Economics Resolves ABS for Genetic Resources and Traditional Knowledge Once Both are Defined Accurately

Simultaneous submission of original English text and Spanish translation in response to Decision NP-2/10 (Paragraph 5) on Article 10 of the Nagoya Protocol.
The need for and modalities of a global multilateral benefit-sharing mechanism (Article 10).
(SCBD/ABS/VN/KG/NH/86849)

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Submitted 15 December 2017 and revised 4 April 2018 in light of "The Consolidated Document Relating to Intellectual Property and Genetic Resources" (WIPO 2018, 21 March)

Acknowledgments

The view submitted here draws on thirty years of thought regarding genetic resources and associated knowledge. Over those years, I have been the beneficiary of academic freedom at Universities in Australia, Brazil, Ecuador and the US. Freedom was also enjoyed in various projects funded by multilateral agencies, national governments and non-governmental organizations. I am especially grateful to Julio Guzmán who, at a young age, adroitly directed the InterAmerican Development Bank-CONADE Project in Ecuador (1995-1998). He encouraged my collaboration in the Project SUBIR of CARE-Ecuador, which resulted in the volume *The Biodiversity Cartel: Transforming Traditional Knowledge into Trade Secrets* (Vogel ed. 2000). This submission is based on that work, whose time may have finally come..."and if not now, when?" (Hillel the Elder).

(1) *Introduction*

"Access to genetic resources" and "the sharing of benefits arising from their utilization" (ABS) has beleaguered all 13 Conferences of the Parties (COP) to the UN Convention on Biological Diversity (CBD) (1993). The failure is especially egregious when traditional knowledge is associated with the genetic resources accessed.[1] Fortunately, ABS lends itself to resolution through the powerful

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* The submission does not necessarily reflect the position of the author's institutional affiliation.

1 For an explanation of how failure in ABS over traditional knowledge sustains itself, albeit in a distinct forum, see Carvalho (2018, 337-349). For empirical evidence on the failure of Users to comply with ABS over genetic resources, see Pauchard (2017).

abstraction of economics. Unfortunately, the COP has never vetted the economic solution despite its continuous appearance in the literature since 1992 (Vogel 2015).

The solution for ABS springs from a field of economics known as the economics of information.[2] The COP appears not to have applied the appropriate economics due to a steadfast adherence to the definition of "genetic resources" as "material" in Article 2 of the CBD,[3] where "material" is (mis)understood as only "matter."[4] However, the material-definition excuse does not work for traditional knowledge. It is irrefutably information. The overarching explanation for the studied ignorance of economics is that its policy implications militate against bilateralism, which is wrongly assumed as non-negotiable in the framework convention (Ruiz Muller 2015).

I will suggest that "the way forward in relation to Article 10" is to pay "particular attention to situations in which it is not possible to grant or obtain prior informed consent" (CBD Secretariat 2017a). I shall explain the "situations in which it is not possible to grant or obtain prior informed consent" are *all* situations where bilateral agreements are concluded between Users and Providers. The categorical "all" derives from an application of the economics of information to traditional knowledge.

In choosing references for the elaboration of the submitted view, I give preference to those which are open access and available in translation. English should not be a barrier for stakeholders who wish to delve into the literature which supports the argument. For that reason, the submission carries a Creative Commons license (cc) which means that anyone may translate and/or reproduce it as long as there is attribution. A Spanish translation was submitted simultaneously with the original English version.

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[2] Pioneers in the economics of information include many recipients of the Nobel Memorial Prize: Kenneth Arrow (1972), Friedrich August von Hayek (1974), George J. Stigler (1974), George A. Akerlof and A. Michael Spence (1982), and Joseph E. Stiglitz (2001). https://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/index.htmls

[3] Adherence to incorrect definitions has led to the misapplication of economics. See, for example, *The Economics of Ecosystem & Biodiversity* (TEEB). The opening pages offer a disclaimer: "In the TEEB assessment, we largely follow the definitions of the United Nations 1992 Convention on Biological Diversity" (de Groot 2010, 15).

[4] Brazil (2017), India (2017) and others argue that "material" already includes "information." Although the logic appears unassailable and the evidence, strong, I will assume that "material" is only "matter." Should the COP accept the argument of Brazil et al., then the argument that I make, will be greatly facilitated.

