

*ARTICLE:*

**DIVERSITY AND DEADLOCK:  
TRANSCENDING CONVENTIONAL WISDOM  
ON THE RELATIONSHIP BETWEEN  
BIOLOGICAL DIVERSITY  
AND INTELLECTUAL PROPERTY**

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## I. BIODIVERSITY AND BIOTECHNOLOGY: DEBATE AS DISTRACTION

The struggle for human survival, so successful that it now consumes 20 to 40% of the solar energy captured by plants,<sup>2</sup> has cast a gloomy shadow on almost all other forms of life. “[H]alf the world’s species will be extinct or on the verge of extinction” by the end of the 21st century.<sup>3</sup> The death toll from rainforest destruction alone “might easily reach 20 percent by 2022 and rise as high as 50 percent or more thereafter.”<sup>4</sup> In its evolutionary impact, civilization has easily outclassed an ice age, or even 20.<sup>5</sup> In geological terms as well as in a colloquial sense, contemporary mass extinctions “mark the end of an epoch.”<sup>6</sup>

Amid this evolutionary catastrophe, the United Nations Conference on Environment and Development met at Rio de Janeiro in 1992 to fashion two international agreements, a framework convention on climate change<sup>7</sup> and the Convention on Biological Diversity.<sup>8</sup> Although global warming may in time land an even more devastating blow,<sup>9</sup> this Article will focus on more direct efforts under the Biodiversity Convention to stem the tide of extinctions. Crippled by the United States’ lack of cooperation, the Convention has weathered nearly a decade of controversy over the relationship between biodiversity and biotechnology.

At the outset, I must define my terms. Under the Biodiversity Convention, “‘*biotechnology*’ means any technological application that uses biological systems, living organisms, or derivatives thereof, to make or

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<sup>2</sup> See Edward O. Wilson, *THE DIVERSITY OF LIFE* 272 (1992).

<sup>3</sup> Jared Diamond, *World of the Living Dead*, 30 *Natural Hist.* 32, 32 (1991).

<sup>4</sup> WILSON, *supra* note 2, at 278; see also Jeffrey A. McNeely et al., *Conserving the World’s Biological Diversity* 41 (1990) (estimating a risk of a 25% loss in total biological diversity by 2010 or 2020).

<sup>5</sup> See Jared M. Diamond, *Quaternary Megafaunal Extinctions: Variations on a Theme by Paganini*, 16 *J. Archaeol. Sci.* 167 (1989) (observing that large mammals such as mammoths and ground sloths had survived 22 glacial cycles before succumbing upon the arrival of humans in North America, 11,000 to 12,000 years before the present). See generally *Quaternary Extinctions: A Prehistoric Revolution* (Paul S. Martin & Richard G. Klein eds., 1984).

<sup>6</sup> Jim Chen, *Globalization and Its Losers*, 9 *Minn. J. Global Trade* 157, 158 (2000).

<sup>7</sup> United Nations Framework Convention on Climate Change, 31 *I.L.M.* 849 (1992), *entered into force*, March 21, 1994; see also Kyoto Protocol to the United Nations Framework Convention on Climate Change (Dec. 10, 1997).

<sup>8</sup> 31 *I.L.M.* 818 (1992) [hereinafter CBD].

<sup>9</sup> See Robert L. Peters, *Conservation of Biological Diversity in the Face of Climate Change*, in *Global Warming and Biological Diversity* 15, 21-22 (Robert L. Peters & Thomas E. Lovejoy eds., 1992).

modify products or processes for specific use.”<sup>10</sup> In common parlance, “biotechnology” carries a comparably broad connotation, embracing any “means or way of manipulating life forms...to provide desirable products for [human] use.”<sup>11</sup> Although “beekeeping and cattle breeding could be considered to be biotechnology-related endeavors,” the term as used “in the United States has come to mean all parts of an industry that knowingly create[s], develop[s], and market[s] a variety of products through the willful manipulation, on a molecular level, of life forms or utilization of knowledge pertaining to living systems.”<sup>12</sup>

The ownership and use of biotechnology give rise to distinct concerns and consequently to distinct bodies of law. Domestic law typically treats the *ownership* of biotechnology as a question of intellectual property. Under American law, for instance, plant breeders can protect their work through patents,<sup>13</sup> plant patents,<sup>14</sup> plant variety protection certificates,<sup>15</sup> and possibly even copyrights.<sup>16</sup> The trade secret laws of the states can provide additional

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<sup>10</sup> CBD, *supra* note 8, art. 2.

<sup>11</sup> Manfred H. Fleschar & Kimball R. Nill, *Glossary of Biotechnology Terms* 18 (1993).

<sup>12</sup> *Id.*; *see also* Office of Tech. Assessment, *A New Era for American Agriculture* 65 (1992) (defining biotechnology narrowly as “new technologies [such] as recombinant DNA techniques (also called genetic engineering), cell culture, and monoclonal antibody (hybridoma) methods” designed to “use ‘living organisms... to make or modify products, to improve plants or animals, or to develop micro-organisms for specific uses’”).

<sup>13</sup> *See* Patent Act of 1952, §1, 35 U.S.C. § 101 (2000); *Diamond v. Chakrabarty*, 447 U.S. 303 (1980); *Ex parte Hibberd*, 227 U.S.P.Q. 443 (1985).

<sup>14</sup> *See* Plant Patent Act of 1930, 35 U.S.C. §§161-164 (2000); *Yoder Brothers, Inc. v. California-Florida Plant Corp.*, 537 F.2d 1347 (5th Cir. 1976), *cert. denied*, 429 U.S. 1094 (1977); *Pan-American Plant Co. v. Matsui*, 433 F. Supp. 693 (N.D. Cal. 1977).

<sup>15</sup> *See* Plant Variety Protection Act of 1970, 7 U.S.C. §§ 2321-2582 (2000); *Asgrow Seed Co. v. Winterboer*, 513 U.S. 179 (1995).

<sup>16</sup> *See* Dan L. Burk, *Copyrightability of Recombinant DNA Sequences*, 29 *Jurimetrics J.* 469 (1989); Irving Kayton, *Copyright in Living Genetically Engineered Works*, 50 *Geo. Wash. L. Rev.* 191 (1982); Doreen M. Hogle, Comment, *Copyright for Innovative Biotechnological Research: An Attractive Alternative to Patent or Trade Secret Protection*, 5 *High Tech. L.J.* 75 (1990); Donna Smith, Comment, *Copyright Protection for the Intellectual Property Rights to Recombinant Deoxyribonucleic Acid: A Proposal*, 19 *St. Mary's L.J.* 1093 (1988). *But see* Iver P. Cooper, *Biotechnology and the Law* §11.02 (1985) (disputing the copyrightability of DNA sequences); Office of Tech. Assessment, *Patenting Life* 43 (1989) (noting the Copyright Office's unofficial position that nucleic acid sequences are not copyrightable).

protection for certain hybrid crops.<sup>17</sup> Finally, since 1988 the Patent Office has routinely granted utility patents for transgenic animals.<sup>18</sup>

Regulating the *use* of biotechnology, by contrast, is a vastly messier affair. In the United States, for example, the U.S. Environmental Protection Agency (EPA), the Department of Agriculture, and the Food and Drug Administration (FDA) share regulatory responsibility.<sup>19</sup> Since 1992, questions of biotechnology use have overshadowed questions of ownership. European resistance to transgenic crops,<sup>20</sup> not to mention the violent protests against the World Trade Organization's 1999 meeting in Seattle,<sup>21</sup> helped shift the spotlight. Buoyed by the Rio Convention's decision to defer questions over the use of biotechnology, I too shall table a fuller discussion of that subject.<sup>22</sup> What concerns me here is an older but more conceptually

<sup>17</sup> See, e.g., *Pioneer Hi-Bred Int'l, Inc. v. Holden's Found. Seeds, Inc.*, 35 F.3d 1226 (8th Cir. 1994).

<sup>18</sup> See, e.g., Philip Leder & Timothy A. Stewart, Transgenic Non-Human Mammals, U.S. Patent No. 4,736,866 (issued April 12, 1988); see also Policy on Patenting of Animals, 1077 Off. Gaz. Pat. Off. 24 (1987) (outlining procedures for animal patents).

<sup>19</sup> See generally Coordinated Framework for Regulation of Biotechnology, 50 Fed. Reg. 47174 (Nov. 14, 1985) (setting forth a "regulatory matrix" that outlines the patchwork of laws and agencies governing the use of biotechnology in the United States).

<sup>20</sup> See generally Marsha A. Echols, *Food Safety Regulation in the EU and the U.S.: Different Cultures, Different Laws*, 4 Colum. J. Eur. L. 525 (1998); Paul Raeburn, *Clamor over Genetically Modified Foods Comes to the United States*, 8 N.Y.U. Envtl. L.J. 610 (2000); Terence P. Stewart & David S. Johanson, *Policy in Flux: The European Union's Laws on Agricultural Biotechnology and Their Effects on International Trade*, 4 Drake J. Agric. L. 243 (1999); Jeffrey K. Francer, Note, *Frankenstein Foods or Flavor Savers?: Regulating Agricultural Biotechnology in the United States and European Union*, 7 Va. J. Soc. Pol'y & L. 257 (2000).

<sup>21</sup> See, e.g., Gerard Baker, *Starbucks Wars*, Fin. Times, Dec. 4, 1999, at 10 (describing the protests as "America's first post-modern riot"). See generally Jim Chen, *Pax Mercatoria: Globalization as a Second Chance at "Peace for Our Time,"* 24 Fordham Int'l L.J. (forthcoming 2001) (discussing the legal significance of the Seattle riots).

<sup>22</sup> See CBD, *supra* note 8, art. 19(3). On January 29, 2000, the parties to the Convention outlined the contemplated "protocol setting out appropriate procedures" regarding "the safe transfer, handling and use of any living modified organism... that may have adverse effect on the conservation and sustainable use of biological diversity." *Id.*; Cartagena Protocol on Biosafety to the Convention on Biological Diversity, *opened for signature* Jan. 29, 2000 (available at <<http://www.biodiv.org/biosafel/biosafety-protocol.html>>). A full discussion of the Cartagena Protocol and the World Trade Organization's Sanitary and Phytosanitary Standards agreement lies outside the scope of this article.

basic question: Do intellectual property rights fundamentally promote or inhibit legal efforts to protect endangered species and ecosystems?

These questions have become muddled after a decade of debate. Biodiversity and biotechnology, according to received wisdom, can scarcely coexist. The global south is home to most of earth's threatened and endangered species, while the global north holds the capital and technology needed to develop this natural wealth. The south argues that intellectual property laws enable pharmaceutical companies and seed breeders in the industrialized north to engage in biopiracy. Such an outcome violates the spirit and possibly also the letter of international commitments to preserve biological diversity. A variant of this argument posits that traditional knowledge is fundamentally incompatible with the developed world's understanding of intellectual property. By contrast, the United States has characterized the Biodiversity Convention and related international laws as a threat to the global life sciences industry in general and to American seed breeders and pharmaceutical companies in particular. All sides magnify the significance of the dispute, having reached an apparent consensus that commercial exploitation of genetic resources holds the key to biodiversity conservation.

Mindful that later contributions to a mature body of scholarship tend to criticize rather than confirm,<sup>23</sup> I now contest these conventional views of the relationship between biodiversity and biotechnology. Rather than duplicating an already comprehensive literature, this article seeks to expose gaps in the conventional narrative on the Biodiversity Convention and its putative conflict with other bodies of international law.

Part II of this Article places the "biodiversity versus biotechnology" debate in its proper environmental context. Both sides have overstated the significance of commercial exploitation. The pharmaceutical and agricultural bonanza that remains to be realized will have at most a peripheral impact on biodiversity. Saving critical ecosystems—biodiversity's "hot spots"—promises a far greater environmental payoff. Commercial development aids biodiversity primarily by overcoming perverse economic incentives to consume scarce natural resources that may turn out to have greater value from a global, long-term perspective.

Bioprospecting therefore plays a narrow but politically volatile role in the debate over biotechnology's impact on biodiversity. Parts III and IV will address in turn the arguments advanced by the genome-rich but underdeveloped global south and by the genome-poor, technologically wealthy north. Neither side can emerge unscathed. The global south has erred in

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<sup>23</sup> See Daniel A. Farber, *Gresham's Law of Legal Scholarship*, 3 Const. Commentary 307 (1986); Mark G. Kelman, *Trashing*, 36 Stan. L. Rev. 293 (1984); cf. Frank J. Sulloway, *Born to Rebel: Birth Order, Family Dynamics, and Creative Lives* (1996) (arguing that latecomers rebel rather than conform as a matter of survival and success).

characterizing the issue as whether intellectual property in the abstract can coexist with the international legal framework for preserving biodiversity. Part III examines the southern challenge through three conceptual filters: genotypes versus phenotypes, genes versus memes, and pharmaceutical versus agricultural applications of biotechnology. Properly envisioned, the notion of intellectual property is elastic enough to embrace all of the intangible assets at stake, including raw genetic resources, advanced agricultural and pharmaceutical research, and the ethnobiological knowledge that often transforms a locally useful organism into a globally valued application of biotechnology.

The developed world, for its part, has identified no more than an illusory threat to its plant breeders and pharmaceutical companies. In particular, the United States has wrongfully refused to ratify the Convention for Biological Diversity. After reviewing the relevant provisions of the Biodiversity Convention, the annex on Trade-Related Aspects of Intellectual Property Rights (TRIPS),<sup>24</sup> and the International Convention for the Protection of New Varieties of Plants (UPOV),<sup>25</sup> Part IV concludes that north and south have only themselves to blame. Unlike TRIPS and UPOV, the Biodiversity Convention insulates from legal challenge some instances of expropriation of genetic material and ethnobiological knowledge from the developing world. Conversely, it is not the Biodiversity Convention but rather treaties on trade liberalization and plant variety protection that establish international legal authority for compulsory licensing. If the developing world intends to obtain access to the technology and wealth of the developed world, it is likelier to do so through TRIPS and UPOV than through the Biodiversity Convention.

In short, proprietary protection for biotechnological inventions will neither save nor destroy biological diversity. Moreover, south and north alike have exaggerated the conflict between intellectual property and the Biodiversity Convention. Part V urges a reduction in the vehemence of the debate, coupled with a sober second look at the biodiversity crisis. Intellectual property is not inherently hostile to the interests of the global south. Indeed, proprietary notions offer the best hope of compensating developing nations for the ethnobiological knowledge that is used in developing valuable commercial products. If anything, continued emphasis on piecemeal

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<sup>24</sup> Annex 1C to the General Agreement on Tariffs and Trade, Uruguay Round, World Trade Organization, *done at Marrakesh*, April 15, 1994, 33 I.L.M. 1981 (1994), *reprinted in* World Trade Organization, *The Results of the Uruguay Round of Multilateral Trade Negotiations* 365 (1995) [hereinafter TRIPS].

<sup>25</sup> International Convention for the Protection of New Varieties of Plants, as revised at Geneva on March 19, 1991 (UPOV Pub. No. 221(E)) [hereinafter UPOV]. The acronym UPOV is derived from the French name of the organization that administers this agreement: *Union pour la Protection des Obtentions Végétales*.

bioprospecting diverts attention from more valuable remedies for the biodiversity crisis. Direct financial aid would have a greater positive impact. Given the remarkable range and reach of “transnational epistemic communities,”<sup>26</sup> governments, businesses, and nongovernmental organizations should cooperate more aggressively toward establishing the financial mechanism contemplated by the Biodiversity Convention. The attention lavished upon clever ways to exploit individual species should yield to a reinvigorated commitment to funding cooperative conservation efforts under the aegis of the Convention.

## II. BIODIVERSITY IN THE BALANCE

Biodiversity preservation is arguably humanity’s greatest challenge. It certainly qualifies if the relevant gauge is the duration and difficulty of corrective measures. According to the geological record of previous extinction spasms, the “full recovery of biodiversity” after a catastrophe such as a meteor strike “require[s] between 10 and 100 million years.”<sup>27</sup> By this measure, “the loss of genetic and species diversity by the destruction of natural habitats” is probably the contemporary crisis “our descendants [will] most regret” and “are least likely to forgive.”<sup>28</sup> The staggering sweep of geological time and the sheer extent of life on earth<sup>29</sup> demand careful consideration of the evolutionary implications of legal decisions.<sup>30</sup> Because biologists “do not know to the nearest order of magnitude how many species exist on earth,”<sup>31</sup> all policies bearing on biodiversity are necessarily framed in a fog

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<sup>26</sup> See generally Peter Haas, *Epistemic Communities and International Policy Coordination*, 46 Int’l Org. 1 (1992).

<sup>27</sup> Wilson, *supra* note 2, at 330; David M. Raup, *Diversity Crises in the Geological Past*, in Biodiversity 51, 52 (E.O. Wilson ed., 1988).

<sup>28</sup> *ESA Oversight, Hearings Before the Subcomm. on Environmental Pollution of the Senate Environment and Public Works Comm.*, 97th Cong., 1st Sess. 366 (1981) (quoting E. O. Wilson); see also Wilson, *supra* note 2, at 254 (“I cannot image a scientific problem of greater immediate importance for humanity.”).

<sup>29</sup> The usual estimates of earth’s biodiversity range from 5 to 30 million species of living organisms. See E.O. Wilson, *The Current State of Biological Diversity*, in Biodiversity, *supra* note 27, at 3, 5; Mark A. Urbanski, Note, *Chemical Prospecting, Biodiversity Conservation, and the Importance of International Protection of Intellectual Property Rights in Biological Materials*, 2 Buff. J. Int’l L. 131, 133 (1995).

