

HOW SHOULD THE BENEFITS OF BIOPROSPECTING BE SHARED?

by JOSEPH MILLUM

The search for valuable new products from among the world's stock of natural biological resources is mostly carried out by people from wealthy countries, and mostly takes place in developing countries that lack the research capacity to profit from it. Surely, the indigenous people should receive some compensation from it. But we must build a robust defense for this intuition, rooted in the Western moral traditions that are widely accepted in wealthy countries, if we are to put it into practice and enforce it.

Bioprospecting—the search for valuable chemical products in natural biological resources—is an important source of novel chemical and biological products with potential uses in medicine, agriculture, and other industries.¹ But a great deal of the world's “biodiversity” is found in developing countries, which often lack the research capacity to make use of it. Bioprospecting in such environments generally requires outside bioprospectors and sponsors from the developed world. This has led to concern that bioprospectors will take what is valuable without compensating the community from which the samples come or whose knowledge led to the discovery. Critics label such practices “biopiracy.”

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Consider the famous *Hoodia* case.² For millennia, the San people of southern Africa have used native plants of the *Hoodia* genus as appetite suppressants. Their practice was documented by colonial botanists, and *Hoodia*'s properties were then investigated in the late twentieth century by the South African Council for Scientific and Industrial Research, which attempted to isolate the active ingredients. In 1995, following nine years of development, CSIR applied for a patent on the chemical components of the plant that suppressed appetite. Three years later, they signed a licensing agreement with a private company named Phytopharm that developed a program with Pfizer for commercialization of *Hoodia* products for the lucrative Western weight loss market. All this research and development proceeded without the knowledge of the San. Only in

2001, following extensive press exposure, did CSIR enter into negotiations with San representatives about whether and how the San ought to benefit from *Hoodia's* commercialization.

Clearly, there was something wrong with the behavior of CSIR in this case. Many people think that the San should have been consulted about the use of their traditional knowledge and should have the opportunity to benefit from *Hoodia's* development. Indeed, the Convention on Biological Diversity, to which 191 countries are signatories, requires the “fair and equitable sharing of the benefits arising out of the utilization of genetic resources.”³ However, the ethical justifications for such sharing have not been established, beyond appeals to intuitions about justice and exploitation. Consequently, what share of benefits is owed—and to whom—is also uncertain.

Current good practice for bioprospecting consistent with the Convention on Biological Diversity is found in the benefit-sharing arrangements of the U.S.-sponsored International Cooperative Biodiversity Groups, or ICBGs.⁴ These arrangements specify, first, that benefit-sharing agreements should be negotiated with the local community and require the prior informed consent of its members, and second, that benefits should be shared in return for access to genetic resources *and* for the use of the community’s “traditional knowledge” about the pharmacological properties of local flora and fauna under study.⁵ From the perspective of Western accounts of property, both these principles appear strange. The first principle seems strange because it is natural to think that community members deserve a share of benefits in virtue of their ownership of the organisms containing the genetic resources, but ownership normally implies that people may do as they wish with their possessions (within moral limits). In this case, for example, individuals could sell plant products. Why, in the case of bioprospecting,

are individuals’ rights abrogated? Compensation for the use of traditional knowledge also seems strange. Compensation is required *even when* the originators of the knowledge are not alive and the knowledge is common within the community. But intellectual property rights over the knowledge then seem unwarranted. No one who has the knowledge worked to acquire it, so there is no compensatory basis for sharing benefits with them. Moreover, the knowledge is already public, so there is no need to encourage people to reveal it. In short, the standard justifications

whole is the appropriate party for bioprospecting negotiations, and its share of benefits should be apportioned equally among its members. Determining a fair share of benefits is not straightforward, but must be linked to the market value of access, which will be established partly by negotiation. We should focus on preventing various transactional wrongs and distorting influences on the efficient operation of the market. The question of whether property rights in biodiversity are justified is clearly crucial. Though it is not the main focus of this paper, I sketch some consider-

IF MEMBERS OF A community have morally justified property rights over areas of biological diversity, then their rights over access to genetic resources within these areas should be considered collective rights. Consequently, the community as a whole is the appropriate party for bioprospecting negotiations, and its shares of benefits should be apportioned equally among its members.

for intellectual property rights do not apply.

The absence of rigorous theoretical justification for fair benefit-sharing arrangements, along with these puzzling features, might lead one to doubt the moral importance of benefit-sharing. If the only available justifications are simple appeals to intuition, and the practice of benefit-sharing involves principles that look implausible, then perhaps it need not be taken seriously.

This paper seeks to justify benefit-sharing in a way that both gives guidance about what is owed to whom and makes sense of these puzzling features. I argue that if members of a community have morally justified property rights over areas of biological diversity, then their rights over access to genetic resources within these areas should be considered collective rights. Consequently, the community as a

ations of justice that favor ascribing property rights to certain communities. Finally, I show how parallel arguments apply to traditional knowledge. Until then, for the sake of simplicity, I concentrate on what is owed just for physical access to genetic resources.

