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LIVELY CAPITAL

BIOTECHNOLOGIES, ETHICS, AND GOVERNANCE IN GLOBAL MARKETS

Edited by Kaushik Sunder Rajan

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SHEILA JASANOFF

TAKING LIFE

Private Rights in Public Nature

Once out of nature, I shall never take
My bodily form from any natural thing . . .
W. B. YEATS, "BYZANTIUM"

When does something in nature become property? When may it be owned, exchanged, manipulated, given away, entirely used up, or even destroyed? Does it matter if that thing is alive? I will show in this chapter that the answers given by the law depend not on the nature of the thing in question but on the culture that conditions our understandings of what it means for something to be natural.

Takings: Public and Private

Let us begin with land, the bedrock from which the juncture of nature and property springs. The Fifth Amendment to the U.S. Constitution provides in its "takings clause" that no private property "shall be taken for public use, without just compensation." That clause circumscribes the state's power of eminent domain, which allows governments to claim land for public purposes such as building highways and railroads, protecting environmental amenities, and fostering neighborhood renewal. Private ownership of land

is not in itself a barrier to takings. The law focuses instead on interpreting the key terms of the constitutional guarantee, that is, on defining what is a legitimate "public use," entitling appropriation by the state, and what constitutes "just compensation." For instance, a controversial Supreme Court decision of 2005, *Kelo v. City of New London*, held that a local authority may take private property for economic redevelopment, even though the proposed use would benefit some private parties, and even though the condemned property included private homes that were neither derelict nor abandoned. All that the municipality needed to show was that it had formulated a carefully considered plan to benefit the entire community. In a sternly utilitarian calculus, it was enough justification that many would gain from a decision that disadvantaged only a few.

That logic can undermine public takings that fail to meet a mathematical test. Protecting the environment, for example, was at one time unquestionably a valid public purpose under the takings clause; indeed, the public value of environmental protection was so taken for granted that it hardly called for explicit justification. Governments imposed restrictions on land use, and even blocked development altogether, in order to prevent environmental degradation or improve the quality of urban life. Measures such as reducing traffic congestion or creating green spaces still are seen as legitimate public purposes, but recent case law makes it clear that the state's power to mandate such measures is not unlimited.

Beginning in the 1980s, property owners gained increasing political influence and the federal courts began restricting the power of eminent domain in environmental cases. In a decision signaling that the tide was turning, the Supreme Court held that a law depriving property of all its economic value would always count as a taking, triggering a right to compensation (*Lucas v. South Carolina Coastal Council* 1992, 505 U.S. 1003). In other landmark cases, the court instructed communities that they had to demonstrate an "essential nexus" between imposed conditions and legitimate regulatory objectives (*Nollan v. California Coastal Commission* 1987, 483 U.S. 825), as well as a "rough proportionality" between those conditions and the scope of the planned development (*Dolan v. City of Tigard* 1994, 512 U.S. 374). Most controversially, the court ruled that a city wishing to protect a designated wetland had to pay a property owner for any resulting losses, even though the owner had acquired his property knowing that it included a legally protected wetland.[1]

The logic in all these cases favors uses of real property that generate greater economic value over uses that promote only nonmaterial values,

such as the integrity or aesthetic quality of nature. The relative value of alternative uses is measured, in part, by their capacity to circulate.[2] Economic development overflows the territorial limits of land; it converts place, which sits still, into money, which moves. A mall generates more wealth than a park. Aesthetic or other intrinsic value by definition does not circulate, or so we imagine; it stays bound up in the land, permitting at best private enjoyment by those who own or have access to it. The inverse principle is that removing land from imagined, or even imaginable, economic productivity—making it sit still, lie fallow, or be seen by only a few—requires compensation, even if the taking serves a recognized public good. Not surprisingly, the first rule has tended to benefit mainly private property developers, although in *Kelo* it was a city (to be sure, acting in concert with a private developer) that put forward the more gainful land-use plan, and thus overrode the interests of private dwellers who could not so readily translate land into money.

Inanimate land, then, can be owned, developed, mined for private gain, or be otherwise made to circulate in commerce; and it can be "taken" out of circulation for noneconomic public purposes only on adequate compensation. Undeveloped land offends U.S. law's predisposition toward use and commerce. It is as if in the eye of the law the right of ownership *naturally* belongs to the party who can do most to render land fluid, enabling a bounded, immovable territory to overcome its inert condition. Land becomes lively through the commerce it enables or sustains. That logic explains why seeking to maintain spaces in static or undeveloped form, whether for preservation or for individual use as in *Kelo*, has fared less well in recent legal conflicts than efforts to open up those spaces to the presumptively greater mobility of commerce. In the hierarchy of utility, the user who does most to overcome land's earthbound limits gains priority, though it may be at the cost of compensating a less entrepreneurial prior owner.

A very different imagination regulates the ownership of living things and of nature's laws. Here, the assumption in Western legal systems has been that lively nature belongs to all: it is the taking of nature for private purposes that should be banned or strictly regulated. Nature is considered to be the common property of humankind. Private claims would corral a part of universal nature, secreting it away from open access or enjoyment. In particular, one may not stake an intellectual-property claim based on the mere discovery of a natural object or law. Einstein could no more copyright the equation "$e = mc^2$" than Edmund Hillary or Tensing Norgay could own Mount Everest, or Neil Armstrong, the Apollo astronaut who in 1969 took

the famed "giant step for mankind," could lay claim to the moon whose surface he first set foot on. The logic again is utilitarian: no private use, the law imagines, could possibly outweigh the public benefit of a nature whose works and workings remain available, in equal measure, to everyone. In order to claim an intellectual-property right in natural objects, the claimant has to do more than merely find it, picture it, publicize it, or celebrate it. The would-be patent holder has to change the quality of the thing itself, so that it no longer partakes of the character of the "commons" that we see in nature. The object of the patent claim has to be clearly marked, indeed set apart from nature, as a creation of human ingenuity and enterprise. It has to be a result of invention, not discovery. It has to remove the thing being patented from nature to culture.

How have these understandings of inanimate land versus living nature, and of public versus private benefit, intersected with, disrupted, and to some degree refashioned intellectual-property rights in the products of modern biotechnology? What steps, specifically, are required to move something from the domain of nature to the domain of culture? "Taking life" by asserting private-property rights in natural objects or phenomena involves two kinds of moves that are tacitly, though not explicitly, granted controlling status in the law: specificity and circulation. Put differently, the property claim has to involve *both* taking a specific, characterizable, and reproducible bite (and, today, perhaps as much byte as bite) out of nature *and* a capacity to make the excised element circulate widely in commerce. In this way, patentable, human-made, "natural" objects escape the conditions of unruliness, complexity, and nongovernability that environmental historians have associated with American visions of wild nature (Nash 1982).

I elaborate this argument in five parts. I first look at varied treatments of the nature-culture boundary to illuminate how that divide is constructed and maintained while things move back and forth across it. I then offer the historical example of slave ownership to illustrate the importance of ontological stability and circulation in legal constructions of life as capital. I next provide a brief account of U.S. patent law and the framework it lays out for asserting intellectual-property claims in biological materials. Turning then to case law, I compare the strategies for culturing nature, or failing to do so, in two leading North American patent decisions: the judgments on patenting life forms by the Supreme Courts of the United States and Canada in 1980 and 2002, respectively. I conclude with reflections on the law's role in constructing the metaphysics, the value, and the moral economy of nature in the era of biotech patenting.