<sup>30</sup> See Ryan M.T. Iwasaka, Note, *Chakrabarty to Chimeras: The Growing Need for Evolutionary Biology in Patent Law*, 109 Yale L.J. 1505 (2000).

<sup>31</sup> Wilson, *supra* note 2, at 273.

of ignorance.<sup>32</sup> No other policymaking arena merits a stronger application of the National Environmental Policy Act's (NEPA's) admonition against the "irreversible and irretrievable commitment of resources."<sup>33</sup>

The conventional view of biodiversity suggests that its primary economic benefit derives from commercial exploitation of rare species and that the development of such resources holds the key to conservation. The global north's pharmaceutical and seed breeding industries extol commercial development as biodiversity's savior. By contrast, critics sympathetic to the global south contend that biotechnology will hasten the destruction of fragile ecosystems. At a minimum, they argue, intellectual property laws contribute to the continued expropriation of southern wealth by northern interests.

Neither extreme rings true. Though of obvious pecuniary interest—not only to life sciences companies in the north, but also to potential beneficiaries in the financially strapped south—commercial exploitation has at most indirect impact. To put it bluntly, most species lack significant pharmaceutical or agricultural value. "The vast majority of endangered species probably will not cure cancer."<sup>34</sup> Many organisms, especially plants and insects, are so short on charisma that humans are unlikely to value them for aesthetic reasons or to lobby on their behalf. "Those of us who love nature, and who would like to ensure that nature persists for future generations to love, need to think about saving ordinary places and ordinary things."<sup>35</sup>

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<sup>32</sup> Cf. David Takacs, *The Idea of Biodiversity: Philosophies of Paradise* 92 (1996) (urging ecologists to lead as "masters of ignorance" by advising policymakers to eschew irreversible actions until they fully understand the consequences).

<sup>33</sup> 42 U.S.C. §4332(C)(v), ELR Stat. NEPA §102(C)(v).

<sup>34</sup> Zygumt J.B. Plater, *The Embattled Social Utilities of the Endangered Species Act—A Noah Presumption and Caution Against Putting Gasmasks on the Canaries in the Coal Mine*, 27 *Envtl. L.* 845, 853 (1997); see also Oliver A. Houck, *Why Do We Protect Endangered Species, and What Does That Say About Whether Restrictions on Private Property to Protect Them Constitute "Takings"?*, 80 *Iowa L. Rev.* 297, 298 (1995); John Copeland Nagle, *Playing Noah*, 82 *Minn. L. Rev.* 1171 (1998); Zygumt J.B. Plater, *In the Wake of the Snail Darter: An Environmental Law Paradigm and Its Consequences*, 19 *U. Mich. J.L. Ref.* 805, 824 (1986).

<sup>35</sup> Holly Doremus, *The Special Importance of Ordinary Places*, 23 *Environs Envtl. L. & Pol'y J.* 3, 4 (2000); see also Aldo Leopold, *A SAND COUNTY ALMANAC AND SKETCHES HERE AND THERE*, at vii (1949) ("There are some who can live without wild things, and some who cannot."); cf. Kimberly K. Smith, *Mere Taste: Democracy and the Politics of Beauty*, 7 *Wis. Env'tl. L.J.* 151, 194 (2000) (counseling against the exclusion of "aesthetic interests...from political deliberation" as "an elitist judgment that the public is incapable of making rational aesthetic judgments").

Existing law fails to fulfill this aspiration. Most laws on biological diversity favor utilitarian rationales and privilege the charismatic over the pedestrian. Since most of the world's biological diversity lurks in single-celled organisms,<sup>36</sup> laws genuinely seeking the "preservation of genetic diversity" would not confine their "protection to members of the plant and animal kingdoms."<sup>37</sup> Nor would they perversely consign plants and nonvertebrate animals to lower levels of protection. The United States' Endangered Species Act (ESA), for example, denies shelter to an otherwise endangered insect if its "protection...would present an overwhelming and overriding risk to man."<sup>38</sup> Evidently Congress is unimpressed by the fact that a world stripped of its insects and other land-dwelling arthropods would soon lose "[m]ost of the amphibians, reptiles, birds, and mammals" as well as "the bulk of the flowering plants and...the physical structure of most forests and other terrestrial habitats."<sup>39</sup> Furthermore, even though "[t]he biological differences between animals and plants...offer no scientific reason for lesser protection of plants,"<sup>40</sup> the ESA establishes a significantly lower level of protection for plants. Threatened and endangered plants are protected only insofar as they appear on federal land or are destroyed in knowing violation of state law.<sup>41</sup> The difference is substantial, for more than half of listed

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<sup>36</sup> See Robert F. Service, *Microbiologists Explore Life's Rich, Hidden Kingdoms*, 275 *Science* 1740 (1997); cf. J. Frederick Grassle, *Deep-Sea Benthic Biodiversity*, 41 *BioScience* 464 (1991) (estimating perhaps as many as 10 million species of animals on the floor of the deep sea without guessing even to an order of magnitude as to the diversity of bacteria and other microorganisms); Vigdis Torsvik *et al.*, *Comparison of Phenotypic Diversity and DNA Heterogeneity in a Population of Soil Bacteria*, 56 *Applied & Environ. Microbiol.* 776 (1990) (declining to speculate on the total degree of microbiological diversity on earth); Vigdis Torsvik, *High Diversity in DNA of Soil Bacteria*, 56 *Applied & Environ. Microbiol.* 782 (1990) (same).

<sup>37</sup> Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 *Wash. U. L.Q.* 1029, 1107 n.407 (1997).

<sup>38</sup> 16 U.S.C. §1532(6), ELR Stat. ESA §3(6). See generally *National Ass'n of Home Builders v. Babbitt*, 130 F.3d 1041, 1053, 28 ELR 20403, 20408 (D.C. Cir. 1997); John Copeland Nagle, *The Commerce Clause Meets the Delhi Sands Flower-Loving Fly*, 97 *Mich. L. Rev.* 174 (1998).

<sup>39</sup> Wilson, *supra* note 2, at 133. See generally Edward O. Wilson, *The Little Things That Run the World*, 1 *Conservation Biology* 344 (1987).

<sup>40</sup> National Research Council, *Science and the Endangered Species Act* 90 (1995).

<sup>41</sup> See 16 U.S.C. §1538(a)(2)(B), ELR Stat. ESA §9(a)(2)(B).

species are found exclusively on private land,<sup>42</sup> and plants (but not animals) are property merely by virtue of being present on privately owned land.<sup>43</sup>

But the species that are commercially valuable pack quite a wallop.<sup>44</sup> The powerhouse pharmaceutical and agribusiness industries of the global north are dependent on nature's chemical arsenal. Roughly four-fifths of all known drugs are derived from natural sources.<sup>45</sup> Genetic materials traceable to developing countries account for more than 95% of the global output of humanity's top twenty food crops.<sup>46</sup> Perhaps as much as three-fifths of the 20th century's "Green Revolution" in agricultural productivity stemmed from newly exploited plant genetic resources.<sup>47</sup> In the United States alone, the contribution is worth \$1 billion each year.<sup>48</sup> The derivation of the polymerase chain reaction, a critical tool in molecular biology, from a heat-loving microbe (*Thermus aquaticus*) found in Yellowstone National Park suggests that the vast, unexplored depths of microbial biodiversity may yield further riches.<sup>49</sup> Even more significant is the value of the world's ecosystems as intact, living organisms in their own right.<sup>50</sup> Once we take account

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<sup>42</sup> See Oliver A. Houck, *The Endangered Species Act and Its Implementation by the U.S. Departments of Interior and Commerce*, 64 U. Colo. L. Rev. 277, 293 (1993).

<sup>43</sup> See Holmes Rolston III, *Property Rights and Endangered Species*, 61 U. Colo. L. Rev. 283, 293 (1990).

<sup>44</sup> See generally Kerry ten Kate & Sarah A. Laird, *The Commercial Use of Biodiversity* (1999).

<sup>45</sup> See Wilson, *supra* note 2, at 283.

<sup>46</sup> See African Centre for Technology Studies, *Biodiplomacy: Genetic Resources and International Relations* 52 (Vincente Sanchez & Calestous Juma eds., 1994).

<sup>47</sup> *National Ass'n of Home Builders v. Babbitt*, 130 F.3d 1041, 1053, 28 ELR 20403, 20408 (D.C. Cir. 1997) (opinion of Wald, J.) (noting that the genes of wild plants have accounted for much of "the explosive growth in farm production since the 1930s"), *cert. denied*, 524 U.S. 937 (1998).

<sup>48</sup> See *Endangered Species Act: Oversight Hearing Before the Task Force on Endangered Species Act of the Comm. on Resources, House of Representatives*, 104th Cong. 190 (1995); Karen Anne Goldman, *Compensation for Use of Biological Resources and the Convention on Biological Diversity: Compatibility of Conservation Measures and Competitiveness of the Biotech Industry*, 25 L. & Pol'y Int'l Bus. 695, 701 (1994).

<sup>49</sup> See generally Holly Doremus, *Nature, Knowledge and Profit: The Yellowstone Bioprospecting Controversy and the Core Purposes of America's National Parks*, 26 Ecology L.Q. 401 (1999); Michael Milstein, *Yellowstone Managers Eye Profits from Hot Microbe*, 264 Science 655 (1994); Carla Mattix, *The Debate over Bioprospecting on the Public Lands*, 13 Nat. Res. & Env't. 528 (1999).

<sup>50</sup> See, e.g., R. Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 Nature 253 (1997); Ricardo A. Godoy et al., *A Method for*

of rainforests as oxygen generators and wetlands as water filters, the value of endangered species and ecosystems becomes “literally...incalculable.”<sup>51</sup>

In short, neither “the wealth of Midas [nor] the wit of man” can approach “nature’s own” chemical genius.<sup>52</sup> Even at its apex, human innovation can mock but never match the evolutionary process.<sup>53</sup> Nature “permits us [invariably] to mar, but seldom to mend, and, like a jealous patentee, on no account to make.”<sup>54</sup>

Against biodiversity stands an apocalyptic “Evil Quartet”: habitat destruction, overkill, introduced species, and secondary extinctions.<sup>55</sup> Of these four killers, habitat destruction is by far the greatest threat.<sup>56</sup> The impact of introduced species is becoming ever graver in an increasingly interconnected world.<sup>57</sup> *In situ* preservation of ecosystems is the only effective way to save biodiversity. The larger the tract of land set aside for conservation, the better.<sup>58</sup> Zoos, gene banks, and other *ex situ* strategies fall far short of

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*the Economic Valuation of Non-Timber Tropical Forest Products*, 47 *Econ. Bot.* 220 (1993).

<sup>51</sup> *TVA v. Hill*, 437 U.S. 153, 178, 8 ELR 20513, 20519 (1978) (internal quotation marks omitted).

<sup>52</sup> *FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 629 (1944) (Jackson, J., dissenting) (noting that “manufactured [gas] has only about half the heating value per unit of” natural gas).

<sup>53</sup> Cf. J.R.R. Tolkien, *The Two Towers* 89 (2d ed. 1965) (describing Sauron’s creation of orcs as a flawed, perverse effort to emulate the creation of humans); J.R.R. Tolkien, *The Return of the King* 409-10 (2d ed. 1965) (same).

<sup>54</sup> Nathaniel Hawthorne, *The Birthmark*, in *The Complete Short Stories of Nathaniel Hawthorne* 227, 230 (1959).

<sup>55</sup> See Jared Diamond, “Normal” Extinctions of Isolated Populations, in *Extinctions* 191 (M.H. Nitecki ed., 1984); Jared Diamond, *Overview of Recent Extinctions*, in *Conservation for the Twenty-First Century* 37, 39-41 (David Western & Mary C. Pearl eds., 1989).

<sup>56</sup> See, e.g., Paul R. Ehrlich, *The Loss of Diversity: Causes and Consequences*, in *Biodiversity*, *supra* note 2, at 21; cf. *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, 515 U.S. 687, (1995) (recognizing habitat destruction as a violation of the Endangered Species Act); Larry E. Morse et al., *Native Vascular Plants*, in *Our Living Resources: Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals, and Ecosystems* 205, 208 (1995) (describing “[h]abitat alteration and incompatible land use” as larger threats to endangered plants in the United States than overcollecting, global climate change, and sea-level rise).

<sup>57</sup> See, e.g., Theodore C. Foin et al., *Improving Recovery Planning for Threatened and Endangered Species*, 48 *BioScience* 177, 180-81 (1998); David S. Wilcove et al., *Quantifying Threats to Imperiled Species in the United States*, 48 *BioScience* 607, 608-09 (1998).

<sup>58</sup> See Bradley C. Karkkainen, *Biodiversity and Land*, 83 *Cornell L. Rev.* 1, 10-12 (1997).

the mark.<sup>59</sup> Responsible for a trivial amount of biodiversity (and a significant portion of the amount expended for its protection),<sup>60</sup> *ex situ* conservation cannot preserve the adaptive and evolutionary value of individual species, to say nothing of ecosystems.<sup>61</sup> By introducing criteria designed to suit human tastes and preferences, *ex situ* preservation exerts selective pressure on those species that are targeted for protection.<sup>62</sup> Only an *in situ* strategy can effectively preserve the “conditions where genetic resources exist with ecosystems and natural habitats,” or at least the surroundings where “domesticated or cultivated species have developed their distinctive properties.”<sup>63</sup>

Even American agriculture, a First World industry with deep pockets and a longstanding record of bending biological diversity to serve human preferences, can muster no more than a relatively “diffuse” and feeble “network of laboratories and research stations” such as the National Seed Storage Laboratory.<sup>64</sup> The industry’s *ex situ* strategy is guided by no mandate more specific than the Department of Agriculture’s charge to preserve genetic diversity through “research ‘into the laws and principles underlying the basic problems of agriculture in its broadest aspects.’”<sup>65</sup>

Misdirected toward politically visible but environmentally secondary acts of overkill and commercial exploitation, international law before Rio likewise proved tragically impotent. Direct regulation of traffic in goods derived from endangered species has scarcely slowed the slaughter. The plight of the elephant grimly illustrates the shortcomings of the Convention

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<sup>59</sup> See Holly Doremus, *The Rhetoric and Reality of Nature Protection: Toward a New Discourse*, 57 Wash. & Lee L. Rev. 11, 54-57 (2000).

<sup>60</sup> See Roger A. Sedjo, *Property Rights, Genetic Resources, and Biotechnological Change*, 35 J.L. & Econ. 199, 201 (1992).

<sup>61</sup> See, e.g., Edward C. Wolf, *On the Brink of Extinction: Conserving the Diversity of Life* 44 (1987); Matthew B. Hamilton, *Ex Situ Conservation of Wild Plant Species: Time to Reassess the Genetic Assumptions and Implications of Seed Banks*, 8 Conservation Biology 39 (1994); G. Ledyard Stebbins, *Why Should We Conserve Species and Wildlands?*, in *Conservation Biology: The Theory and Practice of Nature Conservation, Preservation and Management* 453, 463 (Peggy L. Fiedler & Subodh K. Jain eds., 1992); Urbanski, *supra* note 29, at 181.

<sup>62</sup> See Holly Doremus, *Comment, Patching the Ark: Improving Legal Protection of Biological Diversity*, 18 Ecology L.Q. 265, 284 (1991).

<sup>63</sup> CBD, *supra* note 8, at art. 2.

<sup>64</sup> See National Research Council, *Managing Global Genetic Resources: The U.S. National Plant Germplasm System* 1 (1991) (describing the National Seed Storage Laboratory in Fort Collins, Colorado, as one of the Department of Agriculture’s most active steps toward preserving germplasm diversity).

<sup>65</sup> *Foundation on Econ. Trends v. Lyng*, 943 F.2d 79, 80-81, 21 ELR 21439, 21439 (D.C. Cir. 1991) (quoting 7 U.S.C. §427).

on International Trade in Endangered Species (CITES).<sup>66</sup> Efforts to stop the ivory trade through restrictions on harvesting and trafficking have largely failed.<sup>67</sup> By contrast, engaging local populations in the controlled harvest of elephants for profit have yielded modest but marginally greater success.<sup>68</sup> The lesson is clear: efforts to isolate humans from biological resources are self-defeating.<sup>69</sup>

The orchid market teaches similar lessons. The extension of CITES to “all aspects of trade and research” in orchids during the 1980s “immediately increased the desire for the plants, raised their market value dramatically, and led to even more collecting of rare orchid species from the wild.”<sup>70</sup> Meanwhile, it remains “perfectly legal to flood [critical] habitat with a hydroelectric dam, log it, level the hillsides of a road, build a golf course on the site, or burn the jungle to the ground for agricultural purposes.”<sup>71</sup> Biodiversity conservation, alas, must appease *Homo economicus*, the profit-seeking ape. When it comes to biodiversity, so the Costa Rican wisdom goes, we must “use it or lose it.”<sup>72</sup>

All this trouble stems from a maldistribution of wealth and a mismatch of burdens and benefits.<sup>73</sup> Outsiders value the rainforest not only as treasure troves of biodiversity but also as carbon sinks and sources of other

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<sup>66</sup> 27 U.S.T. 1087 (1973), entered into force July 1, 1975.

<sup>67</sup> See Michael J. Glennon, *Has International Law Failed the Elephant?*, 84 Am. J. Int'l L.1 (1990).

<sup>68</sup> See Edward Barbier et al., *Elephants, Economics and Ivory* 132-38 (1990); Frances Cairncross, *Costing the Earth: The Challenges for Governments, the Opportunities for Business* 132-41 (1992).