This paper does not attempt to deal with all the important ethical issues regarding benefit-sharing. First, in arguing for my claims, I abstract away from the messy details of actual bioprospecting ventures. I discuss idealized models in order to isolate the morally relevant structural features of these cases.⁶ Second, I assume that bioprospecting ventures can be reliably expected to lead to profitable discoveries.⁷ I also treat these benefits as though they are fungible, which allows me to consider only economic benefits and simplifies the analysis of what counts as a fair allocation.

The principles I use to reach my conclusions are taken from mainstream Anglo-American moral and political thinking. It might seem peculiar to use a normative framework rooted in the Western tradition, given that many of the cultures whose members are the intended beneficiaries of the Convention on Biological Diversity reject Western concepts of property. The idea of land and the living world as amenable to individual ownership is frequently contrasted with a worldview that treats humans as a part of nature and the custodians of the land they inhabit.⁸ However, because these Western concepts underlie the legal regimes that purportedly make biopiracy permissible, it is vitally important to show that benefit-sharing can be defended and explained even from within the Anglo-American philosophical tradition. No special pleading is therefore required in order to defend indigenous people's rights.

Rights to Genetic Resources

In working out how to share the benefits of bioprospecting, we must distinguish several issues. We need to know who deserves a share of benefits and what that share should be. Further, we need to know with whom benefit-sharing arrangements should be negotiated—who gets to decide whether and on what terms access to genetic resources is granted. Answering these questions requires determining who has rights over the genetic resources and what sorts of rights these are.

What rights might be held? Within the Western paradigm that this paper adopts, we may assume, without begging any important questions, that the rights in question are property rights. Property rights are bundles of rights that allow access to and control over tangible and intangible objects.⁹ There are three broad types of property: individual, collective, and common. *Individual* property is held exclusively by one person. *Collective* property is held by a group of indi-

viduals, so that the exercise of the attendant rights must be performed by the group as a whole. *Common* property is open to use by all, so long as no one prevents others from also using it.¹⁰ Note that an object may have different characteristics in virtue of which people have different property rights over it. For example, the owners of most uncultivated Scottish land may not exclude others from walking on it. In this respect, the land is held in common. But the owner alone retains the right to build on the land, and in this respect the land is individually owned.

We should also note the distinction between moral and legal considerations. Legal property rights are the creation of positive law. However, we can investigate their moral justification. Where they are morally justified, I will speak of *legitimate* property rights. It is primarily these rights that I discuss.¹¹

The practice of seeking prior informed consent from community members implies that access to genetic resources is not generally believed to be governed by individual property rights. If someone has individual property rights over a resource, then she is allowed to make certain decisions about what happens to it without consulting others. For example, she may unilaterally transfer her rights over it. This is not true of genetic resources: individuals are believed to be permitted to alienate plant samples for scientific study, for example, only with the agreement of their community. This implies that the property rights in question are believed to be *collective*. But is this belief warranted?

Why property rights in biodiversity should be held collectively. It will help to examine a simplified model of bioprospecting—one that allows us to see how property rights over genetic resources are morally different from property rights over most other physical property. The difference implies that someone's rights over genetic resources in a piece of property are held collectively with other property own-

ers, *even if* her other rights over that property are not.

Consider a community living in a forest that is believed to contain many unique species. The area is valuable to people outside the community in two ways: it contains timber, and it has scientifically interesting genetic resources. Assume that the members of the community have legitimate property rights over the forest. These might be common, individual, collective, or some mixture. Clearly, if they are collective, then the argument is already over. So assume that they are either common (that is, everyone may harvest whatever she wishes) or individual (different individuals own distinct patches of forest).

As genetic resources, the biological specimens are valuable because of the information they contain. Studying them may reveal pharmacological characteristics that can be used, for example, to develop medicines. But to access this information, one need not have access to the whole forest; only samples of the relevant types of flora and fauna are needed.¹²

Suppose that the forest is individually owned by the community members. Let each piece of property contain roughly the same range of species and so the same genetic information. The genetic resources of each are therefore equally valuable. Call this *ex ante* value *v*. But then suppose some individual P sells access to the genetic resources on her property to an outside prospector. This agreement, if fair, will give *v* to P. Those parts of the genetic information that turn out to be valuable (that have *ex post* value) will generally end up as public information controlled by the bioprospector (through the patent system, for example). Since accessing the genetic resources of other individuals in the community will not produce additional information, the value of their genetic resources is now much less than *v*. Similar reasoning applies if the land is commonly held—that is, if individuals are allowed to appropriate materials from the land and do with them as they wish: if one person

appropriates and sells samples, or sells access, she prevents others from doing the same.

Contrast this with the sale of timber. If P sells timber from her land, this does not significantly reduce the value of other individuals' timber: its ability to function, say, as a building material remains the same. Likewise, if she harvests timber from a common forest, she does not prevent others from doing the same (until they use up all the timber).

In general, where information is at stake, the sale (and subsequent publicity) of that information by one person reduces the value of the same information held by others. By selling access to her biodiversity, P imposes a cost on the other members of her community. But, all else being equal, if I impose a cost on someone without her consent, then I owe her compensation. Indeed, I owe at least the value of the cost I imposed. This implies that the benefits of selling access should be distributed among all the people who have legitimate property rights in the genetic resources.