Nature/Culture: Intertwinings

It hardly needs stating that ideas of nature stem from culture. Nevertheless, the intensity of engagement between scientific and other imaginations—literary, artistic, and legal, for example—in crafting biological categories deserves comment. Modern biotechnology builds on long histories of human preoccupation with the natural. Can art emulate nature? Explorations abound, from Galatea, the marble image of perfect womanhood awakened to life by Pygmalion's prayers, to Oscar Wilde's happy prince, who gave away his precious apparel to the poor and hungry until his leaden heart was revealed to be worthy of god's grace (Wilde 1990). How *un*natural is nature? Collectors such as Rudolf Virchow in Berlin and Peter the Great in St. Petersburg sought answers to that question by amassing biological malformations and monstrosities in their cabinets of curiosities. Where does the human end and the nonhuman begin? Hybrids that cross that categorical line are both revered and feared. The potbellied, elephant-headed god Ganesha is one of India's favorite deities, whereas in Western legends part-human creatures were seen as slippery, treacherous beings—mermaids and centaurs, vampires and werewolves.

Long predating the genetic turn, the possibility of tampering with human nature presented forbidding possibilities. In the Gothic tales of the nineteenth century, attempts to compete with nature usually led to disaster. Mary Shelley's *Frankenstein* became the iconic cautionary tale of human overreaching. H. G. Wells and Robert Louis Stevenson offered in *The Invisible Man* and *Dr. Jekyll and Mr. Hyde*, respectively, their own, near mythic glosses on the hazards of tinkering with human nature. Leon Kass, the first chair of the President's Council on Bioethics, established by George W. Bush, asked his fellow committee members to read Nathaniel Hawthorne's short story "The Birthmark" (1843), in which an overzealous scientist attempts to rid his beautiful wife of a hand-shaped mark on her cheek. He cures the defect but kills the beneficiary.

Biomedicine today uses material technologies to reinscribe the nature-culture boundary yet again. These developments challenge our intuitions about when human life begins and ends, which states of being are worth preserving, and who should decide. The case of Karen Ann Quinlan in New Jersey spotlighted the uncertain legal and ethical status of persons in a persistent vegetative condition, kept "alive" through technological devices supporting nutrition and respiration (*Matter of Quinlan* 1976, 70 N.J. 10). In 2004 the fate of Terri Schiavo, a brain-dead woman in Florida, plunged

America into a media-saturated controversy about who should have power, in disputed cases, to bring an end to liminal states of existence. While the family fought bitterly over the removal of Schiavo's feeding tube, the U.S. president and members of Congress took up the cudgels in support of continued treatment in a misguided attempt to placate America's pro-life religious Right. Disrupting kinship categories, new reproductive technologies, beginning with the first use of in vitro fertilization, in England in 1978, have allowed childless couples to conceive, postmenopausal women to bear children, same-sex couples to become parents, procreation to occur between dead and living spouses, and babies to be preselected to donate healing tissue to diseased siblings (Thompson 2005). By introducing new biological entities into the world—frozen gametes, cell lines, induced pluripotent cells—these techniques have also tested the limits of our understanding of the human community.

Curiously, it was the birth in Edinburgh's Roslin Institute of a sheep named Dolly, cloned from a mammary-gland cell of an adult ewe, that provoked some of the deepest reflections on human nature. The announcement of Dolly's birth in an issue of *Nature* in February 1997 sparked intense debate about the ethics of human cloning. At the epicenter of controversy was the legal and moral status of human embryonic stem cells. Pregnant with possibility, these biologically undifferentiated entities excited biomedical researchers as much as they disturbed Christian fundamentalists and others who believe that human life begins with the fusion of egg and sperm. In their moral universe, the extraction of stem cells so as to prevent an embryo from developing into a full human being was equivalent to murder. President George W. Bush, explaining why he would restrict federal funds for working with embryonic stem cells, ratified this reading with characteristic bluntness. His administration would not, he pronounced, promote research "which destroys life in order to save life" (Stolberg 2005).

In all of these stories, nature manifests itself through disagreements about what should be seen as natural. As Bruno Latour famously observed, "The settlement of a controversy is the *cause* of Nature's representation, not the consequence" (1987, 99). What we see as belonging to nature is, in other words, the result of all kinds of prior commitments to ways of seeing, studying, and classifying life. Natural settlements are contingent on established ways of knowing.[3] If nature appears devoid of social influences, then that, too, is the result of concentrated labor, which Latour (1993) in a bow to biotechnological processes labeled "purification."

We accept that traditional or premodern societies did not see nature as

cleanly bounded off from society. The Achuar of the Amazon, for example, up until the late twentieth century, still conceived of plants and animals as persons because they possess the ability to communicate with people (Descola 1996, 224). But our own nature-culture divisions are no less the products of cultural predispositions and institutional histories. They are experience congealed into material-semiotic systems and actors.[4] The new technologies of life naturalize new self-definitions and forms of sociality (Rabinow 1992). For instance, reproductive technologies reinscribe stereotypical gender relations by constructing technologically mediated conception as "natural," and hence desirable (Hartouni 1997). *Not* using the available technologies—by choosing to remain childless, for example—then becomes the marked, or unnatural, behavior.

Nonhuman entities in some sense actively participate in technological innovation. Blurring hard distinctions between agents and things acted on, technological systems come into being as products of complex enrollments and translations among their heterogeneous components, both animate and inanimate.[5] Recognizing this interplay, the proponents of actor-network theory (ANT) have ascribed a kind of agency to the "actants" (nonhuman agents) in such systems, denying any *a prioristic* divide between nature and culture. The inanimate components are capable of resisting, and so redirecting, human agency; as Latour pointed out with his famous example of the traffic bump, or "sleeping policeman," inanimate technological artifacts can take over human functions, with varying normative and social, as well as physical, consequences (Latour 1992).

Even in modern societies, then, distinctions between person and property, actor and object, human and nonhuman should not be seen as given in advance. Our definitions of things as they are and things as we would like them to be are not independent but are frequently established together through processes of co-production (Jasanoff 2004). It follows that ontological settlements reached in one social or cultural context, with its particular normative commitments, need not be universal, though they may become so through concerted attempts to harmonize differences. As I have shown elsewhere, Britain's epistemic respect for empiricism and common sense logic, coupled with a political history of deferring to elite public servants, produced a legal regime that treated pre-fourteen-day-old embryos (sometimes called pre-embryos) as not yet human (Jasanoff 2005a). Parliament and, by extension, the British public, accepted the view that the formation of the primitive streak, precursor to the central nervous system, in embryos around the fourteenth day marks a meaningful rupture in human biologi-

cal development. There was no scientific consensus that the embryo under fourteen days is any less human than after that date. The fourteen-day limit was not, to start with, universally accepted. In Germany and the United States, for example, dominant cultures of public knowledge, or civic epistemologies, kept alive questions about the embryo's moral status and could not produce a pragmatic bright line for research comparable to Britain's. Only gradually has the fourteen-day rule been smuggled into U.S. policy, largely through the voluntary, self-regulatory activities of scientific bodies interested in furthering research with stem cells.