(2) *The Definition of Genetic Resources and the Absence of a Definition for Traditional Knowledge*

Article 2 of the CBD and Article 2 the NP define "genetic resources" as "material" even though the object of access is almost always "natural information."[5] As early as 1992, economists had already identified genetic resources as information and applied the appropriate economics (Vogel 1992, Swanson 1994, Stone 1995). Nevertheless, that literature has been studiously ignored despite its accessibility in almost all the official languages of the UN plus Portuguese ((Oduardo-Sierra et al, 2012, Vogel et al, 2011a, available in Arabic (2011b), Chinese (2011c), French (2011d), Portuguese (2011e) and Spanish (2011f)). For the SBSTTA of COP14, the Peruvian Society of Environmental Law has drawn on the economics of information in its submitted views titled "Lawful Avoidance of ABS" and "Unpacking 'Digital Sequence Information on Genetic Resources'" (PSEL 2017a and 2017b, respectively). This submission on traditional knowledge complements those submissions, which the interested reader is encouraged to examine as a trilogy.

Whereas "genetic resources" is misdefined" in the CBD and NP, "traditional knowledge" associated with genetic resources is simply left undefined.[6] The absence of a definition is surprising inasmuch as the term is frequently employed. The words "traditional knowledge" or reference thereto, appear in the Preamble, Article 8 (j) and Article 17 of the CBD. The NP goes further and addresses "traditional knowledge" thirty-one times, which begins in the Introduction and continues through the Preamble and twelve articles. Although "traditional knowledge" may seem self-defining, the absence of a definition obscures the selection of the only field of economics which can grapple with the problem of a fair and equitable benefit sharing, viz., the economics of information. In crafting a definition, the first rule of logic is to capture the essence of the thing defined (Copi et al. 2010, 98). For "traditional knowledge" , that essence encompasses "artificial information", "provenance", "groups" and "cultural identity". A definition well crafted should also be succinct. One possibility is:

> Traditional knowledge: Artificial information with provenance in a group whose members share a cultural identity.

When genetic resources are associated with traditional knowledge, "natural information" becomes part of the essence of the qualified term:

> Traditional knowledge associated with genetic resources: The artificial complement to natural information with provenance in a group whose members share a cultural identity.

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[5] "Natural information" first appeared as a logical construct in Vogel (1991, 7). The term qualifies as a "big idea" whose attribution or lack thereof, has significant consequences for its own development due to "the basic economy of the academy" (Fish 2016).

[6] If the intended meaning of "material" includes "information", then the CBD and NP did not misdefine "genetic material." Given that many Parties and Users insist that "material" means "matter" and "matter" only, then the drafters of the CBD and NP can be accused of carelessness. If they had meant only "matter" than they should have stated "matter" in the definition of "genetic material" in the CBD. They did not. See note (3).

By leaving "traditional knowledge" undefined, the COP has created a vacuum which other multilateral agencies will fill in ways that may not behoove the objectives of the CBD and NP. For example, The World Intellectual Property Organization is vetting three options in the revision (WIPO 2018, March 21) to its "Glossary of Key Terms Related to Intellectual Property and Genetic Resources, Traditional Knowledge and Traditional Cultural Expressions":

> Option 1: "Traditional knowledge associated with genetic resources" means knowledge which is dynamic and evolving, generated in a traditional context, collectively preserved and transmitted from generation to generation including but is not limited to know-how, skills, innovations, practices and learning, [that subsist in] [that are associated with] genetic resources.]
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> Option 2: "Traditional knowledge associated with genetic resources' means substantive knowledge of the properties and uses of genetic resources held by [rightful holders, including] indigenous [people[s]] and local communities [and which directly leads to a claimed [invention][intellectual property]][and where, but for the traditional knowledge, the invention would not have been made].]
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> Option 3: "Traditional knowledge associated with genetic resources' means substantive knowledge of the properties and uses of genetic resources generated in a traditional context, collectively preserved and transmitted from generation to generation, held by [rightful holders, including] indigenous [people[s]] and local communities [and which directly leads to a claimed [invention][intellectual property]] [and where, but for the traditional knowledge, the invention would not have been made].] (WIPO 2018, March 21, 2018 p. 2)

Vetting options is unavoidable for WIPO precisely because there is "no accepted definition of traditional knowledge (TK) at the international level" (2018, 39). Alas, whichever option is ultimately chosen will also not be accepted by those who insist that it meet the aforementioned first rule of logic. To do so and capture the essence of the thing defined will mean, at a minimum, that the word "knowledge" be replaced with "artificial information" in the definition. The replacement brings us back to the economics of information.

