

Bioprospecting the public domain

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Abstract (Article Summary)

Brush reflects on the value of bioprospecting contracts for addressing the inequity implied in the disparity between communities that are economically poor but biologically affluent and others with the opposite attributes.

Full Text (9380 words)

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I expect that my potatoes will make you rich," asserted one of the farmers whom I had interviewed about nomenclature and preferences for the native potatoes of the Tulumayo Valley in Peru. The comment was not unanticipated, but it still baffled me. The obvious contrasts between us made objection inappropriate. I was not going to use the potatoes I had collected in the valley to breed a new potato variety that might make me rich or famous, but it was possible that others might do so. Plant collectors had previously combed the area for genetic resources, and my collections for research on knowledge systems might someday end up in a breeding program. Scientific curiosity and an abiding fascination about the complexities of Andean cultural ecology had brought me to the Tulumayo, but I also hoped that my research would enhance my career. At the same time, I believed that Andean farmers could benefit from agricultural research, including my work on folk taxonomy and cultural ecology. This same farmer had planted his mahuay (short-cycle) fields in the variety renacimiento (renaissance), bred from native varieties.

The farmer expected that renacimiento would provide income that native types would not yield. The Peruvian breeder of the variety had not become wealthy from its public release, but he had attained international recognition. Finally, the conjecture that the farmer's potatoes might increase my wealth implied a personal transfer of resources. But whose resources were these?

My bafflement about how to respond to the farmer's assertion that his potatoes might enrich me resulted from the numerous layers that it touched. One was our shared knowledge that the potatoes in his field were useful to many people. They were part of an evolutionary heritage that has given the world one of its great staple foods, benefiting farmers and consumers around the world, as well as seed companies and scientists. The value of these resources is greater now because of the declining supply of native varieties and the increased demand to use this germ plasm to breed new potato varieties. Despite the value of the potato's genetic resources in Peru, farmers who maintain them remain among the poorest in the nation. The loss of native crop varieties before the tidal wave of modern agricultural technology has led to conservation in gene banks. Many conservationists are also concerned about preserving the agricultural ecosystem that created crop genetic resources, but this requires that farmers have sufficient incentive to maintain native crop populations and crop evolution processes such as natural and conscious (farmer) selection and gene flow between wild and domesticated species. On-farm conservation is, however, compromised by the use of native crop resources to create new crop varieties that increase food and income. The potatoes I had gathered were valuable, but how could value be returned to the farmer without impairing the system that had created them?

"Bioprospecting" offers an approach that aims to return benefits to the stewards of biological resources. This approach establishes a contractual relationship between those who provide genetic resources, such as Andean potato farmers, and others who use resources, such as seed companies. Bioprospecting contracts provide for short-term payments and long-term (royalty) benefits to producers and stewards of genetic resources in return for access to those resources. The interplay of ideas about conservation, equity, and development that surrounded me in the farmer's field in 1978 has produced several responses among researchers and conservation planners, but none is more direct or apparently straightforward than bioprospecting. Bioprospecting was first defined as a means to compensate countries for genetic resources that are used to create natural compounds for chemicals and pharmaceuticals (Eisner 1989; Reid et al. 1993b), but the concept was quickly adapted to other genetic resources (for an example, see Chapela 1997). Agenda 21 (Robinson 1993) and the Convention on Biological Diversity: Texts and Annexes (Convention on Biological Diversity [CBD] 1994), texts from the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, emphasize benefit sharing as a way to assure continued access to genetic resources. These texts aggregate resources and assert the need to find mechanisms for "sharing in a fair and equitable way the results of research and development and the benefits arising from commercial and other utilization of genetic resources with the Contracting Party providing such resources" (CBD 1994:13). The framers of the CBD text propose that achieving fairness in the international flow of biological resources is essential to protecting those resources. Bioprospecting gives us a blueprint for implementing the CBD's mandates.

My potato collections in the Tulumayo were not made directly for crop breeding or commercial interests, but they were part of the transfer of local genetic resources into a global research system that includes commercial interests. My collecting activities seemed to be just the type of

articulation between the global genetic resource system and local farming communities that the CBD and bioprospecting address. Almost daily while conducting research in the Tulumayo Valley of central Peru in 1978, I faced the underlying themes signaled in the farmer's assertion that his potatoes would enrich me. Should my continued research on crop ecology and indigenous knowledge proceed under a bioprospecting contract? The issues raised in this question are in the air wherever cultural differences, economic disparity, and the collection of biological resources are in active association.

This article's objective is to reflect on the value of bioprospecting contracts for addressing the inequity implied in the disparity between communities that are economically poor but biologically affluent and others with the opposite attributes. The article uses the perspective of an anthropologist studying the culture and ecology of farming communities in centers of crop origin and evolution, where crop genetic resources are most abundant and diverse. It first outlines the background and nature of bioprospecting contracts. It then begins its reflection on the value of these contracts by discussing the conceptual framework of the biological commons that prevailed before the CBD mandate. To weigh the contractual approach, the article presents ethnographic material from Peru on the management of potato diversity by peasant farmers in the Tulumayo Valley. It then gives some views of indigenous peoples' organizations, private and public users of biological resources, and nation-states on issues involved in bioprospecting. The concluding sections examine social issues in the dialogue about biological resources and the appropriation of indigenous knowledge. The article's main conclusion is that the contract mode and its ensuing relationships for obtaining biological resources are incongruous with the nature of indigenous knowledge and management of biological resources. These resources and their attendant knowledge are products of "bio-cooperation," and their collective management is intimately connected to the ecology of subsistence agriculture and crop evolution. The article ends with an appeal to recognize biological resources as public goods and to find mechanisms that defend rather than abrogate the public domain.