The cost that would otherwise be imposed on nonconsenting others explains why the benefits of selling access to genetic resources should be distributed among the legitimate property owners in a community. However, it does not yet tell us who may decide whether that access will be sold and for what price. One possibility is that everyone affected by the sale of access should be able to veto it. But this would allow individuals too much power to prevent others from realizing their assets, since the community would be held hostage to its most reluctant members. With regard to its genetic resources, the community members' interests rise and fall together: no deal, or a bad deal, may affect everyone as much as a good deal.

Fortunately, we already have a model for how decisions that affect the interests of all members of a group may be made. This is the model of government. Legitimate governments, ideally, make decisions

that take equally into account the interests of all those subject to them. Moreover, they are generally thought to be empowered to negotiate on behalf of their subjects and to make agreements that bind them, even when individuals disagree with particular government actions or policies. This suggests that benefit-sharing agreements can permissibly be made by legitimate governments of communities living in areas of biodiversity.

In practice, it may be difficult to find legitimate decision-makers for

on the traditional knowledge of indigenous communities to identify new ingredients, and it has developed ongoing relationships with communities for the supply of raw materials. In an analysis of Natura's access and benefit-sharing agreements, Sarah Laird notes that "Over time, the company found that it is important to work with communities that are organized, with an association, and to not deal with an individual or small group within a community."¹⁴ Although individuals should not be able to make independent decisions about bio-

IN PRACTICE, IT may be difficult to find legitimate decision-makers for indigenous communities living in areas of biodiversity. The national government might not represent fully these communities' interests, making negotiation with other local parties necessary. Although individuals should not be able to make independent decisions about bioprospecting, appropriate community representatives can do so.

indigenous communities living in areas of biodiversity. The national government might not represent fully the interests of such communities, making negotiation with other local parties necessary. As with community consultation prior to human subjects research, researchers may have to facilitate the creation of ad hoc decision-making bodies that can represent the interests of community members. However, these practical difficulties should not drive us to the view that every affected individual must give informed consent. If unanimous agreement were necessary for actions affecting the interest of all the members of a community, no government could undertake such actions. As we have seen, not being able to take such actions would itself negatively affect community members' interests.¹³

The experiences of Natura, a Brazilian cosmetics company, illustrate these points. Natura has drawn

bioprospecting, appropriate representatives of communities can nevertheless have the authority to do so.

Apparent counterexamples. I have argued that control over access to genetic resources should be a collective right because if one person allows access to their genetic resources, then the similar genetic resources held by others are devalued. However, there are cases in which someone's actions predictably impose costs on others, but where we do not think compensation is required. Such cases might appear to be counterexamples to my general claim.

Consider the timber market. Suppose you and I both possess stocks of timber. If I release mine onto the market, the supply of timber will be increased. In turn, if the market is functioning well, increasing the supply will reduce the price. I have thereby reduced the value of your property. But surely I do not owe you restitu-

tion for imposing this cost—otherwise all sales would be morally problematic.

We may address this apparent counterexample by distinguishing *prima facie* and *all-things-considered* obligations. Imposing a cost on someone does not always entail an all-things-considered duty to compensate her. But this does not disprove the principle that imposing a cost on someone without consent creates a *prima facie* obligation to compensate her.¹⁵ It is just that this obligation may be overridden by other morally relevant factors.

Markets have two valuable features. One is that being able to exchange one's possessions is an intrinsically important freedom. The other is that well-functioning markets lead to efficiency gains and facilitate increased productivity to the benefit of all.¹⁶ This latter feature explains why the price drop caused by increasing the supply of timber does not entail a duty to compensate other holders of timber: maintaining a dynamic relationship between demand, supply, and price is one way in which markets regulate the amounts of different goods that get produced and so increase efficiency. Eliminating this relationship would be bad for everyone.¹⁷ But the market would not work this way in the case of genetic information: if I sell genetic information, the reason that information drops in value is not a decrease in demand relative to supply, but the fact that after one individual has sold the information, there is no more information to be sold. Thus, allowing the first seller to take all of the payment for access to genetic information does not seem to benefit society in the same way. Moreover, I suggest, no other moral factors in the genetic information case are sufficient to outweigh the *prima facie* obligation to compensate. At any rate, the burden of proof rests on those who would reject the compensation principle.

A Fair Share of Benefits

We have established that all the people with legitimate property rights over an area of biodiversity should receive a share of the benefits of bioprospecting, and that they—or their legitimate representatives—have the right to decide whether to allow access to that biodiversity. Nothing has yet been established, however, about what share of the gains from bioprospecting they are owed—that is, what counts as a *fair* share of benefits.