(3) *The Policy Implication of Applying the Economics of Information: Bounded Openness as the Modality for the GMBSM*

Economics is a "powerful tool of abstraction" (Heilbroner 1968, 99). Inasmuch as abstraction requires detachment, a useful metaphor is the "Woman from Mars." How would she understand "genetic resources" and "traditional knowledge"? From the universal perspective of reductionism, the Woman from Mars would understand "genetic resources" as "natural information" and

"traditional knowledge" as "artificial information."[7] The noun common to the two classifications invites the economics of information.

How would the Woman from Mars expect knowledge to be stewarded within traditional communities subject to market forces? Logic would allow her to stylize the dynamics. In a market where Providers compete, the price of traditional knowledge falls to its marginal cost, which is the negligible expense of recording a knowledgeable member of the community, who is usually the shaman. An example occurred in the Siona-Secoya Community of Ecuador in 1986 (Asar 1996). Samples of ayahuasca (*Banisteriopsis caapi*) were reportedly exchanged for two packages of Marlboro® cigarettes. *B. caapi* is found throughout the Amazon basin and its hallucinogenic properties have appeared in the literature since colonial times (Alarcón and Morales 2000). Two packages of Marlboro® cigarettes would have been well above the marginal cost of the shaman, which was the time taken to clip some vines and chat with the ethnobotanist. However, two packages of Marlboro® cigarettes are also well below the value of the opportunities to be foregone for long-term stewardship of traditional knowledge by the community.[8]

Stewardship over traditional knowledge justifies an oligopolistic relationship among Providers. Only an oligopoly allows Providers to obtain "economic rents" which is the difference in price between what would have been paid in a protected market and what was paid in the competitive market, i.e., the two packages of Marlboro® cigarettes. Economics implies that exclusivity through intellectual property rights is a necessary condition for both efficiency and equity in most markets for non-public-domain information, be it artificial or natural.[9] For ABS, an efficient and equitable policy must make illegal all bilateral negotiations over genetic resources and traditional knowledge that are not already in the public domain.[10] However, I hasten to add, communal decisions to

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[7] "Artificial" in "artificial information" assumes intent. For example, drug-resistant pathogens can be considered natural information subject to ABS (Vogel et al, 2013). Thus the Anthropocene does not imply that all biodiversity is artificial information.

[8] *B. caapi* is not an ideal example of biopiracy. The deal occurred before the 1993 ratification of the CBD; knowledge of its hallucinogenic effects have long been public domain. From the perspectives of the shaman and the ethnobotanist, the deal was not only legal but mutually advantageous. However, from the perspective of society and future generations, it was horrific. Before a literature search, the shaman did not know whether or not the knowledge to be disclosed had appeared in the published literature. N.B. To get from the principal settlement of the Siona-Secoya to the nearest city is an all-day trip by canoe, upriver.

[9] Exceptions exist. "Patent thickets" is an accurate metaphor for R&D in biotechnology. The argument against intellectual property is also strong in plant breeding. See Brush and Stabinsky (ed) (1996). For a hypothetical venue to discuss the ethical dilemmas, see Vogel (ed) (2010).