<sup>69</sup> See A. Dan Tarlock, *Can Cowboys Become Indians? Protecting Western Communities as Endangered Cultural Remnants*, 31 Ariz. St. L.J. 539, 565 (1999); A. Dan Tarlock, *Exclusive Sovereignty Versus Sustainable Development of a Shared Resource: The Dilemma of Latin American Rainforest Management*, 32 Tex. Int'l L.J. 37, 57-61 (1996).

<sup>70</sup> Eric Hansen, *Orchid Fever: A Horticultural Tale of Love, Lust, and Lunacy* 67 (2000).

<sup>71</sup> *Id.* at 17.

<sup>72</sup> Ana Sittenfeld, *Tropical Medicinal Plant Conservation and Development Projects: The Case of the Costa Rican National Institute of Biodiversity (INBio), in Medicinal Resources of the Tropical Forest: Biodiversity and Its Importance to Human Health* 334,335 (Michael J. Balick et al. eds., 1996); cf. Hansen, *supra* note 70, at 262-63 (“[N]o reliable data [show] that CITES and similar efforts ha[ve] reduced smuggling, saved any orchid species from extinction, helped protect orchid habitats, or even salvaged orchid plants facing...certain destruction.”).

<sup>73</sup> See generally Stephen G. Breyer, *Analyzing Regulatory Failure: Mismatches, Less Restrictive Alternatives, and Reform*, 92 Harv. L. Rev. 547 (1979) (describing mismatches between economic problems and legal tools as the greatest source of regulatory failure).

ecological services.<sup>74</sup> The global value of these high-end uses (and “non-uses”) of the rainforest typically “overshadows the value of the forest as a purveyor of physical goods” to the local population.<sup>75</sup> But those closest to the forest typically receive a small share of the global benefits. Moreover, rural people bear the lion’s share of conservation costs, if only because they can no longer harvest scarce species or cultivate their habitat.<sup>76</sup> Unless inhabitants of the rainforest are compensated for forgoing their immediate source of “foods, construction and craft materials, and foods,” local residents “may be easily persuaded” to clear-cut for farmland or to harvest species without regard for global interests.<sup>77</sup> No story depicts this problem as vividly as the fate of the world’s last imperial woodpecker, shot and eaten because it was “*un gran pedazo de carne*.”<sup>78</sup>

In short, commercial exploitation provides the most visible and politically viable way of engaging human communities to preserve the world’s remaining biodiversity. This is especially true of the poorest communities that are placing most of the immediate pressure on biodiversity’s “hot spots”—the ecosystems whose biological wealth is matched only by their fragility.<sup>79</sup> Economic incentives are consistent with the Biodiversity Convention’s exhortation that signatory countries adopt “economically and socially sound measures...as incentives” to conserve biodiversity and to contribute to its sustainable development.<sup>80</sup>

Several other reasons, none of them insignificant, further justify the acceptance of commercial bioprospecting. International coordination on commercial exploitation of biodiversity can improve the very process of collecting rare specimens. If even casual hiking affects the distribution and

<sup>74</sup> See Nature’s Services: Societal Dependence on Natural Ecosystems (G.C. Daily ed., 1997); Costanza, *supra* note 50.

<sup>75</sup> Ricardo Godoy *et al.*, *Valuation of Consumption and Sale of Forest Goods from a Central American Rain Forest*, 406 *Nature* 62, 63 (2000).

<sup>76</sup> See Jeffrey A. McNeely, *Economics and Biological Diversity: Developing Incentives to Conserve Natural Resources*, at xi (1988); *cf.* *Babbitt v. Sweet Home Chapter of Communities for a Great Or.*, 515 U.S. 687, 714, 25 ELR 21194, 21201 (1995) (Scalia, J., dissenting) (complaining that habitat preservation “on private lands imposes unfairness to the point of financial ruin—not just upon the rich, but upon the simplest farmer who finds his land conscripted to national zoological use”).

<sup>77</sup> Godoy, *supra* note 75, at 62; *cf.* *Christy v. Lujan*, 490 U.S. 1114, 1116 (1989) (White, J., dissenting from denial of cert.) (describing a \$2,500 fine for shooting an endangered grizzly bear that threatened domesticated sheep as “the constitutional equivalent of an edict taking” the sheep “in the first place”).

<sup>78</sup> George Plimpton, *Un Gran Pedazo de Carne*, 79:6 *Audubon Mag.* 10 (1977). In Spanish, the phrase means “a big piece of meat.”

<sup>79</sup> See Wilson, *supra* note 2, at 259-72.

<sup>80</sup> CBD, *supra* note 8, art. 11.

population of wildlife,<sup>81</sup> purposeful bioprospecting expeditions can leave a deep human footprint. The need for government intervention is far more urgent in the biosphere than in the ionosphere; unlike the supposedly “scarce” but physically inexhaustible electromagnetic spectrum,<sup>82</sup> natural resources can be depleted through unpatrolled exploitation. Even though the collapse of global fisheries has shaken public confidence in official efforts to achieve “sustainability,”<sup>83</sup> bitter experience teaches that the lack of coordination would be even worse. The slash-and-collect approach of Victorian orchid harvesters, no less vivid or horrible than Joseph Conrad’s *Heart of Darkness*,<sup>84</sup> would probably prevail in an unregulated world.<sup>85</sup> Rationalized harvesting would limit instances of “the wonderfully unusual accomplishment of discovering and eradicating in the same instant a new species.”<sup>86</sup>

In addition, international cooperation would facilitate the rise of “parataxonomy” as a profession.<sup>87</sup> Transnational cooperation can help translate ethnobiological knowledge into terms understood by the global scientific community. Finally, like the larger process of global economic integration, bioprospecting can indirectly aid conservation by generating new wealth that in turn can relieve the economic pressure on the environment of the

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<sup>81</sup> See Francesca Ortiz, *Candidate Conservation Agreements as a Devolutionary Response to Extinction*, 33 Ga. L. Rev. 413, 508 (1999). See generally David S. May, *Tourism and the Environment*, 14 Nat. Res. & Env’t 57 (1999).

<sup>82</sup> Cf., e.g., *FCC v. Sanders Bros. Radio Station*, 309 U.S. 470, 474 (1940) (condemning “attempt[s] by a broadcaster to use a given frequency in disregard of its prior use by others, thus creating confusion and interference”); *Red Lion Broadcasting Co. v. FCC*, 395 U.S. 367, 376 (1969) (footnote omitted) (decrying the “cacophony of competing voices, none of which [can] be clearly and predictably heard,” that would arise in an unregulated broadcast market).

<sup>83</sup> See, e.g., Michael Harris, *Lament for an Ocean: The Collapse of the Atlantic Cod Fishery* (1998); Bob Holmes, *Biologists Sort the Lessons of the Fisheries Collapse*, 264 Science 1252 (1994); Donald Ludwig *et al.*, *Uncertainty, Resource Exploitation, and Conservation: Lessons from History*, 260 Science 17 (1993).

<sup>84</sup> Joseph Conrad, *Heart of Darkness* (Verlyn Klinkenborg ed., 1993) (1st ed. 1902).

<sup>85</sup> See Harold Koopowitz & Hilary Kaye, *Plant Extinction: A Global Crisis* 199-205 (1983); Susan Orlean, *The Orchid Thief* 62-67 (1998).

<sup>86</sup> Bill Bryson, *A Walk in the Woods: Rediscovering America on the Appalachian Trail* 92 (1998).

<sup>87</sup> See Christopher Joyce, *Earthly Goods: Medicine-Hunting in the Rainforest* 118-21 (1994); cf. Wilson, *supra* note 2, at 317-19 (describing the labor-intensive nature of the science of systematics and estimating that the task of classifying 10 million species would require 25,000 professional lifetimes).

global south.<sup>88</sup> Environmental remediation is not cheap, especially large-scale efforts to retire critical habitat and systematic campaigns to reduce pesticides, fertilizers, and erosion. Unless wealthy nations back their environmental demands with financial support, much of the developing world will continue to regard the environmental imperatives of the developed world as imperialism in green drag.<sup>89</sup>

### III. PROPERTY IN PROPER PERSPECTIVE

#### A. "Biopiracy": A Bifurcated Biography

The putative conflict between biodiversity and biotechnology arises from a fundamental difference in factor endowments.<sup>90</sup> The global north is rich in financial capital and industrial technology but poor in genetic resources. The global south is the precise opposite: rich in genetic resources but poor in capital and technology. This split gives rise to the south's traditional attack on northern conceptions of intellectual property.<sup>91</sup> The United Nations Environment Programme has succinctly articulated the south's complaint:

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<sup>88</sup> See, e.g., Peter Huber, *Hard Green* 141, 151 (2000); Marian Radetzki, *Economic Growth and the Environment*, in *International Trade and the Environment* 129 (Patrick Low ed., 1992). See generally Chen, *supra* note 6, at 212-16 (arguing that economic gains from trade liberalization should be redirected toward preserving ecosystems and remediating environmental damage attributable to globalization).

<sup>89</sup> See Raj Bhala, *Mrs. WATU and International Trade Sanctions*, 33 *Int'l Law* 1, 21 (1999); Bartram S. Brown, *Developing Countries in the International Trade Order*, 14 *N. Ill. U. L. Rev.* 347, 376-77 (1994).

<sup>90</sup> See, e.g., Robert S. Pindyk & Daniel L. Rubinfeld, *Microeconomics* 597-99 (2d ed. 1992) (defining comparative advantage in terms of superior transportation, natural resources, and labor); Robert E. Hudec, *Differences in National Environmental Standards: The Level-Playing-Field Dimension*, 5 *Minn. J. Global Trade* 1, 21-22 (1996) (defining "factor endowments" as "[n]atural advantages such as the fertility of soil, climate, rainfall, available raw materials, and transportation facilities such as deep harbors and navigable rivers"); cf. *Strategic Trade Policy and the New International Economics* 1, 7-8 (Paul R. Krugman ed., 1992) (distinguishing between natural "factor endowments" and human capital). See generally Robert J. Carbaugh, *International Economics* 17-50 (5th ed. 1995); Christopher R. Drahozal, *On Tariffs Versus Subsidies in Interstate Trade: A Legal and Economic Analysis*, 74 *Wash. U. L.Q.* 1127, 1142-50 (1996).

<sup>91</sup> See generally Ruth Gana Okediji, *Copyright and Public Welfare in Global Perspective*, 7 *Ind. J. Global Leg. Stud.* 117 (1999); J.H. Reichman, *Intellectual Property in International Trade: Opportunities and Risks of a GATT Connection*, 22 *Vand. J. Transnat'l L.* 747 (1989).

[Intellectual property rights] systems [either] encourage the appropriation of [traditional knowledge] for commercial use without the fair sharing of benefits, or...violate indigenous cultural precepts by encouraging the commodification of such knowledge.<sup>92</sup>

Read carefully, the southern complaint embodies two distinct objections. First, northern notions of intellectual property have deprived the south of its fair share of developmental benefits. Second, the northern understanding of intellectual property cannot coexist with the communal systems of knowledge on which so much of southern culture relies. Whether couched as biopiracy or as an affront to the autonomy of developing countries, the failure to reconcile southern claims to sovereignty over biological resources with northern intellectual property interests may, at the very least, disappoint aspirations expressed in the international law of human rights.<sup>93</sup>

Insofar as the southern complaint alleges a failure to divide benefits more equitably, the real objection does not lie with the recognition of intellectual property in developed nations, but rather with the richer countries' failure to share the spoils. The developing world, to put it bluntly, expects minimal gain from a strengthening of existing intellectual property laws.<sup>94</sup> In a legal regime more sympathetic to its grievances, the south would demand fair compensation for its contribution to the world's life sciences industries. Coupled with ample capital and advanced technology, intellectual property rights have enabled the north to extract enormous wealth from genetic inputs that originated primarily from the south. Worse still, the north

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<sup>92</sup> United Nations Environment Programme, *The Impact of Intellectual Property Rights Systems on the Conservation and Sustainable Use of Biological Diversity and on the Equitable Sharing of Benefits from Its Use* 32, U.N. Doc. No. UNEP/CBD/COP/3/22 (1996); accord, e.g., Josephine Axt et al., *Biotechnology, Indigenous Peoples, and Intellectual Property Rights* 58 (1993).

<sup>93</sup> See Rosemary J. Coombe, *Intellectual Property, Human Rights and Sovereignty: New Dilemmas in International Law Posed by the Recognition of Indigenous Knowledge and the Conservation of Biodiversity*, 6 *Ind. J. Global Leg. Stud.* 59 (1998); Kara H. Ching, *Indigenous Self-Determination in an Age of Genetic Patenting: Recognizing an Emerging Human Rights Norm*, 66 *Fordham L. Rev.* 687 (1997). See generally Ruth L. Gana, *The Myth of Development, the Progress of Rights: Human Rights to Intellectual Property and Development*, 18 *Law & Pol'y* 315 (1996).

<sup>94</sup> See Kevin W. McCabe, *The January 1999 Review of Article 27 of the TRIPS Agreement: Diverging Views of Developed and Developing Countries Toward the Patentability of Biotechnology*, 6 *J. Intell. Prop. L.* 41, 56-57 (1998); Arvind Subramanian, *The International Economics of Intellectual Property Rights Protection: A Welfare-Theoretic Trade Policy Analysis*, 19 *World Dev.* 945, 947-52 (1991).

often proceeds to gouge the south on the sale of finished products. The story is the traditional agrarian complaint of buying at retail and selling at wholesale, played out on a global stage.<sup>95</sup> Critics favoring the south have concisely described the north's posture as "biopiracy," an insidious channel for further economic exploitation of the south.<sup>96</sup> Such harsh rhetoric reflects the passions of the larger war against globalization, particularly the debate over potential conflicts between liberalized trade and environmental protection.<sup>97</sup>

The south's second and more broadly gauged attack takes aim at the very notion of intellectual property. The northern conception of intellectual property, so the argument goes, does not suit the communally acquired and collectively shared nature of ethnobiological knowledge.<sup>98</sup> Privileging northern views of intellectual property allegedly impairs the "vital role" of "[i]ndigenous people and their communities," derived from "their knowledge and traditional practices," "in environmental management and development."<sup>99</sup> Nor is southern hostility to intellectual property limited to indigenous populations. Elements of mainstream society have taken up the cause. For instance, the Catholic Church in Brazil has condemned a new law allowing patents on genetically modified organisms, while intellectual property holders in Peru must pay enforcement and prosecution costs.<sup>100</sup> Among developing nations, perhaps India has taken the most aggressive stance against what it considers the postcolonialist commodification of its natural heritage.<sup>101</sup>

<sup>95</sup> See Gilbert C. Fite, *American Farmers: The New Minority* 32 (1981) ("[F]armers bought at retail and sold at wholesale").

<sup>96</sup> See, e.g., Vandana Shiva, *Biopiracy: The Plunder of Nature and Knowledge* (1997); Keith Aoki, *Neocolonialism, Anticommons Property, and Biopiracy in the (Not-So-Brave) New World Order of Intellectual Property Protection*, 6 *Ind. J. Global Legal Stud.* 11 (1998); Craig D. Jacoby & Charles Weiss, *Recognizing Property Rights in Traditional Biocultural Contribution*, 16 *Stan. Envtl. L.J.* 74, 89-91 (1997); Lakshmi Sarma, *Biopiracy: Twentieth Century Imperialism in the Form of International Agreements*, 13 *Temp. Int'l & Comp. L.J.* 107 (1999).

<sup>97</sup> See generally Chen, *supra* note 6, at 183-93; Jim Chen, *Epiphytic Economics and the Politics of Place*, 10 *Minn. J. Global Trade* 1 (2001) [hereinafter Chen, *Epiphytic Economics*]; Chen, *supra* note 21.

<sup>98</sup> See, e.g., James Boyle, *Shamans, Software, and Spleens: Law and the Construction of the Information Society* 141 (1996); Aoki, *supra* note 96, at 46; Lara E. Ewens, Note, *Seed Wars: Biotechnology, Intellectual Property, and the Quest for High Yield Seeds*, 23 *B.C. Int'l & Comp. L. Rev.* 285, 304-05 (2000).

<sup>99</sup> Rio Declaration on Environment and Development, *adopted* June 14, 1992, 31 *I.L.M.* 874, 880 (1992) (principle 22) [hereinafter Rio Declaration].

<sup>100</sup> Jeb Blount, *Hands of Steel*, 24 *Latin Trade* 50, 54, 58 (1996).

<sup>101</sup> See generally Meetal Jain, *Global Trade and the New Millennium: Defining the Scope of Intellectual Property Protection of Plant Genetic Resources and Traditional Knowledge in India*, 22 *Hast. Int'l & Comp. L. Rev.* 777 (1999).

