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An Agricultural Law Research Article

There's No Such Thing as Biopiracy…and It's a Good Thing Too

by

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I. ONE PILL MAKES YOU SMALL

This Article begins, as do so many other works of legal scholarship, with a story.[1] Imagine a wonder plant teeming with extraordinary chemical properties. Like most living organisms in a diverse but fragile biosphere, it is native to one of the many poor countries of the global south. The local population and

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* *Cf.* STANLEY FISH, THERE'S NO SUCH THING AS FREE SPEECH . . . AND IT'S A GOOD THING TOO (1994).

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1. *Compare, e.g.*, Daniel A. Farber & Suzanna Sherry, *Telling Stories Out of School: An Essay on Legal Narratives*, 45 STAN. L. REV. 807 (1993), *with, e.g.*, Richard Delgado, *On Telling Stories in School: A Reply to Farber and Sherry*, 46 VAND. L. REV. 665 (1993).

professional botanists agree that the wonder plant deserves the title of "village pharmacy."[2] 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, and even contraceptives. One product in particular, a pesticide and insect repellant, is markedly more stable and effective than traditional formulations known to and used by farmers in the source country. The American company proceeds to patent the new pesticide. The company not only fails to compensate the source country; it also asserts patent rights in this pesticide and other products developed from that wonder plant and traditional knowledge of its uses. In other words, the company stands in position to collect a patent-driven premium from the very villagers who informed it of the wonder plant's properties and who helped harvest the company's first samples of the plant.

Writers of fiction are repeatedly told to draw the elements of their craft from real life. So too with this slightly more fact-driven version of storytelling. W.R. Grace's encounter with India's neem tree (*Azadirachta indica*) neatly fits this narrative.[3] Approaching this story in notoriety is that of Eli Lilly & Company's derivation of vinblastine and vincristine, two cancer-fighting alkaloids, from the rosy periwinkle (*Catharanthus roseus*, formerly classified as *Vinca rosea*).[4] Vinblastine is used in treating Hodgkin's disease,[5] while vincristine has become the drug of choice for treating childhood leukemia.[6] Though neem and the periwinkle deserve more airspace, I shall offer a third story as the paradigmatic tale of alleged northern greed and southern victimhood in the global debate over biodiversity, biotechnology, and the proper relationship between the environmental protection, technological innovation, and social justice.

The United States has literally gotten fat. In this Malthusian world,[7] references to food security as an apology for American agricultural policies that constrict production and raise producer prices are nothing short of obscene.[8] "Only a nation that is obscenely rich by the West's historical standards and the larger world's

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2. *See* EDWARD O. WILSON, THE DIVERSITY OF LIFE 285 (1993).

3. *See generally* NATIONAL RESEARCH COUNCIL, NEEM: A TREE FOR SOLVING GLOBAL PROBLEMS (1992).

4. *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 Policies to Conserve Raw Medical Materials*, 25 B.C. ENVTL. AFF. L. REV. 129, 130 (1999).

5. *See* Richard Little et al., *Vinblastine for Recurrent Hodgkin's Disease Following Autologous Bone Marrow Transplant*, 16 J. CLINICAL ONCOLOGY 584 (1998).

6. *See* A.J. Veerman et al., *High Cure Rate with a Moderately Intensive Treatment Regimen in Non-High-Risk Childhood Acute Lymphoblastic Leukemia: Results of Protocol ALL VI from the Dutch Childhood Leukemia Study Group*, 14 J. CLINICAL ONCOLOGY 911 (1996).

7. *See generally* Luther Tweeten, *Dodging a Malthusian Bullet in the 21st Century*, 14 AGRIBUSINESS 15 (1998) (assessing the prospects for global food security in next 100 years); Symposium, *Malthus, Mendel, and Monsanto: Intellectual Property and the Law and Politics of Global Food Supply*, 19 J. ENVTL. L. & LITIG. 397 (2004).

8. *See* Guadalupe T. Luna, *The New Deal and Food Insecurity in the "Midst of Plenty,"* 9 DRAKE J. AGRIC. L. 213 (2004) (discussing domestic food supply policy during the last period of serious food insecurity in American history).

contemporary standards can indulge in food aid either as a means of suppressing domestic supplies or as a tool for shaping foreign relations, much less both."[9] The real public health crisis in America and other wealthy nations is not starvation, but obesity.[10] The prescription for this societal pathology is actually quite simple.[11] Americans should eat less and exercise more. Having experienced a shocking increase of 26 years in life expectancy over the course of a mere 75 years of comprehensive food and drug regulation, however, American society as a whole evidently expects to continue the twentieth century's unprecedented and probably unrepeatable actuarial leap forward through pharmaceutical wizardry.[12] In other words, we would sooner take diet pills than limit portions or work out. What we want is a slick pharmaceutical solution: "One pill makes you small."[13]

As is true of roughly four-fifths of all known drugs, an effective pharmaceutical remedy for obesity is likely to be derived from a natural source.[14] One plausible pharmacological candidate, the cactus *Hoodia gordoniis*, is prized for its appetite-suppressing, thirst-quenching, and awareness-heightening qualities.[15] What the San people of South Africa have known for thousands of years about the plant they call "Xhoba" languished for three decades in the laboratories of the Council for Scientific and Industrial Research (CSIR).[16] Pfizer Corporation eventually acquired the rights to a hoodia-derived compound called P57 (so named because it was the 57th chemical tested) and at one time planned to market a diet drug that would compete against currently available concoctions that rely on the troubled combination of ephedra and caffeine.[17] A safe, effective

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9. Jim Chen, *Epiphytic Economics and the Politics of Place*, 10 MINN. J. GLOBAL TRADE 1, 34 (2001). For an overview of contemporary American food aid policies that is as incisive as it is concise. *See generally* Vernon W. Ruttan, *Does Food Aid Have a Future?*, 80 AM. J. AGRIC. ECON. 572 (1998).

10. *See, e.g.*, P.I. Boumtje et al., *Dietary Habits, Demographics, and the Development of Overweight and Obesity Among Children in the United States*, 30 FOOD POL'Y 115 (2005); Katherine M. Flegal *et al.*, *Prevalence and Trends in Obesity Among U.S. Adults*, 288 J.A.M.A. 1723 (2002); Roland Sturm, *The Effects of Obesity, Smoking, and Drinking on Medical Problems and Costs*, 21:2 HEALTH AFFAIRS 245 (March/April 2002); Roland Sturm, Jeanne S. Ringel & Tatiana Andreyeva, *Increasing Obesity Rates and Disability Trends*, 23:2 HEALTH AFFAIRS 199 (March/April 2004); *cf.* Michelle M. Mello, Eric B. Rimm & David M. Studdert, *The McLawsuit: The Fast-Food Industry and Legal Accountability for Obesity*, 22:6 HEALTH AFFAIRS 207 (Nov./Dec. 2003).

11. *Cf.* Alyson C. Flournoy, *Restoration Rx: An Evaluation and Prescription*, 42 ARIZ. L. REV. 187 (2000) (applying a medical analogy to the problem of ecological degradation and restoration).

12. *See* Peter Barton Hutt, *Food and Drug Law: A Strong and Continuing Tradition*, 37 FOOD DRUG COSM. L.J. 123 (1982).

13. JEFFERSON AIRPLANE, *White Rabbit*, *on* FEAR AND LOATHING IN LAS VEGAS (RCA 1967) ("Go ask Alice / When she's ten feet tall.").

14. WILSON, *supra* note 2, at 2.

15. *See generally* D.B. MacLean & L.G. Luo, *Increased ATP Content/Production in the Hypothalamus May Be a Signal for Energy Sensing of Satiety: Studies of the Anorectic Mechanism of a Plant Steroidal Glycoside*, 1020 BRAIN RES. 1 (2004); Orien L. Tulp, et al., *Effect of Hoodia Plant on Food Intake and Body Weight in Lean and Obese LA/Ntul//-cp Rats*, 15:4 FASEB J. A404 (March 2001); Orien L. Tulp, Nevin A. Harbi & Ara DerMarderosian, *Effect of Hoodia Plant on Weight Loss in Congenic Obese LA/Ntul//-cp Rats*, 16:4 FASEB J. A648 (March 2002).

16. *See generally* Gerard Bodeker, *Traditional Medical Knowledge, Intellectual Property Rights & Benefit Sharing*, 11 CARDOZO J. INT'L & COMP. L. 785, 795-96 (2003).

17. *See, e.g.*, Regulations on Statements Made for Dietary Supplements Concerning the Effect of the

substitute, if successfully tested and marketed, would earn massive profits. "Purchasers of diet products are often 'pathetically eager' to obtain a more slender figure."[18] In July 2003, however, Pfizer withdrew from the project and discontinued clinical development of P57.[19] The failure to exploit hoodia commercially mooted the immediate question of whether P57's developers owed the San people any compensation. As the stories of neem and the rosy periwinkle illustrate, however, demands for global justice hound almost every effort to extract agricultural or pharmaceutical value from the biological bounty of the developing world.

So frequent, so familiar, and so uniform are tales of biological exploitation that they now follow a predictable script:

> *<Large northern corporation> <seeks / is developing>* a highly sophisticated *<plant variety / pharmaceutical product>* and sends researchers to *<exotic place>*. After interviewing local *<farmers / foragers>*, the company's researchers identify a *<species / variety / breed>* of *<life form>* that seems responsible for *<desirable trait>*. The researchers collect a few speciments and collate their interviews. The samples and the local lore inspire a successful program of *<cross-breeding / genetic engineering / pharmaceutical development>*, which saves the company thousands of hours and enables it to eclipse its competition. The company never shares its profits, however, with the local community from which it derived genetic resources and traditional knowledge.[20]

This is the paradigmatic *biopiracy* narrative. That unmistakably accusatory word has set the rhetorical baseline in many debates within the international law of environmental protection and intellectual property for years to come. Many critics condemn the northern "[c]orporations [that] are surveying remote areas of the world for medicinal plants, indigenous relatives of common food crops, exotic sweeteners, sources of naturally occurring pesticides, and even the genetic material of once-isolated indigenous peoples."[21] The epithets "biological colonialism,"[22] "genetic imperialism,"[23] and even plain "plunder"[24] dominate many instances of the biopiracy narrative.

Product on the Structure or Function of the Body, 65 Fed. Reg. 1000 (Jan. 6, 2000); Dietary Supplements Containing Ephedrine Alkaloids, 65 Fed. Reg. 17,474 (April 3, 2000).

18. United States v. An Article of Food . . . "Manischewitz . . . Diet Thins," 377 F. Supp. 746, 749 (E.D.N.Y. 1974).

19. *See* Press Release, Phytopharm, Pfizer Returns Rights of P57 (last visited Sept. 12, 2005) *available at* http://www.phytopharm.co.uk/ press/Rel%2080finalfinal.htm (on file with the *McGeorge Law Review*).

20. *See* Paul J. Heald, *The Rhetoric of Biopiracy*, 11 CARDOZO J. INT'L & COMP. L. 519, 521 (2003) (inspiring this fill-in-the-blank biopiracy form).