[10] Should natural information have experienced value added through intellectual property rights now expired, then that natural information would lie in the public domain along with the value added. Biotech can relax. Using the favorite metaphor of synthetic biology, the LEGGO building blocks are public domain. For Parties to the CBD, public-domain genetic resources are restricted to just the hundred crops listed in Annex I to the International Treaty on Plant Genetic Resources for Food and Agriculture (2001, 45). Public-domain traditional knowledge is all information about genetic resources that was published where a patent had expired or where a patent was sought and not granted, or where a patent was never sought. The first and second of the aforementioned three possibilities are vanishingly small percentages of the total.

disclose non-public domain traditional knowledge without compensation would be permitted.[11] Prohibition and permission are the overarching bounds in "bounded openness" (May 2010, 142-146) over traditional knowledge as the modality for the Global Multilateral Benefit-Sharing Mechanism (GMBSM) (Vogel et al, 2018).[12]

In the vernacular, an oligopoly is a cartel. The "c" word may take both Parties and stakeholders aback, putting them in the mental frame of drug trafficking and other nefarious activities. However, the "c" word also jars the reader into entertaining the surprisingly uncontroversial economics. As John Maynard Keynes, the Darwin of Economics, eloquently quipped "We do not distinguish, at first, between the color of the rhetoric with which we have won a people's assent and the dull substance of the truth of our message. There is nothing insincere in the transition. Words ought to be a little wild for they are the assault of thoughts on the unthinking" (1933, 761).

The institutional arrangement of the GMBSM for traditional knowledge has been fleshed out in the anthology *The Cartel of Biodiversity: Transforming Traditional Knowledge to Trade Secrets* (Vogel ed. 2000a) and "Reflecting Financial and Other Incentives of the TMOIFGR: The Biodiversity Cartel" (Vogel 2007), the former also available in Spanish (Vogel ed 2000b) and the latter, in French and Spanish (Vogel 2011d, Vogel 2009f). Economics justifies a Cartel of Providing Communities over secret traditional knowledge as well as facilitated access of traditional knowledge that has entered the public domain.[13] There is no contradiction in the previous sentence. Ability to explain the lack of contradiction is a test of one's comprehension of the economics.

(4) *Foothold for the economics-of-information argument in the Nagoya Protocol*

The point of entry for integrating the economic argument into the Nagoya Protocol (NP) (2010) lies in the third-to-last paragraph of its Introduction:

"Further recognizing the unique circumstances where traditional knowledge associated with genetic resources is held in countries, which may be oral, documented or in other forms..." (2010, 4).

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[11] Communities which regard benefit sharing as irreligious would be allowed to freely disclose information, as long as no compensation is involved. Although they would do so to the detriment of other communities that wish to collect a rent, disclosure cannot be stopped for all practical purposes. Moreover, prohibiting disclosure would impinge upon freedom of religion for the sake of the monetary gain of others. Any argument that such freedom of religion includes bilateralism is specious.

[12] "Bounded Openness: Legal enclosures which default to, yet depart, from *res nullius* [property of no one] to the extent the departures enhance efficiency and equity, which must be balanced when in conflict (PSEL 2016, 2, fn2).

[13] Social justice re-enforces the economics. For millennia, ancestors have experimented on themselves and members of the community with toxic plants. Precious few proved useful. Sale of that patrimony for a trifling is one of the many obscenities of bilateralism.

By distinguishing the medium of the traditional knowledge ("oral, documented or in other forms") from the traditional knowledge itself, the NP has implicitly recognized traditional knowledge as information. Implicit recognition continues in Article 10 (Global Multilateral Benefit-sharing Mechanism) and Article 11 (Transboundary Cooperation), which refer to "transboundary situations...[w]here the same traditional knowledge associated with genetic resources is shared by one or more indigenous and local communities in several Parties."

Article 11 does not say that holders have rights over the same information found in transboundary situations; it only says that "Parties should endeavour to cooperate." The language ignores the costs of cooperation and the human drive of self-interest. Exhorting cooperation while enabling a race to the bottom, bodes ill. Historic parallels are worthy of close examination.

Like Article 11 of the NP, Decision 391 of the Andean Pact (1996) does not establish negotiating capacity of Providers but rather exhorts "[s]trengthen[ing] the negotiating capacity of Member Countries" (Title 2(e)). Inasmuch as the bilateralism of Decision 391 guts the capacity to negotiate, its Final Provisions, "to bear in mind the interests of other Member Countries", are rendered Orwellian.