Where multiple parties contribute to the creation of some social surplus (that is, some good whose value exceeds the combined cost of their contributions), the return each deserves should reflect her contribution. But exactly how much someone deserves could be affected by many things, including the relative importance of the individual's contribution, the effort she put into it, the costs she incurred, and so forth. Here, we are interested in the value of the contribution made by granting access to genetic resources, which is a capital investment. If we assume that the other people involved in bioprospecting (such as the scientific researchers) are being treated fairly by their employers, then we only need to calculate the value of access relative to the value of the other capital investments made by the research sponsors.¹⁸ This means we do not have to compare different possible grounds for establishing desert.¹⁹

The value of a capital resource is determined by the benefits it is expected to create; as a means to other goods, its value is determined by the value of those other goods. This provides a simple way to calculate how much the resource is worth: we can look at how much people are willing to pay for it. Of course, the price will reflect the value of the resource only if potential buyers and sellers make their decisions under the appropriate conditions. For example, they must have accurate information about what benefits can be realized with the resource, and neither they nor the

holder of the resource should be taking advantage of some special position they are in, such as the possession of a monopoly. In short, the value of a capital resource, in terms of the compensation merited for its use, is given by its price in a well-functioning market.²⁰

Ideally, we could work out how much something would cost in a well-functioning market by modeling the market. But a complete model is likely to be impossible. For example, the value of goods ultimately depends on people's autonomous choices, and modeling such choices is a poor substitute for actually using them. We would do better, where possible, to bring the actual market closer to the ideal. This requires that we eliminate factors that lead either to wrongful transactions or to poorly functioning markets. The former include deception and coercion, both of which are liable to lead people to agree to exchanges that they would reject if acting freely. The latter include actions such as the exercise of market power to bargain down the prices offered by competing suppliers.

The tactic used here is a way to achieve fair transactions without having to specify a principle of fairness.²¹ The idea is that though such a principle is hard to specify, we can still identify certain factors that tend to lead to unfair divisions of benefits. For example, coercion, as well as being wrong in itself, tends to result in the person coerced making agreements that favor the coercer. However, the fact that coercion is involved is not a reason to think that the division of surplus value *ought* to favor the coercer. Hence, coercion tends to lead to unfair agreements. Preventing it therefore increases the probability of a fair division of benefits.

This tactic also means that we do not have to worry separately about exploitation. Take Alan Wertheimer's account of exploitation, for example, according to which exploitation involves taking "unfair advantage" of someone.²² Judging whether a transaction is exploitative requires making

a judgment about fairness. But if we have already eliminated the factors we think lead to unfair divisions, then we have already done what we can to ensure that the transaction is fair, and so to avoid the possibility of exploitation.

To sum up, to calculate what share of the benefits of bioprospecting should go to those who possess the genetic resources, we determine the price that access to those resources would command in a well-functioning market. Ideally, this will be determined in negotiations between the interested parties. Such negotiations will produce a fair outcome only if we compensate for distorting factors such as the lack of relevant information or expertise, and the exercise of morally irrelevant power differences. Those negotiating bioprospecting arrangements should either minimize these factors or aim for the result that they judge would be reached without them.

In principle, these considerations give guidance on how to establish a fair share of benefits. In practice, they are likely to be taken into account only if a system of governance is in place. The possibility of such a system is suggested by the formal and informal structures that already exist to encourage benefit-sharing arrangements. Formally, these include the Convention on Biological Diversity and guidelines that have resulted from it, such as the *Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising Out of Their Utilization*, as well as national legislation such as Brazil's Bill 306/95 that governs access to genetic resources.²³ Informally, organizations already exist that put pressure on companies and research sponsors to conform to best practice. These include public examples of good practice, such as the ICBGs already mentioned, and nongovernmental organizations that publicize cases of suspected "biopiracy." Of course, these existing systems are not perfect; for example, pressure from foreign NGOs led to the downfall of

the Maya ICBG project in Mexico, which many commentators regard as having been ethically benign.²⁴ However, they do suggest that the theoretical requirements for fair benefit-sharing delineated in this paper could be put into practice.²⁵

Benefits and Multiple Owners

The owners of areas of biodiversity could share their cut of the benefits of bioprospecting among themselves in different ways. For example, they could distribute the benefits in proportion to the amount of land

manufacture of products from Jeevani (*Trichopus zeylanicus travancoricus*), a plant thought to boost energy.²⁷ These fees are paid into a trust for community development activities for all the Kanis.

But what happens when an area of scientifically interesting biodiversity extends over the property of people who do not belong to any one community? Those people are equally liable to lose the value of their genetic resources through the bioprospecting venture and, if the argument here is correct, also deserve a share of benefits.²⁸ This might seem problematic:

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each individual owns, or according to whose property biological specimens were taken from. But the fairest way to internally distribute the benefits is suggested by the argument for why rights over genetic resources should be collective. Each owner of land containing the genetic resources stands to gain the same amount from allowing access to them, and to lose the same amount if others allow access without compensating her. In other words, each person's property has the same value with regard to its genetic resources. Hence each deserves to gain equally, and so the benefits should be shared equally among everyone who has morally legitimate claims to property in the areas of biodiversity.²⁶ This sharing could be implemented by simply dividing up the benefits; it could also be implemented by funding institutions that equitably support the community. For example, members of the Kani tribe of Kerala, India, receive a share of license fees for the

not only does it make finding legitimate negotiators harder, but it implies that the number of people who deserve compensation may not be known until the range of a genetically valuable species is ascertained.