21. BRIAN TOKAR, EARTH FOR SALE, RECLAIMING ECOLOGY IN THE AGE OF CORPORATE GREENWASH 162 (1997).

22. *See id.*; S.M. Mohamed Idris, *Doublespeak and the New Biological Colonialism*, 39 THIRD WORLD

I come not to praise the biopiracy narrative, but to bury it. Most allegations of biopiracy are so thoroughly riddled with inconsistencies and outright lies that the entire genre, pending further clarification, must be consigned to the realm of "rural" legend. Grace has no patent on neem-derived products in India,[25] and it is "not clear that the Grace patent," granted under American law,[26] "will have any [negative] economic or social effect in India."[27] The European Patent Office's decision to revoke the Grace patent further weakens its impact on India.[28] The fear that the Grace patent would deprive Indian villagers of the right to continue traditional uses of neem (including the use of the tree's branches as toothbrushes) is purely scurrilous. Neem in its natural form is unpatentable.[29]

As for the rosy periwinkle, Madagascar has an even weaker claim of unjust treatment.[30] The rosy periwinkle is native to Madagascar but grows throughout the tropics. In 1952, Robert Laing Noble, a member of the medical faculty at the University of Western Ontario, received 25 rosy periwinkle leaves from his brother, Clark Noble, who in turn reported that the leaves were used in Jamaica for diabetes treatment when insulin was unavailable. The leaves had little effect on blood sugar but strongly inhibited white blood cells. By 1958, Robert Noble's research team at Western Ontario successfully isolated and purified the potent alkaloid extract now known as vinblastine. Working independently, Eli Lilly & Co. found that a crude extract of the whole periwinkle plant prolonged the lives of mice with leukemia. Eli Lilly eventually synthesized vincristine. Insofar as Jamaica has a much stronger claim as the source of traditional knowledge that facilitated the development of vinblastine and vincristine, even advocates of benefit-sharing find it difficult, if not altogether impossible, to fashion a convincing case that Eli Lilly should compensate Madagascar.[31]

Despite its implausibility, the biopiracy narrative now dominates legal

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RESURGENCE 20 (1993).

23. *See* TOKAR, *supra* note 21, at 162-64.

24. *See, e.g.*, VANDANA SHIVA, PROTECT OR PLUNDER: UNDERSTANDING INTELLECTUAL PROPERTY RIGHTS (2001).

25. *See* George K. Foster, Comment, *Opposing Forces in a Revolution in International Patent Protection: The U.S. and India in the Uruguay Round and Its Aftermath*, 3 UCLA J. INT'L L. & FOREIGN AFF. 283, 308 (1998).

26. *See* James F. Walter, *Storage Stable High Azadirachtin Solution*, Patent No. 5,281,618 (Jan. 25, 1994).

27. Emily Marden, *The Neem Tree Patent: International Conflict over the Commodification of Life*, 22 B.C. INT'L & COMP. L. REV. 279, 285 (1999).

28. *See* Decision Revoking European Patent No. 0436257 (Eur. Patent Off. Feb. 13, 2001).

29. *See* Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948).

30. *See* Alain Marie, *The Rosy Periwinkle: The Little Flower That Saves Lives* (June 2003), *available at* http://www.symbiosisonline.com/jun03_periwinkle.htm (last visited Aug. 9, 2005) (on file with the *McGeorge Law Review*).

31. *See, e.g.*, A.B. CUNNINGHAM, ETHICS, ETHNOBIOLOGICAL RESEARCH, AND BIODIVERSITY 6 (1993); DARRELL A. POSEY & GRAHAM DUTFIELD, BEYOND INTELLECTUAL PROPERTY: TOWARD TRADITIONAL RESOURCE RIGHTS FOR INDIGENOUS PEOPLES AND LOCAL COMMUNITIES (1996); Karen Anne Goldman, *Compensation for Use of Biological Resources and the Convention on Biological Diversity: Compatibility of Conservation Measures and Competitiveness of the Biotechnology Industry*, 25 LAW & POL'Y INT'L BUS. 695, 717 (1994).

scholarship on the commercialization of products whose development can be traced to a developing country. Advocates for the global south have been clamoring for proprietary protection against northern, industrial uses of ethnobiological knowledge, and that demand shows no sign of abating.[32] Against this tide, piecemeal rebuttal of the biopiracy narrative seems futile. In any event, "[i]t would be a very easy and cheap display of commonplace learning" to pierce the "glowing and emphatic language" of the biopiracy narrative,[33] as conveyed in individual stories about neem, rosy periwinkle, or hoodia. The time has come, in short, to dismantle the myth of biopiracy root and branch.

This Article takes a modest first step toward deconstructing the biopiracy narrative. It will assess claims of biopiracy according to the layered model of information platforms. Every information platform consists of three distinct layers—physical, logical, and content—and biological information is no exception. Layer by layer, I will strip the biopiracy narrative of its plausibility. The conventional biological distinction between phenotypes and genotypes separates the physical from the logical layer of information in individual biological specimens and in species at large. Ethnobiological knowledge is best characterized as the inventive transformation of genetic information into commercially valuable applications. An appropriately utilitarian view of property and its relationship to each layer of biological information thus dissolves any allegation of biopiracy.

Having drained the biopiracy narrative of its rhetorical power, this Article will conclude by briefly considering what the proponents of this narrative have been seeking and how the global community might give the global south what it needs (if not necessarily what it wants). Most of all, advocates for the global south seek some way of compensating traditional communities for their contribution to the global storehouse of biological knowledge. Although that goal remains out of reach, more modest—and in many ways more beneficial—intermediate objectives are quite feasible. Simple and salutary reforms of existing patent law can prevent outsiders from securing intellectual property in knowledge already developed by traditional communities. To the extent that bioprospecting will remain part of the global community's portfolio of tools for protecting the biosphere, countries rich and poor should develop a framework for regulating this practice and cooperate in encouraging the professionalization of parataxonomy.

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32. *See* Heald, *supra* note 20, at 522-23.

33. Regina v. Dudley & Stephens, 14 Q.B.D. 273, 287 (1884).

II. STRIPPING THE BIOPIRACY NARRATIVE OF ITS POWER, LAYER BY LAYER

A. Biological Diversity as a System of Information

Each alleged episode of biopiracy involves three distinct sources of potential biological value. First, plant or animal specimens may be valuable as physical chattels. Second, the chemical and genetic information contained in those specimens represents a distinct and potentially lucrative source of value. Finally, local communities are likelier than the world at large, including even trained scientists, to recognize which native species have medicinally useful properties. This final bundle of value may be called *ethnobiological knowledge*. This interlocking trio corresponds with the biological categories of phenotype, genotype, and meme. The trio collectively forms a comprehensive information platform on which enterprising human agents, ranging from village shamans to multinational pharmaceutical companies, can develop applications of commercial value in local and global markets. Biopiracy narratives often fail to identify where episodes of alleged "theft" take place. Attention to the layered nature of biological information clarifies the extent to which alleged acts of expropriation warrant legal concern.

Every information platform consists of three layers: a *physical* layer, a *logical* layer, and a *content* layer.[34] Thanks to the relationship between energy and information,[35] "the beneficence of the sun could be regarded as a continuous gift of 10^{37} words of information per second to the Earth, rather than as 5×10^{7} megawatt hours of power per second."[36] Blessed with "information that has . . . flow[ed] for millions of years," nature has compiled "more information of a higher order of sophistication and complexity . . . in a few square yards of forest than there is in all the libraries of mankind."[37] The resulting information is encoded within living organisms. The genetic information from a common mouse, for instance, could "fill every edition of the *Encyclopædia Britannica* published since 1768."[38] Given the dynamic nature of the biosphere as a network of living things that continually renegotiate the links between them,[39] "[t]he biosphere that is the planet earth" should be regarded "as an exceedingly complex 'computer program' with millions of parts, each of which is evolving."[40]

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34. *See* Yochai Benkler, *From Consumers to Users: Shifting the Deeper Structures of Regulation Toward Sustainable Commons and User Access*, 52 FED. COMM. L.J. 561, 562-63 (2000).

35. *See generally* Myron Tribus & Edward C. McIrvine, *Energy and Information (Thermodynamics and Information Theory)*, SCI. AM., Sept. 1971, at 179.

36. J.E. LOVELOCK, GAIA: A NEW LOOK AT LIFE ON EARTH 150 (1979).

37. GARY SNYDER, TURTLE ISLAND 108 (1974).

38. RICHARD J. TOBIN, THE EXPENDABLE FUTURE: U.S. POLITICS AND THE PROTECTION OF BIOLOGICAL DIVERSITY 10 (1990).

39. *See generally* RICHARD SOUTHWOOD, THE STORY OF LIFE (2003).

40. John Charles Kunich, *Preserving the Womb of the Unknown Species with Hotspots Legislation*, 52

Biologist Richard Dawkins eloquently lauds the "illuminating insight" of nature as megacomputer:

> You can, if you wish, think of the genes in all the populations of the world as constituting a giant computer, calculating costs and benefits and currency conversions, with the shifting patterns of gene frequencies doing duty for the shuttling 1s and 0s of an electronic data processor.[41]

An appropriately high level of abstraction makes it easy to perceive the layered nature of the biosphere at large as an information platform. The planet's surface, its waters, and its atmosphere constitute a physical layer, which in turn provides habitat for all organisms. The biological dynamics that dictate ecosystem function and stability comprise a logical layer of sorts, much as languages such as HTML and Java and standards for interconnection such as TCP/IP enable the Internet to function. The success or failure of efforts to conserve biodiversity often hinges on the law's treatment of the biosphere's physical and logical layers.[42] Since their impacts are felt most profoundly at these "lower" layers, climate change, habitat destruction, and alien invasive species pose the greatest threats to biological diversity.[43]

Most casual observers, however, have difficulty understanding the biosphere as an information platform. Instead, treating nature as an admittedly dynamic collection of species and specimens is probably the most popular and most easily understood sense in which the biosphere serves as a storehouse of information.[44] Even when embodied within smaller units of transmittable biological information (species, specimens, and genes), however, biological "content" is itself layered. The biological content represented by a single species can be further divided into physical, logical, and application-based sub layers. Individual specimens represent the *physical sublayer*. The genetic information within these specimens' DNA constitutes the *logical sublayer*. Finally, human knowledge regarding potential applications of genetic information forms a uniquely "soft" form of biological content. The electronic analogy is complete: just as individual websites manipulate HTML, Java, TCP/IP, and other elements of the Internet's logical "code," human ingenuity transforms the biological "code" embedded in other organisms' DNA into foods, drugs, and other products that serve humans.

HASTINGS L.J. 1149, 1168 (2001).

41. RICHARD DAWKINS, CLIMBING MOUNT IMPROBABLE 72 (1996).

42. *See generally* Jim Chen, *Webs of Life: Biodiversity Conservation as a Species of Information Policy*, 89 IOWA L. REV. 495, 530-64 (2004).