Bioprospecting Contracts

Global Biodiversity Strategy (World Resources Institute et al. 1992) lays out an ambitious and comprehensive agenda for conserving biological and genetic resources. Action 42 of the 85 actions promulgated in the book is to "base the collection of genetic resources on contractual or other agreements ensuring equitable returns" (World Resources Institute et al. 1992:94). These recommendations imply that noncontractual approaches are iniquitous. The noncontractual collection of biological samples is described by some as an act of "biopiracy" (Odek 1994; Shiva 1997). Piracy assumes that biological resources are a form of property and have been illicitly appropriated. Contracts between collectors on the one hand and states or communities on the other are proposed as a direct way to end piracy. This recommendation draws on the wider concept, articulated in Agenda 21 and the Convention on Biological Diversity, of formalizing the relationship between broadly defined "sources" and "users" of genetic resources. Sources are states and indigenous communities in regions where biological diversity, including crop diversity, is greatest. Users are institutions and enterprises in industrial regions with few native biological resources. Users include private seed and pharmaceutical companies and public research or conservation agencies.

The model for this process is the agreement between an American pharmaceutical company, [Merck](#), and InBio, a quasi-public nongovernmental organization in Costa Rica (Reid et al. 1993b).

The agreement between [Merck](#) and InBio specifies that InBio provides [Merck](#) with chemical extracts from biological preserves in Costa Rica for screening to identify commercial natural compounds or genetic traits. [Merck](#) provides direct payments to InBio (\$1,135,000) and an undisclosed share in royalties that might be earned in the future (Reid et al. 1993a). The agreement between [Merck](#) and InBio has spawned similar arrangements by private pharmaceutical companies, such as Shaman Pharmaceutical (King et al. 1996), and public institutions, such as the U.S. National Institutes of Health (Mays et al. 1996).

The agreement between [Merck](#) and InBio is a useful model for agricultural research institutions that also rely on access to biological resources. Private companies and public agencies breeding new crops have developed alternate sources for crop germ plasm, but the concept of contractual agreements resonated with discussions within the crop research community (Juma 1989; Kloppenburg 1988). One discussion concerned the possibility of creating a system of "farmers' rights" that would complement "breeders' rights" to intellectual property over new varieties (Brush 1992). Another discussion was on whether to use "material collection agreements" and "material transfer agreements" for the flow of crop genetic resources (Barton and Siebeck 1994). Both the natural products and the agricultural sectors perceived the need to find new mechanisms to staunch the rapid loss of biological diversity and to address the rising concern for equity in the transfer of biological resources. Both of these concerns threatened to upset the flow of resources that had become increasingly valuable with the development of biotechnology.

Some conservationists proposed that increasing the private value of biological resources, such as crop germ plasm, is an efficient way to reward stewardship, promote conservation, and balance equities (Sedjo 1992; Vogel 1994). Bioprospecting solves the imbalance between providers and users of genetic resources by establishing a mechanism to transfer some of the public value of crop germ plasm into private benefit through contracts between farmers and collectors. Theoretically, this solution is applicable across vastly different ecological and cultural conditions, assuming that states and markets exist to play supporting roles. The contract involves offering direct benefits (money, training, community development assistance) and long-term benefits (a share in royalties) in exchange for the right to collect both knowledge and genetic resources. These agreements seemingly satisfy the spirit and letter of the CBD's terms (Cleveland and Murray 1997; Gollin and Laird 1996). Contracts acknowledge control by local people over genetic resources by requiring consent to obtain and use the resources. Equally importantly, bioprospecting contracts increase the private value of biological resources and knowledge to indigenous people through both material and nonmaterial compensation. The concept of bioprospecting emerged in a period that saw international development and lending agencies embrace the neoliberal politics of privatization, politics that could also be recast as a means to empower Third World states and their local communities (Vogel 1994). A few advocates for national and indigenous interests in the south have reinforced this idiom (e.g., Gamez et al. 1993; [Shiva](#) 1997).

Bioprospecting is one of the more fully developed proposals to transform common heritage into a stream of compensation. However, this mechanism involves appropriation from the public domain. Bioprospecting contracts for crop genetic resources change the relationship not only between farmers and collectors but also among farmers and farming communities. As an incursion into the public domain, bioprospecting reveals pitfalls similar to other incursions, for instance in closing the agrarian commons and the penetration of capital into peasant societies.