The first of these concerns must just be accepted. It is a shame for bioprospecting agreements that the boundaries of political communities are drawn differently from the boundaries of ecosystems, since it makes negotiations more complicated. That fact does not affect who has a moral claim to the benefits, though.²⁹ However, wider boundaries can also lessen the problem, in a way: the larger the population occupying a particular ecosystem, the smaller the compensation each individual deserves for its use (until the biological resources can be reasonably considered common property).

The second concern may be assuaged by careful consideration of exactly what benefit-sharing agreements

are about. What counts as a fair price for access to a region's genetic resources should be judged by the expected *ex ante* value of the resources.³⁰ Now, the price might be paid up front, or it might be offered as a predetermined fraction of the *ex post* value. But either way, it can be judged fair or unfair only in terms of the *ex ante* benefits—there is no sense to saying that an agreement turned out to be unfair after the fact.

An analogy may help. Suppose you and I together win a bottle of wine at a bridge tournament. Living at a distance from each other, we cannot share it, so we toss a coin to decide who gets it. This is a fair arrangement, since the expected benefit for each of us is the same—half a bottle of wine. The fact that after the coin toss, one of us will have a full bottle of wine and the other will have nothing does not impact the fairness of the agreement. (A biased coin, on the other hand, would make that agreement unfair, precisely because it would change the distribution of expected benefits.)

This means that the extent to which benefit-sharing should include additional communities depends on the extent to which the total genetic resources of the two communities are expected to overlap, not on whether they turn out to share some particular valuable species after the fact. Thus, adjacent communities living in the same ecosystem can reasonably demand that the benefits from exploiting that ecosystem be shared; communities that have just a few species in common will have nowhere near as strong a claim.³¹

Property Rights and Global Justice

The argument so far has been in support of a conditional claim: if members of a community have legitimate property rights over an area of biodiversity, then these rights are collective with regard to the genetic resources that the area provides, the community as a whole deserves a fair

share of the benefits resulting from use of the genetic resources, and the benefits to the community should be shared equally among the property holders. Nothing has yet been said to persuade us that the members of indigenous communities actually have legitimate property rights.³²

To many people, it may appear obvious that communities have legitimate property rights over the land they have historically inhabited. To question this would seem hypocritical, given that members of the dominant groups of contemporary nations frequently have legal property rights simply in virtue of their *de facto* control of land. We should not hold indigenous people to a different standard than other land-users. I am sympathetic to this line of thought. However, it is helpful to see how rights over valuable land may ultimately be morally justified.

Providing a moral justification for indigenous people's property rights over areas of biodiversity is not straightforward. There are three standard ways to justify the assignment or acquisition of property rights: labor, personality, and instrumental accounts.³³ Labor- and personality-based accounts both require that the people who acquire the property rights have transformed the property in some way. For example, according to John Locke's labor theory, a person acquires initial property rights over an object only if she has worked on it.³⁴ These two types of account will not normally apply to communities with regard to their biodiversity, which is the product (for the most part) of evolution by natural selection.³⁵ Merely occupying land does not give someone property rights over it, according to these theories, even if she was there first.

Instrumental accounts justify property rights in virtue of the socially beneficial consequences of having the rights assigned in a particular way. Instrumental reasons could possibly be given for assigning property rights to the people who occupy areas of biodiversity. Part of the purpose of

the Convention on Biological Diversity is the conservation of biodiversity.³⁶ Giving people who live in areas of biodiversity some economic interest in it can promote that goal, if they can best gain economically by conserving it. However, conserving biodiversity cannot explain why indigenous people should have *control* over land; that goal could be achieved simply by paying them not to damage it. Neither does it explain our intuition that there is an issue of justice here—that the holders of genetic resources *deserve* compensation, and that paying them is not merely a good way to motivate conservation.

However, the intuition can be explained, and the property rights justified, if they are viewed instead as instrumental to achieving distributive justice. Over the last decade or so, political philosophers have become increasingly concerned with questions of global justice. Where once the requirements of justice were considered to end at the borders of nations, now the world community is seen as a possible subject of justice-related demands. In part, this is because the political and economic connections among nations have been acknowledged. The policies of one nation, and the actions of its citizens, affect the citizens of other nations. But the concern with global justice stems also from widespread acknowledgment of the massive and preventable disparities in wealth among people in different countries. For example, it seems horribly unfair that 2.6 billion people live on less than two dollars a day³⁷ while the ten richest people on earth have a net worth of \$253 billion.³⁸

Theories of justice disagree about how property should be distributed and redistributed, but it is hard to see how any serious theory could endorse the present global disparities: justice requires treating people as equals,³⁹ and if some people are born wealthy while others are born into inescapable poverty, then they are not being treated equally.⁴⁰ We cannot claim that the global poor have or had the same opportunities as wealthier people, we

cannot hold them responsible for their situation, and we cannot regard the unsavory historical events that led to present disparities as anything like fair transactions.⁴¹

However, it is one thing to acknowledge global injustice and another to do something about it. Political realities make a wholesale redistribution of resources unlikely. The best thing for a supporter of global justice to do may therefore be to support piecemeal changes that bring the world closer to justice. This may include supporting policies that are expected to improve the distribution of resources. One, I now argue, would be a policy of benefit-sharing.