43. *See generally* Jim Chen, *Across the Apocalypse on Horseback: Imperfect Legal Responses to Biodiversity Loss*, 17 WASH. U. J.L. & POL'Y 12 (2005); Jim Chen, *Across the Apocalypse on Horseback: Imperfect Legal Responses to Biodiversity Loss*, *in* THE JURISDYNAMICS OF ENVIRONMENTAL PROTECTION: CHANGE AND THE PRAGMATIC VOICE IN ENVIRONMENTAL LAW 197 (Jim Chen ed., 2003).

44. *See* Jim Chen, *Diversity and Deadlock: Transcending Conventional Wisdom on the Relationship Between Biological Diversity and Intellectual Property*, 31 ENVTL. L. RPTR. 10,625, 10,628-29, 10,633 (2001).

Some layered models of information policy identify not one but two layers beyond logic: *applications* and *content*.[45] To avoid confusion with the notion of species in their own right as a source of biological "content," I shall describe the corpus of human knowledge about genetic information as the *application sublayer* of the biosphere.

Happily, the boundaries between the physical and logical sublayers and between the logical and application sublayers correspond to two standard dividing lines in biology: the distinction between phenotypes and genotypes and the distinction between genes and memes. Careful examination of these distinctions and of the sublayers they demarcate undermines the normative premises of the biopiracy narrative.

B. The Physical and Logical Sublayers: Distinguishing Phenotypes from Genotypes

1. Phenotypes Versus Genotypes, or, Bad Sex Makes Good Eating

The distinction between phenotypes and genotypes separates biological specimens as physical chattel from biological specimens as sources of genetic code. In a world shaped by natural and sexual selection, two and only two forces really matter. One of them is food. The other is sex.[46] The seed is both. "It is both means of production and, as grain [or fruit], the product."[47] The seed itself is a mere chattel, but the genetic information it contains is conceptually independent. A genome is at once a set of instructions for assembling and operating an organism, and a dynamic record of that organism's evolutionary history.[48] The standard legal distinction between chattel and intellectual property, which corresponds to the distinction between phenotypes and genotypes, explains why mere possession of the stationery on which a letter is written does not entitle the possessor to quote or paraphrase the letter itself.[49] In economic as well as biological terms, the phenotypical information contained in a single organism is quite distinct from that organism's genotype. Whereas consumption of a physical specimen precludes any other use, genetic information resembles a nonrivalrous

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45. *See, e.g.*, COMMITTEE ON THE INTERNET IN THE EVOLVING INFORMATION INDUSTRIES, THE INTERNET'S COMING OF AGE 126-29 (2001); Mark A. Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. REV. 925, 940 (2001); Kevin Werbach, *A Layered Model for Internet Policy*, 1 J. ON TELECOMMS. & HIGH TECH. L. 37, 57-64 (2002).

46. Jim Chen, *Law as a Species of Language Acquisition*, 73 WASH. U. L.Q. 1263, 1278 n.99 (1995). *See generally* GEOFFREY F. MILLER, THE MATING MIND: HOW SEXUAL CHOICE SHAPED THE EVOLUTION OF HUMAN NATURE 8-9 (2000) (distinguishing between natural and sexual selection as evolutionary forces).

47. JACK RALPH KLOPPENBURG JR., FIRST THE SEED: THE POLITICAL ECONOMY OF PLANT BIOTECHNOLOGY, 1492-2000, at 10 (1988).

48. *See generally* ANTOINE DANCHIN, THE DELPHIC BOAT: WHAT GENOMES TELL US (Alison Quayle transl., 2003).

49. *See* Salinger v. Random House, Inc., 811 F.2d 90, 94-95 (2d Cir. 1987), *supplemented*, 818 F.2d 252 (2d. Cir. 1987), *cert. denied*, 484 U.S. 890 (1987).

public good in that a single use does not preclude independent use by a different party.[50]

The Flavr Savr™ tomato, the first transgenically modified organism approved by the Food and Drug Administration for human consumption,[51] vividly illustrates the distinction between phenotypes and genotypes. 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."[52] The introduced gene directed the production of complementary RNA that would bind itself to mRNA that ordinarily governs the production of polygalacturonase (the enzyme associated with the decomposition of pectin). Tomatoes with lower levels of polygalacturonase have a longer shelf life because their cell walls remain intact for a longer period of time.

In plain English, Calgene tricked the tomato into abandoning its original genetic instructions as a delivery vehicle for seeds and accepting new commands better suited to shelf life within human kitchens. Natural selection typically does not yield traits that are useful to humans but inimical to the organism's well-being.[53] 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 humans. As with hogs and oysters, bad sex makes good eating.[54]

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50. *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).

51. *See* Calgene, Inc.: Request for Advisory Opinion, 57 Fed. Reg. 22,772 (May 29, 1992); Statement of Policy: Foods Derived From New Plant Varieties, 57 Fed. Reg. 22,984 (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).

52. *Calgene*, 57 Fed. Reg. at 22, 772; *see also* Enzo Biochem, Inc. v. Calgene, Inc., 188 F.3d 1362, 1370-77 (Fed. Cir. 1999) (holding that Calgene's Flavr Savr tomato did not infringe patents on the use of antisense technology in *Escherichia coli* bacteria). The FDA rightly referred to the tomato as a fruit, not vegetable. Love over gold; biology over law. But the Supreme Court disagrees:

> Botanically speaking, tomatoes are the fruit of a vine, just as are cucumbers, squashes, beans and peas. But in the common language of the people, whether sellers or consumers of provisions, all these are vegetables, which are grown in kitchen gardens, and which, whether eaten cooked or raw, are, like potatoes, carrots, parsnips, turnips, beets, cauliflower, cabbage, celery and lettuce, usually served at dinner in, with, or after the soup, fish or meats which constitute the principal part of the repast, and not, like fruits generally, as dessert.

Nix v. Hedden, 149 U.S. 304, 307 (1893).

53. Tulip mania in seventeenth century Holland provides a partial exception. A virus transmitted by the peach potato aphid, *Myzus persicae*, causes the tulip to "break" into multiple colors. This virus "is the only known instance of a plant disease which greatly increases the value of the infected plant." ANNA PAVORD, THE TULIP: THE STORY OF A FLOWER THAT HAS MADE MEN MAD 11 (1999); *cf.* Keith Saunders *et al.*, *The Earliest Recorded Plant Virus Disease*, 422 NATURE 831 (2003) (reporting that a poem attributed to an eighth century Japanese empress records the symptoms of a viral disease that turns *Eupatorium makinoi* a striking yellow in summer).

54. *See Ex parte* Allen, 2 U.S.P.Q.2d 1425 (Patent & Trademark Off. 1987) (recognizing a polyploid oyster as patentable subject matter, but denying the patent for failure to satisfy the obviousness requirement of 35 U.S.C. § 103) *aff'd without opinion*, 846 F.2d 77 (Fed. Cir. 1988). "[E]xposing newly fertilized oyster eggs to extreme water pressure disrupts the normal allocation of chromosomes during cell division, leaving . . . oysters with three

2. *National Control over the Physical Layer*

Let us return to the basic biopiracy narrative, the better to apply these insights about phenotypes and genotypes. Suppose that a researcher working for a northern pharmaceutical company harvests a few specimens of a rare and potentially valuable plant from its native soil and packs those specimens in her luggage. The act of harvesting those specimens unquestionably represents a "taking" of that plant within the meaning of the United States' Endangered Species Act (ESA).[55] That statute, however, appears to have no territorial effect outside the United States.[56] Even if the Endangered Species Act could be construed so that it overcomes the usual presumption against extraterritorial application of American law,[57] private litigants would face formidable barriers to enforcing the Act.[58] Unless the biological hot spot from which this plant is harvested happens to fall within the jurisdictional reach of the United States, some other source of law must supply restrictions on takings of that plant.

One pertinent source of law is the Convention on Biological Diversity, an international agreement aimed at promoting "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."[59] 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 within their jurisdiction or control do not cause damage to the environment . . . beyond the limits of national jurisdiction."[60] Through this simple proclamation, the Convention on Biological Diversity extinguishes any preexisting claim in international law that genetic resources belong to the "heritage of mankind" or otherwise lie within a global public domain.[61] At the

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copies of each chromosome, instead of the normal two . . . . This makes the oysters sterile and also eliminates their normal two-month reproductive cycle," which in turn permits the oysters to "be harvested year-round." Robert P. Merges, *Intellectual Property in Higher Life Forms: The Patent System and Controversial Technologies*, 47 MD. L. REV. 1051, 1053-54 (1988) (footnotes omitted).

55. *See* 16 U.S.C. § 1538(a)(1)(B), (C) (2000) (declaring it "unlawful for any person subject to the jurisdiction of the United States to . . . take [an endangered] species within the United States or the territorial sea of the United States" or "upon the high seas"); *cf. id.* § 1532(19) ("The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."). *Id.*

56. *See* Lujan v. Defenders of Wildlife, 504 U.S. 555, 585-89 (1992) (Stevens, J., concurring in the judgment).

57. *See, e.g.*, EEOC v. Arabian Am. Oil Co., 499 U.S. 244, 248 (1991); Foley Bros v. Filardo, 336 U.S. 281, 284-85 (1949); Murray v. The Charming Betsy, 6 U.S. (2 Cranch) 64 (1804).

58. *See Defenders of Wildlife*, 504 U.S. at 562-71.

59. United Nations Conference on Environment and Development: Convention on Biological Diversity, 1999, art. 1, 31 I.L.M. 818 [hereinafter CBD].

60. *Id.* art. 3; *accord* Rio Declaration on Environment and Development, *adopted* June 14, 1992, 31 I.L.M. 874, 876 (1992) (principle 2).

61. *See, e.g.*, 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."). *See generally* KEMAL BASLAR, THE CONCEPT OF THE COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW 9, 307 (1998) and ACHIM LERCH, VERFÜGUNGSRECHTE UND BIOLOGISCHE VIELFALT 91 (1996) (describing the common heritage principle in international law).

same time, by recognizing sovereign control over natural resources, the Convention places the onus for preventing the depletion of a commercially valuable endangered species squarely on national governments and on domestic environmental law.

The Convention on Biological Diversity, reviled by the United States government because it allegedly "requir[es] open access to research activities" and thereby "effectively transfer[s] technology at the expense of" intellectual property,[62] provides an extremely unlikely platform for credible allegations of biopiracy. International cooperative biodiversity groups—commercial partnerships involving multinational life sciences companies and national governments in countries rich in biological diversity—owe their existence to the Convention.[63] The Convention requires that all contracting parties "[i]dentify components of biological diversity," take special care in monitoring "those [components] requiring urgent conservation measures and those which offer the greatest potential for sustainable use," and identify and monitor "activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity."[64] The capacity-building impetus supplied by this requirement to catalog and monitor biodiversity reinforces the national control conferred by article 3 of the Convention. Fearful that extinctions will outpace the research and recovery efforts of poorly trained, equipped, and financed domestic biologists, nearly all countries welcome foreign bioprospectors.[65] On the other hand, some source countries have begun to restrict collection by traditional intermediaries, such as botanical gardens, in an effort to retain local control, build domestic scientific infrastructure, and capture profits from the value-added phases of commercial bioprospecting.[66]

The larger point is that source countries exert complete control over the physical, phenotypical layer of information in bioprospecting. Subjecting genetic resources to national sovereignty means, quite simply, that access to those resources rests entirely under the control of national governments. Accusations that commercial development is inflicting environmental damage, though

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62. Goldman, *supra* note 31, at 714. *See generally* Robert F. Blomquist, *Ratification Resisted: Understanding America's Response to the Convention on Biological Diversity, 1989-2002*, 32 GOLDEN GATE U. L. REV. 493 (2002).