Neither prong of the southern assault on intellectual property withstands careful scrutiny. There is no way to determine *a priori* whether any particular distribution of benefits from the commercial development of biological resources is “just.” From an evolutionary and ecological perspective, many of the contemporary world’s inequalities stem from differences in initial natural endowments.<sup>102</sup> There is a perverse relationship between absolute levels of biological diversity and contemporary socioeconomic welfare. At a critical phase in human development, certain temperate, relatively nondiverse portions of the northern hemisphere had precisely the combination of plant and animal candidates for domestication that vaulted Eurasia to global domination.<sup>103</sup> Meanwhile, the tropical islands that shelter much of the world’s biodiversity pose formidable physical barriers to human habitation and development.<sup>104</sup> Ironically, it is not biological diversity per se but rather the right combination of factor endowments that dictates the wealth and poverty of nations.<sup>105</sup>

The recent natural history of Hawaii illustrates the tenuous connection between human development and absolute levels of biological diversity. Throughout Polynesia, each island’s fortunes turned not on its native biological diversity, but rather on whether its first human settlers succeeded in transplanting as many as three species of domesticated animals originally from the Eurasian mainland: pigs, dogs, and chickens.<sup>106</sup> The prominence of words for these three animals in the Hawaiian language—*pua’a*, *’ilio*, *moa*—demonstrates the centrality of animal husbandry in Polynesian culture before European contact. Agriculture in contemporary Hawaii relies principally on three exotic crops: coffee (from Anatolia), sugar cane (from southeastern Asia), and pineapple (from Brazil). Notwithstanding the infamous Supreme Court case which invalidated Hawaii’s discriminatory tax scheme favoring *okolehao* (a brandy distilled from the native *ti* plant),<sup>107</sup> the macadamia nut is the only significant contribution from Hawaii’s native botanical bounty to that state’s farm economy. Not surprisingly, an agricultural economy so dependent on non-native crops came to be dominated by large, feudalistic landowners.<sup>108</sup> As lucrative as Hawaiian agriculture and tourism have become, we can only guess how much richer Hawaii would be

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<sup>102</sup>See Jared Diamond, *GUNS, GERMS, AND STEEL: THE FATES OF HUMAN SOCIETIES* 405-25 (1997); Hugo Hassinger, *Geographische Grundlagen der Geschichte* 9 (2d ed. 1953).

<sup>103</sup>See Diamond, *supra* note 102, at 93-103.

<sup>104</sup>See Barbara Crossette, *Small Islands, Big Trouble: Looking for Paradise? Keep Looking*, N.Y. Times, June 11, 2000, §4, at 1.

<sup>105</sup>See Chen, *Epiphytic Economics*, *supra* note 97, at 17.

<sup>106</sup>See Diamond, *supra* note 102, at 60.

<sup>107</sup>See *Bacchus Imports, Ltd. v. Dias*, 468 U.S. 263 (1984).

<sup>108</sup>See *Hawaii Housing Auth. v. Midkiff*, 467 U.S. 229, 232 (1984).

today had neither Polynesians nor Europeans destroyed so much habitat, introduced so many exotics, or killed off so many native species.<sup>109</sup> The youngest of America's fifty states thus answers, at long last, that bitter question of the biodiversity debate, "How did a continent of berries become a global power?"<sup>110</sup>

A broader geographical and historical perspective derails the southern attack on the very idea of intellectual property. What we now call the developing world enjoys no monopoly on communal notions of ownership. Communal practices have prevailed from time to time in the West.<sup>111</sup> As late as 1994, American courts asked seriously whether the widespread practice of copying from scientific journals could sustain a claim of fair use.<sup>112</sup> American scientists, the intellectual force behind the life sciences juggernaut of the developed world, appear far more communal in their approach to the sharing of information than their caricature as corporate lackeys suggests.<sup>113</sup> It is treacherous to rely on essentialist legal distinctions between the developed and developing worlds. Putative distinctions between European and non-European notions of property justified colonial decisions to privilege exclusionary uses over communal ones.<sup>114</sup>

<sup>109</sup>Cf. Shayana Kadidal, Note, *Plants, Poverty and Pharmaceutical Patents*, 103 Yale L.J. 223, 228-30 (1993) (describing the conflict in many developing countries between biodiversity conservation and extractive industries such as agriculture).

<sup>110</sup>Calestous Juma, *The Gene Hunters: Biotechnology and the Scramble for Seeds* 51-52 (1989) (attributing the United States' success to "plant introduction, technical change and institutional reform"); accord Neil D. Hamilton, *Who Owns Dinner: Evolving Legal Mechanisms for Ownership of Plant Genetic Resources*, 28 Tulsa L.J. 587, 607-08 (1993).

<sup>111</sup>See Robert P. Merges, *Property Rights Theory and the Commons: The Case of Scientific Research*, 13 Soc. Philos. & Pol'y 145 (1996); Ejan MacKaay, *L'édition électronique par et pour la communauté scientifique*, 12 Cahiers de Propriété Intellectuelle 159 (1999).

<sup>112</sup>See *American Geophysical Union v. Texaco Inc.*, 60 F.3d 913, 931 (2d Cir. 1994) (rejecting the claim), cert. dismissed, 516 U.S. 1005 (1995); see also *Basic Books, Inc. v. Kinko's Graphics Corp.*, 758 F. Supp. 1522 (S.D.N.Y. 1991) (approving a settlement in a dispute over the photocopying of college textbooks).

<sup>113</sup>See generally Dan L. Burk, *Research Misconduct: Deviance, Due Process, and the Disestablishment of Science*, 3 Geo. Mason Ind. L. Rev. 305 (1995); Rebecca Eisenberg, *Proprietary Rights and the Norms of Science in Biotechnology Research*, 97 Yale L.J. 177 (1987).

<sup>114</sup>See, e.g., *Johnson v. McIntosh*, 21 U.S. (8 Wheat.) 543, 590-91 (1823) (Marshall, C.J.) (distinguishing the colonial society of economically specialized "agriculturalists, merchants and manufacturers" from a native American society of "fierce savages, whose occupation was war, and whose subsistence was drawn chiefly from the forest"); Shiva, *supra* note 96, at 2-5.

## B. Darwin's Dual Dynamic

The Convention on Biological Diversity stands at an impasse. Nearly a decade after the United Nations Convention on Environment and Development met in Rio, commentators still describe bioprospecting either as a savior or as a scourge. I will now enlist metaphors from the natural world in an effort to settle the grudge match between biodiversity and biotechnology.

Two pairs of biological distinctions, between phenotypes and genotypes and between genes and memes, enable us to reconceptualize more fruitfully the conflict between biodiversity and biotechnology. The standard distinction between phenotypes and genotypes clarifies the types of property at stake in disputes over biotechnology. Virtually all of the fury in this debate focuses not on the value of living things as chattels, but rather on their worth as sources of genetic information.

In resorting to the more controversial distinction between genes and memes, I hope to show that the global north and the global south are fighting over common conceptual ground. Both sides seek to confer proprietary status on valuable pieces of information that would display, in the absence of positive law, the attributes of public goods. The conflict, of course, arises from the fact that the two sides seek protection for different things.

### 1. Phenotypes and genotypes

In a Darwinian world, there are two and only two forces that matter. One of them is food. The other is sex.<sup>115</sup> Remarkably, the seed is both. "It is both means of production and, as grain [or fruit], the product."<sup>116</sup> Edible seed—the phenotype—is a mere chattel, but the genetic information embedded in that seed is amenable to some form of proprietary protection.<sup>117</sup> Analyzing the seed as food and as sex therefore holds the key to that crucial task in any question of intellectual property, separating any claim in valuable information from the chattel to which the informational claim attaches.<sup>118</sup>

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<sup>115</sup>Jim Chen, *Law as a Species of Language Acquisition*, 73 Wash. U. L.Q. 1263, 1278 n.99 (1995).

<sup>116</sup>Jack Ralph Kloppenburg Jr., *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000*, at 10 (1988).

<sup>117</sup>See Joseph Straus, *Bargaining Around the TRIPS Agreement: The Case for Ongoing Public-Private Initiatives to Facilitate Worldwide Intellectual Property Transactions*, 9 Duke J. Comp. & Int'l L. 91, 104 (1998).

<sup>118</sup>*Cf.* 17 U.S.C. §109(a) (1994) (enabling the purchaser of a particular copy or phonorecord of a copyrightable work to dispose of that copy or phonorecord); *id.* § 202 (providing that the sale of a particular copy or phonorecord does not of itself transfer the copyright in the work); *Forward v. Thorogood*, 985 F.2d 604 (1st Cir. 1993).

Consider the Flavr Savr™ tomato, the first transgenically modified organism approved for human consumption by the United States Food and Drug Administration.<sup>119</sup> Calgene, Inc., “introduced into tomatoes” a gene “that produces, as messenger ribonucleic acid (mRNA), an antisense copy of the polygalacturonase gene,” which in turn “suppresses the production of an enzyme...that is associated with the breakdown of pectin, a constituent of the cell wall in tomato fruit.”<sup>120</sup> In plain English, Calgene cleverly tricked the tomato into abandoning its original genetic instructions as a delivery vehicle for seeds in favor of new commands better suited to long-term storage. In the tomato’s natural state, failure to decompose is lethal to reproductive success. That same trait, however, enhanced the Flavr Savr’s value to tomato-consuming humans.

In their dual capacities as chattels and as carriers of chemical and genetic information, however, organisms exhibit starkly contrasting economic characteristics. A harvested organism can provide useful information either as a chemical blueprint or as a source of genes and traits for further manipulation through conventional breeding or transgenic engineering.<sup>121</sup> In other words, living things transmit information through either the proteins they manufacture or the nucleic acids they carry. Unlike chattels, both types of information are public goods in that a single use does not preclude independent use by a different party.<sup>122</sup> In other words, proteins and genes are nonrival, nonexclusive goods. This is the dynamic at the heart of the southern complaint: A single sample, either of a rare rainforest plant or of tribal lore, can be transformed by a northern life sciences company into a lucrative

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<sup>119</sup>See Calgene, Inc.: Request for Advisory Opinion, 57 Fed. Reg. 22772 (May 29, 1992); Statement of Policy: Foods Derived From New Plant Varieties, 57 Fed. Reg. 22984 (May 29, 1992). See generally Judith E. Beach, *No “Killer Tomatoes”*: Easing Federal Regulation of Genetically Engineered Plants, 53 Food & Drug L.J. 181 (1998).

<sup>120</sup>Calgene, 57 Fed. Reg. at 22772.

<sup>121</sup>See Sedjo, *supra* note 60, at 201.

<sup>122</sup>See Christopher D. Stone, *What to Do About Biodiversity: Property Rights, Public Goods, and the Earth’s Biological Riches*, 68 S. Cal. L. Rev. 577, 597 (1995); cf. *Graham v. John Deere Co.*, 383 U.S. 1, 9 n.2 (1965) (quoting Thomas Jefferson: “He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me.”); Dan L. Burk, *Protection of Trade Secrets in Outer Space Activity: A Study in Federal Preemption*, 23 Seton Hall L. Rev. 560, 584-85 (1993) (arguing that “intellectual goods appear to resemble public goods, such as national defense,” because such goods “often do not encompass natural physical barriers that exclude potential consumers,” “may be held by more than one person at a time,” can be distributed at “minimal or nonexistent” cost, and once disclosed face “no real barriers to free appropriation”). See generally Robert P. Benko, *Protecting Intellectual Property Rights* 16-17 (1987).

drug or plant variety, and the physical means ordinarily used to confine chattels cannot stop the outward flow of information and wealth.

## 2. *Genes and memes*

Therein lies a second, more important distinction. The southern “package” at issue in many commercial applications of biodiversity actually consists of two distinct components: the chemical and genetic information encoded in a biological specimen, plus ethnobiological knowledge regarding that species. Claims of biopiracy often focus on the sociological component to the exclusion of the biological, or else treat the two components as if they were inseparable.<sup>123</sup> But genetic information is readily distinguished from communal knowledge of plants and animals.

The crucial distinction is the one that separates genes from memes. A “meme” is “a unit of cultural transmission,” such as “tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches.”<sup>124</sup> The sociological equivalent of a gene, the meme as “a new kind of replicator...is [already] achieving evolutionary change at a rate that leaves the old gene panting far behind.”<sup>125</sup> Every ethnobiological tale is a meme, easily severed from the chemical and genetic information that inspired it. For purposes of economic exploitation and legal protection, gene and meme deserve separate consideration.

Intellectual property can be transformed to protect traditional as well as “scientific” knowledge,<sup>126</sup> perhaps by treating traditional knowledge as trade secrets.<sup>127</sup> If we are willing to sacrifice some theoretical precision, we can achieve “principled consistency” in the treatment of the northern and southern contributions to biotechnology by resorting to “principles operating

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<sup>123</sup>See, e.g., Winona LaDuke, *Traditional Ecological Knowledge and Environmental Futures*, 5 Colo. J. Int'l Env'tl. L. & Pol'y 127 (1994); June Starr & Kenneth C. Hardy, Note, *Not by Seeds Alone: The Biodiversity Treaty and the Role for Native Agriculture*, 12 Stan. Env'tl. L.J. 85 (1993); Lester I. Yano, Comment, *Protection of the Ethnobiological Knowledge of Indigenous Peoples*, 41 UCLA L. Rev. 443 (1993).

<sup>124</sup>Richard Dawkins, *The Selfish Gene* 192 (new ed. 1989).

<sup>125</sup>*Id.*

<sup>126</sup>See Intellectual Property Rights for Indigenous Peoples: A Source Book (Tom Greaves ed., 1994); Darrell A. Posey & Graham Dutfield, *Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities* (1996); David R. Downes, *How Intellectual Property Could Be a Tool to Protect Traditional Knowledge*, 25 Colum. J. Env'tl. L. 253 (2000).

<sup>127</sup>See Gelvina Rodriguez Stevenson, Note, *Trade Secrets: The Secret to Protecting Indigenous Ethnobiological (Medicinal) Knowledge*, 32 N.Y.U. J. Int'l L. & Pol. 1119 (2000).

at a low or intermediate level of abstraction.”<sup>128</sup> A good starting point is the constitutional requirement in the United States that just compensation be granted for the abrogation of trade secrets.<sup>129</sup> To extend the constitutional analogy, we need only observe that proteins, genes, and memes as public goods are systematically undervalued.<sup>130</sup> Public law typically responds to the undervaluing of information by granting special constitutional protection.<sup>131</sup> The Convention on Biological Diversity, writ large, establishes a comparable sort of fundamental legal support on the international level for undervalued ethnobiological knowledge. If indeed the ethnobiological lore of indigenous peoples and other forms of traditional knowledge can be reconceptualized as suitable subjects of intellectual property, the south's complaint is simply that international law has failed so far to secure adequate protection for its most valuable memes.<sup>132</sup>

The only barrier is a feeble imagination. Economically speaking, all that matters is that traditional knowledge lacks “common currency in the intellectual life of the” outside world where such knowledge would attain proprietary status.<sup>133</sup> The traditional definition of trade secrets easily embraces ethnobiological knowledge:

[A] trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of

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<sup>128</sup>Cass R. Sunstein, *On Analogical Reasoning*, 106 Harv. L. Rev. 741, 746 (1993).

<sup>129</sup>See *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986, 14 ELR 20539 (1984); see also Susan Rose-Ackerman & Jim Rossi, *Disentangling Deregulatory Takings*, 86 Va. L. Rev. 1435, 1469 (2000) (identifying structural and economic similarities “between American takings law” and the “much larger problem of the political risk of investing in emerging markets”).

<sup>130</sup>See *supra* text accompanying notes 121-122.

<sup>131</sup>See Daniel A. Farber, *Free Speech Without Romance: Public Choice and the First Amendment*, 105 Harv. L. Rev. 554, 555 (1991).

<sup>132</sup>See, e.g., United Nations Commission on Human Rights, *Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples*, U.N. Doc. E/CN.4/Sub.2/AC.4/1993/CRP.5.

<sup>133</sup>Justin Hughes, *The Philosophy of Intellectual Property*, 77 Geo. L.J. 287, 294 (1988); accord Karen W. Baer, *A Theory of Intellectual Property and the Biodiversity Treaty*, 21 Syracuse J. Int'l L. & Com. 259, 261 (1995).

manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers.<sup>134</sup>

This requirement of secrecy need not meet the test of “novelty” under patent law or TRIPS.<sup>135</sup> When the recipient of knowledge enjoys a licensing arrangement or some other business relationship with its originator, the law readily imposes a duty to respect its confidentiality.<sup>136</sup> “The protections of...trade secret law are most effective at the developmental stage, before a product has been marketed....”<sup>137</sup> “A trade secret law, however, does not offer protection against discovery by fair and honest means, such as by independent invention, accidental disclosure, or by so-called reverse engineering, that is by starting with the known product and working backward to divine the process which aided in its development or manufacture.”<sup>138</sup>

One final note of caution is in order. Like every other “living thing,” the meme is a selfish “imperialist, seeking to transform as much of its environment as it can into itself and its seed.”<sup>139</sup> Some ethnobiological memes may conflict with competing values expressed through environmental law. Asian folk medicine drives global demand for rhinoceros horns and black bear claws.<sup>140</sup> On opposite sides of the Pacific, Japanese appetites<sup>141</sup> and Makah rituals<sup>142</sup> clash with the International Convention on Whaling.<sup>143</sup>

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<sup>134</sup>Restatement of Torts §757, comment b (1939); accord, e.g., *Monsanto*, 467 U.S. at 1002, 14 ELR at 20542-43; *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 474-75 (1974).

<sup>135</sup>See *W.R. Grace & Co. v. Hargadine*, 392 F.2d 9, 14 (6th Cir. 1968). On the availability of trade secret protection even where patent protection would fail, see *Aronson v. Quick Point Pencil Co.*, 440 U.S. 257 (1979).

<sup>136</sup>See, e.g., *Kewanee Oil*, 416 U.S. at 475 & n.4; *Lear, Inc. v. Adkins*, 395 U.S. 653 (1969).

<sup>137</sup>*Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 161 (1989).

<sup>138</sup>*Kewanee Oil*, 416 U.S. at 476.

<sup>139</sup>Bertrand Russell, *An Outline of Philosophy* 30 (1974).

<sup>140</sup>See, e.g., William Carroll Muffett, *Regulating the Trade in Bear Parts for Use in Asian Traditional Medicine*, 80 Minn. L. Rev. 1283 (1996).

<sup>141</sup>See *Japan Whaling Ass'n v. American Cetacean Soc'y*, 478 U.S. 221 (1986) (interpreting the International Whaling Convention); Kazuo Sumi, *The Whale War Between Japan and the United States: Problems and Prospects*, 17 *Denv. J. Int'l L. & Pol'y* 317 (1989).