Many indigenous peoples, in both developed and developing countries, are relatively and absolutely very poor. This makes them excellent candidates for a justice-based redistribution of resources in their favor. Given the global inequalities in wealth, we should expect the additional resources they deserve to be quite substantial. In particular, the value of the resources they deserve is likely to exceed the *ex ante* value of the land they occupy. This means that there is good reason for such people to *at least* be given property rights over that land, with all that this implies regarding the ownership of genetic resources.⁴² Doing so would bring them closer to the situation they ought to be in.

Benefit-sharing arrangements are one acknowledgment of people's rights over the land they occupy. As the Convention on Biological Diversity and actual benefit-sharing agreements show, they are also politically practical. This gives the supporter of global justice reason to support benefit-sharing agreements and the policies that facilitate them.

Although considerations of justice therefore give us reason to support benefit-sharing agreements, we should bear in mind that these agreements are neither equivalent to nor sufficient for justice. This point has two important implications. First, the resources expended by third parties on facilitating fair benefit-sharing

agreements should be balanced against other uses of resources to promote global justice. We should, for example, be just as concerned to find mechanisms that help impoverished people who do not live in areas of scientifically valuable biodiversity, including by supporting their claims to land rights. Second, we should not be as concerned about the property rights over genetic resources of people whose present situation is not unjust. Indigenous people's property rights over genetic resources, and the claims to benefit-sharing that they warrant,

plant, but from their healers' prior knowledge of *mamala's* curative properties.

As I noted earlier, traditional knowledge frequently fails to meet the criteria for intellectual property on the standard justifications given in the Western tradition. As *traditional* knowledge, it is not the product of work done by the people who possess it and, where it is already public among them, incentives are not required for its creation or dissemination. However, the knowledge may be valuable: information about the phar-

THE INTUITION THAT there is an issue of justice here—that the holders of genetic resources *deserve* compensation—can be explained, and their property rights justified, if these rights are viewed as instrumental in achieving distributive justice. Giving indigenous peoples *at least* property rights over the land they occupy would bring them closer to the situation they ought to be in. Benefit-sharing arrangements are one acknowledgment of these rights.

are just a means to a distinct moral goal.

Traditional Knowledge

For the sake of simplicity, I have focused on cases in which members of a community contribute only permission to access their genetic resources. A separate though related question is how to compensate a community whose knowledge helps with the bioprospecting enterprise. For example, villagers in Samoa have a benefit-sharing agreement with U.S.-based research institutions for shares of royalties from the use of prostratin, an antiviral chemical derived from the bark of the native *mamala* tree (*Homalanthus nutans*).⁴³ Their claim to compensation was thought to derive not just from their occupation of land containing the

maceutical properties of local organisms can help to direct research and thereby cut down considerably on the time and resources needed to find valuable chemical compounds.

Thus, normal intellectual property rights justifications do not apply, the knowledge has commercial value, and once it is acquired by someone with the resources to commercialize it, community members will lose that value. This implies that we are in a situation analogous to the case of access to genetic resources. Similar considerations of justice may justify sharing the benefits from using traditional knowledge with the communities who possess it. Again, we should judge a policy of ascribing rights over traditional knowledge according to whether it would promote the goal of global justice. Regarding the nature of these property rights, if the knowl-

edge is shared in the community, then whatever rights community members have over it should be collective. And we may infer the same corollary: that benefits from the knowledge should be distributed equally among its holders. Finally, knowledge about the pharmaceutical properties of organisms may be spread across a number of communities. The use of that knowledge confers an obligation to share benefits with all who possess it. However, as the knowledge is shared with more people, it will be more like simple common knowledge, compensation for which is unnecessary.⁴⁴

It is worth noting that in the case of traditional knowledge, unlike possession of genetic resources, there are sometimes specialists within a community (such as healers) who have privileged access to the knowledge. Traditional knowledge may therefore not be public. This may change the details of the conclusions we draw regarding compensation for its use. If, say, traditional healers have invested work into learning their craft, or if incentives are required in order for that craft to be maintained in the culture, then a greater share of benefits might legitimately be claimed by these individuals. Fair benefit-sharing agreements will need to take such details into account.⁴⁵

Guidance and Justification

I have sought to defend benefit-sharing from within a Western understanding of property and justice that is sometimes supposed to be antithetical to indigenous people's claims. Naturally, my conclusions are not sufficient to specify how benefits should be shared in particular cases. This is for two reasons. First, other moral considerations may make a difference. For example, if community members are employed by the bioprospectors (as technicians, for example), then they may deserve special compensation for their work. Second, the details of particular bioprospecting projects are important. For example, the parties involved in bioprospecting,

the nature of the benefits that are expected to be generated, and the involvement of the local communities will all vary from case to case.

Nevertheless, the arguments I have given may help to both guide and justify current practice. They show why unanimous community agreement to bioprospecting is unnecessary, they isolate the moral factors relevant to how the benefits of bioprospecting should be shared, and they justify focusing on development when deciding where resources should be used to facilitate bioprospecting with benefit-sharing.