63. *See, e.g.*, Asebey & Kempenaar, *supra* note 61, at 725-30; Sarah A. Laird, *Contracts for Biodiversity, in* BIODIVERSITY PROSPECTING: USING GENETIC RESOURCES FOR SUSTAINABLE DEVELOPMENT 104 (Walter V. Reid ed., 1993) [hereinafter BIODIVERSITY PROSPECTING]; Charles R. McManis, *Intellectual Property, Genetic Resources and Traditional Knowledge Protection: Thinking Globally, Acting Locally*, 11 CARDOZO J. INT'L & COMP. L. 547, 559-60 (2003); Kristen Peterson, *Recent Intellectual Property Trends in Developing Countries*, 33 HARV. INT'L L.J. 277, 288-89 (1992). The leading example of an international cooperative biodiversity group is Costa Rica's *Instituto Nacional de Biodiversidad* (INBio), established in cooperation with Merck.

64. CBD, *supra* note 59, art. 7.

65. *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).

66. *See* Julie M. Feinsilver, *Biodiversity Prospecting: Prospects and Realities, in* PROSPECTS IN BIODIVERSITY PROSPECTING 21, 24 (A.H. Zakri ed., 1995).

justifiable to some degree,[67] should not be laid at the feet of northern bioprospectors. Local governments, not foreign bioprospectors, hold primary responsibility for environmental damage attributable to the collection of biological specimens. Laurie Anne Whitt, for instance, blames pharmaceutical commercialization for depletion of a rare plant, *Pilocarpus jaborandi*, used in the traditional medicine of the Kayapo and Guajajara peoples of Brazil.[68] If jaborandi bushes are indeed being overharvested for their pharmacologically active leaves, the depletion should not be blamed on Merck & Company. Responsibility for this plant's decline does not rest with the multinational pharmaceutical company merely because it has developed an anti-glaucoma drug from jaborandi. Rather, the government of Brazil is accountable for its failure to control access to jaborandi in its natural range or otherwise to regulate its harvest.[69] By the terms of article 3 of the Convention on Biological Diversity, either Brazil has failed to exercise properly its "sovereign right to exploit . . . resources pursuant to [its] own environmental policies," or it has shirked "the responsibility to ensure that activities within [its] jurisdiction or control do not cause damage to the environment." Whatever the merits of Brazil's behavior with respect to jaborandi, the fact remains that national governments in much of the biodiversity belt routinely ignore or even oppose biodiversity conservation and the welfare of indigenous communities.[70] Few if any developing nations share the United States' dedication to biodiversity conservation, let alone the United States' resources for enforcing laws that can be as expensive and politically unpopular as the Endangered Species Act.

The truth is that national and international laws on biodiversity conservation have historically imposed very tight limits on harvesting and trafficking in biological specimens. Section 9 of the Endangered Species Act flatly prohibits the "tak[ing]" of any protected species.[71] "The term 'take,'" in turn "means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[72] Section 9 so unequivocally condemns

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67. Bioprospectors, anthropologists, or journalists have been known to engage in deliberate misconduct. *See* PATRICK TIERNEY, DARKNESS IN EL DORADO: HOW SCIENTISTS AND JOURNALISTS DEVASTATED THE AMAZON (2000). Even casual hiking affects the distribution and population of wildlife. *See* Francesca Ortiz, *Candidate Conservation Agreements as a Devolutionary Response to Extinction*, 33 GA. L. REV. 413, 508 (1999); *cf.* Mausolf v. Babbitt, 125 F.3d 661, 669-70 (8th Cir. 1997) (upholding snowmobiling restrictions in Voyageurs National Park on the basis of biological opinions that showed adverse impacts from snowmobiling on gray wolves). *See generally* David S. May, *Tourism and the Environment*, 14 NAT. RES. & ENV'T 57 (1999).

68. *See* Laurie Ann Whitt, *Indigenous Peoples, Intellectual Property and the New Imperial Science*, 23 OKLA. CITY U. L. REV. 211, 213-14 (1998).

69. *See* Dennis J. Karjala, *Biotech Patents and Indigenous Peoples* 5 & n.12 (unpub. m.s. dated Sept. 17, 2003).

70. *See, e.g.*, Michael Dove, *Center, Periphery, and Biodiversity: A Paradox of Governance and a Developmental Challenge*, *in* VALUING LOCAL KNOWLEDGE: INDIGENOUS PEOPLE AND INTELLECTUAL PROPERTY RIGHTS 43 (Stephen B. Brush & Dorren Stabinsky eds., 1996); Heald, *supra* note 20, at 535-36.

71. *See* 16 U.S.C. § 1538 (2000).

72. *Id.* § 1532(18).

the harvesting of protected organisms that few if any litigated ESA cases discuss this aspect of the statute. One of the most prominent reported cases involving an attempt to harvest a member of a protected species[73] actually arose under the Marine Mammal Protection Act of 1972[74] rather than the ESA.[75]

At the international level, traffic in goods derived from endangered species remains the single act of biodiversity destruction on which the global community has reached a punitive consensus. The Convention on International Trade in Endangered Species (CITES),[76] now in its fourth decade, would represent a major step toward conserving biodiversity, as long as one is willing to overlook the fact that it does not work. During the 1980s, the extension of CITES to "all aspects of trade and research" in orchids "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."[77] Yet the treaty raised no legal barriers to developers and farmers who would "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."[78] Not surprisingly, "no 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."[79] That controlled harvests for profit should outperform direct regulation in taming the ivory trade and deterring the poaching of elephants[80] provides a singularly powerful rebuke of CITES.

In short, responsibility for alleged biopiracy in the physical sublayer falls squarely on the national government asserting sovereignty over commercially valuable species in their natural habitat. Under the Convention on Biological Diversity, individual components of the biosphere do not constitute a shared "heritage of mankind." They fall under the sovereign control of individual nations, which can blame only themselves for any failure to soften the environmental impact of seeking and harvesting biological specimens.

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73. *See* United States v. Hayashi, 22 F.3d 859 (9th Cir. 1993).

74. 16 U.S.C. §§ 1361-1421 (2000).

75. *Cf.* United States v. McKittrick, 142 F.3d 1170 (9th Cir. 1998) (upholding ESA penalties levied against a rancher who shot and decapitated a gray wolf), *cert. denied*, 525 U.S. 1072 (1999).

76. 27 U.S.T. 1087 (1973), *entered into force* July 1, 1975.

77. ERIC HANSEN, ORCHID FEVER: A HORTICULTURAL TALE OF LOVE, LUST, AND LUNACY 67 (2000).

78. *Id.* at 17.

79. *Id.* at 262-63.

80. *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); Michael J. Glennon, *Has International Law Failed the Elephant?*, 84 AM. J. INT'L L. 1 (1990).

3. National Variation in the Patentability of Genetic Information

Within the logical sublayer, genetic information emphatically does lend itself to ownership as intellectual property. To be sure, patent law denies protection to scientific principles deemed to be laws of nature.[81] This doctrine likewise blocks the patenting of a naturally occurring organism. The United States historically denied patent protection to all naturally occurring substances, even those that had been isolated and purified by human agency.[82] The Supreme Court reversed course radically in 1980 with *Diamond v. Chakrabarty*,[83] the celebrated case that upheld a patent on a *Pseudomonas* bacterium that had been genetically altered to degrade several components of crude oil. Today we no longer ask whether life forms can be patented, but merely how far those rights can and should extend. Plant breeders in the United States can secure patents,[84] plant patents,[85] plant variety certificates,[86] and insofar as genetic engineering involves the manipulation of biological information at the molecular level—perhaps even copyrights.[87] The trade secret laws of the states provide additional protection for certain hybrid crops.[88] Since 1988 the Patent Office has routinely granted utility patents for transgenic animals.[89]

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81. *See* Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948); *see also* Parke-Davis & Co. v. H.K. Mulford, 189 F. 95, 114 (S.D.N.Y. 1911) (Hand, J.) (denying patentability to "products of nature" and to mere "discoveries" of scientific principles); *cf.* Convention on the Grant of European Patents, *adopted at* Munich, Oct. 5, 1973, art. 52(2)(a), 1065 U.N.T.S. 255, 13 I.L.M. 270 [hereinafter European Patent Convention] (excluding "discoveries, scientific theories and mathematical methods" from the definition of "inventions which are susceptible of industrial application, which are new and which involve an inventive step").

82. *See* Linda J. Demaine & Aaron Xavier Fellmeth, *Reinventing the Double Helix: A Novel and Nonobvious Reconceptualization of the Biotechnology Patent*, 55 STAN. L. REV. 303, 366-84 (2002).

83. 447 U.S. 303 (1980).

84. *See* Patent Act of 1952, § 1, 35 U.S.C. § 101 (2000); J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 122 S. Ct. 593 (2001); Diamond v. Chakrabarty, 447 U.S. 303 (1980); *Ex parte* Hibberd, 227 U.S.P.Q. 443 (1985); *cf. In re* Kratz, 592 F.2d 1169 (C.C.P.A. 1979) (holding that a compound purified from strawberries can be patented even though a nonpurified form of that compound exists in strawberries).

85. *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).

86. *See* Plant Variety Protection Act of 1970, 7 U.S.C. §§ 2321-2582 (2000); Asgrow Seed Co. v. Winterboer, 513 U.S. 179 (1995); Imazio Nursery, Inc. v. Dania Greenhouses, 69 F.3d 1560 (Fed. Cir. 1995). *See generally* Jim Chen, *The Parable of the Seeds: Interpreting the Plant Variety Protection Act in Furtherance of Innovation Policy*, 7 MINN. J.L. SCI. & TECH. (forthcoming 2005).

87. *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); UNITED STATES CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, PATENTING LIFE 43 (1989) (noting the Copyright Office's unofficial position that nucleic acid sequences are not copyrightable).

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

89. *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)

At the international level, national decisions to recognize private ownership of genetic code is governed by the World Trade Organization's Annex on Trade-Related Aspects of Intellectual Property Rights (TRIPS).[90] TRIPS requires WTO 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."[91] The agreement, however, does permit its members to forgo patents on "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."[92] As a result, the eligibility of genetic information for patent protection varies considerably across national boundaries.

