enlightened future for her children.

This script follows Foucault's delineation of biopower with uncanny precision. An entire continent becomes a medicalized body, requiring urgent therapeutic intervention, both as a collective and for its individual members. The fictional person of Mrs. Namurunda, unveiled in the pages of one of the world's leading scientific journals, becomes a symbol for Africa's "composite" ailments. Advanced societies' power to

⁶⁷ See, particularly, the arguments on this topic by the well-known Indian author and activist Vandana Shiva, *Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology* (London, 1993); *Biopiracy: The Plunder of Nature and Knowledge* (Toronto, 1997); *Yoked to Death: Globalisation and Corporate Control of Agriculture* (New Delhi, 2001).

⁶⁸ Morris, for example, describes Victoria's jubilee celebrations in London as a crystallizing moment for the British Empire in 1897. *Pax Britannica* (cit. n. 26), 21–34. See also the account of the Imperial Assemblage of 1877 in Delhi by Bernard S. Cohn, "Representing Authority in Victorian India," in *The Invention of Tradition*, ed. Eric Hobsbawm and Terence Ranger (Cambridge, 1983), 165–209.

⁶⁹ Jasanoff, "Let Them Eat Cake" (cit. n. 60), 190–4.

⁷⁰ Gordon Conway and Gary Toenniessen, "Science for African Food Security," *Science* 299, no. 21 (2003): 1187–8.

develop and deliver the requisite treatments offers them the right, indeed the obligation, to engage in a new *mission civilisatrice*—built on a biomedical ethic of cure rather than, as in earlier times, a religious model of grace. But, this time, eschewing the forceful, state-led constellations of power that undergirded colonial rule, the neo-liberal state works through a lightly regulated global industry and a largely self-regulating scientific community. *Their* expansion into new territories carries the promise of better jobs and higher incomes back in the home country, thereby allowing the economically more powerful state to justify itself where votes are counted, in its own national community of citizens. The sick and incapacitated recipient, however, has little or no say in either the diagnosis or the treatment of the alleged pathology.

The Constitutional Turn

We turn now to the fifth modality of empire-making identified above—the constitutional approach, which relies for its robustness on the formal consent of citizens. The European Union at the turn of the twenty-first century represents perhaps the most ambitious working out of this approach. With twenty-five member states as of May 2004, the EU brought within a single constitutional regime one of the most linguistically and culturally heterogeneous political assemblages ever created. In contrast to the institutionally inchoate, emergent empire discerned by Hardt and Negri, the EU is very much an orthodox space of governance, circumscribed by law and accountable to its members and (as illustrated by the French and Dutch “no” votes on the EU Constitution) to the particularities of their domestic politics.⁷¹ On its Web pages, the public face it presents to the electronically plugged-in world, the EU takes considerable pains to explain itself: why it exists, how it was formed, its past achievements, and its hopes for the future. At one level, the talk is highly Weberian, a matter of official institutions and considered policies, justified in terms of an overall mission of peace, safety, solidarity, and a European model of society.⁷² At this discursive level, *Europe* very much exists; the question is only how to realize, through concerted, practical action, its already formed sense of collective identity.

At another level, however, Europe’s identity is still very much in the making, and its constitutional union is but a cover for working out varying conceptions of what it means to be European; domains in which European-ness remains an open question, subject to multiple interpretations, include the development and deployment of the life sciences to advance communal interests in the EU. Looking at European engagements with biotechnology, both in Brussels and in the member states, one gets some sense of the issues in this debate, as well as some of the ways in which Europe has approached the problem of coordinating differences among its members without erasing them. The European example offers, in this respect, an intriguing alternative to the totalizing, disciplining vision of global biopower.

To be sure, European policy for biotechnology has followed to some extent famil-

⁷¹ This system of distributed accountability has resulted in a union whose members have not equally bought into all aspects of the EU vision. Thus, Sweden, Denmark, and Britain have not adopted the single currency (euro); Ireland and Britain are not parties to the Schengen agreement on frontier controls; and Britain thus far has not adopted the Community Charter of Fundamental Social Rights for Workers.