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Disclaimer

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References

1. See W.R. Reid et al., *Biodiversity Prospecting: Using Genetic Resources for Sustainable Development* (Washington, D.C.: World Resources Institute, 1993); A.J. Beatie et al., "New Products and Industries from Biodiversity Millennium Ecosystem Assessment," in *Ecosystems and Human Well-Being: Current State and Trends* (Washington, D.C.: Island Press, 2005), 271-95.
2. My summary here draws on R. Wynberg, "Rhetoric, Realism and Benefit-Sharing: Use of Traditional Knowledge of *Hoodia* Species in the Development of an Appetite Suppressant," *Journal of World Intellectual Property* 7, no. 6 (2004): 851-76.
3. Convention on Biological Diversity, Article 1, June 5, 1992; <http://www.cbd.int/convention/convention.shtml>.
4. Seven such groups—each a public-private partnership that includes a developing country organization—are currently operating in different regions of the developing world. They promote the three goals of improving human health, promoting scientific and economic activity in developing countries, and conserving biological diversity. J. Rosenthal et al., "Combining High Risk Science with Ambitious Social and Eco-

nomic Goals," *Pharmaceutical Biology* 37, supplement (1999): 7.

5. See Convention on Biological Diversity, Article 8 (j).

6. For an example of a benefit-sharing agreement, see D.D. Soejarto, "The UIC ICBG (University of Illinois at Chicago International Cooperative Biodiversity Group) Memorandum of Agreement: A Model of Benefit-Sharing Arrangement in Natural Products Drug Discovery and Development," *Journal of Natural Products* 67 (2004): 294-99.

7. The actual benefit is a matter of debate. Many important medicines are derived from natural products; G. Tan et al., "Biodiversity as a Source of Anticancer Drugs," *Current Drug Targets* 7, no. 3 (2006): 265-77. Nonetheless, it is very rare for a natural chemical compound to be useful enough to be brought to market; Rosenthal et al., "Combining High Risk Science with Ambitious Social and Economic Goals," 7.

8. See C.R. Bijoy, "Access and Benefit-Sharing from the Indigenous Peoples' Perspective: The TBGRI-Kani 'Model,'" *Law, Environment and Development Journal* 3, no. 1 (2007): 18.

9. See W. Sumner, *The Moral Foundation of Rights* (Oxford, U.K.: Clarendon Press, 1987), chapter 2.

10. See J. Waldron, "Property," *The Stanford Encyclopedia of Philosophy*, fall 2004 edition, ed. E.N. Zalta; <http://plato.stanford.edu/archives/fall2004/entries/property/>.

11. I assume that indigenous people have legitimate property rights over the land they inhabit, although frequently, either these rights are not acknowledged in law, or the laws that should establish them are not honored.

12. This is a simplification. In fact, there can be significant genetic variation within a species, many samples might be needed to run different tests, and sometimes the same biological sample can be rescreened for new compounds and properties of interest as new tests are developed. The essential point is that additional samples of a species contain rapidly diminishing amounts of extra genetic information about that species.

13. I have assumed that states can have legitimate authority over their citizens. Similarly, local governments can legitimately represent their subjects, including by wielding collective rights.

14. S. Laird, "Natura, Brazil: The Use of Traditional Knowledge and Community-Based Sourcing of 'Biological Materials' in the Personal Care and Cosmetics Sector," in *Access and Benefit-Sharing in Practice: Trends in Partnerships Across Sectors* (Montreal, Canada: Secretariat of the Convention on Biological Diversity, 2008), 82.

15. One might object that the principle applies only when the person affecting another's interests has no right to do so. But this would put the cart before the horse: we are trying to work out who has the right to do what.

16. A. Sen, *Development as Freedom*, (New York: Anchor Books, 1999), 112-19.

17. Farmers' subsidies provide an example of how increasing supply can give legitimate cause for complaint. The European Union massively subsidizes its farmers so that they can produce food at artificially low costs. When a subsidized foodstuff is put on the market, it increases supply and reduces the price of the foodstuff. For farmers outside of the Union, in the developing world, this can make farming uneconomical. In this case, freedom is not enhanced: at best the European farmers have more options they can exercise, and the farmers who now lack a market have fewer. Furthermore, the market is not functioning well: the subsidies decrease the efficiency of the agricultural sector overall. See Oxfam Briefing Paper, "Stop the Dumping! How EU Agricultural Subsidies Are Damaging Livelihoods in the Developing World," 2001; <http://www.globalpolicy.org/soecon/trade/subsidies/2002/10stopdumping.pdf>.

18. Thus, we assume that all the other parties to the transaction are being treated fairly and then consider what else is needed to treat the holders of the genetic resources fairly, too.

19. This is helpful because comparing different grounds for establishing desert is difficult. Consider how we should divide a social surplus between a machine-worker and the owner of the machine. The machine owner may claim that what the worker deserves should be determined by the market price value of the labor, while the worker claims that she deserves the majority of the surplus because reward should be proportionate to effort.