Many controversies about the right way to draw the line between nature and culture illustrate the centrality of the law as a device for performing what I call "ontological surgery" in modern political systems. Courts, legislatures, and regulatory agencies routinely grapple with conflicts about the nature and meaning of natural objects. How we define and characterize boundary-crossing objects, and how we choose to interact with the resulting things, are worked out as much through law as through scientific research and development. Such concepts as the environment, clean air, brain death, DNA fingerprint, or even "natural mother" are located in webs of meaning crucially shaped by the law. The law constructs both life and capital and, more specifically, demarcates those aspects of life that can be owned from those that cannot.

Ontological Border-Crossing: Naturalization, and the Law

A key function of the law is to produce inevitability. A legal decision takes a social issue that is uncertain, disordered, or contested and reorders it within a system of preordained rules and norms. Questions and ambiguities are temporarily eliminated, and the fuzzy boundary between lawful and lawless conduct is constituted once again as sharp and discernible—in a word, natural. In today's text-based legal systems, judicial opinions naturalize the restored order, so that, in the ideal case, no one challenges the rightness of the winning argument. Before a definitive judgment is handed down, there are many possible ways to think about the rights and wrongs of the case, as well as many reasons for choosing between possible outcomes; the law itself appears unsettled. Afterward, only one reading prevails. When a court succeeds, its reading looks like the only one that could have been reached under the circumstances. As if naturally all other rules and reasons fall away, and the law appears to dictate the outcome rather than the outcome rewriting the law. Like scientific writing, legal text-making produces its own authority by erasing the contingencies from which the dominant ruling emerges.

Of course, such erasures can never be complete, and some of the moves by which contingency is backgrounded can be easily recovered within the textual practices of the law. American law writing, for example, offers space for dissenting opinions, so that, in highly contested cases, any reader can follow the debates behind the ultimate legal ruling.[6] Dissenting opinions, however, are consigned to history, like discarded scientific theories. It is the holding in the case, and the arguments justifying it, that circulate as law. All else is considered *dicta*, mere sayings without the force of law. The most authoritative decisions are those that provoke no dissent, but even powerful dissenting voices in the law go underground unless, in the rarest of cases, they colonize the imagination of succeeding generations and ultimately get resurrected as what *should* have been the law all along.

A noted example of such a shift in U.S. law occurred around the infamous *Dred Scott v. Sandford* decision (1857), which is especially interesting here because it sheds historical light on the law's ability (or lack of it) to produce definitive ontological settlements. The case tested at its most basic level the stability of the legal compromise that had allowed slave states and nonslave states to coexist within the Union before the Civil War. Technically, it raised questions about whether Scott, a black man, had the right to sue in federal courts; whether his years of residence in free northern states had made him a free man; and whether Congress had the right to ban slavery in the northern territories acquired through the Louisiana Purchase. Chief Justice Roger Taney, an eighty-year-old, patriotic son of the South and a former slaveowner, ruled on all three questions in a 7–2 decision that has reverberated through time as a moment of shame in American constitutional jurisprudence.[7] The dissenting voices of Justices John McLean and Benjamin Curtis won the day morally, but legally it was the seven-member coalition of proslavery Democrats who prevailed.

Taney devoted nearly twenty-four pages of his fifty-five-page opinion to the first legal issue, which he phrased in this way: "The question is simply this: can a negro whose ancestors were imported into this country and sold as slaves become a member of the political community formed and brought into existence by the Constitution of the United States, and as such become entitled to all the rights, and privileges, and immunities, guarantied by that instrument to the citizen, one of which rights is the privilege of suing in a

court of the United States in the cases specified in the Constitution?" (*Dred Scott v. Sandford* 1857, at 403). He concluded, in what historians have rejected as a perversion of facts and logic, that blacks were not entitled to be regarded as citizens of the United States (McPherson 1990, 174).

There is little doubt that Taney's was a deeply felt, "visceral" opinion, written by an aging, bereaved man who saw a whole way of life that he valued threatening to disappear before his eyes, and was determined to fight that outcome with the most powerful instrument at his command: his nation's constitutional law. But was there no logic to Taney's position? At stake in the case was not only the political composition of the United States but the ontology of a group of persons who constituted a sizeable part of its population. Could American blacks claim rights of citizenship (and thus of personhood) by suing in federal courts, and yet be treated as property, not persons, in some parts of the country? For Taney, this specter presented an intolerable contradiction. An early and ardent defender of Jacksonian free enterprise, Taney was perhaps especially troubled by the notion of a person who could act as a free agent and fully autonomous citizen in some contexts, but elsewhere would function only as useful chattel, devoid of agency. Logic, for him, demanded a resolution of this ambivalent, boundary-disrupting identity, and he opted for a characterization of Dred Scott that would remain unalterably on the side of chattel, regardless of where in the country his masters chose to transport him. As chattel, Scott and others like him could circulate smoothly across state borders, an integral and ontologically stable component of the economic and cultural system that Taney had given his life to defending.

Dred Scott proved to be a pyrrhic victory for the South. In less than five years the slave states and the free states were at war, in a conflagration that put paid to the notion of dual ontologies—as goods and as persons—for human beings of any color living within the United States. Abraham Lincoln, who presided over the Union's victory, bought into Taney's logic of singular ontologies, but famously not into his normative settlement. For Lincoln, the confusion over where to place black humanity within the framework of the U.S. Constitution could be resolved in only one way. *All* men, as the Declaration of Independence stated, were created equal. In a famous speech, just a year after *Dred Scott*, Lincoln said, "I believe this government cannot endure, permanently half slave and half free."[8] A question for modern biotechnology, and particularly for intellectual-property law as it relates to living things, is whether the time has come for similar ontological clarification with respect to manipulated biological entities.

Invention and Its Rewards

In contemporary industrial societies, an inventor, author, or artist is entitled to retain exclusive rights for a period of time in the products of intellectual or artistic creativity, through patents or copyright. For the founders of the American republic, the importance of scientific and technological innovation was important enough to deserve constitutional support. It was not inquiry in and of itself that the founders prized, but useful inquiry, promoting economic and social well-being. Accordingly, the word *science* explicitly appears in the U.S. Constitution only in the clause governing intellectual property. Article 1, section 8 provides that Congress shall have the power "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

The U.S. Patent Act, originally drafted in 1790 by Thomas Jefferson, among others, implements that constitutional grant of authority, and it still remains, with minor revisions, the governing text for assigning intellectual-property rights in the United States. Canada, too, regulates intellectual property under an almost identically worded statute. The operative provisions in both nations specify what sorts of things can be patented ("patentable subject matter") and under what conditions. Thus, patents can be issued for "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof."[9] As the words *new* and *useful* make clear, the most important objective of patents is to reward novelty and utility. Things already discovered and things that contribute nothing to human welfare deserve no acknowledgment. The inventive step, moreover, must be a real advance and not "obvious" to persons "skilled in the art."[10] If a discovery lies too close to what knowledgeable inventors deem to be "prior art," then the claim to exclusivity is unfounded and deserves no special legal protection.

Part of the justification for granting patents is that they encourage inventors to put into the public domain knowledge and know-how that would otherwise be held in confidence and would not circulate for the benefit of would-be inventors and the public. In order for useful inventions to circulate, they must be exactly reproducible, and this requirement is secured by the law's demand for specification. To this end, the law calls for "a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly con-

nected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention."[11] Biological materials that are too complex to be specified through written description can meet the patent law's specificity requirement in a more physical way: through deposit in a storage service like the American Type Culture Collection located in Virginia.