To date, no bilateral contract for access to genetic resources within the Andean Community has included consultation with other Community Members much less a sharing of benefits. The lesson from the history of Decision 391 for the COP is that exhortatory language does not work and distracts Parties from the economic solution for ABS.[14]

The parsing of "endeavor to cooperate" in Article 11 of the NP exposes another weakness. Because exhortation affirms bilateralism, Article 11 contradicts *prima facie* the title of the preceding article, "Global Multilateral Benefit-Sharing Mechanism" (GMBSM). Given the juxtaposition of the articles, how did the Parties not perceive the contradiction? Why did they tolerate it? The pre-history of the CBD provides a clue. In reference to the Intergovernmental Negotiating Committee for a Convention on Biological Diversity, "[g]oing into the final meeting on 22 May 1992, delegates had agreed on less than half of the Draft Convention: 27 out of 42 articles contained square brackets" (McGraw 2000, 15). The text which emerged for signature at Rio'92 on 3 June 1992 "suffer[ed] from basic conceptual and drafting deficiencies. The structure of the negotiations, the haphazard way in which crucial issues were considered, and *the pressures of time*...which should cause distress for international lawyers and policy-makers" (Chandler 1993, 174, *italics added*). Fast forward eighteen years: the drafting of the NP was another cliff hanger (ICTSD 2010), which left a strong sense of *déjà vu* among those present. Recalcitrant Parties were painfully aware of the shortcomings of the text. However, like the drafters of the CBD before them, misgivings could be assuaged by the structure of the COP. The treaties are framework conventions. In theory, errors can be corrected through the future Decisions of the COP. In practice, they are not.

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[14] The foundational flaw of Article 2 of the CBD reverberates. Decision 391 of the Andean Pact defines "*Genetic Resources:* all biological material that contains genetic information of value or of real or potential use." The nod to information is to no avail inasmuch as natural information can be disembodied from biological material and transmitted through other media.

When confronted with the foundational flaws of the CBD and NP, the *modus operandi* is to "move on" under the aegis of *stare decisis* (stand by the decision).[15] The misinterpretation of "material" as exclusively "matter" is the prime example.[16] Opinions to the contrary are not brooked.[17]

(5) *Institutional Differences in Bounded Openness for Genetic Resources and Bounded Openness for Traditional Knowledge*

Although the proposed modality of the GMBSM is "bounded openness" for both "genetic resources" and "traditional knowledge", realization of the bounds will require distinct institutions. For "genetic resources", the modality can be compressed into a few steps:

(1) Genetic resources flow unencumbered for R&D;[18]
(2) Disclosure of utilization occurs through applications for intellect property protection over the value added;
(3) The GMBSM acquires or outsources the capability to determine the diffusion of natural information across taxa and the corresponding geographic distributions across jurisdictions;
(4) Royalty rates are negotiated through the COP and will vary according to the combination of characteristics in utilization;
(5) The royalty is levied only when utilization has become sufficiently successful to cover the costs of determining the diffusion across taxa and determining the apportionment of revenues according to geographic distribution; and
(6) Should the estimates of the aforementioned costs still exceed the revenues collected by the date of expiry of the intellectual property, then the revenues collected are dedicated to the infrastructure of the GMBSM, thereby making the GMBSM self-financing.

Bounded openness over traditional knowledge will not be as easy as (1)-(6). The knowledge only flows freely once it has been determined to lie in the public domain. That determination requires databanks at the community level which is a task more complicated than (5) above. Managers must accurately classify species used traditionally and filter the data entered against existing databases about published traditional knowledge. Should they not match, then the communities may protect

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[15] In the 2017 Online Forum Synthetic Biology (CBD 2017b), withering criticism emerged against the absence of "information" in the encumbered 36-word AHTEG definition of "synthetic biology." The moderator urged dissenting participants to "move on", which became the refrain of a chorus of assenting participants, many of whom readily disclosed that they had helped draft the definition. http://bch.cbd.int/synbio/open-ended/discussion/

[16] To argue conservatively, I repeat the least favorable assumption for my argument, viz. that "material" means exclusively "matter." See note 4.

[17] See, for example, the tautology argued by Switzerland (2017) to equate "material" with "matter".

[18] For the encumbrances posed by the ABS of the CBD and NP, and the importance of unencumbered flows of genetic resources, see Neumann, et al. 2017.

their knowledge as a trade secret.[19] However, to avoid the race to the bottom with other communities which may hold the same knowledge, the databanks must be filtered against one another. The communities which use the same non-public-domain knowledge would constitute the members of the Cartel of Providing Communities.