While bioprospectors envision a contract between a well-defined provider of genetic resources (e.g., a local community) and a private or public institution, it carries implications far beyond the immediate context. Gollin and Laird (1996) observe that the global-local link is only viable with direct involvement and support of national legislation. One obligation is to provide for enforcement of the contract through such mechanisms as litigation, arbitration, or mediation. Another obligation is to extend intellectual property. According to Gollin and Laird (1996), companies that invest through bioprospecting contracts expect an intellectual property framework to protect the results of that investment. The Global Agreement on Trade and Tariffs (GATT) and its attendant agreement, Trade Related Aspects of Intellectual Property Rights (TRIPS), project intellectual property into virtually every country and oblige them to adopt a system of intellectual property similar to the plant variety protection or plant patenting of industrialized countries (Lesser 1998).

The reliance on intellectual property to back up bioprospecting agreements presents an ethical dilemma because the monopoly privileges that one community can gain affect other communities that share the same knowledge and resources. If knowledge and genetic resources collected under contract lead to a patentable product, communities that are not part of the contract but have the same resources can be deprived of the opportunity to commercialize their knowledge. Hypothetically, a contract between a Tulumayo Valley community and a seed company that patents a hybrid potato derived from a "landrace" (a locally selected and maintained crop population) of *Solanum tuberosum* subspecies *andigena* collected under that contract can deprive the same commercial possibility to farmers living in adjacent valleys with the same landraces. While the Tulumayo community may not directly claim intellectual property in their contract, the exclusionary effect of the contract is still felt because the seed company will seek exclusion. Once a company has gained intellectual property connected to specific collection and contract, contracts that might have resulted in the same benefit for other communities become untenable.

The Biological Commons

Biological resources of crops and associated indigenous knowledge were originally collected under the principle of common heritage (Brush 1996), a notion derived from Western concepts of property, including intellectual property. This principle delineates public and private domains and defines products of nature, scientific theory, and folk knowledge to be public goods, belonging to the public domain. Common heritage rests on the assumption that goods that have not been specifically removed from the public domain under state auspices cannot be subject to restricted use. Like the concept of the commons, common heritage and public domain are meaningful only in the epistemology of capitalism (Goldman 1997). The concept of the public domain, like that of common heritage, is elusive and best understood as a negative or residual category in the realm of intellectual property, particularly copyright (Samuels 1993). Litman (1990) argues that the concept is a conceit, a legal fiction erected to justify the artificial concept of authorial originality. A more positive construction of the public domain is postulated by Patterson and Lindberg (1991) and by Samuels (1993), but the essence of alterity persists. Patterson and Lindberg (1991) maintain that the emergence of the modern copyright in England's Statute of Anne (1710) created the public domain as well as individual intellectual property rights, for instance by limiting the period of monopoly rights. Samuels (1993) gives the concept more shape by elaborating several categories of the public domain, but these categories cannot be understood without the preexistence of copyright.

A similar definition might easily be constructed for the public domain relative to other forms of intellectual property. By requiring that patentable inventions be novel, useful, and nonobvious, patent law in effect defines what is public. Likewise, plant variety protection that specifies novelty, uniformity, stability, and distinctiveness signals what types of plants are unprotectable or are to remain in the public domain. The legal systems of most states exclude products of nature from intellectual property, as opposed to products derived from nature (Bozicevic 1987), suggesting that the opposition between nature and culture also animates the public domain concept. Other oppositions, such as the one between basic theory and application, likewise form the piers beneath the concept. The contrast between "basic theory" and "application" is embedded in the intellectual property criterion that knowledge be useful as well as novel and nonobvious (Penrose 1951). An example is the transformation of the knowledge of the double-helix structure of deoxyribonucleic acid (DNA) into the know-how of gene splicing. Knowledge of the molecular structure of DNA was novel and nonobvious but not patented by Watson and Crick, whereas transferring specific gene sequences between organisms is patentable because of its direct utility. The criteria that distinguish what is patentable are specific to national legal systems and mutable by law and fashion. Before 1930, no nation-state recognized intellectual property over plants. Since the passage of the Plant Variety Protection Act in the United States in 1930, intellectual property for plants not only has been extended to many other countries but has also been redefined to become more exclusive (Baenziger et al. 1993). The culture of science that prevailed when Watson and Crick described the double helix has changed with the ascent of commercial interests in science, and a similar discovery today could conceivably be announced as part of a patent application. However, the oppositions that frame the definition of public and private are neither superfluous nor insignificant, as shown in debates over extending intellectual property within different domains and nation-states (Brown 1998; Lesser 1998).

Both seeds and ideas, whether in the public domain or not, are public goods, defined by the quality of noncompetitiveness—the quality that one person's use does not limit another's. One problem with public goods in the public domain is that costs of maintaining them are hard to calculate because the lack of private or exclusive use provisions precludes market pricing. The success of authors and inventors in obtaining control and compensation for their creation of public (noncompetitive) goods has not been widely replicated. For instance, farmers who limit soil erosion and water pollution are not rewarded, nor are their costs of environmental stewardship necessarily compensated. Related to this is the difficulty in rectifying differences between the social and private values of public goods. The deterioration of public goods, such as water pollution or soil erosion, is attributable to the imbalance between private and social values of public goods (Demsetz 1967; Hardin 1968). Thus, farmers may be discouraged from land stewardship if they are not recognized and compensated for the clear water flowing off their farms. The need to recognize a farmer's land stewardship follows the logic of intellectual property, which views inventiveness and creativity as public goods that are likely to be enhanced by recognizing the inventor. Unless the toil of invention is compensated, creative persons may choose other vocations or keep inventions secret. The conundrum of compensating such a replicable and protean entity as knowledge was resolved in the infancy of capitalism by allowing the removal of certain knowledge from the public domain and its monopolization as intellectual property. Creativity remains as a public good, but its expression is made private property.