Patents confer a temporary monopoly on the holder, contrary to the spirit of free circulation that is central to a market economy. The conventional rationale for nevertheless granting such a monopoly is that the inventor compensates society by placing the know-how and the invention itself in the public domain. Any subsequent person wishing to make the same product or use the same process must acquire a license from the patentee; but anyone with sufficient resources can in principle obtain a license, just as anyone with sufficient ingenuity can alter a patented process to make it more efficient and productive, or combine it in novel ways with other processes to produce new entities that can in their turn be patented. The key to making productive use possible is that the patent system must be capable of precisely describing what the inventor did to stake out a claim. Just as owned land has to be precisely surveyed or described, so a patented invention must be described in ways that render it reliably, consistently reproducible. Accidental inventions, those for which there is no surefire recipe for others to follow, cannot be patented.

Intellectual-property laws were not written with modern biotechnology in mind, but a concern for protecting property rights in biological materials dates back at least to the U.S. Plant Patent Act of 1930. The Plant Variety Protection Act of 1970 extended similar rights to nonsexually propagated plant life. Behind these laws was a growing consensus that breeding new plants satisfies the patent regime's desire for the new, the useful, and the reliably reproducible. Utility, as noted, is firmly tied to the notion of replication: to circulate, a patented product or process has to move about as a formula, package, or set of characteristics that can be accurately described, recognized, and exchanged. Even an organism has to be reproducible in predictable ways in order to merit a patent. Thus, Golden Rice, the first and most vigorously debated product of agricultural biotechnology's turn to high-value-added staple commodities, is a highly specific modification of one of the world's most widely consumed grains.[12] It results from incorporating into rice a new trait that no rice ever had before: genetically engineered beta-carotene that confers on the resulting "golden" rice the power

to spur vitamin A production in the consumer's body. It is *novel* in that it crosses the line between food and pharmaceuticals, and builds into ordinary rice a new characteristic that makes this rice nutritionally richer than the natural grain. It is *useful* in that it caters to a new and presumably needy market—people suffering blindness through malnutrition in impoverished regions of the developing world. It is *non-obvious* in that many ingenious extensions of existing knowledge and craft were needed to imagine, create, and standardize this product for widespread cultivation. Indeed, so complex was the translation process that moved Golden Rice from idea to object that it required, according to Ingo Potrykis, of the Swiss Federal Institute of Technology, who is widely regarded as the "father of Golden Rice," seventy separate patents to acknowledge all the inventions that he and his colleagues drew on in producing their new product (Potrykis 2001).

In its landmark 1980 decision, *Diamond v. Chakrabarty*, the U.S. Supreme Court laid out a very broad interpretation of the patent law as it applies to biological products. At issue in the case was whether Ananda Chakrabarty, a research scientist working for General Electric, could patent a new form of the pseudomonas bacterium that he had created. The bacterium was capable of breaking down the components of crude oil and thus was considered potentially useful for cleaning up oil spills. Up to that time, patents had not been granted for living organisms other than plants, and some observers feared that extending patent rights to manufactured life would start society down the slippery slope to commodifying and thus reducing the integrity of life itself. By a 5–4 majority, however, the Supreme Court rejected these fears as irrelevant. Quoting a congressional committee report, the court concluded that the legislature had intended patentable subject matter to "include anything under the sun that is made by man." Chakrabarty's bacterium clearly met that test since it was a product of laboratory manipulation and had never previously existed in nature. Though the decision concerned a bacterium, *Chakrabarty*'s authority was soon used to underwrite patents on many higher animals, including mice, pigs, cats, and cattle.

As the center of biotechnological research and development moved toward drug discovery and the search for genetic links to diseases in the 1990s, scientists and drug companies saw increased value in owning property rights in genes and even gene fragments. Two questions immediately arose. Are genes, entities that (unlike Chakrabarty's bacterium) do occur in nature, encompassed within the law's definition of patentable subject matter? And do they meet the law's additional constraints of novelty, utility,

and non-obviousness? Despite some controversy, the courts and the United States Patent and Trademark Office (PTO), in its 2005 guidelines, ruled positively on both issues.

The decision to allow patenting of genes illustrates again the inclination of property law to favor moves that put otherwise unproductive inanimate matter into circulation, creating economic value. Rejecting arguments that genes are natural objects, and therefore unpatentable, the patent office stated: "An isolated and purified DNA molecule that has the same sequence as a naturally occurring gene is eligible for a patent because (1) an excised gene is eligible for a patent as a composition of matter or as an article of manufacture because that DNA molecule does not occur in that isolated form in nature, or (2) synthetic DNA preparations are eligible for patents because their purified state is different from the naturally occurring compound" (U.S. Patent and Trademark Office 2005, 1093). The patent office cited by way of historical precedent a patent in 1873 to Louis Pasteur for purified yeast, free from disease germs, as a composition of matter. In both cases, purified yeast and purified genes, the inventive step consisted of removing a biologically occurring "composition" from any constraining material matrix. Purification, in effect, was a process of *de*naturing, of taking something out of its natural context. In pure and isolated form, genes are no longer nature's instruments, subject to the vagaries of natural law, but are amenable instead to human intentions and purposes. They are ripe for entering the cultural worlds of sociality and commerce. Indeed, as the PTO guidelines stipulate, a gene patent may be granted only if the claimant provides a description of how the gene will be used.

A number of U.S. biotech patent decisions begin to make sense if reexamined within the specificity-circulation framework. Most instructive, perhaps, is the much-discussed 1990 decision of the California Supreme Court in the dispute between a patient named John Moore and his doctors at the University of California, Los Angeles (UCLA), over who owned the cells excised from Moore's spleen during his treatment for hairy cell leukemia (*Moore v. Regents of the University of California* 1990, 793 P.2d 479). The court held that Moore could sue for lack of informed consent, but that he was not the proprietor of his own cells and tissues, and hence could not pursue a claim of "conversion" or, colloquially, theft. The case has been analyzed by a number of scholars who stress its internal contradictions from the standpoint of legal reasoning.[13] For example, Moore's cells were deemed to be present in all human beings, thereby ruling out his claim to uniqueness; but they were at the same time held to be novel enough as generators

of lymphokines to justify the researchers' patent claim. Equally, the court concluded that granting Moore ownership rights in his own tissues might hamper research, but that granting patent rights to the UCLA researchers would not create a similar impediment.

These apparent contradictions fall away when one views the actions of the UCLA medical researchers as a project in mining nature for extractable entities that can freely circulate. Lodged in Moore's body, the leukemia cells were part of a complex organism and were rendering no value to society at large—indeed, they were producing a potentially incurable disease in the host's own body. Cut loose from context and allowed to exist in their own right, they became the raw material for an "immortal" cell line of possible therapeutic value, which could be instrumentally used to cure other people. Structurally and functionally, the spleen cells were the same, whether in or out of Moore's body. But by excising them from their unruly context, the UCLA researchers rendered this specific piece of nature more tractable to human ends. Though not guilty of *legal* conversion (theft), they in this way effected an ontological conversion, turning nature into property.