To be a member of the Cartel, the community must first have legal standing, which has long been a struggle in many countries (Morales 2000, 53). Fortunately, movements for demarcation and registration enjoy an impetus from the 2007 UN Declaration on the Rights of Indigenous Peoples (Wiessner 2007). The possibility of rents for the genetic resources associated with traditional knowledge may tip the balance for any State still on the fence regarding empowerment of the communities. Without collective property for the community over the knowledge, the rent on the associated genetic resource for the State will not be realized. In other words, bounded openness aligns incentives between the States and the communities.

Rather than negotiating the knowledge between the Cartel of Providing Communities and the User, the table of royalty rates for the characteristics of utilization for genetic resources can be deployed (see point (4) above). Each use for the same genetic resource is a distinct claim to rent.[20] Because the State does not know which genetic resources are associated with secret traditional knowledge, it behooves the State to share the royalty of access to the genetic resource with the Cartel of Providing Communities (Vogel, 2007, 53). What should be the percentage share? From the field of behavioral economics, which also boasts Nobel Memorial Laureates (2001, 2017), one knows that 50-50 splits are the easiest to conclude (see, Kahneman et al., 1986). So, the Cartel of Providing States should share half the rent for genetic resources associated with secret traditional knowledge with the Cartel of Providing Communities. The long-standing dispute between communities and States over ownership of genetic resources (see, for example, West 2012) would be attenuated

[19] Michael Golin was the first to elaborate and publish the idea that trade secrets be "one suitable tool for promoting the sustainable development of biological resources in wild habitats" (1993, 165). However, without the accompanying cartelization over the secrets, that necessary "suitable tool" will not be sufficient to enable a fair and equitable sharing of benefits.

[20] Similar to patented pharmaceuticals for which each new indication is patentable, a genetic resource may have distinct non-public-domain uses over communities. The claim of any given community for a share in the rent depends upon whether the use appears in the filtration of databases. The reason that ethnobioprospecting and bioprospecting receive the same royalty is avoidance of passing off the former as if it were the latter as well as avoidance of competition between the two.

although not eliminated.[21] The benefit to be apportioned[22] to any one community would have to be earmarked for public goods which would not otherwise have been financed. This issue of fungibility, ironically, also frustrates billionaire philanthropists, which I take up in the concluding remarks.

The complexities continue. Most secret traditional knowledge is not diffused within the community but concentrated in the shaman. Under bilateralism, ethnobotanists are tempted to seek prior informed consent from the shaman rather than the community. Divisiveness understandably ensues. Under bounded openness, any such attempt would be fruitless. The proposed GMBSM recognizes the community as titleholder to all traditional knowledge, which grants prior informed consent by its decision whether or not to join the Cartel of Providing Communities. Nevertheless, the GMBSM needs the cooperation of the shaman to work inasmuch as the knowledge diffused within the community is usually public domain. To align incentives between the shaman and his or her community, the shaman should enjoy a disproportionate voice in the choice of the public good to be financed by the benefits of access.

In addition to the exigency of rents which underpins the whole proposal (PSEL 2017c), another issue supports bounded openness as the modality of the GMBSM: the relationship of Users of information with Providers of information. Nobel Memorial Laureate Kenneth Arrow perceived a paradox in information markets which is germane to traditional knowledge: any seller of information must convince the buyer that the information is worth the price. To do so requires disclosure. However, once the information is disclosed, the buyer no longer needs to buy the information (Arrow 1962). In the context of the proposed modality, the Paradox is resolved by the databanks, which filters knowledge across communities. Without disclosing the species utilized, the Cartel of Providing Communities can entice Users whenever a specific use cuts across communities. To the extent that the communities are geographically and/or culturally separated,

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[21] The political struggle should continue for reparations for public-domain traditional knowledge used in accessing genetic resources for which value has recently been added and protected by intellectual property. The visibility of "bounded openness" as the modality of the GMBSM should strengthen the position of advocates.