Although the United States has enthusiastically embraced intellectual property on genetic information, other countries have adopted more restrictive policies. India, to name perhaps the most restrictive example, has chosen not to grant biotechnology patents.[93] Even within the North Atlantic alliance, the United States is strikingly liberal on the issue of biotechnology patents. Harvard University's celebrated "Oncomouse" patent[94] (covering a mouse transgenically altered to be especially prone to cancer) has highlighted differences between the patent laws of the United States and those of its closest allies. The Supreme Court of Canada surprisingly refused in 2002 to uphold a patent on Harvard's Oncomouse.[95] The Canadian decision was all the more striking because it rested solely on the Canadian Patent Act, whose definition of patentable subject matter

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(outlining procedures for animal patents); Rebecca Dresser, *Ethical and Legal Issues in Patenting New Animal Life*, 28 JURIMETRICS J. 399 (1988); Merges, *Intellectual Property in Higher Life Forms*, *supra* note 54; Thomas Traian Moga, *Transgenic Animals as Intellectual Property (Or the Patented Mouse That Roared)*, 76 J. PAT. & TRADEMARK OFF. SOC'Y 511 (1994); Kevin W. O'Connor, *Patenting Animals and Other Living Things*, 65 S. CAL. L. REV. 597 (1991); Paul Blunt, Note, *Selective Breeding and the Patenting of Living Organisms*, 48 SYRACUSE L. REV. 1365 (1998).

90. *See* 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]; *see also* Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations, *done at* Marrakesh, April 15, 1994, ¶ 3, 33 I.L.M. 1143, 1143 (1994).

91. TRIPS, *supra* note 90, art. 27(1); *see also id.* art. 1(1) ("Members shall give effect to the provisions of this Agreement."). TRIPS 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." *Id.* art. 27(1) n.5. Utility and nonobviousness, of course, are the basic requirements for patentability in American law. *See* 35 U.S.C. §§ 101, 103 (2000).

92. TRIPS, *supra* note 90, art. 27(3)(b).

93. Foster, *supra* note 25, at 308.

94. *See* Philip Leder & Timothy A. Stewart, *Transgenic Non-Human Mammals*, U.S. Patent No. 4,736,866 (issued April 12, 1988). *See generally* THE LABORATORY MOUSE (Hans Hedrich ed., 2004).

95. *See* Harvard College v. Canada, 2002 SCC 76.

is almost identical with that of the United States' Patent Act.[96]

Controversy over the Oncomouse also inspired the European Union to adopt a Biotechnology Directive that purported to clarify key provisions of the European Patent Convention.[97] In addition to barring patents on "inventions the publication or exploitation of which would be contrary to *ordre public* or morality,"[98] the European Patent Convention denies patents for "plant or animal varieties or essentially biological processes for the production of plants or animals."[99] On the other hand, "microbiological processes or the products thereof" may be patented.[100]

The European Biotechnology Directive, handed down in July 1998, permits patents on "biological material," more precisely defined as "any material containing genetic information and capable of reproducing itself or being reproduced in a biological system."[101] To be eligible for a patent, such biological material must be "isolated from its natural environment or produced by means of a technical process . . . even if it previously occurred in nature."[102] Plants and animals may be patented under European law, but only "if the technical feasibility of the invention is *not* confined to a particular plant or animal variety."[103] The European "system of Community plant variety rights" thus provides "the sole and exclusive property right for plant varieties" under the law of the European Union.[104] Because the European Patent Convention's bar on patents for "plant . . . varieties" applies to all "plant varieties irrespective of the way in which they were produced," no European patent may be granted for "plant varieties containing genes introduced into an ancestral plant by recombinant gene technology."[105] Though framed as a hard-fought compromise between opponents of biotechnological patents and business interests fearing the flight of biotechnological talent and innovative capital from Europe,[106] the

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96. *Compare* Patent Act, R.S.C. ch. P-4, § 2 (1985) (authorizing patents for "any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter") *with* 35 U.S.C. § 101 (2000) (authorizing patents for "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof"). *See generally* Margo A. Bagley, *Patent First, Ask Questions Later: Morality and Biotechnology in Patent Law*, 45 WM. & MARY L. REV. 469 (2003) (praising the Canadian Oncomouse decision for vesting choices over patentable subject matter with "the correct institutional actor: the legislature").

97. *See* Council Directive 98/44/EC on the Legal Protection of Biotechnological Inventions, 1998 O.J. (L 213) 13 [hereinafter European Biotechnology Directive].

98. European Patent Convention, *supra* note 81, art. 53(a).

99. *Id.* art. 53(b).

100. *Id.*

101. European Biotechnology Directive, *supra* note 97, art. 2.1(a).

102. *Id.* art. 3.2.

103. *Id.* art. 4.2 (emphasis added).

104. *See* Community Plant Variety Rights , Council Reg. (EC) No. 2100/94, 1994 O.J. (L 227) 1, art. 1 [hereinafter European Plant Variety Regulation].

105. European Patent Office, Enlarged Bd. of Appeal, Transgenic plant/NOVARTIS II, G 0001/98 EBA 38 (Dec. 20, 1999), *available at* http://legal.european-patent-office.org/dg3/pdf/g980001ex1.pdf (on file with the *McGeorge Law Review).*

106. *See* GRAEME B. DINWOODIE, WILLIAM O. HENNESSEY & SHIRA PERLMUTTER, INTERNATIONAL AND COMPARATIVE PATENT LAW 432 (2002).

Biotechnology Directive has sparked fierce debate within the European Union.[107] France and the Netherlands, in particular, prefer a more restrictive approach to biotechnology patents.[108]

Within the international legal framework governing intellectual property, individual nations enjoy considerable freedom to grant or deny patent protection to genetic information. Though characterized as bundles of intangible rights, patents remain a peculiarly terrestrial form of property. They are valid only in the country that issues them. There simply is no legal support for contrary assertions, such as the rural legend that an American patent on azadirachtin (the pesticide that W.R. Grace derived from neem) would forbid traditional uses of neem in India. Although TRIPS does require its members to "provide for the protection of plant varieties either by patents or by an effective *sui generis* system,"[109] that accord obliges no country to grant animal patents. Canada and the European Union therefore remain free to adopt strikingly different policies, *vis-à-vis* the United States, on the Harvard oncomouse and a wide range of other biotechnological inventions.

The existence of legal diversity across national boundaries goes a long way toward negating the assertion that the availability of patents on genetic information *per se* represents biopiracy. National governments exert almost as much control over biotechology patents under TRIPS as they do over the collection of biological specimens under the Convention on Biological Diversity. In all events, each nation's patents lose legal vigor upon crossing international boundaries. The window of opportunity for unfair exploitation of genetic material traceable to developing countries is narrow indeed.

C. *From Genes to Memes: The Application Sublayer and the Legal Status of Ethnobiological Knowledge*

1. *Genes Versus Memes*

Organisms exhibit starkly divergent economic characteristics when serving as chattels and as carriers of chemical or genetic information. A harvested organism can provide useful information either as a chemical blueprint or as a

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107. *See* Bagley, *supra* note 96; Jasmine C. Chambers, *Patent Eligibility of Biotechnological Inventions in the United States, Europe, and Japan: How Much Patent Policy Is Public Policy?*, 34 GEO. WASH. INT'L L. REV. 223, 225 (2002); Lydia Nenow, Comment, *To Patent or not to Patent, The European Union's New Biotech Directive*, 23 HOUS. J. INT'L L. 569, 573 (2001).

108. *See* Kingdom of the Netherlands v. European Parliament & Council, Case 377/98, O.J. C 331 (European Ct. Justice 2001); Donna M. Gitter, *International Conflicts over Patenting Human DNA Sequences in the United States and the European Union: An Argument for Compulsory Licensing and a Fair-Use Exemption*, 76 N.Y.U. L. REV. 1623, 1657 (2000).

109. TRIPS, *supra* note 90, art. 27(3)(b); *cf.* Johanna Sutherland, *TRIPS, Cultural Politics, and Law Reform*, 16 PROMETHEUS 291, 295 (1998) (observing that WTO negotiations over TRIPS left no records addressing the characteristics of an "effective" *sui generis* system).

source of genes and traits for further manipulation through conventional breeding or transgenic engineering.[110] Proteins and genes, in other words, are nonrivalrous, nonexclusive goods.[111] Unlike chattels, these types of information are public goods in the sense that a single use does not preclude independent use by a different party.[112] Like "public goods, such as national defense," intellectual 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."[113] In stark contrast with the *rivalrous* nature of most property, whereby "possession by one party results in a gain that precisely corresponds to the loss endured by . . . [an]other party," use of a *nonrivalrous* good "by one entity does not diminish the use and enjoyment of others."[114]

Examining the boundary between phenotype and genotype thus gives us a glimpse at the central dynamic of the biopiracy narrative. A single sample of a rare rainforest plant can be transformed by a northern life sciences company into a lucrative drug or plant variety, and the physical means ordinarily used to confine chattels can scarcely stem the outward flow of information and wealth. Worse still, what is true of a plant specimen is also true of tribal lore. The valuable "package" at issue in many instances of alleged biopiracy actually consists of two distinct components: the chemical and genetic information encoded in a biological specimen, plus ethnobiological knowledge of the traits and traditional uses of that species. Claims of biopiracy often stress the sociological component to the exclusion of the biological, or else treat the two components as if they were inseparable.[115] But genetic information is readily distinguished from communal knowledge of plants and animals.

A sociologically oriented strain in contemporary biology, pioneered by Richard Dawkins, distinguishes sharply between genes and 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."[116] The sociological

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110. *See* Roger A. Sedjo, *Property Rights, Genetic Resources, and Biotechnological Change*, 35 J.L. & ECON. 199, 201 (1992).

111. *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).

112. *See* William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325 (1989).

113. 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).

114. Alabama Power Co. v. FCC, 311 F.3d 1357, 1369 (11th Cir. 2002).

115. *See, e.g.*, STEPHEN A. HANSEN ET AL., TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY: A HANDBOOK ON ISSUES AND OPTIONS FOR TRADITIONAL KNOWLEDGE HOLDERS IN PROTECTING THEIR INTELLECTUAL PROPERTY AND MAINTAINING BIOLOGICAL DIVERSITY 5 (2003); Winona LaDuke, *Traditional Ecological Knowledge and Environmental Futures*, 5 COLO. J. INT'L ENVTL. L. & POL'Y 127 (1994); Naomi Roht-Arriaza, *Of Seeds and Shamans: The Appropriation of the Scientific and Technical Knowledge of Indigenous and Local Communities*, 17 MICH. J. INT'L L. 919 (1996).

116. RICHARD DAWKINS, THE SELFISH GENE 192 (new ed. 1989).

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."[117] Every ethnobiological tale is a meme, easily severed from the chemical and genetic information that inspired it. Even legal concepts are memes.[118] As I have just demonstrated, the gene may qualify for protection as a form of intellectual property. The meme deserves separate economic and legal consideration.