Instructive, too, is the outcome of the lawsuit brought by the prostate-cancer specialist William Catalona against his employer, Washington University, to acquire ownership of a biorepository containing some thirty thousand patient samples that the physician had collected during his research. Catalona wished to take the samples with him when he joined the medical faculty of Northwestern University. He argued that the samples were originally the property of his patients, who had donated them for research, so that he now had exclusive control of them. In a unanimous opinion, the Eighth Circuit Court of Appeals upheld the rights of the university, denying the claims of both Catalona and his patient-donors (*Washington University v. Catalona* 2007, 490 F.3d 667). Superficially, the judgment appears to line up against circulation, since the court did not allow the repository to move with Catalona. Consistency reappears, however, when we look below the surfaces, to the deep structures of capital accumulation. Faced with a choice between the individual researcher's abstract claims of public benefit—"a publication enriches the scientific community, is consistent with the wishes and consent of the patients, contributes to the progress of medicine by furthering research, and in some cases may bring grant money into the university" (Lori Andrews 2006, 399)—and the university's superior wealth-generating and circulation-enabling power, the court opted for the latter.

Another instructive case involved the attempt by a Mississippi farmer

named Homan McFarling to circumvent a licensing agreement with Monsanto, the manufacturer of a genetically modified soybean crop that McFarling had cultivated. In order to boost sales of its popular herbicide Roundup, Monsanto had produced a variety of so-called Roundup Ready crop plants, with growth enzymes resistant to glyphosate, the herbicide's active ingredient. The modified crops would grow in fields treated with Roundup, thus prompting more farmers to use the two products together as a unified technological package. As part of its marketing strategy, the company required all farmers to sign an agreement with their seed distributor, promising not to store or replant Roundup Ready seeds from one growing season to another. Bridging the turn of the century, from 1999 to 2000, McFarling decided to test this new move in patent law by breaking the terms of the agreement and replanting seed that he had saved from his first planting. He alleged that Monsanto's patent did not cover the second-generation product. His legal argument consisted of two parts: first, by restricting use of the second-generation seed, Monsanto had impermissibly broadened the scope of its patent, constituting "patent misuse"; second, by making it impossible to separate the patent on the genetically modified trait from the seed that contained it, Monsanto was performing an impermissible act of "tying" the two products, in violation of antitrust law.

McFarling lost, but not until he had pursued his claim up to the Supreme Court, which refused to hear his appeal on 27 June 2005. That decision let stand the adverse judgment of the Court of Appeals for the Federal Circuit (CAFC), the specialized tribunal that hears all first-round patent appeals. The CAFC ruling, together with the amicus curiae (friends of the court) brief filed by the U.S. government in support of Monsanto, against McFarling, sheds light on the metaphysics of the transition from nature to property in the American legal imagination (Supreme Court of the United States 2005).

With respect to McFarling's claim of patent misuse, the Federal Circuit held that extending Monsanto's patent to the second-generation seed, which also contained the patented anti-glyphosate growth gene, did not constitute an illegal broadening of the patent's scope. This was because the seed in the next generation was, in effect, a nearly identical copy of the original seed, because the plant was "self-replicating" (ibid. 14). This was not, in other words, a case of a manufacturer attempting to keep a subsequent inventor from using the original invention to produce a newly useful product. It was, as the government's brief also argued, a case of a downstream user illegitimately trying to undermine an inventor's lawful right to restrict how its patented product, and all more or less identical products, should be used.

The term *self-replicating* smoothly elided any distinction between one generation and the next of a genetically altered seed. It foregrounded the patented gene and rendered pragmatically immaterial the seed that contained it. It also, incidentally and without fanfare, elided the farmer's labor in cultivating a generation of crops capable of bearing new seeds. McFarling, by this reckoning, was not and could not be party to Monsanto's inventive step; his work of propagation needed no special acknowledgment from the standpoint of patent law. To recognize him in any respect as a party to the invention would only have muddied the waters and gotten in the way of those with more power to make the product circulate. In advocating this result, the government's position bore a striking conceptual resemblance to *Johnson v. Calvert* (1993), the gestational-surrogacy case in which the California Supreme Court decided that the genetic mother of a child should be seen as its natural mother. The surrogate mother, who had provided nine months of labor to bring a genetically unrelated child to life, was held to have no rights to the being she had nurtured, but whose identity she could not legally claim to have shaped.

With respect to the tying issue, the government again argued that no law had been broken. McFarling had claimed that he was, in effect, being forced to buy unwanted new seed as a result of having invested in Monsanto's genetically altered trait. The Federal Circuit considered this claim invalid. McFarling, the court held and the government agreed, was not "entitled to purchase respondent's patented invention without also honoring limits imposed on the use of the product in which that invention finds its useful, tangible expression" (Supreme Court of the United States 2005, 16). The invention (the modified trait) and the product in which it found expression (the seed) became in this way a single, indissoluble package, part of culture not nature. Therefore, as the government counterargued, keeping McFarling and other farmers from storing and reusing seed from earlier plantings was simply within Monsanto's broad legal right to refuse to license its product (Roundup Ready seed of any generation)—a right enjoyed by all patentees. Further, illustrating the potency of economic arguments, the government claimed that the restriction on reuse was not, in any case, likely to be anticompetitive. Monsanto could, after all, have charged an additional fee for reuse, and this plus the cost of monitoring and enforcing any such relicensing system would arguably have driven up costs to a degree that would not have benefited consumers.

As these U.S. cases illustrate, the history of granting patents on biological inventions has tended toward expansion of property rights, though occa-

sionally a case sends a reminder that limits still exist. Such a point was reached in a case involving a diagnostic test for deficiency in B vitamins. An American company named Metabolite Laboratories held patents on both the correlation between elevated levels of the amino acid homocysteine and the vitamin deficiency, and a blood test based on that fact; and it sued a licensee, LabCorp, when it stopped paying royalties because it had switched to using other tests (*Laboratory Corp. of America v. Metabolite Laboratories* 2006, 548 U.S. 2006). Metabolite claimed that LabCorp was infringing its patent simply by permitting physicians to see the homocysteine–vitamin deficiency correlation without paying licensing fees. The suit attracted considerable media attention. In an op-ed column in the *New York Times*, the science fiction writer Michael Crichton attacked Metabolite's claim: "Basic truths of nature can't be owned" (2006, WK 13). Perhaps Crichton was defending his own right to speak of such discoveries in his writing without incurring possible charges of infringement. The case reminds us, in any event, that specificity (as in the statement of a natural law) is not in itself enough to establish a patentable claim. To circulate effectively—usefully—in society, the claim still has to be materialized in some way (in a seed or a blood test), just as money historically achieved circulation through embodiment in shells, feathers, precious metals, and other products of nature.

Legal Metaphysics: Nature or Composition of Matter?

Diamond v. Chakrabarty marked in its way the first day of creation for the U.S. biotechnology industry. With that decision, the Supreme Court threw open the door to patenting any living things that were the creation of human hands and human ingenuity. In effect, nature became a mine for those who could satisfy the authorities that they had extracted or synthesized something that no longer properly belonged in the realm of the natural, and that was at the same time new, non-obvious, and useful. Although the case concerned only the microorganisms produced by Ananda Chakrabarty, most observers believed that the court's logic extended equally well to higher organisms, including mammals. In fact, the PTO waited until 1987 to apply the ruling in this fashion, stating in its guidelines of that year that patents could be granted for any "non-naturally occurring, non-human multicellular living organisms, including animals."[14] The first patent granted for a transgenic mammal in the United States was for the so-called Harvard OncoMouse, a mouse strain that had been modified with a gene to increase its susceptibility to cancer. The resulting construct was useful for cancer research, since

the genetic alteration made the OncoMouse more suitable as a model for studying the development of the disease.