The process of removal from the public domain involves negotiating collective benefits and exclusive rights (Demsetz 1967). The removal process is historically seeded with conflict as the

commons are closed. Intellectual property insures that the costs of invention will be paid by the privatization of the benefits of invention. Conflict brews in the protracted debates over what intellectual products should and should not be covered by intellectual property (Penrose 1951). Historically, conflict over closure of the public domain caused by intellectual property has been mitigated by restrictions on what intellectual goods could be privatized and by limiting the terms of privatization, for example, by setting finite duration of intellectual property. This mitigation is very evident in the case of plant variety protection, for instance, in exemptions for both breeders and farmers to use protected material freely in both Europe and the United States (Baenziger et al. 1993). Nevertheless, the conflict over intellectual property for plants continues as these exemptions break down and as more countries adopt intellectual property.

The genetic resources of crop landraces concentrate in areas where original domestication and crop evolution occurred. These resources in their centers of diversity epitomize public goods and illustrate the problems of estimating and balancing public and private costs and benefits. From the perspective of industrialized countries, we might logically assume that crop genetic resources are common heritage or public goods because they have not been specifically excluded from the public domain and fail to meet the existing criteria for excluding plant materials (e.g., novelty, nonobvious process of invention, stability, and uniformity). This argument, of course, is based on the political and cultural hubris that Western criteria should be extended broadly and that a public domain exists between nation-states as well as within them. Nevertheless, it is also based on the fact that crop genetic resources were customarily managed as public goods, at least until the CBUs negotiations. Moreover, it is clear that a significant international public benefit arises from the common heritage of crop resources, with the widespread movement and use of these resources to create new crop varieties, both publicly and privately. Thus, potato farmers in Rwanda, China, and Idaho receive part of the public value of potato landraces cultivated by farmers in the Tulumayo Valley.

The Convention on Biological Diversity removes crop genetic resources from a vaguely defined international public domain by replacing universal common heritage with national sovereignty. This is a momentous step, presaging the transformation of one of the world's most important public domains and anticipating a mechanism whereby the public benefit that is now provided freely by peasant farmers and indigenous people in centers of crop diversity can be converted to a private benefit. Tulumayo potato farmers, who previously freely provided a public benefit to farmers around the world, may someday receive private compensation for the same. Negotiations for this transformation are in their infancy, and it may develop in different directions or not at all. Numerous and fundamental questions are still open. Should these negotiations be on a multilateral or bilateral basis? Should there be compensation for genetic resources previously collected as common heritage? What is the appropriate position of the nation-state in the stream of benefits from genetic resources? What is the justification for providing financial benefits to farmers or to nation-states for genetic resources? What kind of compensation is most appropriate?

Management of Biological Resources

The rapidity with which potatoes spread to Europe and maize to Africa and Asia after the Colombian contact with the New World bears witness to the ubiquitous nature of the circulation and mixture of useful plants. Indeed, spatial integration rather than isolation appears to be the rule for crop varieties, from field and farm village levels to the global one. Human ingenuity in

altering agricultural landscapes and selecting varieties, the need to renew seed stocks, and constant reconfiguration of the factors of production and consumption make cosmopolitanism rather than endemism the rule for crops and varieties. The worldwide undertaking of plant exploration and introduction of exotics have moved useful traits and whole organisms into new environments. This same quest operates fully at far smaller biological and spatial scales, in the exchange of crops between farmers and the migration of traits through crop populations of villages and microregions (Zimmerer 1996).

The circulation of seed is a result of several factors. Both seeds and crop genotypes have finite viability. Seed stocks degenerate as they become infected with pests and pathogens; the competitive advantages of crop varieties dull against the host of diseases that plague them; the physical and human conditions that favor a particular variety inevitably change to its disadvantage. Some households lose seed, and others gain by selling or exchanging surplus. Tastes go in and out of fashion; input regimes and production systems change. Seeds from different strains are mixed on common threshing floors and through wages in kind, gifts, sale, and bartering of food between households. The circulation of seeds through villages, market networks, and regions is, at once, inevitable because of the practices of everyday production and necessary for the viability of agriculture. Moreover, periodic and small exchanges of seed between farms and villages rapidly compound into significant genetic changes in crop populations. The biological results at the regional level are that crop genes migrate at a high rate and that most crop genetic diversity exists within farms rather than between them (Brush et al. 1995), a pattern that confounds drawing cultural boundaries around crop populations. The needs of farmers to shuffle their seed stock, the biological forces of reproduction, and the economic forces of crop breeding and technological diffusion produce crop populations that look very much like cultures-composites of traits and elements from many sources, some local in origin but many exotic. Just as cultures cannot be described as bounded or essentially derived entities, neither can crops. Like cultures, crops survive by transformation in natural and cultural contexts with permeable boundaries, without definite continuity or authorship, and as heterogeneous rather than homogeneous entities.