2. *Protecting Ethnobiological Knowledge as Trade Secrets*

Article 8(j) of the Convention on Biological Diversity exhorts its contracting parties to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity."[119] The Convention also "encourage[s] the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices."[120] Although these exhortations are binding only insofar as the actions at issue are "possible," "appropriate," and properly "[s]ubject to [the] national legislation" of a contracting party,[121] the Convention remains "the only international treaty that specifically acknowledges the role of traditional knowledge, innovations, and practices in biodiversity conservation and sustainable development" and explicitly admonishes individual countries to provide some form of protection for traditional knowledge, "whether through intellectual property or other means."[122]

Existing laws on intellectual property, at both the national and the international level, can be modified so that they traditional as well as "scientific" knowledge.[123] The ability to change intellectual property laws should come as no surprise. Intellectual property in any form is a creature of positive law, consciously crafted to achieve one regulatory goal or another.[124]

Quite arguably, a workable model for protecting ethnobiological knowledge

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117. *Id.*; *cf.* EDWARD O. WILSON, CONSILIENCE: THE UNITY OF KNOWLEDGE 136 (1998) (proposing the unification of the meme concept with "node[s] of semantic memory" recognized in neuroscience).

118. *See* Michael S. Fried, *The Evolution of Legal Concepts: The Memetic Perspective*, 39 JURIMETRICS J. 291 (1999).

119. CBD, *supra* note 59, art. 8(j).

120. *Id.*

121. *Id.*

122. Graham Dutfield, *TRIPS-Related Aspects of Traditional Knowledge*, 33 CASE W. RES. J. INT'L L. 233, 260-61 (2001).

123. *See, e.g.*, INTELLECTUAL PROPERTY RIGHTS FOR INDIGENOUS PEOPLES: A SOURCE BOOK (Tom Greaves ed., 1994); GRAHAM DUTFIELD, CAN THE TRIPS AGREEMENT PROTECT BIOLOGICAL AND CULTURAL DIVERSITY? (1997); 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. ENVTL. L. 253 (2000); Robert K. Paterson & Dennis S. Karjala, *Looking Beyond Intellectual Property in Resolving Protection of the Intangible Cultural Heritage of Indigenous Peoples*, 11 CARDOZO J. INT'L & COMP. L. 633, 670 (2003).

124. *See* Lloyd L. Weinreb, *Copyright for Functional Expression*, 111 HARV. L. REV. 1149, 1240 (1998).

already exists, for many forms of traditional may satisfy certain elements of the definition of trade secrets.[125] A fairly modest conceptual extension of conventional definitions of trade secrets easily embraces ethnobiological knowledge. The *Restatement of Torts'* formulation has won the Supreme Court's endorsement on multiple occasions:

> [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 manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers.[126]

Similarly, the Uniform Trade Secrets Act protects "a formula, pattern, compilation, program, device, method, technique, or process" as long as the information in question not only "derives independent economic value, actual or potential, from no being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use," but also "is the subject of efforts that are reasonable under the circumstances to maintain its secrecy."[127]

More recently, the *Restatement (Third) of Unfair Competition* has simplified these definitions into a single, brief sentence: "A trade secret is any information that can be used in the operation of a business or other enterprise and that is sufficiently valuable and secret to afford an actual or potential economic advantage over others."[128] A scheme to protect traditional knowledge might begin by excising the words "and secret" from this definition. To be eligible for proprietary protection, traditional knowledge must contain some "information that can be used in the operation of a business or other enterprise and that is sufficiently valuable . . . to afford an actual or potential economic advantage over others."

The requirement of secrecy under trade secret law need not meet the test of "novelty" under patent law.[129] Even where no patent could issue, trade secret protection may be available.[130] Recognition of a trade secret does not depend upon an "inventive step," a requirement of patent law that traditional knowledge rarely if ever satisfies.[131] When the recipient of knowledge enjoys a licensing

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125. *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).

126. RESTATEMENT OF TORTS § 757, comment b (1939); *accord, e.g.*, Ruckelshaus v. Monsanto Co., 467 U.S. 986, 1002 (1984); Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 474-75 (1974).

127. UNIFORM TRADE SECRETS ACT § 1(4) (amended 1985), 14 U.L.A. 437 (1990).

128. RESTATEMENT (THIRD) OF UNFAIR COMPETITION § 39 (1995); *accord, e.g.*, Reingold v. Swiftships, Inc., 126 F.3d 645, 650, 652 (5th Cir. 1997).

129. *See* W.R. Grace & Co. v. Hargadine, 392 F.2d 9, 14 (6th Cir. 1968).

130. *See* Aronson v. Quick Point Pencil Co., 440 U.S. 257, 264 (1979).

131. *Cf.* Doris Estelle Long, *The Impact of Foreign Investment on Indigenous Culture: An Intellectual*

arrangement or some other business relationship with its originator, the law of trade secrets readily imposes a duty to respect its confidentiality.[132] "The protections of . . . trade secret law are most effective at the developmental stage, before a product has been marketed and the threat of reverse engineering becomes real."[133] "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."[134]

3. The Case Against Protecting Ethnobiological Knowledge

Simply because ethnobiological knowledge can be protected through some form of intellectual property, however, does not mean that it should be so protected. The ultimate question is whether ethnobiological knowledge *deserves* proprietary protection. The harsh reality is that there is no economically justifiable reason for protecting ethnobiological knowledge as property. Ethnobiological knowledge already lies in a public domain of sorts, albeit perhaps a very small public consisting of the members of an indigenous tribe whose culture itself is endangered.[135] Biopiracy, by spreading knowledge of an organism's useful properties, is "locally objectionable but globally beneficial."[136] Once ideas enter a global public domain, they should stay. Thomas Jefferson, the first administrator of patents in the United States, observed: "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."[137]

The intellectual property laws of the United States forbid measures that purport to remove ideas from the public domain and to reassign them to a private owner. "Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available."[138] A contrary approach effectively assumes "that the public interest in free access to" cultural information "is entirely worthless and that authors [and inventors], as a class, should receive a windfall solely based on

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Property Perspective, 23 N.C. J. INT'L L. & COM. REG. 229, 277 (1998) (arguing that folk knowledge rarely exhibits the sort of inventive step that patent law demands).

132. *See, e.g.*, Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 475 & n.4 (1974); Lear, Inc. v. Adkins, 395 U.S. 653, 670-71 (1969).

133. Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 161 (1989).

134. *Kewanee Oil*, 416 U.S. at 476.

135. *Cf.* CBD, *supra* note 59, art. 8(j) (exhorting all contracting parties, as part of their obligation to conserve biodiversity *in situ*, to "respect . . . indigenous knowledge" and to "encourage . . . equitable sharing" of the benefits derived from biological resources).

136. Dan L. Burk, *The Trouble with Trespass*, 14 J. SMALL & EMERGING BUS. L. 27, 52 (2000).

137. *See* Graham v. John Deere Co., 383 U.S. 1, 9 n.2 (1965) (quoting Thomas Jefferson).

138. *Id.* at 6.

completed creative activity."[139] As the Supreme Court recognized twelve decades ago:

> It was never the object of [the patent] laws to grant a monopoly for every trifling device, every shadow of a shade of an idea, which would naturally and spontaneously occur to any skilled mechanic or operator in the ordinary progress of manufactures. Such an indiscriminate creation of exclusive privileges tends rather to obstruct than to stimulate invention. It creates a class of speculative schemers who make it their business to watch the advancing wave of improvement, and gather its foam in the form of patented monopolies, which enable them to lay a heavy tax upon the industry of the country, without contributing anything to the real advancement of the art.[140]

Protecting indigenous knowledge as intellectual property would likewise stifle the free exchange of ideas that gave rise to this information in the first place.[141]

Moreover, trade secret law, the mode of intellectual property most often invoked to extend proprietary protection to ethnobiological knowledge, provides an exceptionally poor vehicle for delivering information of any sort into the public domain. Trade secret law, by design, keeps information concealed. By contrast, patent and copyright laws are designed to deliver privately held information into public hands. Proprietary protection of ideas should be designed to spur "release to the public of the products of . . . creative genius"; incidental "reward to the owner [is] a secondary consideration."[142] Introducing an idea to the global community in the broadest sense is the very purpose of intellectual property.[143] "[I]n respect to works already created," however, any grant of intellectual property "*creates no economic incentive at all.*"[144] Indeed, protecting existing work constitutes an economically destructive, preemptive strike against future innovation.[145]

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139. Eldred v. Ashcroft, 537 U.S. 186, 241 (2003) (Stevens, J., dissenting).

140. Atlantic Works v. Brady, 107 U.S. (17 Otto) 192, 200 (1883); *accord* Slawson v. Grand Street, P.P. & F.R. Co., 107 U.S. (17 Otto) 649, 654 (1883); Phillips v. City of Detroit, 111 U.S. 604, 608 (1884); Thompson v. Boisselier, 114 U.S. 1, 12 (1885); Railroad Supply Co v. Elyria Iron & Steel Co., 244 U.S. 285, 293 (1917); Great Atlantic & Pac. Tea Co. v. Supermarket Equip. Corp., 340 U.S. 147, 155 (1951) (Douglas, J., concurring).

141. *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, 78 (1998); Gary P. Nabhan, *Sharing the Benefits of Plant Resources and Indigenous Scientific Knowledge*, *in* VALUING LOCAL KNOWLEDGE: INDIGENOUS PEOPLE AND INTELLECTUAL PROPERTY RIGHTS 186, 192 (Stephen B. Brush & Doreen Stabinsky eds., 1996).

142. United States v. Paramount Pictures, Inc., 334 U.S. 131, 158 (1948); *accord, e.g.*, Mazer v. Stein, 347 U.S. 201, 219 (1954).

143. *See* Fox Film Corp. v. Doyal, 286 U.S. 123, 127 (1932) ("The sole interest of the United States and the primary objective in conferring the monopoly lie in the general benefits derived by the public from the labor of authors.").

144. Eldred v. Ashcroft, 537 U.S. 186, 257 (2003) (Breyer, J., dissenting) (emphasis in original).

145. *See* Dennis S. Karjala, *The Term of Copyright*, *in* GROWING PAINS: ADAPTING COPYRIGHT FOR

Intellectual property rights are not and should not be "given as favors."[146] They "are meant to encourage invention by rewarding the inventor with the right, limited to a term of years . . . , to exclude others from the use of his [or her] invention."[147] A patent "is a privilege which is conditioned by a public purpose": a spur to innovation and a product of realized invention, a patent "is limited to the invention which it defines."[148] The "economic philosophy behind" both "patents and copyrights" is "the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors in 'Science and useful Arts.'"[149] This constitutional mandate commits American intellectual property law to a strictly utilitarian mission, one in which advancing knowledge and generating useful innovations take precedence over abstract concepts such as personal autonomy and self-expression.[150] Just as the fourteenth amendment did not "enact Mr. Herbert Spencer's Social Statics,"[151] the patent and copyright clause of the Constitution did not endorse the property-rights philosophy of John Locke, Immanuel Kant, or Georg Wilhelm Friedrich Hegel.[152]

As the legacy of humanity, ethnobiological knowledge belongs in a global commons. The principal "economic rationale" justifying the privatization of land and other tangible objects—namely, rivalry among competing users of a finite, exhaustible resource—"simply does not apply to" traditional knowledge or any other kind of "information good[]."[153] A utilitarian attitude toward intellectual property dictates a very simple answer: "From an economic perspective, the more people who can use information, the better."[154] Ideas are as "free as the air to common use."[155] Rejecting the rhetoric of biopiracy helps keep ideas in the public domain.