<sup>142</sup>See *North Pacific Eastern Stock of Gray Whales*, 48 Rep. Int'l Whaling Comm'n 28 (1997) (applying the whaling convention's exemption for “traditional uses of whale product by local aboriginal, indigenous or native communities in meeting their nutritional, subsistence and cultural requirements”); *United States v. Washington*, 730 F.2d 1314, 15 ELR 20266 (9th Cir. 1984); Alma Soongi Beck, *The Makahs' Decision to Reinstate Whaling: When Conservationists Clash with Native Americans over an Ancient Hunting Tradition*, 11 *J. Envtl. L. & Litig.* 359

More generally, the “[s]mall-scale communities” celebrated in the standard protest against globalization “are seldom as humane and ecologically sound” as their advocates “portray them to be.”<sup>144</sup> “Small firms...are responsible for a massively disproportionate share of water and air pollution.”<sup>145</sup> Agriculture, perhaps the most decentralized industry in the world,<sup>146</sup> is especially suspect: “One would be hard pressed to identify another industry with as poor an environmental record and as light a regulatory burden.”<sup>147</sup> Lest the perceived hegemony of the north lend undue currency to the romantic myth of the “noble savage,”<sup>148</sup> we should remember “that the propensity to destroy the environment flourishes in any cultural setting.”<sup>149</sup>

In industrialized societies, the law has comfortably assimilated the achievements and shaped the attitudes of life scientists. Nations such as the United States routinely confer patents, plant variety certificates, and other intellectual property rights for biological innovations. With equal vigor, however, western nations also subject those scientists to rigorous regulatory schemes in order to preserve the environment and to prevent ethical abuses. Nature over nurture, leisure over labor: environmental imperatives should prevail in cases of irreconcilable conflict over cultural claims and in all

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(1996); Leesteffy Jenkins & Cara Romanzo, *Makah Whaling: Aboriginal Subsistence or a Stepping Stone to Undermining the Commercial Whaling Moratorium?*, 9 Colo. J. Env'tl. L. & Pol'y 71 (1998).

<sup>143</sup>International Convention for the Regulation of Whaling with Schedule of Whaling Regulations, *adopted* Dec. 2, 1946, 62 Stat. 1716, T.I.A.S. No. 1849, 161 U.N.T.S. 361 (1948).

<sup>144</sup>Martin W. Lewis, GREEN DELUSIONS: AN ENVIRONMENTALIST CRITIQUE OF RADICAL ENVIRONMENTALISM 91 (1992).

<sup>145</sup>Richard J. Pierce, Jr., *Small Is Not Beautiful: The Case Against Special Regulatory Treatment of Small Firms*, 50 Admin. L. Rev. 537, 559 (1998); see also Linda K. Lee, *The Impact of Landownership Factors on Soil Conservation*, 62 Am. J. Agric. Econ. 1070, 1073 (1980) (observing that larger nonfamily corporate farms outperform family-owned farms in soil conservation and erosion control); Luther Tweeten, *The Economics of Small Farms*, 219 Science 1037, 1038 (1983) (same).

<sup>146</sup>See Nancy L. Johnson & Vernon W. Ruttan, *Why Are Farms So Small?*, 22 World Dev. 691 (1994).

<sup>147</sup>J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 Ecology L.Q. 263, 269 (2000); J.B. Ruhl, *The Environmental Law of Farms: 30 Years of Making a Mole Hill Out of a Mountain*, 31 ELR 10203 (Feb. 2001).

<sup>148</sup>See, e.g., Jean-Jacques Rousseau, DISCOURSE ON THE ORIGIN OF INEQUALITY (Franklin Philip trans. & Patrick Coleman ed., 1994).

<sup>149</sup>Chen, *supra* note 6, at 184.

events over full employment.<sup>150</sup> Ethnobiological knowledge has likewise come of age. Treating ethnobiological knowledge as a full-fledged form of intellectual property should represent merely the first step toward the complete integration of human traditions into international law.

### C. “Pharms” and Farmers

So it appears that potential property interests abound whenever biodiversity is exploited for commercial gain. In order to resolve the conflicting claims of the north and the south, let us consider two hypothetical controversies, one “pharmaceutical” in flavor and the other “agricultural.”

Let us turn first to the “pharm.” Imagine a wonder plant teeming with extraordinary chemical properties. The local population and professional botanists agree that it deserves the title of “village pharmacy.” The developing country where this wonder plant is native supplies both the genetic material and the ethnobiological knowledge that an American life sciences company uses to develop pesticides, antiseptics, even contraceptives. Not only does the American company fail to compensate the donor country; it also asserts patent rights in products developed from that wonder plant and traditional knowledge of its uses. In other words, it collects a patent-based premium from the very villagers who helped harvest the company’s first samples of the wonder plant and who advised the company on the plant’s biological properties.

This is a paradigmatic case of biopiracy. The real story of W.R. Grace’s encounter with India’s neem tree reflects some elements of this hypothetical.<sup>151</sup> Almost as notorious is the story of Eli Lilly & Co.’s derivation of vinblastine and vincristine, two cancer-fighting alkaloids, from rosy periwinkles found in Madagascar.<sup>152</sup> In real life, though, Grace has no patent on

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<sup>150</sup>See Chen, *supra* note 6, at 214-18; Chen, *Epiphytic Economics*, *supra* note 97, at 2-4. *But cf.* Mark Kelman, *Could Lawyers Stop Recessions? Speculations on Law and Macroeconomics*, 45 *Stan. L. Rev.* 1215, 1224-25 (1993) (describing unemployment as “the economic problem” for social progressives (emphasis in original)).

<sup>151</sup>See generally National Research Council, *Neem: A Tree for Solving Global Problems* (1992); Shayana Kadilal, *Subject-Matter Imperialism? Biodiversity, Foreign Prior Art and the Neem Plant Controversy*, 37 *IDEA: J.L. & Tech.* 371 (1997); Emily Marden, *The Neem Tree Patent: International Conflict over the Commodification of Life*, 22 *B.C. Int’l & Comp. L. Rev.* 279 (1999); Charles R. McManis, *The Interface Between International Intellectual Property and Environmental Protection: Biodiversity and Biotechnology*, 76 *Wash. U. L.Q.* 255, 257-59 (1998).

<sup>152</sup>See, e.g., Richard Stone, *The Biodiversity Treaty: Pandora’s Box or Fair Deal?*, 256 *Science* 1624 (1992); Christopher J. Hunter, Comment, *Sustainable Bioprospecting: Using Private Contracts and International Legal Principles and*

neem-derived products in India, and it is “not clear that the Grace patent,” granted under American law, “will have any [negative] economic or social effect in India.”<sup>153</sup> Madagascar has an even weaker claim of unjust treatment. Since the periwinkle grows not merely in Madagascar but throughout the tropics, and since Eli Lilly was acting on traditional knowledge from Jamaica and the Phillipines, it is almost impossible to determine what, if anything, the pharmaceutical company owes Madagascar.<sup>154</sup>

Now the farm. Contrast the stories of the neem tree and the rosy periwinkle with a more explicitly agricultural hypothetical. A commercial plant breeder in the United States develops a pest-resistant variety of soybeans. Rather remarkably, and perhaps somewhat counterfactually, the breeder eschews transgenic modification in favor of conventional techniques such as cross-breeding and chemical mutagenesis. In developing the new variety, the company draws on older public varieties, available free of charge from the nearest land grant university,<sup>155</sup> and on previously registered proprietary varieties. After combining the collective wisdom of America’s publicly supported agricultural universities with its own research, the company markets protected seed in the United States and abroad. True to traditional agricultural practice, however, farmers in the developing world save seeds for future planting and even engage in “brown-bag” sales to other farmers, all without compensation to the commercial breeder.

This latter story is rarely if ever discussed in connection with the “biodiversity versus biotechnology” debate. Its legal roots, however, predate the Rio convention by nearly a decade. In 1983 the Food and Agriculture Organization of the United Nations (FAO) adopted a resolution called the International Undertaking on Plant Genetic Resources.<sup>156</sup> In order “to ensure that plant genetic resources of economic and/or social interest, particularly for agriculture, will be explored, preserved, evaluated and made available for plant breeding and for scientific purposes,” the Undertaking invoked the “universally accepted principle that plant genetic resources are a heritage of mankind and consequently should be available without restriction.”<sup>157</sup> Furthermore, the Undertaking proclaimed that plant genetic resources should be available “free of charge, on the basis of mutual exchange or on

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*Policies to Conserve Raw Medical Materials*, 25 B.C. Envtl. Aff. L. Rev. 129, 130 (1999).

<sup>153</sup>Marden, *supra* note 151, at 285.

<sup>154</sup>See Goldman, *supra* note 48, at 717.

<sup>155</sup>See 7 U.S.C. §304 (2000) (donating land in each state for “the endowment, support, and maintenance of at least one college where the leading object shall be...to teach such branches of learning as are related to agriculture and the mechanic arts”).

<sup>156</sup>Report of the Conference of FAO, Rome, 22d Sess., U.N. Doc. C/83/REP.

<sup>157</sup>*Id.* ¶ 285, art. 1.

mutually agreed terms.”<sup>158</sup> The Undertaking simultaneously negated not only plant breeders’ intellectual property rights but also farmers’ rights—namely, the traditional agricultural practices of saving seed for future planting, for resale to neighboring farmers, and perhaps even for development of other new varieties through conventional cross-breeding.

Crippled by the bitter division between north and south and by its own failure to clarify the common heritage principle,<sup>159</sup> the FAO eventually tried to address some of the concerns raised by skeptical northern nations. In a 1989 “interpretation” of the 1983 Undertaking, the FAO declared that “[p]lant breeders’ rights as provided for under UPOV are not incompatible with the International Undertaking.”<sup>160</sup> It also acknowledged that “the term ‘free access’ does not mean free of charge.”<sup>161</sup> At the same time, the 1989 interpretation endorsed the “concept of farmers’ rights,” acknowledging “that farmers of all regions have made” an “enormous contribution...to the conservation and development of plant genetic resources, which constitute the basis of plant production throughout the world.”<sup>162</sup>

Before Rio, farmers’ rights were regarded as a basis for redirecting some profits from biotechnological inventions toward farmers in “Vavilov centres,” or “original centers of plant genetic material.”<sup>163</sup> As we shall see, the Convention on Biological Diversity expressly repudiates the “heritage of mankind” approach that animated the original FAO Undertaking.<sup>164</sup> By declining to treat the genetic world as a global commons, the Biodiversity Convention affirmatively strengthens the idea of farmers’ rights, the ultimate legacy of the Undertaking after its reinterpretation in 1989. At least one commentator has urged the recognition of farmers’ rights under U.S. patent law<sup>165</sup> by analogy to the “crop exemption” in §113 of the Plant Variety Protection Act of 1970,<sup>166</sup> which in turn is based on and implements an optional exemption under UPOV.<sup>167</sup>

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<sup>158</sup>*Id.* ¶ 285, art. 5.

<sup>159</sup>See generally Harold J. Bordwin, *The Legal and Political Implications of the International Undertaking on Plant Genetic Resources*, 12 *Ecology L.Q.* 1053, 1062-69 (1985).

<sup>160</sup>See Interpretation of the International Undertaking on Plant Genetic Resources, U.N. Doc. C89/24 (Nov. 11-30, 1989).

<sup>161</sup>*Id.*

<sup>162</sup>*Id.*

<sup>163</sup>David Gooden, *Induced Institutional Innovation: Plant Variety Rights, Patents and Genetic Engineering* 19 *Oxford Agrarian Stud.* 3, 8 (1991).

<sup>164</sup>See *infra* note 187 and accompanying text.

<sup>165</sup>See Robert P. Merges, *Intellectual Property in Higher Life Forms: The Patent System and Controversial Technologies*, 47 *Md. L. Rev.* 1051, 1068-73 (1988).

<sup>166</sup>U.S.C. §2543 (2000).

<sup>167</sup>See UPOV, *supra* note 25, art. 15(2); *infra* text accompanying note 235.

Whatever its fate as positive law, the Undertaking serves an indispensable jurisprudential function. Its emphasis on farmers' rights reminds us that agriculture is also a life science and that prosperity in farming often depends on the very practices that southern critics ascribe to northern biotechnology companies. "Copying"—often a deviant and difficult deed for would-be infringers of intellectual property in many other industries—is the very essence of agriculture. Whether cultivating plants or raising animals, farmers specialize in plying reproductive techniques and technology. Whoever wields the plow and the scythe controls thereby the power to create and the power to kill.<sup>168</sup> Although the stakes are smaller and the relative economic strengths of the players are reversed, the brown-bagging farmer takes a free ride on the intellectual contributions of American land grant universities and plant breeders, just as First World biopirates have expropriated the ethnobiological traditions of the developing world. After sufficient iterations of this game, it becomes impossible to tell where the creative process begins and ends, to distinguish inventor from infringer. When innovative acts follow each other as if they were so many pancakes in a stack, there is no coherent way to identify one side as the "inventive" one.<sup>169</sup>

In other words, the global south cannot decry "biopiracy" and proclaim "farmers' rights" in the same breath. Both practices exploit the reproductive capacity of organisms in order to expropriate ideas developed by others. The only difference is the magnitude of the pecuniary stakes. Indeed, even the contrast between "pharm" and "farm" evaporates upon closer inspection. Pharmaceutical products are almost as susceptible as seeds to unauthorized duplication. Drugs tend to be durable, subject to intense demand, relatively inexpensive, easily transportable, and readily imitated at a minute fraction of the original research and production costs.<sup>170</sup>

No one in this debate honestly wishes to abandon intellectual property as a legal construct. The real issue is how we should conceptualize property interests during the commercial development of biological treasures. Generally speaking, property responds to scarcity, which in turn stems from competing uses for a single object.<sup>171</sup> Scarcity in this context is twofold.

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<sup>168</sup>See, e.g., Joseph Campbell, *The Masks of God: Primitive Mythology* 177 (1959); Leopold, *supra* note 35, at 214-20. On the critical use of the creation metaphor in agricultural law, see Jim Chen, *Of Agriculture's First Disobedience and Its Fruit*, 48 Vand. L. Rev. 1261 (1995).

<sup>169</sup>See Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 Tex. L. Rev. 989, 997 (1997).

<sup>170</sup>See Otto A. Stamm, *GATT Negotiations for the Protection of New Technologies*, 73 J. Pat. & Trademark Off. Soc'y 680, 685 (1991).

<sup>171</sup>See Harold Demsetz, *Towards a Theory of Property Rights*, 57 Am. Econ. Rev. 347 (1967); cf. Carol M. Rose, *The Several Futures of Property: Of Cyberspace and Folk Tales, Emission Trades and Ecosystems*, 83 Minn. L. Rev. 129, 134

First, the global stake in biodiversity often conflicts with local subsistence, which requires immediate and often nonsustainable consumption of resources. Second, because the genes and the ethnobiological lore at issue have the characteristics of public goods, any value in them is effectively extinguished upon first use. Although outsiders usually place a higher value on their uses and non-uses of biodiversity, efforts to compensate source countries and peoples can be frustrated by the ease with which the value of biodiversity can be dissipated.

#### IV. A TOUR OF THREE TREATIES

Reconciling intellectual property with biodiversity conservation is no easy task. Schemes for protecting genetic information and ethnobiological knowledge fall in a shadowy zone between established “paradigms” of intellectual property.<sup>172</sup> Under copyright law, one of these intellectual property paradigms, the fair use doctrine enables the law to resolve conflicts sparked by clashes between new technology and the proprietary rights of incumbents.<sup>173</sup> TRIPS comes closer to the patent model, especially insofar as both schemes lack a fair use provision.<sup>174</sup> For its part, the 1991 revision of UPOV moved the original 1961 treaty’s copyright-like approach to “a modified patent model.”<sup>175</sup> Finally but not insignificantly, in an international arena where agrarianism is arguably the most destructive of motivating political philosophies,<sup>176</sup> rationality and intellectual honesty vary inversely

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(1998) (“Even crows dispense with their normal territoriality when food is plentiful”).

<sup>172</sup>See generally J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 Colum. L. Rev. 2432 (1994); J.H. Reichman, *Charting the Collapse of the Patent-Copyright Dichotomy: Premises for a Restructured International Intellectual Property System*, 13 Cardozo Arts & Ent. L.J. 475 (1995).

<sup>173</sup>See, e.g., Adrienne J. Marsh, *Fair Use and New Technology: The Appropriate Standards to Apply*, 5 Cardozo L. Rev. 635, 635-36 (1984) (“Successful resolution of the...tension between products of...new technologies and copyright law will depend largely on the doctrine of fair use.”); cf. Fred H. Cate, *The Technological Transformation of Copyright Law*, 81 Iowa L. Rev. 1395 (1996) (urging a restoration of copyright law to the subject matter it covered before information came to dominate the economy).

<sup>174</sup>See Okediji, *supra* note 91, at 159 & n.175; J.H. Reichman, *Universal Minimum Standards of Intellectual Property Protection Under the TRIPS Component of the WTO Agreement*, 29 Int’l Law. 345 (1995).

<sup>175</sup>Reichman, *supra* note 174, at 359; see also J. Benjamin Bai, Comment, *Protecting Plant Varieties Under TRIPS and NAFTA: Should Utility Patents Be Available for Plants?*, 32 Tex. Int’l L.J. 139, 144 (1997).