Potato agriculture in the Tulumayo Valley and elsewhere in the Andes exhibits the circulation of seeds at many levels. Place-names are frequently part of the nomenclature used by farmers to organize knowledge of the crop. The research I was involved in collected 163 names for indigenous potatoes in the valley. Twenty-two noncommercial varieties appeared in at least 20 percent of the household inventories sampled, and the names of five of these varieties reference places, all outside of the Tulumayo Valley. Thirty-one percent of the households in our sample reported purchasing native seed in the previous five years; 57 percent exchanged native seed; and 34 percent sold native seed (Brush et al. 1992). The Tulumayo Valley is south of Ricran, one of central Peru's most important hubs of native potato seed. Farmers from many different communities, including Tulumayo villages, converge there in a yearly seed market. Seed circulation is also evident in commercial potato production that is important to the Tulumayo economy. Selected native potatoes are much in demand and grown commercially on 28 percent of the potato land in Tulumayo (Mayer and Glave 1992), all in varieties that are widely distributed in Peru's central highlands. The most renowned of these, the huayro, is found as far south as Cusco, 500 kilometers distant.

The circulation of potato seed in the Tulumayo Valley appears to reflect patterns that are found in

more traditional and less commercialized Andean economies. Analyzing a comprehensive collection made in Peru and Bolivia in 1939, Hawkes (1947) notes that there is frequent use of Aymard names in Quechua regions, indicating movement of people and interchange of potato seed among different communities. Exchange of seed is prompted by the need to obtain tubers with fewer viruses, a normal problem for improved varieties but also part of native potato agriculture (Zimmerer 1996). Reducing viruses is solved in part by obtaining seed tubers from higher altitudes and locations that may be less favorable for viruses. The result is potato populations without cultural or political boundaries. The flow of Andean tuber seed among farmers in Peru and Bolivia and across the international border around Lake Titicaca shows the stateless nature of peasant seed stocks (Valdivia et al. 1998). The nature of the resource appears to be contrary to the idea that single states or communities can claim it as a form- of autochthonous patrimony.

Contested Agendas

Numerous voices speak in discourse on biodiversity, conservation, intellectual property, and indigenous rights, but four are particularly important: (1) indigenous peoples' organizations, (2) private users of biological resources, (3) public users of biological resources, and (4) nation-states. This debate eddies around four topics: control, access, compensation, and conservation. The CBD, the development of bioprospecting contracts, the tightening of intellectual property in industrial countries, and the international GATT and TRIPS agreements focus the discourse on biodiversity onto the closure of the biological commons. This closure is defended as a way to avert tragedy (Hardin 1968), but it also intrudes into the public domain. The sovereignty clause of the CBD's text requires enabling national policy and legislation to affect closure. The critical locus of debate about closing the biological commons has shifted from the international level to the national and local levels because of the pressure to satisfy the mandate of GATT and TRIPS and because of the spread of biocontracting.

Political ambiguity about the future direction of genetic resource management is apparent in the positions taken by indigenous peoples' organizations toward bioprospecting. Several declarations made in the early stages of discussion about indigenous rights over knowledge and resources avowed that indigenous people did, in fact, possess intellectual property over their knowledge and resources. The 1993 Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous People reaffirms assertions of earlier assemblies, in particular Agenda 21 of the United Nations Conference on Environment and Development (Robinson 1993), the Kari-Oca Declaration, the Indigenous Peoples' Earth Charter, and the Charter of the Indigenous-Tribal Peoples of the Tropical Forests (Posey and Dutfield 1996). The Mataatua declaration, drafted at the First International Conference on the Cultural and Intellectual Property Rights of Indigenous Peoples held in New Zealand, proclaims that intellectual property is a right implied in the right of self-determination: "We declare that Indigenous Peoples of the world have the right to self-determination, and in exercise of that right must be recognized as the exclusive owners of their cultural and intellectual property" (Posey and Dutfield 1996:205).

The U.N. Draft Declaration on the Rights of Indigenous People (part IV.29) likewise asserted in 1993 that "indigenous peoples are entitled to the recognition of the full ownership, control, and protection of their cultural and intellectual property" (Posey and Dutfield 1996:186). Subsequent declarations, however, take a more cautious approach to intellectual property. In 1994, the Regional Meeting of Indigenous Peoples' Representatives on the Conservation and Protection of

Indigenous Peoples' Knowledge Systems averred that "for indigenous peoples, the intellectual property system means legitimization of the misappropriation of our peoples' knowledge and resources for commercial purposes" (Cultural Survival Canada 1997b). At the Second Conference of the Parties to the Convention on Biological Diversity, the Indigenous Peoples' Biodiversity Network avoided mention altogether of intellectual property rights for indigenous people. Rather, they signaled their opposition to the transfer of property rights implied in contracts:

For members of indigenous peoples, knowledge and determination of the use of resources are collective and intergenerational. No indigenous population, whether of individuals or communities, nor the Government, can sell or transfer ownership of resources which are the property of the people and which each generation has an obligation to safeguard for the next. [Cultural Survival Canada 1997a]

This caution may reflect the sea change in the promotion of intellectual property resulting from the conclusion of the GATT and TRIPS negotiations in 1995, the popularity of bioprospecting among multinational corporations and international agencies, or the rising tide of discussion among anthropologists and others who are generally supportive of indigenous rights. In any case, the indigenous delegation to the Second Conference of the Parties of the Convention on Biological Diversity asked for a moratorium on bioprospecting (Cultural Survival Canada 1997a), describing it as biopiracy. This call was repeated at the Third Conference of the Parties of the Convention on Biological Diversity in Buenos Aires in 1996. Both requests for moratorium were rejected.