LIBRARIES, EDUCATION, AND SOCIETY 33, 42-44 (Laura N. Gasaway ed., 1997).

146. Sears, Roebuck & Co. v. Stiffel Co., 376 U.S. 225, 229 (1964).

147. Mercoid Corp. v. Mid-Continent Inv. Co., 320 U.S. 661, 666 (1944).; *cf.* Twentieth Cent. Music Corp. v. Aiken, 422 U.S. 151, 156 (1975) (describing copyright as designed "to stimulate artistic creativity for the general public good").

148. *Mercoid*, 320 U.S. at 666.

149. Mazer v. Stein, 347 U.S. 201, 219 (1954).

150. *See, e.g.*, Yochai Benkler, *Siren Songs and Amish Children: Autonomy, Information, and Law*, 76 N.Y.U. L. REV. 23, 59 (2001); Linda R. Cohen & Roger G. Noll, *Intellectual Property, Antitrust and the New Economy*, 62 U. PITT. L. REV. 453, 461 (2001).

151. Lochner v. New York, 198 U.S. 45, 75 (1905) (Holmes, J., dissenting).

152. For explanations of the impact of these philosphers on European intellectual property law, see generally Thomas F. Cotter, *Pragmatism, Economics, and the* Droit Moral, 76 N.C. L. REV. 1 (1997); Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287 (1988).

153. Mark A. Lemley, *Place and Cyberspace*, 91 CAL. L. REV. 521, 536 (2003).

154. *Id.*

155. International News Serv. v. Associated Press, 248 U.S. 215, 250 (1918) (Brandeis, J., dissenting).

III. THERE'S NO SUCH THING AS BIOPIRACY . . . AND IT'S A GOOD THING TOO

Stripped of its normative premises layer by layer, the biopiracy narrative loses all appeal. The Convention on Biological Diversity's endorsement of national sovereignty assigns national governments all responsibility for initial access to genetic resources. Access to physical biological specimens is the one aspect of bioprospecting that lies entirely within the control of individual nation-states. Few, if any, national governments have elected to throttle this economic chokepoint for fear of destroying all prospective profits from the commercial development of biological diversity. Within the logical sublayer, the TRIPS accord allows the principal jurisdictions of the North Atlantic alliance—the United States, Canada, and the European Union—to adopt radically diverse solutions to the problem of patenting genetic information. Developing countries such as India, which are the usual complaining parties in instances of alleged biopiracy, enjoy ample discretion under TRIPS to refuse patents on a wide range of biotechnological inventions. Finally, although traditional knowledge is susceptible to protection through a modified form of trade secret law, no convincing economic case for such protection can be made.

Within the biopiracy debate, no country strikes a consistent posture toward intellectual property as a legal tool. The southern countries that urge recognition of intellectual property in indigenous knowledge are often proponents of *weakening* proprietary protection on pharmaceuticals, agricultural chemicals, and educational materials in the name of increased access.[156] A study by the World Intellectual Property Organization (WIPO) found that respondents in 28 less developed countries, despite their misgivings about intellectual property as a legal concept and about aspects of specific intellectual property laws, often "expressed interest in exploring further the actual and potential role" of intellectual property in protecting traditional knowledge.[157] Subsequent WIPO publications have committed the organization to the project of developing models for protecting genetic resources, traditional knowledge, and folklore at the international level.[158] North and south, the local attitude toward intellectual

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156. *See* Frank Emmert, *Intellectual Property in the Uruguay Round • Negotiating Strategies of the Western Industrialized Countries*, 11 MICH. J. INT'L L. 1317, 1383 (1990); Muria Kruger, Note, *Harmonizing TRIPs and the CBD: A Proposal from India*, 10 MINN. J. GLOBAL TRADE 169, 170 (2001).

157. WORLD INTELLECTUAL PROPERTY ORG., INTELLECTUAL PROPERTY NEEDS AND EXPECTATIONS OF TRADITIONAL KNOWLEDGE HOLDERS, 1998-99, at 223 (2001), *available at* http://www.wipo.int/tk/en/tk/ffm/report (on file with the *McGeorge Law Review*).

158. *See, e.g.*, WORLD INTELLECTUAL PROPERTY ORG., MATTERS CONCERNING INTELLECTUAL PROPERTY AND GENETIC RESOURCES, TRADITIONAL KNOWLEDGE AND FOLKLORE (Apr.-May 2001), *available at* http://www.wipo.int/documents/en/meetings/2001/igc/pdf/grtkfuc1_3.pdf (on file with the *McGeorge Law Review*); WORLD INTELLECTUAL PROPERTY ORG., MATTERS CONCERNING THE INTERGOVERNMENTAL COMMITTEE ON INTELLECTUAL PROPERTY AND GENETIC RESOURCES, TRADITIONAL KNOWLEDGE AND FOLKLORE (Aug. 15, 2003), *available at* http://www.wipo.int/documents/en/document/govbody/wo_gb_ga/pdf/wo_ga_30_5.pdf (on file with the *McGeorge Law Review*).

property depends on what is being protected and what degree of protection delivers the greatest benefit to local interests. Global cries for justice demand more ethical starch than this. "[I]f you go chasing rabbits / . . . you know you're going to fall."[159]

There's no such thing as biopiracy, and it's a good thing too. The real point of the biopiracy narrative is that the global south wants its largest possible share of the world's wealth. As matters stand, it is quite simple: The north is rich, and the south is not. Developing countries will not soon cease clamoring for some compensatory mechanism, whether or not grounded in the law of intellectual property, that would reward their historical contributions to biological knowledge and applications within the global commons. Motivated by "post-colonial theories of obligation to peoples in areas long exploited by the northern hemisphere," much of the international community seeks some way to alleviate "the extreme distress of those living in bio-rich areas of the world."[160] Thanks to the "deep antagonism" generated by even the mere perception of illicit "appropriation of knowledge and germ plasm without . . . permission" and without compensation, the life sciences companies of the north will continue to make a big target for the developing world's political grievances.[161] The southern quest, so it seems, will stop at nothing short of a formal requirement under international law "that inventors compensate traditional knowledge holders for sharing that knowledge."[162]

The rhetorical consequences of this attack can be quite grim for the developing world. Most obviously, bioprospecting could come to a complete halt. Given the relatively modest profits realized from the first decades of bioprospecting, a comprehensively "instrumental or economic rationale" for protecting the biosphere as a storehouse of commercial value "appears beyond reach."[163] Paul Heald cogently recognizes, even if the most ardent proponents of the biopiracy narrative do not, that the repeated hurling of "biopiracy!" as a misleading epithets will hardly convince profit-driven multinational corporations to engage the developing world.

Moreover, an emphasis on the traditional knowledge of developing countries invites the immediate application of the developed world's standards of environmental protection and performance to vastly poorer countries. Much of the developing world already regards the environmental imperatives of the developed world as imperialism in green drag.[164] The southern campaign to

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159. *Hear* JEFFERSON AIRPLANE, *supra* note 13.

160. Heald, *supra* note 20, at 521.

161. *Id.*

162. Margo A. Bagley, *Patently Unconstitutional: The Geographical Limitation on Prior Art in a Small World*, 87 MINN. L. REV. 679, 725 n. 180 (2003).

163. Mark Sagoff, *Muddle or Muddle Through? Takings Jurisprudence Meets the Endangered Species Act*, 38 WM. & MARY L. REV. 825, 844 (1997). For an older but still instructive survey of utilitarian rationales in environmental law, see Mark Sagoff, *Economic Theory and Environmental Law*, 79 MICH. L. REV. 1393 (1981).

164. *See* Raj Bhala, *MRS. WATU and International Trade Sanctions*, 33 INT'L LAW. 1, 21 (1999); Bartram

enhance the proprietary status of its germplasm and its ethnobiological knowledge will engage not only the law of property, but also the entire legal apparatus of the industrialized world. Many traditional practices may affirmatively harm the environment, or at least conflict with global values expressed through international environmental law. Asian folk medicine drives global demand for rhinoceros horns and black bear claws.[165] On opposite sides of the Pacific, Japanese appetites[166] and Makah rituals[167] clash with the International Convention on Whaling.[168] Consumers in Florida who prize the eggs of endangered sea turtles as aphrodisiacs pay $36 per dozen.[169]

The uncomfortable truth is that the developing world enjoys no moral superiority *vis-à-vis* wealthier countries on matters of environmental ethics. "Small-scale communities are seldom as humane and ecologically sound" as their advocates "portray them to be."[170] "Small firms . . . are responsible for a massively disproportionate share of water and air pollution."[171] Agriculture is especially suspect. "One would be hard pressed to identify another industry with as poor an environmental record and as light a regulatory burden."[172] Smaller, family-owned farms routinely underperform their larger, corporate counterparts in core tasks such as soil conservation and erosion control.[173] The propensity to destroy the environment flourishes in any cultural setting.

Any environmental advantage along the developmental divide favors countries whose legal systems have adopted the most comprehensive and coherent rules for managing their citizens' contact with the living world in an age of growing scarcity and declining diversity. In industrialized societies, the law

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S. Brown, *Developing Countries in the International Trade Order*, 14 N. ILL. U. L. REV. 347, 376-77 (1994).

165. *See, e.g.*, William Carroll Muffett, *Regulating the Trade in Bear Parts for Use in Asian Traditional Medicine*, 80 MINN. L. REV. 1283 (1996).

166. *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).

167. *See* United States v. Washington, 730 F.2d 1314 (9th Cir. 1984); *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").

168. 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).

169. *See* Dana Canedy, *Eggs of Endangered Turtles Fall Prey to Florida Dealers*, N.Y. TIMES, Aug. 2, 2002, at A1.

170. MARTIN W. LEWIS, GREEN DELUSIONS: AN ENVIRONMENTALIST CRITIQUE OF RADICAL ENVIRONMENTALISM 91 (1992).

171. Richard J. Pierce, Jr., *Small Is Not Beautiful: The Case Against Special Regulatory Treatment of Small Firms*, 50 ADMIN. L. REV. 537, 559 (1998).

172. 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 ENVTL. L. REP. 10,203 (2001); *see also* Jim Chen, *Get Green or Get Out: Decoupling Environmental from Economic Objectives in Agricultural Regulation*, 48 OKLA. L. REV. 333 (1995).

173. *See* Linda K. Lee, *The Impact of Landownership Factors on Soil Conservation*, 62 AM. J. AGRIC. ECON. 1070, 1073 (1980); Luther Tweeten, *The Economics of Small Farms*, 219 SCIENCE 1037, 1038 (1983).

has comfortably assimilated the achievements of life scientists and shaped their attitudes. 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.[174] It remains unclear whether traditional knowledge will ever qualify for proprietary protection in the world's wealthiest countries. Those practices having taken center stage in an international legal dialogue dominated by accusations of biopiracy, it hardly stretches the imagination to contemplate ways in which wealthier countries may test the developing world's commitment to the complete integration of their traditions into the positive law of the global community.