<sup>176</sup>See Chen, *Epiphytic Economics*, *supra* note 97, at 23-25.

with the popularity of the agrarian adage that one should not reap where another has sown.<sup>177</sup>

A look at the three principal sources of international law governing the commercialization of biodiversity, however, exposes the shaky legal basis for the supposed clash between biodiversity and biotechnology. Commentators routinely assume that the Convention on Biological Diversity favors the developing world, while TRIPS and UPOV safeguard the interests of the richer nations that participate in those accords.<sup>178</sup> All too often, the positions of the south and of the north are reduced to caricatures of themselves: opposition to biopiracy versus fear of involuntary technology transfer. Yet the texts of the three relevant sources of international law contradict their supposed patrons' interests. Neither TRIPS or UPOV countenances biopiracy, but the Biodiversity Convention shelters some of history's greatest biological heists from legal scrutiny. Likewise, compulsory licensing is not a creature of the Convention, but rather TRIPS and UPOV as the twin charters of intellectual property in living things. The confiscatory strains feared by the technology-rich north come not from Rio but Marrakesh.

### A. Convention on Biological Diversity

The Convention on Biological Diversity proclaims as its objectives "the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources."<sup>179</sup> Article 3 of the Convention grants states "the sovereign right to exploit their own resources pursuant to their own environmental policies," subject to "the responsibility to ensure that activities

<sup>177</sup>See *International News Serv. v. Associated Press*, 248 U.S. 215, 239-40 (1918); Wendy J. Gordon, *On Owning Information: Intellectual Property and the Restitutory Impulse*, 78 Va. L. Rev. 149, 166-96 (1992) (discussing variations on the basic "reap/sow" model of intellectual property).

<sup>178</sup>See, e.g., Scott Holwick, *Developing Nations and the Agreement on Trade-Related Aspects of Intellectual Property Rights*, 1999 Colo. J. Int'l Envtl. L. & Pol'y 49 (2000); A. Samuel Oddi, *TRIPS—Natural Rights and a "Polite Form of Economic Imperialism,"* 29 Vand. J. Transnat'l L. 415, 455 (1996) ("The big winners under TRIPS would clearly be those enterprises...[operating] in developed countries that create inventions and are heavily engaged in international trade."); Mark Ritchie *et al.*, *Intellectual Property Rights and Biodiversity: The Industrialization of Natural Resources and Traditional Knowledge*, 11 St. John's J. Legal Comment. 431 (1996); Valentina Tejera, Note, *TRIPping over Property Rights: Is It Possible to Reconcile the Convention on Biological Diversity with Article 27 of the TRIPS Agreement?*, 33 New Eng. L. Rev. 967 (1999). See generally Carlos Alberto Primo Braga, *The Economics of Intellectual Property Rights and the GATT: A View From the South*, 22 Vand. J. Transnat'l L. 243, 253 (1989).

<sup>179</sup>CBD, *supra* note 8, art. 1.

within their jurisdiction or control do not cause damage to the environment...beyond the limits of national jurisdiction.”<sup>180</sup> In theory a nation could deny all foreigners access to its genetic resources, but the fear that extinctions will outpace the recovery efforts of poorly trained, equipped, and financed domestic biologists deters all except the most doggedly autarkic of governments from excluding foreign bioprospectors.<sup>181</sup> Article 8(j) exhorts all contracting parties to “respect...indigenous knowledge” and to “encourage...equitable sharing” of the benefits derived from biological resources.<sup>182</sup> Appropriately enough for a provision benefiting the frailest of place-based human communities,<sup>183</sup> the charge to respect the rights of indigenous peoples issues appears amid a list of obligations to advance *in situ* conservation.

By far the most controversial provisions of the Biodiversity Convention, articles 15 and 16 modulate the flow of genetic resources and biotechnology. Consistent with article 3’s guarantee of natural sovereignty over natural resources in general, article 15 commits to national governments “the authority to determine access to genetic resources” and subjects such access “to national legislation.”<sup>184</sup> Access to genetic resources may occur only on “mutually agreed terms”<sup>185</sup> and with the “prior informed consent” of the source nation.<sup>186</sup> These conditions “unequivocally abolish[]” the “heritage of mankind” approach of the FAO Undertaking.<sup>187</sup>

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<sup>180</sup>*Id.* art. 3; accord Rio Declaration, *supra* note 99, at 876 (principle 2).

<sup>181</sup>See Vandana Date, *Global “Development” and Its Environmental Ramifications —The Interlinking of Ecologically Sustainable Development and Intellectual Property Rights*, 27 Golden Gate U.L. Rev. 631, 636-37 (1997).

<sup>182</sup>CBD, *supra* note 8, art. 8(j).

<sup>183</sup>See generally Daniel Kemmis, *Community at the Politics of Place* 109-42 (1990) (articulating a “place-based” approach to environmental regulation); Eric T. Freyfogle, *The Particulars of Owning*, 25 Ecology L.Q. 574 (1999) (same); Bryan G. Norton & Bruce Hannon, *Environmental Values: A Place-Based Approach*, 19 *Envtl. Ethics* 227, 244-45 (1997) (same).

<sup>184</sup>CBD, *supra* note 8, art. 15(1).

<sup>185</sup>*Id.* art. 15(4).

<sup>186</sup>*Id.* art. 15(5).

<sup>187</sup>John R. Adair, *The Bioprospecting Question: Should the United States Charge Biotechnology Companies for the Commercial Use of Public Wild Genetic Resources?*, 24 Ecology L.Q. 131, 145 (1997). On the common heritage principle in international law, see generally Kemal Baslar, *The Concept of the Common Heritage of Mankind in International Law* 9, 307 (1998); Achim Lerch, *Verfügungsrechte und Biologische Vielfalt* 91 (1996); Edgar J. Asebey & Jill D. Kempenaar, *Biodiversity Prospecting: Fulfilling the Mandate of the Biodiversity Convention*, 28 *Vand. J. Transnat’l L.* 703, 708-09 (1995) (“Today, source countries reject the common heritage framework.”); David R. Downes, *New Diplomacy for the Biodiversity Trade: Biodiversity, Biotechnology and Intellectual*

Article 16 is the Convention's hotly controversial technology transfer provision. It is worth quoting at length:

Each Contracting Party, recognizing that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article to provide *and/or* facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biodiversity or make use of genetic resources and do not cause significant damage to the environment.<sup>188</sup>

This paragraph boasts two striking characteristics. First, it binds all contracting parties. Unlike other provisions of the Convention on Biological Diversity, article 16 draws no distinctions among developed nations, developing nations, and "countries undergoing the process of transition to a market economy."<sup>189</sup> Second, the operative verbs concerning "access for and transfer to...technologies" are joined by the disjunctive "and/or," and one of those verbs is "facilitate." Almost all observers conclude that this language renders voluntary any obligation under article 16 to transfer technology.<sup>190</sup>

What this opening paragraph merely suggests, the rest of article 16 confirms. Article 16(2) explicitly provides that "access and transfer" of "technology subject to patents and other intellectual property rights...shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights."<sup>191</sup> At no point does article 16 speak coercively. "Threat of loss, not hope of gain, is the essence of...coercion."<sup>192</sup> Like the rest of the Convention, article 16 presumes that

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*Property in the Convention on Biological Diversity*, 4 *Touro J. Transnat'l L.* 1, 6 (1993).

<sup>188</sup>CBD, *supra* note 8, art. 16(1) (emphasis added); *see also id.* art. 2 (clarifying that "Technology" includes biotechnology").

<sup>189</sup>*Id.* art. 20(2) (outlining distinct financial obligations for contracting parties in each of these three classifications among nations).

<sup>190</sup>*See* Michael D. Coughlin, *Using the Merck-INBio Agreement to Clarify the Convention on Biological Diversity*, 31 *Colum. J. Transnat'l L.* 337, 361 (1993); Cheryl D. Hardy, Comment, *Patent Protection and Raw Materials: The Convention on Biological Diversity and Its Implications for U.S. Policy on the Development and Commercialization of Biotechnology*, 15 *U. Pa. J. Int'l Bus. L.* 299, 320-22 (1994).

<sup>191</sup>CBD, *supra* note 8, art. 16(2).

<sup>192</sup>*United States v. Butler*, 297 U.S. 1, 81 (1937) (Stone, J., dissenting).

both the genome-rich south and the capital-rich north can gain through cooperative efforts to develop natural resources. At most article 16 encourages contracting parties to take “appropriate” measures to ensure that countries contributing genetic material, “in particular those that are developing countries...are provided access to and transfer of [proprietary] technology...on mutually agreed terms.”<sup>193</sup> In “recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention,” article 16 merely exhorts contracting parties “to ensure that such rights are supportive of and do not run counter to its objectives.”<sup>194</sup>

Read in its entirety, article 16 echoes but does not extend article 1’s more succinct description of the Convention’s objectives. The Convention does contemplate “appropriate access to genetic resources and...appropriate transfer of relevant technologies,” but only to the extent that access and transfer “tak[e] into account all rights over [the] resources and to [the] technologies” in question.<sup>195</sup> Thanks to article 22’s promise to protect the contracting parties’ “rights and obligations...deriving from any existing international agreement,” developed countries would presumably retain all of their rights under TRIPS and UPOV, “except where the exercise of those [intellectual property] rights and obligations would cause a serious damage or threat to biological diversity.”<sup>196</sup>

Beyond access to genetic materials and technology transfer, the Convention contemplates a third mechanism for sustainable development of biological resources: “appropriate funding.”<sup>197</sup> Articles 19 through 21 put this aspiration into effect. Article 19 encourages all contracting parties to facilitate “effective participation” by gene donor countries “in biotechnological research.”<sup>198</sup> It also requires “all practicable measures to promote and advance priority access on a fair and equitable basis...to the results and benefits arising from biotechnologies based upon genetic resources” garnered through bioprospecting—once again on “mutually agreed terms.”<sup>199</sup>

More pointedly, article 20 declares that “[e]ach contracting party undertakes to provide, in accordance with its capabilities, financial support and incentives” toward fulfillment of the Convention.<sup>200</sup> This article also imposes a specific obligation on “developed country Parties...[to] provide

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<sup>193</sup>CBD, *supra* note 8, art. 16(3).

<sup>194</sup>*Id.* art. 16(5).

<sup>195</sup>*Id.* art. 1.

<sup>196</sup>*Id.* art. 22(1).

<sup>197</sup>*Id.*

<sup>198</sup>*Id.* art. 19(1) (offsetting mandatory language—“shall”—with the qualifier, “as appropriate”).

<sup>199</sup>*Id.* art. 19(2).

<sup>200</sup>*Id.* art. 20(1).

new and additional financial resources to enable developing country Parties to meet" those countries' "full incremental costs" of compliance with the Convention.<sup>201</sup> Contributions under this article, presumably beyond the "economically and socially sound measures" that developed country signatories to the Convention are to offer "as incentives" for biodiversity conservation,<sup>202</sup> are to be managed by a financial mechanism described in but not established by article 21.<sup>203</sup>

## B. TRIPS

The TRIPS agreement requires its members to award "patents...for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application."<sup>204</sup> The agreement expressly permits a member to deem "the terms 'inventive step' and 'capable of industrial application'...to be synonymous with the terms 'non-obvious' and 'useful' respectively."<sup>205</sup>

TRIPS establishes a series of exceptions from this general requirement. Members may deny patents when "necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment," but not merely because a proposed commercial application is prohibited under national law.<sup>206</sup> Learned commentators agree that the word "necessary" requires members to consider and perhaps to exhaust less trade-restrictive alternatives.<sup>207</sup> Members "may also exclude from patentability...diagnostic, therapeutic and surgical

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<sup>201</sup>*Id.* art. 20(2).

<sup>202</sup>CBD, *supra* note 8, art. 11.

<sup>203</sup>*See id.* art. 21.

<sup>204</sup>TRIPS, *supra* note 24, art. 27(1); *see also id.* art. 1(1) ("Members shall give effect to the provisions of this Agreement.").

<sup>205</sup>*Id.* art. 27(1) n.5; *cf.* 35 U.S.C. §§ 101, 103 (2000) (establishing the requirements of utility and nonobviousness in American patent law).

<sup>206</sup>TRIPS, *supra* note 24, art. 27(2).

<sup>207</sup>*See* Steve Charnovitz, *Recent Developments: Environmental Trade Sanctions and the GATT: An Analysis of the Pelly Amendment on Foreign Environmental Practices*, 9 Am. U. J. Int'l L. & Pol'y 751, 785 (1994) ("least-GATT-inconsistent"); Shannon Hudnall, *Towards a Greener International Trade System: Multilateral Environmental Agreements and the World Trade Organization*, 29 Colum. J.L. & Soc. Probs. 175, 188-89 (1996) ("least trade restrictive"); Robert Weissman, *A Long, Strange TRIPS: The Pharmaceutical Industry Drive to Harmonize Global Intellectual Property Rules, and the Remaining WTO Legal Alternatives Available to Third World Countries*, 17 U. Pa. J. Int'l Econ. L. 1069, 1101-06 (1996) (absence of alternatives); Timothy G. Ackerman, Comment, *Dis'ordre'ly Loopholes: TRIPS Patent Protection, GATT, and the ECJ*, 32 Tex. Int'l L.J. 489, 507-08 (1997) (absence of alternatives).

methods for the treatment of humans or animals.”<sup>208</sup> Any suggestion that this provision allows members to forgo patent protection for drugs is contradicted by article 70(8) of TRIPS, which specifies procedures for implementing “patent protection for pharmaceutical and agricultural chemical products.”<sup>209</sup>

Of supreme importance in the realm of biotechnology, members bear no obligation to patent “plants and animals other than micro-organisms” or “essentially biological processes for the production of plants or animals other than non-biological and microbiological processes.”<sup>210</sup> TRIPS, however, does require its members to “provide for the protection of plant varieties either by patents or by an effective *sui generis* system.”<sup>211</sup> The United States fulfills this obligation through the Plant Variety Protection Act of 1970 (PVPA),<sup>212</sup> which in turn does not exploit the possibility of granting protection beyond the core requirements of UPOV.<sup>213</sup> Finally, TRIPS allows “limited exceptions” to patents, “provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties.”<sup>214</sup>

TRIPS offers developing countries a soft transition into the international intellectual property regime.<sup>215</sup> TRIPS entitles developing countries to delay implementation until January 1, 2000, a full five years after the entry into force of the World Trade Organization (WTO) agreement.<sup>216</sup> “In

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<sup>208</sup>TRIPS, *supra* note 24, art. 27(3)(a).

<sup>209</sup>*Id.* art. 70(8); see Straus, *supra* note 117, at 100; Rosemary Sweeney, *The U.S. Push for Worldwide Patent Protection for Drugs Meets the AIDS Crisis in Thailand: A Devastating Collision*, 9 Pac. Rim L. & Pol’y J. 445, 455 (2000).

<sup>210</sup>TRIPS, *supra* note 24, art. 27(3)(b).

<sup>211</sup>*Id.*

<sup>212</sup>7 U.S.C. §§ 2321-2582 (2000).

<sup>213</sup>See UPOV, *supra* note 25, art. 14(4); Jerome H. Reichman, *The TRIPS Component of the GATT’s Uruguay Round: Competitive Prospects for Intellectual Property Owners in an Integrated World Market*, 4 Fordham Intell. Prop. Media & Ent. L.J. 171, 196 (1993); cf. TRIPS, *supra* note 24, art. 1(1) (“Members may, but shall not be obliged to, implement in their law more extensive protection than is required by this Agreement.”).

<sup>214</sup>*Id.* art. 30.

<sup>215</sup>See generally, e.g., World Trade Organization, *Trade Policy Review: Nicaragua*, WT/TPR/M/61 (Nov. 24, 1999) (reviewing the transitional arrangements applicable to developing countries); Doris E. Long, *Copyright and the Uruguay Round Agreements: A New Era of Protection or an Illusory Promise?*, 22 AIPLA Q.J. 531, 563-65 (1994) (same).

<sup>216</sup>See TRIPS, *supra* note 24, art. 65(2). The WTO agreement entered into force on January 1, 1995. See Final Act Embodying the Results of the Uruguay Round of

view of [their] special needs and requirements..., their economic financial and administrative constraints, and their need for flexibility to create a viable technological base,” the least-developed members of the WTO may delay implementation until January 1, 2006 and even longer “upon duly motivated request[s]” for “extensions of this period.”<sup>217</sup> All developing countries may defer for another five years the granting of product patents in “areas of technology not...protectable in its territory” before its implementation of TRIPS.<sup>218</sup>

These transitional arrangements, however, are subject to a set of conditions favoring “pharmaceutical and agricultural chemical products.”<sup>219</sup> Members not offering patent protection for such products as of January 1, 1995, must adopt a “mailbox rule” in order to preserve the priority of inventors’ rights.<sup>220</sup> They must also grant “exclusive marketing rights” for five years on all products with pending patent applications in other WTO member countries, unless “a product patent is granted or rejected” in the country at issue.<sup>221</sup> The United States has successfully challenged India’s failure to respect these conditions on patents for pharmaceutical and agricultural chemical products.<sup>222</sup>

TRIPS does not require that patent applications state the origin of genetic materials or biological knowledge used to invent a product.<sup>223</sup> This omission is a sore point for the developing countries that perceive

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Multilateral Trade Negotiations, *done at Marrakesh*, April 15, 1994, ¶ 3, 33 I.L.M. 1143, 1143 (1994).

<sup>217</sup>TRIPS, *supra* note 24, art. 66(1).

<sup>218</sup>*See id.* art. 65(4).

<sup>219</sup>*Id.* art. 70(8).

<sup>220</sup>*See id.*

<sup>221</sup>*Id.* art. 70(9).