Knowledge, Resources, and Community: Social Issues

Escobar (1994) describes the expansion of the sustainable development narrative as the semiotic conquest of nature by capitalist relations of production. Concepts such as unrecognized environmental costs--externalities--and futures markets for public goods are staple items in environmental policy discourse and attest to the pervasive force of the market mentality in shaping both thought and action toward society and nature. The semiotic conquest of nature by the capitalist narrative proceeds from its triumph in Western cultural and social life, beamed around the world in ever more voluminous and penetrating messages. The juggernaut of marketplace terms and concepts has found its way into social and cultural domains around the world. Bioprospecting extends this semiotic conquest into the realm of farmers' knowledge of seeds and plants. Indigenous groups have protested the specific appropriation of knowledge and resources, and they have sought a more favorable position in negotiating bioprospecting contracts, but these efforts do not pretend to contest the semiotic conquest identified by Escobar (1994). Indeed, tendrils of the process of semantic conquest by capitalism reveal themselves in the discourse of indigenous groups and follow the rhetorical pattern described by Escobar (1994) for Western developmentalist discourse: a transcendence of the conditions of indigenous people, a glossing of poverty and environmental degradation, a reconciliation of growth and environment, and a reconceptualization of nature as environment. For instance, territorial and political autonomy- essential subjects of indigenous rights-are now alloyed with rights over local knowledge.

The discussants in the dialogue on biological resources and indigenous rights share certain agenda items (notably, control) but not others (notably, conservation). Bioprospecting contracts

establish a common domain for producers and users of genetic resources to negotiate agendas and balance interests. Bioprospecting has served the semiotic conquest by capitalist relations, but it has done little to advance environmental justice. The terrain of balancing equities among indigenous people, private and public users of biological resources, and nation-states is poorly charted and rough. Gollin and Laird observe that "the devil is in the details" in designing national legislation for bioprospecting (1996: par. 44), but command of details is affected by political and economic power. Knowledge about the process of negotiation, contract enforcement, and redress of grievances will be disproportionate in the future, as they are today. Lack of understanding and information on these details may obscure unintended, negative consequences of bioprospecting agreements. As the lexicon and tools of bioprospecting are mobilized to balance equities, the biological commons will be closed and, as with all such closures, dispossession and marginalization will result.

The treatment of other forms of cultural property might help us reflect on the appropriation of indigenous knowledge through bioprospecting. Robust markets in archaeological artifacts, antiquities, and ethnic art, along with the repatriation of human remains and grave goods to native North Americans, have made cultural property a familiar category (Coombe 1993; Greaves 1996; Merryman 1989; Seeger 1992). The prevailing definition of cultural property designates competitive objects of artistic, archaeological, ethnological, or historic value (Merryman 1989): Mayan stelae, Parthenon marble reliefs (the Elgin Marbles), burial goods from the tombs of Pharaohs or Mochica nobility, and sacred textiles of Bolivian communities. The usefulness of conventional cultural property concepts to intellectual resources is, however, limited by the fundamental quality of competitiveness. Moreover, it is unclear whether cultural property rights should pertain to nation-states or cultural groups (Coombe 1993; Merryman 1989). Cultural property is designed to avoid or exclude commercialism (Coombe 1993), whereas the purpose of bioprospecting is overtly commercial. Finally, the concept of cultural property may conflict with received notions of intellectual property, especially authorship.

A limited discussion of the appropriation of cultural property suggests a labyrinth of issues. Cultural property is most easily construed when bounded in objects (Coombe 1993; Strathern 1996; Woodmansee and Jaszi 1994). The essentialization of culture, the nature of authorship, and the arrogation of the public domain emerge as elementary and embedded issues of nonmaterial cultural property. While rudimentary, these issues have not received thorough attention by anthropologists, indigenous spokespersons, or the proponents of bioprospecting. While some anthropologists (e.g., Greaves 1996; Posey 1990) have championed the right of indigenous people to own and commercialize their knowledge, the discipline in general has moved away from the idea of culture as a bounded object that might be possessed, let alone commercialized (e.g., Clifford 1988; Handler 1991). The attributes of property are conspicuously problematic in our current definition of culture (Handler 1991). Property implies definitive boundaries, exclusion, and reification that contrast with the permeability and fluidity of cultures.

The concept of authorship is a natural offspring of a society based on the doctrine of possessive individualism and the commoditization of labor (MacPherson 1962). While possessive individualism is part of the warp in the fabric of liberalism, the social flaws derived from the doctrine are cautions against embracing possessive individualism for the cause of cultural equality. One flaw is the tendency to reduce individual aspiration and potential to material acquisition, and a second is the tendency for possessive individualism to obscure inequality and

subordination to the owners of capital (Carens 1993; MacPherson 1962). According to MacPherson, the inequality of the modern condition and the breakdown of cohesive self-interests undermine the doctrine of possessive individualism (1962:272-273). These same factors are equally injurious to culture as a possessive individual. While culture serves critically important roles in material life, pushing a possessive, commoditizing function onto culture distorts its character and capacity. Moreover, asserting cultural equality through the idiom of the market obscures the hegemonic power of particular cultures in the global economy and thereby fails to address the true inequalities that characterize the landscape of cultures and societies.