20. See A. Wertheimer, *Exploitation* (Princeton, N.J.: Princeton University Press, 1999), 230-36.

21. *Ibid.*, chapter 7.

22. *Ibid.*, 10.

23. Bill of Law No. 306/95 (Draft), tr. V. Tavares; http://www.lclark.edu/law/clinics/international_environmental_law_project/brazil_genetic.php, accessed September 28, 2009.

24. For details, see B. Berlin and E.A. Berlin, "Community Autonomy and the Maya ICBG Project in Chiapas, Mexico: How A Bioprospecting Project That Should Have Succeeded Failed," *Human Organization* 63, no. 4 (2004): 472-86.

25. Thanks to an anonymous reviewer for the *Hastings Center Report* for pressing me on this point.

26. This conclusion applies to what people deserve because they have legitimate property rights over an area of biodiversity. Further redistribution of benefits might be required by, for example, distributive justice.

27. R.V. Anuradha, "Sharing with the Kanis: A Case Study from Kerala, India," Convention on Biological Diversity, Biological Diversity Case Studies, 1998, <http://www.biodiv.org/doc/case-studies/abs/cs-abs-kanis.pdf>.

28. For example, the San of South Africa are not the only group to claim traditional use of *Hoodia*. San communities exist in Namibia and Botswana, and other non-San tribes use the plant; Wynberg, "Rhetoric, Realism and Benefit-Sharing," 852-53.

29. Part of the problem is that the Convention on Biological Diversity gives nations sovereign rights over their biological resources (see Preamble and Article 15.1). We must hope that where the biological resources of different countries overlap, this will engender cooperation, not competition.

30. The expected value would be the sum of a series of products—the probabilities of the various outcomes of bioprospecting multiplied by their values.

31. Another question is whether the benefits given to communities living in areas of biodiversity should be based on the resources' *ex ante* value or on their *ex post* value. For example, should a community receive fixed milestone payments as a research project progresses, or should it have a chance to receive a potentially lucrative share of the royalties on an eventual product? In the abstract, it seems to me, the parties to benefit-sharing agreements should be free to negotiate for *ex ante* benefits, *ex post* benefits, or a mix of the two. In practice, however, a community may well want at least some *ex ante* benefits. Any given bioprospecting venture is unlikely to produce profitable products, and any products will take a long time to get to the market. But many communities have immediate needs. Consequently, immediate and certain benefits are in their interests. See J. Rosenthal, "Equitable Sharing of Biodiversity Benefits: Agreements on Genetic Resources," in *Investing In Biological Diversity: Proceedings of the Cairns Conference*, Organisation for Economic Co-operation and Development, 1997.

32. Legally, this may vary between communities. The Convention on Biological Diversity grants control over genetic resources to national governments. However, I am concerned with the moral justification of property rights, which is what determines the moral justification for benefit-sharing. See P. Gepts, "Who Owns Biodiversity, and How Should the Owners Be Compensated?"

Plant Physiology 134 (2004): 1295-1307.

33. Waldron, "Property."

34. J. Locke, *Two Treatises of Government*, book II (London, U.K.: Printed for C. and J. Rivington, 1824), 144-59.

35. One might argue that the property rights are justified because the property has been inherited by the community members from ancestors who legitimately acquired it through one of these two methods. However, the legitimacy of such transfers is unclear. It may seem unjust for the actions of long-dead individuals to govern the property rights of living individuals. And in any event, the ancestors will often not have performed the actions necessary for acquiring property rights according to these two theories.

36. Convention on Biological Diversity, Article 1.

37. The World Bank, "Poverty Drops below 1 Billion, Says World Bank," <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21299914~pagePK:64257043~piPK:437376~theSitePK:4607,00.html>.

38. Forbes.com, "The World's Richest People," <http://www.forbes.com/2004/02/25/bill04land.html>.

39. W. Kymlicka, *Contemporary Political Philosophy: An Introduction*, second ed. (Oxford, U.K.: Oxford University Press, 2002), 3-5.

40. See G. Sreenivasan, "International Justice and Health: A Proposal," *Ethics and International Affairs* 16, no. 2 (2002): 81-82.

41. See T. Pogge, *World Poverty and Human Rights: Cosmopolitan Responsibilities and Reforms* (Cambridge, U.K.: Polity Press, 2002), 203-4. A libertarian might think of the distributive requirements I mention as rectification for past unjust transactions; see R. Nozick, *Anarchy, State, and Utopia* (New York: Basic Books, 1974), 152-53 and 230-31.

42. Alternatively, people could be given some other, equally valuable property, but moving people is costly, and unfamiliar property is less likely to be useful to people.

43. B. Vastag, "Traditional Medicine, Novel Partnership," *The New Scientist* (October 28, 2006): 54-55.

44. See. B. Berlin and E.A. Berlin, "Private and Public Knowledge in the Debate on Bioprospecting: Implications for Local Communities and Prior Informed Consent," in *Ethical Issues in International Biomedical Research: A Casebook*, ed. J. Lavery et al. (Oxford, U.K.: Oxford University Press, 2007), 29-30.

45. My thanks to Joshua Rosenthal for this point.