What the global south and its advocates really seek in the struggle over biopiracy is a simple measure of justice. Massive wealth transfers are what they seek later; modest obstacles to patents on biotechnology may appease these advocates while the global community progresses, albeit at a snail's pace, toward some sort of profit-sharing scheme for spreading the rewards of the biotechnological revolution. Resolving disputes over alleged biopiracy does not require significant revision of existing intellectual property laws, let alone the novel and economically senseless solution of proprietary status for traditional knowledge of biological properties and applications. It may be enough simply to ensure that alleged acts of biopiracy do not form the basis for patents under existing intellectual property laws.

Cleansing the current patent system of the taint of biopiracy requires little more than a few modifications that would effectively deny intellectual property rights to outsiders who export and exploit knowledge originally developed within a traditional community. American patent law in particular could withstand a modest degree of legislative revision. As the Patent Act of 1935 now reads, "[a] patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."[175] Prior art, if found, has a devastating effect on a patent. Prior art that defeats section 102's novelty requirement can also be used to crush a patent for failure to overcome section 103's hurdle of nonobviousness.[176]

The trouble lies in the *definition* of prior art. The Patent Act's definition of prior art embraces patenting or publication in any country, but includes public

174. *See, e.g.*, Agricultural Risk Protection Act of 2000, Pub. L. No. 106-224, 114 Stat. 358 (2000); Animal Welfare Act, 7 U.S.C. §§ 2131-2156 (2000); Plant Protection Act, Pub. L. No. 106-224, § 412, 114 Stat. 358, 441 (2000).

175. 35 U.S.C. § 103 (a) (2000).

176. *See* Oddz on Prods., Inc. v. Just Toys, Inc., 122 F.3d 1396, 1401-04 (Fed. Cir. 1997); *In re* Bass, 474 F.2d 1276, 1290 (C.C.P.A. 1973).

use or sale solely "in this country."[177] To be exact:

> A person shall be entitled to a patent unless . . . the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or . . . the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States.[178]

In other words, "while almost all domestic prior knowledge, use, or invention is considered against a later United States patent, almost all similar foreign activity is not."[179]

The United States' policy of limiting prior art to domestic knowledge is out of step with patent law in other developed countries. The European Union considers evidence of foreign public use in assessing the validity of its patents.[180] Indeed, on the basis of foreign public use—specifically, widespread applications of the neem tree in India—the European Patent Office revoked W.R. Grace's patent on "Neemix," a pesticide and insect repellant derived from azadirachtin, a chemical naturally occurring in neem.[181] Redefining "prior art" to include traditional knowledge found in other countries would limit the complicity of American patent law in instances of alleged biopiracy.[182] Even under the existing definition of prior art, the Patent and Trademark Office revoked a patent on turmeric after prior art on medicinal uses of the spice was demonstrated through an ancient Sanskrit text and a scientific paper published in 1953 by the Indian Medical Association.[183] Eliminating American patent law's existing geographical limitation on prior art would, however, still allow "inventions based on

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177. 35 U.S.C. § 102(a), (b) (2000). *See generally* Garrett Corp. v. United States, 422 F.2d 874, 190 Ct. Cl. 858 (1970); Donald S. Chisum, *Foreign Activity: Its Effects on Patentability Under United States Law*, 11 INT'L REV. INDUS. PROP. & COPYRIGHT L. 26 (1980).

178. 35 U.S.C. § 102(a), (b).

179. Shayana Kadidal, *Subject-Matter Imperialism? Biodiversity, Foreign Prior Art and the Neem Patent Controversy*, 37 IDEA: J.L. & TECH. 371, 376 (1997); *accord* Emily Marden, *The Neem Tree Patent: International Conflict over the Commodification of Life*, 22 B.C. INT'L & COMP. L. REV. 279, 284 (1999); *see also* Bagley, *supra* note 162 at 695-96; Stevenson, *supra* note 125, at 1146-48. See generally Curtis A. Bradley, *Territorial Intellectual Property Rights in an Age of Globalism*, 37 VA. J. INT'L L. 505, 520 (1997) (discussing the territoriality of American patent law.

180. *See* European Patent Convention, *supra* note 81, art 54(2) ("The state of the art shall be held to comprise *everything* made available to the public by means of a written or oral description, by use, or in any other way, before the date of filing of the European patent application." (emphasis added)).

181. *See* Decision Revoking European Patent No. 0436257 (Eur. Patent Off. Feb. 13, 2001); Geeta Nair, *European Patent Office Revokes WR Grace's Neem Patent*, FINANCIAL EXPRESS, May 18, 2000, *available at* http://www.financialexpress.com/fe/daily/20000518/fec18041.htm; Frederick Nzwili, *Multinationals Lose Exclusive Rights over Neem Tree*, AFRICAN NEWS SERV. (May 22, 2000), *available at* 2000 WL 2161415.

182. *See* Bagley, *supra* note 162, at 724-27; Downes, *supra* note 123, at 281.

183. *See* INTERNATIONAL INTELLECTUAL PROPERTY LAW 1056 (Anthony D'Amato & Doris Estelle Long eds., 1997).

traditional knowledge and genetic resources" to be "patentable as long as they are novel and nonobvious in view of [that] prior art."[184]

At the international level, TRIPS does not require that patent applications state the origin of genetic materials or biological knowledge used to invent a product. Although TRIPS directs 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,"[185] the treaty imposes no further disclosure obligations or other mandatory conditions on patent applicants. More comprehensive protection for traditional knowledge lies entirely beyond the scope of TRIPS, and even the most ardent advocates lament that a legal framework for protecting traditional knowledge is "highly unlikely" to "be inserted into TRIPS anytime soon."[186]

What, in the meanwhile, might gainfully warrant the attention of countries both rich and poor? No matter how unprofitable, and no matter how modest in its impact on biodiversity conservation, commercial bioprospecting will persist for years to come. International policymakers should develop a joint framework for its regulation. International coordination on commercial exploitation of biodiversity can improve the very process of collecting rare specimens. Even though the collapse of global fisheries has shaken public confidence in official efforts to achieve "sustainability,"[187] bitter experience teaches that the lack of coordination would be worse. The slash-and-collect approach of Victorian orchid harvesters would probably prevail.[188] Rationalized harvesting would limit instances of "the wonderfully unusual accomplishment of discovering and eradicating in the same instant a new species."[189]

The international community might also facilitate the professionalization of parataxonomy,[190] especially in the developing world. Millions of species await collection and classification by properly trained field biologists. Transnational

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184. Bagley, *supra* note 162, at 725 n.180.

185. TRIPS, *supra* note 90, art. 29.

186. Dutfield, *supra* note 122, at 273.

187. *See, e.g.*, MICHAEL HARRIS, LAMENT FOR AN OCEAN: THE COLLAPSE OF THE ATLANTIC COD FISHERY: A TRUE CRIME STORY (1998); CARL SAFINA, SONG FOR A BLUE OCEAN (1998); LISA SPEER ET AL., HOOK, LINE, AND SINKING: CRISIS IN MARINE FISHERIES (1997); H. Scott Gordon, *Economics and the Conservation Question*, 1 J.L. & ECON. 110 (1958); H. Scott Gordon, *The Economic Theory of a Common Property Resource: The Fishery*, 62 J. POL. ECON. 124 (1954); 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); Alison Rieser, *Property Rights and Ecosystem Management in U.S. Fisheries: Contracting for the Commons?*, 24 ECOLOGY L.Q. 813 (1997); Anthony Scott, *The Fishery: The Objectives of Sole Ownership*, 63 J. POL. ECON. 116 (1955); Barton H. Thompson, Jr., *Tragically Difficult: The Obstacles to Governing the Commons*, 30 ENVTL. L. 241, 247-49 (2000); Nicola Kieves, Note, *Crisis at Sea: Strengthening Government Regulation to Save Marine Fisheries*, 89 MINN. L. REV. 1876 (2005).

188. *See* HAROLD KOOPOWITZ & HILARY KAYE, PLANT EXTINCTION: A GLOBAL CRISIS 199-205 (1983); SUSAN ORLEAN, THE ORCHID THIEF 62-67 (1998).

189. BILL BRYSON, A WALK IN THE WOODS: REDISCOVERING AMERICA ON THE APPALACHIAN TRAIL 92 (1998).

190. *See* CHRISTOPHER JOYCE, EARTHLY GOODS: MEDICINE-HUNTING IN THE RAINFOREST 118-21 (1994).

cooperation can help translate ethnobiological knowledge into terms understood by the global scientific community. Its economic impact is simple and immediate. "Scientific research," to put it bluntly, "generates jobs."[191] The science of systematics is so labor-intensive that the task of classifying 10 million species would require 25,000 professional lifetimes.[192] Whether framed as cooperative bioprospecting or north-to-south technology transfer for the enrichment of parataxonomy, commercially oriented initiatives satisfy the Convention on Biological Diversity's exhortation that the international community should adopt "economically and socially sound measures . . . as incentives" to conserve biodiversity and to contribute to its sustainable development.[193]

This much binds proponents and enemies of the biopiracy narrative. Bioprospecting represents merely one of many tools needed to stem the ongoing degradation of the global environment. Of this mutually dependent world's numerous environmental problems, "persistent poverty may turn out to be the most aggravating and destructive."[194] 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."[195] In environmental protection, as in any other challenge in international law, "[t]he threat of economic punishment does not deter nations with nothing to lose."[196] Under the Biodiversity Convention, "economic and social development and eradication of poverty are the first and overriding priorities of" developing countries.[197]

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191. Gibbs v. Babbitt, 214 F.3d 483, 494 (4th Cir. 2000), *cert. denied*, 531 U.S. 1145 (2001).

192. *See* WILSON, *supra* note 2, at 317-19.

193. CBD, *supra* note 59, art. 11.

194. Patrick Low, *Trade and the Environment: What Worries the Developing Countries?*, 23 ENVTL. L. 705, 706 (1993).

195. 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).

196. Todd M. Rowe, Comment, *Global Technology Protection: Moving Past the Treaty*, 4 MARQ. INTELL. PROP. L. REV. 107, 137 (2000).

197. CBD, *supra* note 59, art. 20(4).

With cooperation and some measure of good fortune, global north and global south may yet resolve their differences. The discarding of the biopiracy narrative would make a good start on this long journey. In the meanwhile, frustrated partisans on both sides of this debate might do well to heed the wisdom of Mick Jagger and the Rolling Stones:

> You can't always get what you want
> You can't always get what you want
> You can't always get what you want
> But if you try sometime, . . .
> you just might find you get what you need.[198]

198. *Compare* Mick Jagger & Keith Richards, *You Can't Always Get What You Want* (1969, Abkco Music, Inc.), *quoted in* William Van Alstyne, *Cracks in "The New Property": Adjudicative Due Process in the Administrative State*, 62 CORNELL L. REV. 445, 470 (1977), *with* Mathews v. Eldridge, 424 U.S. 319 (1976).