Coombe (1993, 1996) notes the rich ironies of possessive individualism in the appropriation of cultural symbols for political and commercial purposes, when non-Western people are obliged to embrace Western ideological constructions if they are to limit the use of their cultural knowledge. The logic allowing companies to own cultural symbols and names as trademarks (e.g., Cherokee(R) and Winnebago) extends also to the right of cultures to claim objective identity (Coombe 1993). Both trademarks and ownership of cultural symbols are utilitarian devices that constrict the public domain in order to meet socially negotiated goals, both commercial and civic.

A similar logic would seem also to extend to biological resources and cultural knowledge about plants. Landraces and ethnobotanical knowledge are, after all, cultural artifacts, and ownership meets a social goal: stewardship of environmental goods. The fact that natural compounds-genetic sequences and whole organisms-are classified as intellectual property in industrial countries lends credence to the idea that local ethnobotanical knowledge, medicinal plants, and crop species also fit this category (Greaves 1996). The proposal for ownership of cultural objects raises the issue of partibility. Can ownership be given without also granting the right to commercialize culture? Values other than the market certainly drive certain groups to claim ownership of cultural objects (Coombe 1993; Handler 1991), but market values are central to claims of control of biological resources. Partibility can, of course, be limited, as in the case of national monuments; but which classes of cultural property should be treated as nonpartible?

Partibility implies a form of essentialism that may be unproblematic for objects whose authorship is unambiguous and whose use is competitive, but immaterial cultural goods lack these qualities. Ethnobotanical knowledge, design motifs in material arts, musical styles, and other immaterial elements pass through cultural boundaries with ease, making it all but impossible to attribute authorship. Indeed, it is fair to assume that ethnobotanical knowledge is cosmopolitan. The permeability of cultural boundaries that blurs authorship of cultural knowledge is amplified in ethnobotanical domains by the usefulness of knowledge about plants, the naturally wide distribution of plants, and their easy transport.

Extending the characteristics of alienable property to cultural goods, such as ethnobotanical knowledge, rests, therefore, on an essentialist's concept of cultural authorship--one that has been largely rejected in anthropology. The concept of author springs from the doctrine of possessive individualism (Handler 1991) and embraces the hero-inventor quality of authorship, a quality fixed in law but challenged by writers, artists, and ethnographers (e.g., Mays et al. 1996; Woodmansee and Jaszi 1994). Coombe notes that copyright laws are intended for individuals and their specific creations, not for "ideas, cultural themes, practices and historical experiences" (1993: n. 102). Rejecting the idea that intellectual property can be extended to "collective rights, collective authors, and claims of intergenerational creation" (1993: n. 104), Coombe notes that indigenous ownership of cultural symbols is limited by the nature of authorship of cultural knowledge.

Authorship by capitalism's agential subjects (corporations, nation-states, juridical persons) is intentional, dedicated, and specifically constituted. Authorship by tribes, communities, and ethnic groups may have these qualities, but it is also collective, incremental, ambiguous, tacit, and socially distributed (Strathern 1996). Strathern (1996) observes that the contrast between authorship by individuals and that by collective, cultural entities is analogous to distinct modes of knowledge in industrial countries. The qualities of monopoly, exclusion, and partibility flow easily from the form and function of juristic persons but not from the other cultural forms.

Strathern (1996) also points out that social communities, not cultures, claim cultural identity and rights in corporate images and that societies, not cultures, determine boundaries. Because cultures are fluid, permeable, and protean, the boundaries that societies may draw around cultural identities are artifices. A social claim of exclusive cultural identity may bemuse both persons in other societies who share the culture and those within the same society who construct separate identities. Cultural identity is not dependent on exercising monopoly over the objects of cultural property. Thus, diaspora communities are not discouraged from retaining a sense of ownership in the cultural identity of their original societies. The tolerance of blurred ownership of cultural property is, however, untenable when the conditions of partibility and commoditization are added.

Conclusion

During this century, the genetic code has been transformed into capital, and living organisms and biological processes have been stripped from the public domain. The grip of nation-states and their acquiescence to free trade give capital the means and mandate to extend its reach into the remotest villages. Indeed, the collection of genetic resources from the cradles of agricultural diversity can be seen as capital's successful penetration of yet another sphere. Indigenous people have belatedly reacted to the expansion of capitalism into the genome by insisting on the right to control their genetic resources and on recognition of their contribution to the store of genetic wealth already extracted. Following Hirschman's (1970) maxim, indigenous people have three choices: exit, voice, or loyalty. Exit, a familiar strategy of resistance by subaltern populations, forecloses control and recognition that might create a stream of income or other benefits from genetic resources because this stream depends on intercession of the nation-state to protect rights over entities that are infinitely reproducible. Loyalty, likewise, appears to offer little resolution to indigenous demands. Few nation-states have ceded even minimal rights or recognition to indigenous people, making it difficult to foresee enlightenment vis-A-vis genetic resources. Voice, therefore, remains as the logical choice for indigenous people in securing control over genetic resources. Indeed, indigenous people are already vocal, but their voice must be more audible in national discourse rather than in international forums that have little impact on legislation or executive action. This article suggests that although bioprospecting is promoted as a way to give voice to indigenous people, it does so only in the idioms of a dominating market rather than in idioms that indigenous people might themselves prefer. The negotiating space for indigenous people is severely constrained by the loci and time frame of negotiation, ambiguities in the terrain of intellectual property, the protean and diffuse nature of knowledge and biological resources, and disorganization among indigenous groups.