Environmental, religious, and animal-rights groups protested the extension of patents to higher organisms, but the PTO's broad reading of *Chakrabarty* remained intact. That human intervention had produced an entity not otherwise occurring in nature was sufficient to define the altered thing as a patentable "composition of matter." Other possible readings of the nature-culture boundary were accordingly ruled out. Over time, though with some hiccups along the way, patent offices in Europe, Japan, and other countries mostly fell in line behind the American decision. But in 2002, in *President and Fellows of Harvard College v. Canada*, the Canadian Supreme Court became the first judicial body to rule that higher animals could not be viewed as compositions of matter under the Canadian Patent Act, whose wording is almost identical to that of the corresponding U.S. law.[15]

In neither the U.S. nor the Canadian case was there a monolithic position to which we unproblematically attach the label of "legal culture." Indeed, each was a 5–4 decision, with a vigorous, almost winning dissent. The significant point is that the opinions split along very different intellectual lines. The U.S. debate centered on an imaginary of progress: in science, in law, and in national life. The Canadian decision, by contrast, occupied itself with the difference between life and matter, even in the case of such a lowly creature as a mouse. The differences of opinion in the United States mapped roughly onto the liberal-conservative divide on the court, a divide historically associated with opposing views of the free market and the utility of centralized regulation. All five of the majority justices in this case were Republican appointees, hence presumably more in sympathy with economic interests; the dissenters included the only two Democratic appointees (Thurgood Marshall, Byron White) and two moderate-to-left Republicans (William Brennan, Lewis Powell).

In Canada, the court's make-up reflected the fault line of national identity, which runs along linguistic and religious divisions between Anglophone and Francophone, and between Protestant and Catholic. The judges' names may tell a part of the story. On the side of the cautious majority were Michel Bastarache (the lead author), Claire l'Heureux-Dubé, Charles Doherty Gonthier, Frank Iacobucci, and Louis LeBel. On the side of the acerbic minority were all three judges with identifiably English names, including the lead author William Binnie, together with Louise Arbour, John C. Major, and Beverly McLachlin. Some (l'Heureux-Dubé, LeBel, Arbour) had received a part of their education in Canadian Catholic institutions or in

France (Bastarache, Gonthier). Bastarache himself was an authority on language rights, a federalist by political inclination, and, perhaps most important, a man who had experienced genetic tragedy in his own life: both of his children suffered from a congenital convulsive disorder, and both had died before he was appointed to the court, one at three and a half and one at seventeen (Corelli and Bergman 1997).

In comparing the two decisions, it is helpful to read the *Chakrabarty* opinion together with two contrasting amicus curiae briefs. Routinely submitted in important Supreme Court cases, such briefs supplement the arguments advanced by the parties and often provide conceptual and rhetorical resources that the justices use in crafting their written opinions. Key amicus briefs were submitted in *Chakrabarty* by the biotechnology company Genentech and the People's Business Commission (PBC), an antibiotechnology group founded by the author and political activist Jeremy Rifkin. Genentech devoted a considerable part of its argument to debunking the claims put forward by PBC, dismissing its opponent as having an "essentially Luddite philosophy" (Supreme Court of the United States 1979a, 11). Appealing to an American myth of self-fashioning through technology, the strategy succeeded. The majority opinion relied substantially on the Genentech brief and, except for a few dismissive words, almost entirely ignored the PBC's.

On Liveliness

The most revealing points of comparison between the two decisions, as well as between the two *Chakrabarty* briefs, have to do, first, with the characterization of life and liveliness and, second, the definition of the public good. Genentech's intention was to diminish as far as possible the distance between Chakrabarty's microorganism and the kinds of objects for which patents had been granted in the past. To this end, the brief stressed the similarity between the novel bacterium and inanimate matter, such as chemicals and even carburetors. There could be no legal dispute worth commenting on, Genentech argued, if the question before the court were the patenting of a plasmid, for plasmids are "absolutely inanimate" structures, each building block of which "is an absolutely dead bench chemical" (Supreme Court of the United States 1979a, 15). Curiously, however, these very "dead chemicals" (a term used several times in Genentech's text) are endowed with the capacity to "cough the bacterial engine [that contains them] into useful life"—a rhetorical move that at once converts the dead chemical into an agent of life, and its living container into a mere machine, like a car engine (ibid. 16,17). Such admixtures of living and dead substances, Genentech suggested, should be treated in effect as utilitarian objects whose composition should not in any way bear on their patentability: "Can it be said that Congress intended patents on living organisms inside inanimate bits of straw but prohibited them in the case of inanimate bits of chemical inside microorganisms, or are we beginning to draw distinctions that border on the silly?" (ibid. 16).

To PBC these questions seemed anything but silly. For this intervenor, the very attempt to equate a living organism with a mere inanimate composition of matter raised profound ethical issues. After all, the PBC argued, "the thing which sets living organisms apart from nonliving entities is their very 'aliveness'" (Supreme Court of the United States 1979b, 5). Granting patents on life, they suggested, was the first step down an all too predictable slippery slope toward turning human beings into objects of manipulation and design, in violation of the human spirit. In support, they quoted the American physician and ethicist Leon Kass, later head of George W. Bush's ethics commission, and the French philosopher of technology, Jacques Ellul. Over and over, the PBC brief insisted that once the line between life and nonlife was breached, there would be no way to hold on to the most meaningful distinctions, between natural and artificial reproduction, between human and machine, and between higher and lower organisms. Neither law nor science would be in a position to stop the slide, for "if patents are granted on microorganisms there is no scientific or legally viable definition of 'life' that will preclude extending patents to higher forms of life" (ibid.). Notably, the brief did little to unpack the difference between nature and artifice. It was fundamentalist in its assertion that human life should be held apart from manipulation and ownership. It raised no serious metaphysical questions.

In advocating for Chakrabarty's patent, Genentech, too, bought into PBC's humanist concerns, but not into their implications for patenting life. Its brief repeatedly sought to distance the chemical-like microorganism from any connection with forms of life that could give rise to deeper ethical concerns. Thus, the company noted that "animal cloning, test tube insemination and other extravagances have nothing to do with the minute concerns of Chakrabarty, and those in turn have nothing to do with gene-splicing, which alone has generated all the controversy" (Supreme Court of the United States 1979a, 10). It would be perverse, the brief went on, to impede potentially life-giving research by showing altruism toward "invisible bacteria that can be freeze-dried to a powder having no semblance of livingness" (ibid. 12). The question before the court, accordingly, was not, as PBC

had argued, "the rapid proliferation of genetic technologies in the areas of energy, agriculture, medicine, industrial processes and many other aspects of the nation's economic life" (Supreme Court of the United States 1979b, 3). Rather, the court's obligation was simply "one of statutory interpretation, of grammar leavened with reason" (Supreme Court of the United States 1979a, 11). The majority went along with this narrow construction of its role, announcing in the opinion's first line that its task was only "to determine whether a live, human-made micro-organism is patentable subject matter under 35 U.S.C. §101" (*Diamond v. Chakrabarty* 1980, 447 U.S. 305).