<sup>222</sup>*See* Report of the Panel, India – Patent Protection for Pharmaceutical & Agric. Chem. Prods., WT/DS50/R (Sept. 5, 1997); Report of the Appellate Body, India – Patent Protection for Pharmaceutical & Agric. Chem. Prods., WT/DS50/AB/R (Dec. 19, 1997); Action by the Dispute Settlement Body, India – Patent Protection for Pharmaceutical & Agric. Chem. Prods., WT/DS50/9 (Jan. 27, 1998). *See generally* Jerome H. Reichman, *Securing Compliance with the TRIPS Agreement After United States v. India*, J. Int’l Econ. L. 585 (1998); David K. Tomar, Note, *A Look into the WTO Pharmaceutical Patent Dispute Between the United States and India*, 17 Wis. Int’l L.J. 579 (1999). On India’s compliance with TRIPS generally, see Martin Adelman & Sonia Baldia, *Prospects and Limits of the Patent Provision in the TRIPS Agreement: The Case of India*, 29 Vand. J. Transnat’l L. 507 (1996); Jain, *supra* note 101.

<sup>223</sup>*See* TRIPS, *supra* note 24, art. 29 (directing members to “require that an applicant for a patent shall disclose the invention in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art,” but imposing no further mandatory conditions on patent applicants).

themselves to be the biggest victims of biopiracy.<sup>224</sup> The treaty's provision for protection of "[g]eographic indications" offers no cure, for it is limited to those instances "where a given quality, reputation or other character of the good is essentially attributable to its geographic origin."<sup>225</sup>

Finally, TRIPS outlines a rigorous set of safeguards in the event of compulsory licensing. Under the agreement, "use of the subject matter of a patent without the authorization of a right holder" must be permitted under "the law of [that] Member."<sup>226</sup> A proposed user must at least "ma[ke] efforts to obtain authorization from the right holder on reasonable commercial terms and conditions."<sup>227</sup> Article 31 of TRIPS confines "the scope and duration of such use...to the purpose for which it was authorized"<sup>228</sup> and requires that licensed goods be used "predominantly for the supply of the domestic market" of the country that imposes the compulsory license.<sup>229</sup> Crucially, TRIPS entitles "the right holder [to]...adequate remuneration" based on the value lost through compulsory licensing.<sup>230</sup> Both the initial decision to impose a compulsory license and the remuneration decision are subject to judicial review or its functional equivalent.<sup>231</sup>

### C. UPOV

Just as TRIPS establishes a floor for patent protection in its member states, UPOV compels "[e]ach Contracting Party [to] grant and protect breeders' rights."<sup>232</sup> Two provisions of UPOV merit special notice.<sup>233</sup> First, article 15 outlines three compulsory limits on breeders' rights and one optional exception. Under no circumstances may a breeder allege infringement protection against "private," "non-commercial" acts; "acts done for experimental purposes"; and "acts done for the purpose of breeding other varieties."<sup>234</sup>

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<sup>224</sup>See United Nations Conference on Trade and Development, *The TRIPS Agreement and Developing Countries* 17 (1997).

<sup>225</sup>TRIPS, *supra* note 24, art. 22.

<sup>226</sup>*Id.* art. 31.

<sup>227</sup>*Id.* art. 31(b).

<sup>228</sup>*Id.* art. 31(c).

<sup>229</sup>*Id.* art. 31(f).

<sup>230</sup>*Id.* art. 31(h).

<sup>231</sup>See art. 31(i), (j).

<sup>232</sup>UPOV, *supra* note 25, art. 2; see also *id.* art. 14 (describing the scope of breeders' rights).

<sup>233</sup>See generally Carlos M. Correa, *Biological Resources and Intellectual Property Rights*, 5 *Eur. Intell. Prop. Rptr.* 154 (1992).

<sup>234</sup>UPOV, *supra* note 25, art. 15(1).

Article 15 also permits signatory countries to adopt an exception endorsing the traditional agricultural practice of saving seed:

[E]ach Contracting Party may, within reasonable limits and subject to the safeguarding of the legitimate interests of the breeder, restrict the breeder's right in relation to any variety in order to permit farmers to use for propagating purposes, on their own holdings, the product of the harvest which they have obtained by planting, on their own holdings, the protected variety....<sup>235</sup>

Second, UPOV imitates TRIPS in contemplating compulsory licensing and in providing safeguards in the event it occurs. "When [a] restriction has the effect of authorizing a third party to perform any act for which the breeder's authorization is [otherwise] required, the Contracting Party concerned shall take all measures necessary to ensure that the breeder receives equitable remuneration."<sup>236</sup>

#### D. A Plague on Both Their Houses

Even this breezy tour of the Convention on Biological Diversity, TRIPS, and UPOV undermines virtually all objections, northern or southern, to the sources of international law implicated in the supposed clash between biodiversity conservation and biotechnological development. At no point does the Biodiversity Convention compel technology transfer from developed nations to their developing counterparts. For its part, TRIPS offers significant concessions to the developing world. A country removed from the tumult of the global economy may categorically refuse to award animal patents,<sup>237</sup> for instance, and may ease into the developed world's approach to trade liberalization and intellectual property. Indeed, a closer look at these treaties reveals a shocking reversal of fortune. If anything, each side's favored body of law inflicts the deeper wound against its grievances.

Let us begin by examining—and ultimately burying—the United States' objections to the Biodiversity Convention. The United States refused to sign the Convention because of dissatisfaction with "the text's treatment of intellectual property rights; finances...; technology transfer and biotechnology."<sup>238</sup> The first Bush administration believed that article 16 treated

<sup>235</sup>*Id.* art. 15(2).

<sup>236</sup>*Id.* art. 17(2); *see also id.* art. 17(1) (stating that a contracting party may restrict breeders' rights only upon a showing "of public interest").

<sup>237</sup>*See* TRIPS, *supra* note 24, art. 27(3)(b).

<sup>238</sup>Declaration of the United States of America, 31 I.L.M. 848, 848 (1992) (made in Nairobi, May 22, 1992, at the United Nations Environment Programme

intellectual property rights “as a constraint to the transfer of technology rather than a prerequisite.”<sup>239</sup> American concerns over the lack of minimum standards for intellectual property spurred the inclusion of TRIPS in the treaty establishing the World Trade Organization.<sup>240</sup> The United States likewise refused to ratify the Kyoto Protocol absent “commitments for countries with developing economies” and assurances against “serious harm to the economy of the United States.”<sup>241</sup> Despite these concerns, President Clinton signed the Biodiversity Convention on June 4, 1993.<sup>242</sup> The Senate considered the treaty in each of the next two years but never ratified it.<sup>243</sup>

The American complaint does rest on some factual basis. Annual losses to piracy in the pharmaceutical industry, measured according to obviated investments in research and development, are alleged to have reached \$1.9 billion in 1986.<sup>244</sup> Pharmaceutical research and development is long, risky, and expensive. In 1990 it cost \$359 million to run a single pharmaceutical product through FDA approval and bring it to market.<sup>245</sup> The American pharmaceutical industry in 1997 plowed 21 percent of its sales revenue back into research and development, a higher percentage than other high-technology manufacturing industries such as electronics and aerospace.<sup>246</sup> And the intensity of research and development explains trade success for manufacturing industries better than any other variable.<sup>247</sup>

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Conference for the Adoption of the Agreed Text of the Convention on Biological Diversity).

<sup>239</sup>Convention on Biological Diversity, 3 U.S. State Dep’t Dispatch 423 (1992). *See generally* Adam L. Steltzer, *U.S. Biotechnology Intellectual Property Rights as an Obstacle to the UNCED Convention on Biological Diversity: It Just Doesn’t Matter*, 6 *Transnat’l Law*. 271 (1993).

<sup>240</sup>*See* Tara Kalagher Giunta *et al.*, *Ownership of Information in a Global Economy*, 27 *Geo. Wash. J. Int’l L. & Econ.* 327, 335 (1993-94); Richard A. Morford, *Intellectual Property Protection: A United States Priority*, 19 *Ga. J. Int’l & Comp. L.* 335, 339-40 (1989); Weissman, *supra* note 207, at 1083.

<sup>241</sup>S. Res. 82, 105th Cong., 1st Sess. (1997).

<sup>242</sup>*See U.S. Signs Biodiversity Treaty, Urges Global Patent Protection for Biotech*, 16 *Env’tl. Rptr. (BNA)* 432 (June 16, 1993).

<sup>243</sup>*See generally* Convention on Biological Diversity, 140 *Cong. Rec.* S14,046-54 (Oct. 4, 1994).

<sup>244</sup>*See* U.S. Trade Representative, *Foreign Protection of Intellectual Property Rights and the Effect on U.S. Industry and Trade* 4-3 (1988).

<sup>245</sup>*See* U.S. Congress, Office of Technology Assessment, *Pharmaceutical Research and Development: Costs, Risks and Rewards* (1993).

<sup>246</sup>Pharmaceutical Research & Manufacturers of America <<http://www.phrma.org/publications/publications/brochure/leading/lead3.phtml>> (visited Jan. 24, 2001).

<sup>247</sup>*See* William Gruber *et al.*, *The R&D Factor in International Trade and International Investments of United States Industries*, 75 *J. Pol. Econ.* 20, 22-23 (1967); Donald B. Keesing, *The Impact of Research and Development on United*

In America's further defense, the United States often plays the bully on trade controversies involving the developing world. "Potential allies, such as Japanese video-game makers, German and Swiss drug concerns, and British and French film makers prefer to walk softly and let the United States carry the big stick."<sup>248</sup> In this instance, however, other nations joined the United States in objecting to article 16 of the Biodiversity Convention.<sup>249</sup> The real wonder is why the United States took such a solitary tack. Rather than adopting the standard European strategy of signing first and then using creative, *post hoc* interpretation of contested language to guide actual implementation of a controversial international agreement,<sup>250</sup> the United States chose to "read demons" into the text of the Convention.<sup>251</sup> There never was a real conflict, not between the Convention on Biological Diversity and TRIPS, and not between biodiversity conservation and intellectual property rights.

If anything, the United States and the rest of the global north have been spared retroactive application of the Biodiversity Convention. Article 15(3) confines the Convention to two categories of genetic resources: (1) "only those" genetic resources "provided by Contracting Parties that are countries of origin" and (2) resources "that *are* acquired...in accordance with this Convention."<sup>252</sup> To be sure, the argument against retroactive application of the Convention hinges on a conjugated form of the verb "to be"—in this case, "are." But sometimes a question of law really does depend on what the meaning of the word "is" is.<sup>253</sup> Moreover, TRIPS demonstrates that the international community is aware of the retroactivity issue and knows how to draft a treaty so that it unequivocally will or will not have retroactive effect. Article 24(3) of TRIPS provides that "a Member shall not diminish the protection of geographical indications that existed in that Member immediately

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*States Trade*, 75 J. Pol. Econ. 38, 39-45 (1967). See generally Okediji, *supra* note 91, at 163 & n.189.

<sup>248</sup>Blount, *supra* note 100, at 52.

<sup>249</sup>See Coughlin, *supra* note 190, at 344, 346.

<sup>250</sup>Hamilton, *supra* note 110, at 623-24.

<sup>251</sup>Rebecca L. Margulies, *Protecting Biodiversity: Recognizing International Intellectual Property Rights in Plant Genetic Resources*, 14 Mich. J. Int'l L. 322, 337 (1993).

<sup>252</sup>CBD, *supra* note 8, art. 15(3) (emphasis added).

<sup>253</sup>*Cf. Gwaltney of Smithfield, Ltd. v. Chesapeake Bay Found.*, 484 U.S. 49, 18 ELR 20142 (1987) (holding that §505 of the Clean Water Act, 33 U.S.C. §1365, ELR Stat. FWPCA §505, which authorizes civil actions "against any person...who is alleged to be in violation of...an effluent standard or limitation," requires proof of an ongoing violation (emphasis added)).

prior to the date of entry into force of the WTO Agreement.”<sup>254</sup> TRIPS further provides that it “does not give rise to obligations in respect of acts which occurred before the date of application of the Agreement for the Member in Question.”<sup>255</sup> Though the language of the Biodiversity Agreement could have been clearer, the nonretroactive nature of the treaty’s language effectively undermines the most extreme claims of the global south to disgorgement of northern wealth based on earlier instances of genetic expropriation. Peru cannot claim compensation for the full value of all modifications of the potato after the conquest of the Incas. The United States’ agricultural powerhouse will not be reduced to a clutch of crops native to North America, such as Jerusalem artichokes and cranberries.<sup>256</sup>

There is no plausible way, by contrast, to escape an interpretation of article 15(3) that eliminates coverage of illegally acquired genetic material. Plainly put, it is the Convention on Biological Diversity and not TRIPS or UPOV that winks at biopiracy.

Finally, southern nations have no real incentive to advance an interpretation of the Biodiversity Convention that would fulfill the nightmares of the United States. Because articles 15 and 16 of Convention on Biological Diversity are phrased so similarly, any reading of article 16 to require involuntary transfer of technology would support an equally aggressive interpretation of article 15 to compel nations to provide access to their genetic resources.<sup>257</sup> Article 16, we should recall, requires contracting parties to “provide and/or facilitate” access to technology and transfer of technology.<sup>258</sup> This language imposes at most a duty to *facilitate* access and transfer. That very verb also animates Article 15’s command that “[e]ach Contracting Party shall endeavour to create conditions to *facilitate* access to genetic resources.”<sup>259</sup> Rather obviously, forcible swaps of northern technology for southern specimens is “a result no source country would happily accept.”<sup>260</sup>

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<sup>254</sup>TRIPS, *supra* note 24, art. 24(3). Compare Jim Chen, *A Sober Second Look at Appellations of Origin: How the United States Will Crash France’s Wine and Cheese Party*, 5 Minn. J. Global Trade 29 (1996) (taking a dim view of AOCs and other geographic indicator) with Louis Lorvellec, *You’ve Got to Fight for Your Right to Party: A Response to Professor Jim Chen*, 5 Minn. J. Global Trade 65 (1996) (defending the prominence of AOCs and other food labeling systems in French law).

<sup>255</sup>TRIPS, *supra* note 24, at art. 70(1).

<sup>256</sup>*Cf.* Hamilton, *supra* note 110, at 607-08.

<sup>257</sup>*See* Adair, *supra* note 187, at 144 n.100.

<sup>258</sup>CBD, *supra* note 8, art. 16(1).

<sup>259</sup>*Id.* art. 15(3) (emphasis added).

<sup>260</sup>Michael Gollin, *The Convention on Biological Diversity and Intellectual Property Rights*, in World Resources Institute, *Biodiversity Prospecting: Using*

If the United States had a mission to find legal phantoms at Rio, it looked in the wrong place. Though the American objections to the Biological Convention characterized compulsory licensing as a *bête noire*, such arrangements are in fact quite common in international law and in American environmental law.<sup>261</sup> Not one word in the Convention on Biological Diversity can be fairly construed to require compulsory licensing. That concept stems instead from article 31 of TRIPS and article 17 of UPOV.

Indeed, the best model for a compulsory licensing scheme comes from the heart of American intellectual property protection for biotechnology. Under the PVPA, the United States government “may declare a protected variety open to use on a basis of equitable remuneration to the owner, not less than a reasonable royalty, when...such declaration is necessary in order to insure an adequate supply of fiber, food, or feed in this country and that the owner is unwilling or unable to supply the public needs for the variety at a price which may reasonably be deemed fair.”<sup>262</sup> These conditions satisfy both the public interest and just compensation conditions of TRIPS and UPOV. They could provide models for compulsory licensing of the fruits of commercial exploitation of biodiversity.

Moreover, the PVPA represents merely a single instance in which United States law has chosen not to extend full copyright or patent protection to otherwise eligible works and inventions. James Madison and Alexander Hamilton favored a system of prizes and awards over the copyright and patent system that the Constitution eventually adopted.<sup>263</sup> Civilian nuclear technology is ineligible for patents, but Congress has authorized prizes in the interest of compensating inventors who work in this field.<sup>264</sup> Federal copyright law directs the Copyright Royalty Tribunal to administer compulsory licensing and to conduct ratemaking for a variety of works, including secondary transmissions by cable television systems, phonorecords of nondramatic musical works, public performance of musical compositions through jukeboxes, and artwork and music used in public radio and television broadcasts.<sup>265</sup>

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Genetic Resources for Sustainable Development 289, 295 (Walter V. Reid *et al.* eds., 1993).

<sup>261</sup>See McManis, *supra* note 151, at 264-65, 267.

<sup>262</sup>7 U.S.C. § 2404 (2000).

<sup>263</sup>See Donald W. Banner, *An Unanticipated, Nonobvious, Enabling Portion of the Constitution: The Patent Provision – The Best Mode*, 69 J. Pat. Off. Soc’y 631, 637, 639 (1987).

<sup>264</sup>See 42 U.S.C. §§2181, 2183 (2000).

<sup>265</sup>See 17 U.S.C. §§111, 115, 116, 118 (2000); *National Cable Television Ass’n, Inc. v. Copyright Royalty Tribunal*, 724 F.2d 176 (D.C. Cir. 1983) (R. Ginsburg, J.).