The locus for negotiating control of genetic resources is definitive-within the framework of the nation-state, a place crowded with competing interests and powerful political factions. Existing legal frameworks for intellectual property will determine the terms of negotiation about control of

genetic resources over life forms and knowledge, frameworks that reflect the international standard espoused by the World Intellectual Property Organization (Baenziger et al. 1993). Negotiating indigenous control over genetic resources is encumbered by public domain issues that have heretofore impeded the expansion of intellectual property over life forms and knowledge about natural phenomena, except in a few advanced industrial societies. One group's control may deprive another group from making equally legitimate claims as collective authors. Restricting the flow of genetic material and information will be opposed because it jeopardizes public and private research to improve food production or identify new medicines. National discourse about intellectual property over life forms is now directed as much by the free trade milieu of the GATT and TRIPS agreement as by local concerns (Lesser 1998). Indeed, the national discourse of signatories to GATT is about not whether to install an intellectual property system for plants but what type to install. Thus, the indigenous voice for control over genetic resources will only resonate to the degree that it is in harmony with the free trade mantras of capitalism. Moreover, GATT's rule is to install intellectual property for plants by the turn of the millennium, a forbidding obstacle to the indigenous voice.

Equally daunting, however, is the need to agree on a common definition of control in the indigenous discourse. This term has been appropriated from the lexicon of territorial rights, but it does not translate well into the lexicon of rights over ideas and other noncompetitive goods. Both control and bioprospecting are predicated on a cultural construction of possessive individualism, which in turn is buttressed by the successes of late capitalism in framing our imagination of how individuals and societies relate to one another and to the natural world. This ideological construction is so pervasive that the public domain has become all but invisible, and use of biological public goods is erroneously labeled as biopiracy (Odek 1994; Shiva 1997). Expropriating the public domain is vilified as a crime of agents of public and private interests in industrial countries, but indigenous groups are encouraged to become partners in this expropriation. Bioprospecting rests on the appropriation of culture and biological resources whose origin is ambiguous. The urgency of preserving biological resources or balancing equities may prompt us to overlook this trespass onto the commons. The state's interest in delegating control or overseeing contracts is to encourage conservation, stewardship, and accessibility; however, unintended impacts will surely follow, especially if control or contracts disregard the nature of the cultures and biological resources they are intended to save. For instance, the normal give and take of cultural ideas and genetic resources between farmers and villages may easily be obstructed or otherwise distorted by property relations and the expectation of profit.

The two information systems discussed in this article, culture and crop genetic resources, share the attribute of transparency. There is overwhelming evidence that crop genetic resources come from culturally and biologically open systems. To remain vital, both cultures and crop populations depend on the constant acquisition of new information-on the exchange of information across ephemeral boundaries. The notion of public dominion for cultural knowledge and genetic resources is logical and widely held, deduced from the facts that all cultures and farming systems absorb and give off information and that authorship springs from the stream of ideas that flows through cultures and villages.

The logical framework of bioprospecting is that the noncontractual collection and use of genetic resources is biopiracy. This formulation is inaccurate because it misconstrues the nature of creating genetic resources and disregards the public domain. The challenge of genetic and

cultural erosion can be met with frameworks other than the possessive individualism implied in bioprospecting. Defending the public domain seems quaint in the glare of late capitalism, but in the villages and farms of the Tulumayo Valley where potato genetic resources abound, bio-cooperation remains the common ethic. Nevertheless, the farmer's query to me about the fate of his potatoes in my collection shows that the issues of benefit sharing are as tangible to peasants as to politicians who negotiated the Convention on Biological Diversity. The dilemma is whether bio-cooperation at the village level can survive in a context in which ownership and contracting dominate the exchange of seeds and farmer knowledge beyond the village. Biocooperation between the stewards of genetic resources in peasant villages and users of those resources in industrial countries rests on identifying a broad spectrum of interests, values, and methods of recognition and compensation. Monetary compensation is but one of many alternatives in this spectrum. Bioprospecting is but one alternative to increase the private value of genetic resources. Compensation for genetic resources does not have to be cast into the mold of possessive individualism. Enhancing other public goods-education, health, and agricultural technology-can also give recognition to indigenous farmers' contributions to world agriculture. Unfortunately, the volume of neoliberal rhetoric stunts our imagination about these alternatives, a stunting that affects every discourse about the future of our collective biological patrimony.

Note

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[Author Affiliation]

Stephen B. Brush

[Author Affiliation]

Department of Human and Community Development

[University of California](#) at Davis