PBC's fears turned out to be partly justified. In spite of its focus on one of the most minute and micro forms of life (a bacterium), *Chakrabarty* was read within a few years to authorize the expansion of patent protection across the full domain of genetically altered life forms, including all nonhuman animals. In Genentech's conceptually groundbreaking brief, the living container for a patentable "composition of matter" (a gene, a plasmid) came to be seen as mere matter—analogous to an automobile engine needing to be coughed into life, or even to straw. Once that sleight of mind was accomplished, the same reasoning was smoothly extended by administrative decree to genetically altered higher animals, oysters, mice, and eventually larger mammals. All these met the test, in Genentech's words, that they were "called into being solely by the hands of man" (Supreme Court of the United States 1979a, 4), and in the Supreme Court's echoing language, were "not nature's handiwork," but the inventor's own (*Diamond v. Chakrabarty* 1980, 447 U.S. 310).

This was precisely the move that the five-member majority of the Canadian Supreme Court refused to make twenty-two years after *Chakrabarty*. That court's leavening of grammar with reason led to a very different metaphysical resolution than did the U.S. Supreme Court's seemingly unproblematic construction of the law.[16] The situation confronting the Canadian justices was, of course, crucially different from that in *Chakrabarty*. Canada had extended patent rights to microorganisms and fungi without debate or litigation. In the *Harvard College* case, however, the Canadian court had before it a mammal that could by no stretch of the imagination be likened to a mere composite of inert chemicals.

History mattered. By 2002, after Dolly and the cloning wars, some of the Canadian jurists clearly felt that the specter of the slippery slope was more real than it had seemed in 1980. In particular, the PBC's warnings about the march toward depersonalizing and commodifying human nature seemed to have more substance than it had two decades earlier. Allowing patents on higher organisms, the majority concluded, would create problems in a time when the boundary between animals and humans was becoming blurred through biomedical advances such as xenotransplantation. As Justice Bastarache wrote for the majority: "The pig receives human genes. The human receives pig organs. Where does the pig end and the human begin?" In such an environment, it was imperative for metaphysical lines to be redrawn and clarified through legislative action. "In my view," Bastarache observed, "it is not an appropriate function for the courts to create an exception from patentability for human life given that such an exception requires one to consider both what is human and which aspects of human life should be excluded" (*President and Fellows of Harvard College v. Canada* 2002, SCC 76, para. 181).

It was, however, in what the dissent dismissed as "murine metaphysics" that Bastarache's opinion most strikingly parted company from *Chakrabarty* (ibid. para. 45). For the Canadian dissenters, who in essence followed *Chakrabarty*'s logic, classifying the OncoMouse as a composition of matter was thoroughly unproblematic because every cell in its body had been changed through the addition of an oncogene: "The oncogene is everywhere in the genetically modified oncomouse, and it is this important modification that is said to give the oncomouse its commercial value" (ibid. paras. 68, 69, 96). By contrast, the majority was substantially less impressed by the inventor's degree of control over the whole mouse. To them, it was almost common sense that altering one small bit of a complex organism's genetic code does not produce an altogether different entity, a human invention that is no longer part of nature.

> Although some in society may hold the view that higher life forms are mere "composition[s] of matter," the phrase does not fit well with common understandings of human and animal life. Higher life forms are generally regarded as possessing qualities and characteristics that transcend the particular genetic material of which they are composed. A person whose genetic make-up is modified by radiation does not cease to be him or herself. Likewise, the same mouse would exist absent the injection of the oncogene into the fertilized egg cell; it simply would not be predisposed to cancer. *The fact that it has this predisposition to cancer that makes it valuable to humans does not mean that the mouse, along with other animal life forms, can be defined solely with reference to the genetic matter of which it is composed.* The fact that animal life forms have numerous unique qualities that transcend the particular matter of which they are

composed makes it difficult to conceptualize higher life forms as mere "composition[s] of matter." It is a phrase that seems inadequate as a description of a higher life form. (ibid. para. 163, emphasis added)

In this way, the Canadian court repudiated the logic that had, in the United States, so smoothly subordinated and made immaterial the container of the patentable genetic trait, regardless of whether that container was a mouse or a microorganism. Specificity and circulation were not enough, in the Canadian jurists' minds, to confer property rights over the mammalian matrix within which the inserted oncogene found expression.

The Public Interest

The two North American patent decisions also differed in their understandings of the public interest and the respective roles of legislatures and courts. Chief Justice Warren Burger, writing for the *Chakrabarty* majority, picked up on two themes that Genentech had highlighted and that resonated well with America's founding myth of progress through discovery. First, the court sustained the company's view that the patent law, as an instrument for furthering invention, should be given an expansive reading. Genentech had played on the theme of exploration and advancement—"The system seeks not to catalogue the past, but rather to compass the future" (Supreme Court of the United States 1979a, 4)—which it backed up with evidence from legislative history. Quoting congressional committee reports accompanying the law's 1952 reenactment, Genentech observed that "patent laws are written in large and prospective terms, so as to include 'anything under the sun that is made by man'" (ibid. 6). This formulation proved influential with the court. Burger in turn sustained the widest possible application of the law with a quotation from Thomas Jefferson—"Ingenuity should receive a liberal encouragement" (*Diamond v. Chakrabarty* 1980, 447 U.S. 308)—and he incorporated into his opinion the same bit of 1952 legislative history that Genentech had cited. From 1980 onward, the rubric "anything under the sun that is made by man" became identified with the subject-matter provision of the Patent Act, now ratified by the highest law of the land (ibid. 309).

The court's second theme, again echoing Genentech, was judicial deference to the will of Congress. The company's brief had asserted that it was up to the legislature, not the courts, to decide what to include in or exclude from "the broad compass of patentability" (Supreme Court of the United States 1979a, 7). The field was too complex for judicial evaluation, and the

"surgical precision" of legislative policy discriminations was to be preferred to the "meat ax" approach of the petitioner, who was advocating the curtailment of advances across a vast field of technological development (ibid. 8). The Supreme Court agreed that restrictions on patenting, if there were to be any, had to come from Congress. Courts were institutionally incapable of making the right sorts of judgments. On the one hand, fears such as those voiced by the PBC (referred to only obliquely as "the [petitioner's] *amicus*") could be resolved only "after the kind of investigation, examination, and study that legislative bodies can provide and courts cannot" (*Diamond v. Chakrabarty* 1980, 447 U.S. 317). On the other hand, any attempt to put brakes on innovation would be fruitless anyway, because "legislative or judicial fiat will not deter the scientific mind from probing the unknown any more than Canute could command the tides" (ibid.). Even this shopworn metaphor of helplessness was not the Court's own. In its brief, Genentech had written that it was not for the Court "to attempt, like King Canute, to command the tide of technological development" (Supreme Court of the United States 1979a, 12).

For the *Chakrabarty* majority, then, all the relevant lines—legal, metaphysical, institutional—were bright lines, admitting no ambiguity. In particular, there was and could be no question whether an object for which a patent was sought existed in nature or was the work of human hands. Anything on the nonhuman side of the boundary deserved a patent in accordance with the broad purposes of the law. Limiting patentability—hence limiting the circulation of inventions—was the step that required justification, and courts moreover lacked the institutional capacity to carve out exceptions. If there were slippery slopes and special dangers inherent in patenting life, those were matters that only lawmakers could competently address.