⁷² See *Why the European Union?* http://europa.eu.int/abc/12lessons/index1_en.htm (accessed Nov. 2004).

iar modernist impulses toward standardization and central control. Brussels has sought for decades to foster technological innovation and create new jobs, partly for the sake of continued European economic growth and partly in response to perceived threats from U.S., and now Chinese and Indian, innovation. Older discourses on international competitiveness⁷³ have been joined of late to new worries about labor mobility within Europe, the out-sourcing of jobs to developing countries, and concomitant pressures to lower regulatory and ethical barriers to the free flow of scientists within the European research area. Since 1990, the EU has issued directives on research with genetically modified organisms (GMOs), release of GMOs into the environment, labeling of foods containing GMOs, and patenting of the products of biotechnology. In its efforts to counter popular resistance, the EU has also sponsored research on the public understanding of science—constituting in the process a citizenry whose needs the European state can characterize and cater to with aggressive programs of science and risk communication.⁷⁴

These centralizing initiatives from Brussels, however, have run up against resistance from members states and their polities, showing that—at least in Europe—the prerogative of imagining technological futures no longer rests with governments alone but must be shared with increasingly knowledgeable publics. Those publics, moreover, approach the promises of biotechnology with significantly different ethical sensibilities toward nature and different attitudes toward uncertainty and responsibility from the industries wishing to commercialize the new technologies.⁷⁵ While public perceptions converge in important respects across Europe, the means through which people express their concerns and seek reassurance remain different, conditioned by national political culture and traditions. Thus, the nationwide public debate on GM crops held in Britain had no exact parallels anywhere else in the EU; other states conducted their own consultative exercises, in the form of citizen juries, consensus conferences, and referenda. The results, too, have varied, with member states disagreeing about how to establish the adequacy of data bearing on risk, as well as in the actions they have taken with respect to specific GM crops.

In sum, European experience with the governance of biotechnology indicates that, in an empire built on constitutional principles, there may be broad agreement in public attitudes toward technology and on the rulers' willingness to take account of public views and values while actively pursuing the agenda of technological development. At the same time, democratic consultation pursued with genuine respect for diversity may produce locally specific accommodations that bear little resemblance to the global legibility sought by some twenty-first-century multinational corporations, or striven for in vain by Scott's over-ambitious twentieth-century planning states.

CONCLUSION

Imperial projects, as many are arguing today, did not end with the end of colonialism but may be resurfacing in new guises with the passage of time. Since early modernity, these projects have benefited from the enterprises of science and technology, and the

⁷³ Herbert Gottweis, *Governing Molecules: The Discursive Politics of Genetic Engineering in Europe and the United States* (Cambridge, Mass., 1998).

⁷⁴ Jasanoff, *Designs on Nature* (cit. n. 42), chap. 3.

⁷⁵ Claire Marris, Brian Wynne, Peter Simmons, and Sue Weldon, *Public Perceptions of Agricultural Biotechnologies in Europe*, <http://www.pabe.net> (accessed Nov. 2004).

biological sciences in particular have been caught up for centuries in the spread of imperial forms of governance. It is no surprise, then, to find contemporary biotechnology enrolled in various modalities of empire-making, whether through bottom-up resistance, top-down ideological imposition, administrative standardization, or consensual constitutionalism. In particular, as shown above, the capacity to engineer the genetic characteristics of plants has blended seamlessly with state and corporate projects of managing human populations so as to legitimate the exercise of power. Both nation-states and, in an era of neoliberalism, the multinational corporations that states are in league with have displayed their readiness to deploy agricultural biotechnology in advancing their interests on a global scale.

Struggles over the governance of biotechnology complicate any easy, linear narrative of progress. Instead, the nexus of globalization and technological innovation emerges on closer inspection as a politically contested site, where opposing conceptions of how human societies should live, and what other life forms should sustain them, remain very much at play. The example of European integration around biotechnology strongly suggests that there is considerable cross-cultural variation in the lines that human societies, even closely similar ones, choose to draw between nature and culture and the extent to which they are willing to tolerate line-crossings between those two domains. Given a chance to express themselves democratically, moreover, stable societies often opt to retain old boundaries and forms of life, preferring gradual, internally motivated change to imported, alien visions of progress, no matter how glittering the offerings presented to them.

These observations should not be taken as closing the door on the global promises of agricultural biotechnology, which may be considerable, even if not immediately on the horizon. The genie of genetic manipulation is with us in any case: there are not many precedents for turning the clock back on what human inquiry has revealed of the workings of the natural world, although highly developed techniques have occasionally been lost or gone into long periods of recession. Nor *should* we seek refuge in regress from innovation. The challenge, rather, is to constitute in tandem with global advances in technology the institutional capacity that will permit citizens to participate meaningfully in debating the implications of the new technologies. This essay speaks for more enlightened uses of our knowledge and capacity, preferably employed within constitutionally governed systems—keeping in mind that enlightenment flows not only from ingenious ways of tinkering with the material world but also as much, or more, from reflecting on how we should deploy for the good our profoundly human ingenuity.