The lack of clarity in the Biodiversity Convention, TRIPS, and UPOV may offer an unintended benefit. Because no party can be sure of prevailing unilaterally, the absence of clear legal rules motivates countries to settle bioprospecting disputes.<sup>266</sup> There really is such a thing as an “anticommons” where an excessive number of many competing property rights can paralyze the economy.<sup>267</sup> In cases of doubt, underprotection of intellectual property is a much sounder economic strategy than overprotection.<sup>268</sup>

In short, each side can only blame itself. Thanks to temporal and physical limits on its jurisdiction, the Convention on Biological Diversity and not TRIPS or UPOV is the treaty that winks at biopiracy. The compulsory licensing feared by the United States is a creature of TRIPS and UPOV. The Biodiversity Convention does not so much as mention the concept, which flourishes not only in these northern-dominated international charters but also in American intellectual property law. Especially in light of the Convention’s silence on compulsory licensing, the sanctioning of the practice under TRIPS and UPOV would control under the “[u]sual” international norm “that the more specific agreement...prevails over the more general.”<sup>269</sup> As a legal concept, compulsory licensing fits more comfortably in a system of intellectual property than in framework agreements on environmental protection and sustainable development.

## V. SHARING THE TREASURE OF THE TIERRA MADRE

Perhaps conventional wisdom on the relationship between biological diversity and intellectual property can be redeemed after all. The first decade of international collaboration on biodiversity has yielded partnerships between multinational life sciences companies and national governments. Merck’s collaboration with Costa Rica’s *Instituto Nacional de Biodiversidad* (INBio) is a leading example. Other international cooperative biodiversity groups are flourishing. Without cooperative research, a concept

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<sup>266</sup>Dan Burk, *Muddy Rules in Cyberspace*, 21 *Cardozo L. Rev.* 121, 136-43 (1999); see also Carol M. Rose, *Crystal and Mud in Property Law*, 40 *Stan. L. Rev.* 577 (1988).

<sup>267</sup>See Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 *Harv. L. Rev.* 621 (1998).

<sup>268</sup>See generally, e.g., Stephen Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 *Harv. L. Rev.* 281 (1970); Robert M. Hurt & Robert M. Schuchman, *The Economic Rationale of Copyright*, 56 *Am. Econ. Rev. Papers & Proc.* 42 (1966); William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 *J. Legal Stud.* 325 (1989).

<sup>269</sup>Robert E. Hudec, *GATT/WTO Constraints on National Regulation: Requiem for an “Aim and Effects” Test*, 32 *Int’l Law.* 619, 644 (1998).

strongly favored by the Biodiversity Convention and UPOV,<sup>270</sup> commercial development of rainforest riches and other natural treasures could never have taken place. The sheer scale of the research effort needed to develop even one commercial valuable drug makes it impossible for an impoverished gene donor nation to go it alone. Odds of one in five to 10,000 all but dictate the sort of concentrated market structure seen in established markets for ornamental plants.<sup>271</sup>

On the other hand, the heavily utilitarian tone of the debate has skewed the international agenda, and not consistently for the better. Instead of teaching citizens and policymakers the importance of ecosystems and the value of habitat conservation, commercial development of biodiversity's resources has diverted public attention toward individual species and their potential for profitable exploitation. In learned discussions of biodiversity since Rio, the commercial focus has crowned a new type of species beyond the usual categories of charismatic megafauna. Behold now a new sort of "flagship" species for the post-Rio era: the "charismatic moneyflora."<sup>272</sup>

Nor has the commercial focus promoted fruitful national responses to the global challenge of biological diversity in decline. In environmental affairs, after all, "[r]hetoric matters."<sup>273</sup> On one hand, a country justly described as "the Michael Jordan of geopolitics"<sup>274</sup> has held out against an admittedly flawed Biodiversity Convention, almost exclusively because of fear of an illusory threat to American economic interests. On the other hand, the global south takes umbrage at the merest hint of biopiracy.

Neither posture is particularly healthy. The United States should sign the Biodiversity Convention, if only to demonstrate that it is serious about tackling the environmental challenges of a world dominated by America and rapidly being reshaped in its image.<sup>275</sup> Rather than rejecting "green aid" and foreign investment out of hand as "eco-colonialis[t]" incursions on their

<sup>270</sup>See CBD, *supra* note 8, arts. 12, 15; UPOV, *supra* note 25, art. 15(1)(ii) & (iii).

<sup>271</sup>*Cf. Yoder Brothers, Inc. v. California-Florida Plant Corp.*, 537 F.2d 1347, 1352 (5th Cir. 1976) (describing a highly integrated system of breeders, self-propagators, and retail florists engaged in the production, distribution, and marketing of chrysanthemums), *cert. denied*, 429 U.S. 1094 (1977). See generally Frederick Grinnell, *The Scientific Attitude* 32-34 (2d ed. 1992) (explaining the role of luck in science).

<sup>272</sup>See generally Daniel Simberloff, *Flagships, Umbrellas, and Keystones: Is Single-Species Management Passé in the Landscape Era?*, 83 *Biological Conservation* 247 (1998).

<sup>273</sup>Doremus, *supra* note 59, at 11.

<sup>274</sup>Thomas L. Friedman, *Medal of Honor*, N.Y. Times, Dec. 15, 2000, at A29.

<sup>275</sup>See Thomas L. Friedman, *The Lexus and the Olive Tree: Understanding Globalization* 308 (1999) ("With the end of the Cold War, globalization is globalizing Anglo-American-style capitalism.... It is globalizing American culture and cultural icons. It is globalizing the best of America and the worst of America.").

sovereignty, developing nations should “accept[] the fact that the rest of the world has an interest” in their biological treasures.<sup>276</sup> In a rapidly globalizing society, national autonomy has become so degraded<sup>277</sup> that even critics of global integration can accept “[t]he loss of sovereignty” as long as democracy is preserved.<sup>278</sup>

Wisdom begins with an acknowledgement of the limits of the conventional approach to reconciling biotechnology with biodiversity. Commercial development of scarce genetic resources contributes to the solution but cannot serve as a magic bullet. The Biodiversity Convention rightfully commits gene donor nations, most of which are developing nations, to respect international arrangements for protecting established forms of intellectual property. In exchange, the developing world stands to benefit from international recognition of new norms that acknowledge the genetic and cultural contributions of the south. The nations of the industrialized north should confess that TRIPS, UPOV, and even their own domestic legislation outperform the Biodiversity Convention in undermining the intellectual property rights of plant breeders and pharmaceutical companies. Having laid these legal phantoms to rest, all parties should turn toward refining a financial mechanism for facilitating the transfer of wealth and technology from north to south, from gene-receiving nations to gene-giving nations.

Let us adopt instead the pragmatic voice in environmental analysis.<sup>279</sup> Much of the Convention on Biological Diversity remains unexplored, but not its access and technology transfer provisions in articles 15-16. To repeat, biodiversity is more than a start-up business opportunity. The Convention offers its contracting parties a broader range of legal and political options. Among other possibilities, signatory nations can and should reinvigorate cooperative efforts toward stemming the cross-boundary flow of alien invasive species.<sup>280</sup> Globalization is the proximate cause; globalism is the ultimate cure.

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<sup>276</sup>Cairncross, *supra* note 68, at 154; *accord* Chen, *supra* note 6, at 214.

<sup>277</sup>See John H. Jackson, *Reflections on International Economic Law*, 17 U. Pa. J. Int'l Econ. L. 17, 24-25 (1996) (“[Given] the difficulty of government regulation of international economic behavior...there is today hardly any subject that can be said to be effectively controlled by a single national sovereign.”).

<sup>278</sup>Phillip P. Trimble, *Globalization, International Institutions, and the Erosion of National Sovereignty and Democracy*, 95 Mich. L. Rev. 1944, 1948 (1997).

<sup>279</sup>See generally Daniel A. Farber, *Eco-Pragmatism: Making Sensible Environmental Decisions in an Uncertain World* (1999).

<sup>280</sup>See Lyle Glowka, *Bioprospecting, Alien Invasive Species, and Hydrothermal Vents: Three Emerging Legal Issues in the Conservation and Sustainable Use of Biodiversity*, 13 Tul. Env'tl. L.J. 329, 333-49 (2000); *cf.* Steven A. Wade, *Stemming the Tide: A Plea for New Exotic Species Legislation*, 10 J. Land Use & Env'tl. L. 343 (1995) (urging similar efforts at the domestic level).

An even more pressing subject for study is the relatively neglected cluster of provisions, articles 19 through 21, that spell out how the Biodiversity Convention can and should be funded. The details of the Convention's finance mechanism will prove crucial to its future mission. Legal fights over treaty-borne phantoms and economic struggles over the precise trajectory of commercial development must yield in favor of a more fruitful discussion. Despite all the haggling and the United States' holdout posture, the international community has "not taken any concrete action to interpret or implement" the Biodiversity Convention's "vigorously contested provisions relating to access to genetic resources, benefit sharing, and biotechnology."<sup>281</sup>

Imagine what doors would be unlocked by clever analysis and implementation of articles 19 through 21. The financial mechanism contemplated by the Convention would enable a broader spectrum of gene donor nations to negotiate cooperative research arrangements with the developed world. The slowly emerging consensus on the delivery of patented, trademarked anti-AIDS medication to the African nations hardest hit by that epidemic provides not only inspiration but also a working model for a comprehensive, multilateral, and cooperative approach to the exploration and commercial exploitation of the biodiversity that remains.<sup>282</sup>

This is not an altogether novel idea. Thomas Eisner has proposed an international "biotic fund" partially financed through profits from patents on plant genetic materials.<sup>283</sup> At stake is an endowment worth a quarter of a billion dollars toward global biodiversity preservation. At first glance that amount seems staggering. It is more than 200 times Merck's \$1 million initial investment in INBio. From another perspective, \$250 million is an eminently reasonable and manageable sum. Much of the purported conflict between biodiversity and biotechnology derives from a concern over the legal rights and economic welfare of farmers. Even a quarter of a billion dollars would make a trivial dent in either the United States' or the European Union's annual outlay for agricultural price and income support.<sup>284</sup> Alternatively, if we focus exclusively on pharmaceuticals, \$250

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<sup>281</sup>Chris Wold, *The Futility, Utility, and Future of the Biodiversity Convention*, 9 *Colo. J. Int'l Envtl. L. & Pol'y* 1, 22 (1998).

<sup>282</sup>*Cf.* Tina Rosenberg, *How to Solve the World's AIDS Crisis: Look at Brazil*, N.Y. Times, Jan. 28, 2001, §6, at 26.

<sup>283</sup>*See* Thomas Eisner, 138 *Proceedings Am. Phil. Soc'y* 388 (1994); Thomas Eisner & Elizabeth A. Beiring, *Biotic Exploration Fund – Protecting Biodiversity Through Chemical Prospecting*, 44:2 *BioScience* 95 (1994).

<sup>284</sup>*See* Andrew Feltenstein, *Agricultural Policies and the U.S. Federal Budget and U.S. Deficit*, in *Macroeconomic Consequences of Farm Support Policies* 200, 205-07 (Andrew B. Stoeckel *et al.* eds. 1989); Stewart & Johanson, *supra* note 20, at 294-95. In the United States, direct annual expenditures have fluctuated

million represents a 1/2% excise tax on a global market worth \$53 billion<sup>285</sup> or even a surcharge of less than 2% on what was a \$15.5 billion market for plant-derived drugs in the United States during 1990.<sup>286</sup> It is a quarter to a twelfth of the annual sum that the World Bank and the United Nations consider necessary to combat the spread of AIDS in sub-Saharan Africa.<sup>287</sup>

Finally, let us consider precedents in the specific realm of endangered species protection. In its infancy, the ESA was interpreted to require the demolition of a \$110 million dam.<sup>288</sup> More recently and more realistically, the United States has set aside \$2 million every year toward the conservation of a single species, the Florida panther.<sup>289</sup> That amount also represents the annual federal contribution toward preserving the last surviving languages of North American natives.<sup>290</sup> Not coincidentally, the relatively compact acreage that contain most of the world's rarest species also houses a disproportionate portion of the languages still spoken by human beings.<sup>291</sup> This striking coincidence gives us a remarkable chance, and an equally grave responsibility, to protect human and natural diversity in a single stroke.

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around \$10 billion, at least before implementation of the 1996 "freedom to farm" legislation. On the other side of the Atlantic, the Common Agricultural Policy has quite notoriously become the most expensive item in the budget of the European Union.

<sup>285</sup>See K. ten Kate & Laird, *supra* note 44, at 40. The \$53 billion figure is probably a gross understatement of the current value of the global pharmaceutical market; it reflects only over-the-counter drugs and was based on sales in 1985.

<sup>286</sup>See Walter V. Reid, *The Economic Realities of Biodiversity*, 49 *Issues in Science & Tech.* 48 (1993/94); Steven M. Rubin & Stanwood C. Fish, *Biodiversity Prospecting: Using Innovative Contract Provisions to Foster Ethnobotanical Knowledge, Technology, and Conservation*, 5 *Colo. J. Int'l Envtl. L. & Pol'y* 23, 27 (1994).

<sup>287</sup>See Michael Phillips, *World Bank Is Targeting AIDS in Africa*, *Wall St. J.*, Sept. 12, 2000, at A3 (reporting an estimate of \$1-3 billion per year).

<sup>288</sup>See *Tennessee Valley Auth. v. Hill*, 437 U.S. 153, 8 *ELR* 20513 (1978).

<sup>289</sup>See James Brooke, *Indians Striving to Save Their Languages*, *N.Y. Times*, April 12, 1998, at A1.

<sup>290</sup>See *id.*

<sup>291</sup>See Ken Hale, *On Endangered Languages and the Safeguarding of Diversity*, 68 *Language* 1, 1 (1992) (comparing the risks from the "loss of cultural and intellectual diversity" through linguistic extinction to "the dangers inherent in the loss of biological diversity"); Michael Krauss, *The World's Languages in Crisis*, 68 *Language* 4, 4 (1992) ("Language endangerment is significantly comparable to—and related to—endangerment of biological species in the natural world."); *cf.* Thomas S. O'Connor, "We Are Part of Nature": *Indigenous Peoples' Rights as a Basis for Environmental Protection in the Amazon Basin*, 5 *Colo. J. Int'l Envtl. L. & Pol'y* 193, 203 (1994) (noting that linguistic extinction carries with it an especially steep price in lost ethnobiological knowledge).

Human misery makes an inviting but elusive first target. Of the myriad environmental problems in this mutually dependent world, “persistent poverty may turn out to be the most aggravating and destructive.”<sup>292</sup> We must remember “above all else” that “human degradation and deprivation... constitute the greatest threat not only to national, regional, and world security, but to essential life-supporting ecological systems.”<sup>293</sup> Under the Biodiversity Convention, “economic and social development and eradication of poverty are the first and overriding priorities of” developing countries.<sup>294</sup> Economic development, after all, is also a “universal and inalienable right and an integral part of fundamental human rights.”<sup>295</sup>

The converse is also true. As the conferees at Rio recognized, “environmental protection...constitutes an integral part of [sustainable development] and cannot be considered in isolation from it.”<sup>296</sup> The earth’s most pressing environmental problems involve “the depletion and destruction of the global commons.”<sup>297</sup> Climate change, ozone depletion, and the loss of species, habitats, and biodiversity should be the international community’s top environmental priorities.<sup>298</sup> These “diffuse, cross-jurisdictional” environmental crises defy “haphazard local encouragement” and

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<sup>292</sup>Patrick Low, *Trade and the Environment: What Worries the Developing Countries?*, 23 *Envtl. L.* 705, 706 (1993).

<sup>293</sup>James A. Lee, *Conservation in a World in Search of a Future*, in *Conservation for the Twenty-First Century* 284, 287 (David Western & Mary C. Pearl eds., 1989).

<sup>294</sup>CBD, *supra* note 8, art. 20(4).

<sup>295</sup>Vienna Declaration and Programme of Action, U.N. Doc. A/CONF.157/24, *adopted at Vienna, June 14-25, 1993, reprinted in* 32 *I.L.M.* 1661 (1993); *see also* Report of the International Conference on Population and Development, U.N. Doc. A/CONF.171/13, preamble, princ. 3, adopted at Cairo, Sept. 5-13, 1994; Report of the U.N. Secretary-General, Development and International Economic Cooperation: An Agenda for Development, ¶ 3, U.N. Doc. A/48/935, 48th sess., agenda item 91, May 6, 1994; *cf.* Richard Bilder & Brian Z. Tamanaha, *The Lessons of Law-and-Development Studies*, 89 *Am. J. Int'l L.* 470, 479 (1995) (describing the promotion of “the right to development as a fundamental human right [as] the most ambitious wing” of dependency theory in interational law”). *See generally* Law and Development (Anthony Carty ed., 1992); Amartya Sen, *Development as Freedom* (1999); Lan Cao, *Towards a New Sensibility for International Economic Development*, 32 *Tex. Int'l L.J.* 209 (1997); James C.N. Paul, *The United Nations and the Creation of an International Law of Development*, 36 *Harv. Int'l L.J.* 307 (1995).

<sup>296</sup>Rio Declaration, *supra* note 99, at 877 (principle 4).

<sup>297</sup>Chen, *supra* note 6, at 186.

<sup>298</sup>*See* U.S. EPA, Science Advisory Bd., *Reducing Risk: Setting Priorities and Strategies for Environmental Protection* 13 (1990).

require cooperative solutions.<sup>299</sup> “[E]nvironmental interconnection has become too real to ignore”; the “existence of transboundary communities inevitably creates a drive away from localism in all spheres.”<sup>300</sup> Should the north and the south fail to set aside their parochial objections to the existing international scheme for conserving biological diversity, their refusal to cooperate on earth’s greatest challenge will accelerate and deepen the irretrievable loss of life’s diverse pageant.

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<sup>299</sup>Stephen M. Nickelsburg, Note, *Mere Volunteers? The Promise and Limits of Community-Based Environmental Protection*, 84 Va. L. Rev. 1371, 1409 (1998).

<sup>300</sup>Daniel A. Farber, *Stretching the Margins: The Geographic Nexus in Environmental Law*, 48 Stan. L. Rev. 1247, 1271 (1996).