The Canadian Supreme Court, too, decided that it was not in a position to make the sorts of policy judgments that the OncoMouse case called for, but the starting point for invoking judicial restraint was the reverse of that adopted in the United States. Unlike the U.S. court, which took the ontological line between natural and manmade as clearcut, the Canadian justices saw scientific and technological practices as blurring important boundary lines: between human invention and nature's handiwork, especially with regard to gene-altered complex organisms; between human and nonhuman organisms and entities; and between permissible innovation and protection of a valued status quo. Accordingly, the court viewed the patenting of higher life forms as "a highly contentious and complex matter that raises serious

practical, ethical and environmental concerns that the Act does not contemplate" (*President and Fellows of Harvard College v. Canada* 2002, SCC 76, para. 155). The justices refused to undertake such a "dramatic expansion of the traditional patent regime" (ibid.); instead, they held that higher life forms did not constitute a "manufacture" or "composition of matter" within the meaning of the term *invention* in the Patent Act.

The principles of judicial construction and deference were essentially the same for both courts: it was their application that differed. In both common law cultures, it was concededly the legislature's job to make policy through law. Courts could determine whether or not a particular question fell within the law's intended purview, but they could not redraw the legislated lines to fit new facts in the world. The point of divergence between *Chakrabarty* and *Harvard College* lay in their treatment of the ontological challenges posed by biotechnology. The U.S. court saw life patents as unproblematic in the light of an analysis that stressed the manufactured character of bioengineered entities and the inevitability of technological advances. Applying the classic "but for" test, the Supreme Court concluded that the bacterium would not have existed but for Chakrabarty's ingenuity. The Canadian court, faced with a mouse rather than a microorganism, trained its analytic sights on an altogether different question. That human agency had endowed a commercially valueless animal with high economic value did not, in that court's judgment, turn a mouse into a "composition of matter." It merely raised difficult questions about where this entity, and others like it, stood in relation to the objectives of the Patent Act, and to human values more broadly. In the public's interest, *that* complexity had to be resolved by Parliament, not the judiciary.

Conclusion

Patent law is often described as a highly technical area of legal practice, mainly oriented to resolving questions of priority (who is the first mover), as well as whether the claimed invention meets the tests of novelty, nonobviousness, and utility. It is seen as a site of technical assessment and narrow legal construction, not for high matters of ethics, politics, or philosophy. For U.S. patent law in particular, as the rhetoric of litigants and of courts constantly reminds us, the most important policy choice was that written into the Constitution and the first Patent Act: "Ingenuity should receive a liberal encouragement." Patenting is only a means to an end, namely,

that the nation should continue to renew itself through invention, and so remain true to its founding imaginary.

That reading, when applied to claims relating to novel biological constructs, has led to a systematic favoring in U.S. law of moves that isolate specific bits of nature and put them into economic circulation. In this respect the law of life patents is logically consistent with the law of "takings" as it relates to real property. Whether nature resides in inanimate land or in living things, what the law rewards is the act of economic agency that takes something that was fixed, embedded, and immovable and makes it specific, dynamic, and commercially value-laden. In short, *lively*. Like precious metals mined from a mother lode, genes and other biological constructs extracted from living nature can be patented by anyone ingenious enough to detach them from their physical surroundings and make them useful in commerce or industry. That logic of the market, grounded in Lockean notions of value creation through labor, helps to explain why John Moore, whose diseased body produced cells of potential therapeutic value, could not patent his own tissues, but why such a patent was granted to the physicians and the company that manufactured from his spleen a cell line for use in biomedical research and development. It explains why William Catalona could not act as an agent on behalf of his sample-donating patients. It also explains why Homan McFarling, the farmer who wanted the right to replant Monsanto's genetically altered soybean, failed in his bid to restrict the company's rights in the second-generation seed that contained the manipulated genetic trait. Backtracking a century, it may also help explain why Chief Justice Roger Taney, confronted by the ambiguous ontology of the slave body, opted for the legal reading that would allow it to circulate freely without losing value.

Even market logic, however, has metaphysical ramifications when it is applied to "private takings"—taking things out of public nature for private gain. As *Chakrabarty* and *Harvard College* dramatically illustrate, granting patents on living things involved decisions about where to draw the line between life and matter. Silently and with little fanfare, the U.S. Supreme Court decided in *Chakrabarty* that any circulating commodity containing within it a part altered by human invention is eligible for a patent. The court's interpretation of invention seamlessly carried over to the patenting of higher animals, blurring the line between living genetically engineered cows or soybean seeds and mechanical contraptions such as cars with newly designed engines.

The Canadian Supreme Court's refusal to classify the OncoMouse as a

"composition of matter," and hence to treat it as patentable, drew a line that U.S. patent law does not recognize between patentable microorganisms and nonpatentable higher life forms. But it also put back on the agenda of public debate previously glossed-over questions about the degree of intervention, innovation, and control that must be shown in order to move something across the boundary from nature to culture, or from life to capital. That question is unlikely to recede as life and capital come to be bonded together in ever more intricate assemblages. In the lively, global landscape of intellectual-property law, it remains to be seen whether the division between the aggressively materialist commodity culture of the United States and Canada's more cautious respect for the ungovernable complexity of life can long endure.

Notes

1. *Palazzolo v. Rhode Island et al.* 2001, ruling that acquisition of land after an environmental regulation's effective date does not bar a takings claim, since otherwise future generations could not assert a right that the present generation was unable to assert through lack of will or resources (533 U.S. 606).

2. On theories of valuation, see Graeber 2001; Singer 2000. Singer argues, consistently with the broad argument of this chapter, that the ownership model of property rights is deficient because it includes no element of obligation.

3. Even philosophers of science who do not embrace a radical skepticism about the reality of nature accept the contingency of specific representations. See Kitcher 2001; Hacking 1999.

4. See particularly Haraway 1991, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," 149–81. Also see Latour 1993. Unlike Haraway, Latour has not written specifically about the socially constitutive properties of the life sciences and technologies, but much of his work on hybridization and purification of material objects bears importantly on our understanding of the contemporary metaphysics of living things.

5. For a classic exposition of actor-network theory, including a definition of the concept of translation, see Callon 1986.

6. One can see this practice as similar in some ways to the German ideal of *Nachvollziehbarkeit* (follow-through-ability) that Stefan Sperling describes in "Science and Conscience: Bioethics, Stem Cells and Citizenship in Germany" (2006). Only in the U.S. case what seems to matter is the fact of a debate and not the transparency of the reasoned argument itself.

7. For a detailed account of the contorted politics of the *Dred Scott* decision, see McPherson 1990, 170–81.

8. Abraham Lincoln, speech before the Republican State Convention, Springfield, Illinois, 16 June 1858.

9. 35 USC Sec. 101.

10. 45 USC Sec.103.

11. 35 USC 112.

12. On the concerns expressed about Golden Rice in relation to food security and public health, see Jasanoff 2005b.

13. See Boyle 1996, 97–107; Jasanoff 2005a, 213–24.

14. Donald J. Quigg, Assistant Secretary and Commissioner of Patents and Trademarks, "Animals—Patentability," 7 April 1987, available at U.S. PTO, Consolidated Notices, 3 December 2008, 1337 CNOG 487, http://www.uspto.gov/web/patents/patog/week53/OG/TOCCN/item-115.htm#cli115, accessed 23 June 2011.

15. Patent Act, R.S., c. P-4, s. 1.

16. Of course, the Canadian court too saw its task as a matter of statutory construction rather than policymaking. Both the majority and the dissent agreed that the words of the Patent Act should be read "in their grammatical and ordinary sense" (*President and Fellows of Harvard College v. Canada* 2002, SCC 76, paras. 8, 11, 154, 155).