[22] Apportionment would vary inversely with the number of distinct uses associated with the genetic resource bioprospected. Imagine three communities, X, Y and Z which reflect extremes in discernment of indications for genetic resource If the communities associate, respectively, 1, 6 and 11 secret uses to the same genetic resource yet only one use is of interest to industry, then the percentage claim of each community would have to be weighted according to the number of uses disclosed. The rule might be to diminish an equal claim by 2% for each additional use beyond the minimum number of uses declared, leaving the remaining percentage with the community that least reports uses. So rather than X, Y and Z each receiving 1/3, (33%) of the royalties, Y would receive 23% (33%-(2%X5))%, Z, 13% (33%-(2%X10)), and X 64%. Under such weighting, no community would have an incentive to falsely report uses. In designing the hypothetical rule, the percentage reduction for reported uses would have to decline with an increase in the number of member communities. For example, should there be 6 rather than 3 communities, the percentage share of each would reduce by 1% rather than 2% for each additional reported use, 12 communities rather than 3, by 0.5%, and so on. A similar weighting scheme could also be imposed on the sheer number of entries of genetic resources used traditionally.

User interest should augment. Indeed, convergence in use across diverse communities signals a high probability of the presence of an active ingredient (AI).

Upon first exposure of the application of economics to ABS, one may be tempted to characterize the solution of "bounded openness" as simple for genetic resources and, for traditional knowledge, as anything but simple! Any such a characterization would be a mischaracterization. Both are as simple as they could possibly be. Bounded openness for traditional knowledge addresses a half dozen realities:

a) Relentless market forces undermine the interest of the young in learning traditional knowledge from their elders;
b) Transboundary situations eliminate rents;
c) Traditional communities do not have the expertise to negotiate the rents;
d) Fifty-fifty splits can align interests between the State and the community over access to non-public-domain genetic resources and secret associated knowledge;
e) The shaman requires incentives to participate that are not divisive and do not compromise the collective property of the community; and
f) Match of the same use for a genetic resource across communities signals an AI and fortuitously resolves Arrow's Paradox.

(6) *"The Way Forward" on ABS over Traditional Knowledge*

Bounded openness requires commitment. Whereas the conceptual resolution of ABS has been an intellectual exercise thankfully funded by research universities, multilateral agencies, national governments and non-governmental organizations since the early 1990s, implementation will require costly infrastructure and community organization. In the sphere of public finance, no political will exists to invest in projects that span decades. The lackluster reception to the solution to ABS for traditional communities---first published in 2000 (Vogel (ed) 2000)----can also be explained by uncontroversial economics: the problem of discounting. Projects are disfavored whenever the benefits arise in the long run and the costs are incurred in the short run. The "way forward" is Darwinian. To change the commitment of multilateral institutions or national governments is quixotic; to seek alternative funding is realistic.

Much has been written in contemporary economics about the new Gilded Age of the late twentieth century and new millennium (see, for example, Piketty 2014). Almost all of it is negative, regarding not just issues of equity but also those efficiency. However, few things in life are absolutely bad. The concentrated wealth of the 0.01% affords an opportunity for both efficiency and equity. Philanthropists are interested in legacy. Translated economically, public goods which generate benefits in the long-run and incur costs in the short run, show promise for legacy. For the discerning philanthropist, any such project must be, above all, non-fungible, which means that national governments should have been funding the project but did not and will not. Nonfeasance may be due reasons which go beyond the problem of discounting: some of them are ideological and

cultural but most are just a conflict of the proposed project with private interests.[23] In other words, rejected proposals, nonetheless worthwhile, often run counter to businesses whose voice is overrepresented in the political process. The truth of that statement can guide the 0.01% who are concerned with the wise disposal of their wealth, which may be as difficult as was its accumulation (Gelles 2017). Because legacy occurs over a long time and even the greatest of fortunes is finite, the necessary conditions for proposals is that they be not only non-fungible but also, eventually, self-financing.

Bounded openness over traditional knowledge should fare well. Should the COP embrace the efficient and equitable solution to ABS, its gravitas will help attract the necessary private funding for implementation.

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[23] Mancur Olson explains the political economy in *The Logic of Collective Action* (1965). An alternative explanation is rooted in group psychology and the resilient propensity of people not to be bothered by fallacious arguments (Vogel, 2013).

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