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Movement forward on ABS for the Convention on Biological Diversity: Bounded openness over natural information

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 **SOUTH
CENTRE**



RESEARCH PAPER

160

MOVEMENT FORWARD ON ABS FOR THE CONVENTION ON BIOLOGICAL DIVERSITY: BOUNDED OPENNESS OVER NATURAL INFORMATION

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SOUTH CENTRE

21 JULY 2022

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ABSTRACT

"Access to genetic resources" and "fair and equitable sharing of benefits arising [from their] utilization" is the third objective of the 1992 United Nations Convention on Biological Diversity (CBD). The expression is included in the full title of the 2010 Nagoya Protocol (NP). Neither agreement defined "material" in the phrase "genetic material" which resulted in misinterpretation that the object of access for R&D is tangible. Unfairness ensues: competition among provider Parties leads to the elimination of economic rents, which is desirable for tangibles but undesirable for intangibles. Once interpreted as natural information, the economics of information justifies a Global Multilateral Benefit-Sharing Mechanism (GMBSM) (Article 10 NP) which collects and distributes rents on value added to genetic resources. "Bounded openness over natural information" is the modality proposed for the GMBSM. The Executive Secretary of the United Nations Secretariat of the CBD recognized the argument in the 2021 Note "Digital Sequence Information on Genetic Resources".

"L'accès aux ressources génétiques et le partage juste et équitable des avantages découlant de leur utilisation" (APA) est le troisième objectif de la Convention sur la diversité biologique des Nations Unies de 1992 (CDB). L'expression apparaît dans le titre complet du Protocole de Nagoya de 2010 (PN). Aucun des deux accords ne définissent le terme "matériel" dans la phrase "matériel génétique", entraînant l'interprétation erronée que l'objet d'accès pour la recherche et le développement est tangible. L'injustice s'ensuit: la compétition entre fournisseurs entraîne l'élimination des rentes économiques, ce qui est désirable pour les biens tangibles mais indésirable pour les biens intangibles. Un temps considérée comme information naturelle, l'économie de l'information justifie un Mécanisme Multilatéral Mondial de Partage des Avantages (MMMPA) qui collecte et distribue des rentes sur la valeur ajoutée aux ressources génétiques. "L'ouverture limitée sur l'information naturelle" est la modalité proposée par le MMMPA. Le Secrétaire exécutif du Secrétariat du CDB aux Nations Unies reconnaît l'argument dans une note de 2021 à propos des "Séquences numériques d'informations sur les Ressources Génétiques".

"Acceso a recursos genéticos" y "la participación justa y equitativa de los beneficios que se derivan de su utilización". El tema es el tercer objetivo de la Convención sobre la Diversidad Biológica de las Naciones Unidas de 1992 (CDB). Las expresiones entre citas aun se encajan en el pleno título del Protocolo de Nagoya de 2010 (PN). Ninguno de los dos acuerdos define el término "material" en la frase "material genético", así resultando en que el objeto de acceso para I+D pueda ser entendido como tangible. La tergiversación impide la justicia y equidad. La competencia entre proveedores lleva a la eliminación de rentas económicas, que es deseable para tangibles empero indeseable para intangibles. Una vez los recursos genéticos sean interpretados como información natural, la economía de la información justifica un Mecanismo Mundial Multilateral de Participación en los Beneficios (MMPB) (Art. 10 de PN) que recauda y reparte las rentas sobre el valor añadido. La "Apertura delimitada sobre información natural" es la modalidad propuesta para el MMPB. La Secretaria ejecutiva de la Secretaría del CDB de la NU reconoció el argumento de la Nota de 2021 titulada "Información digital sobre secuencias de recursos genéticos".

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ACRONYMS

ABS	"Access to genetic resources" and the "fair and equitable sharing of benefits arising [from their] utilization"
AHTEG	Ad Hoc Technical Expert Group
CBD	Convention on Biological Diversity
COP	Conference of the Parties
DSI	Digital Sequence Information
FCCC	Framework Convention on Climate Change
GMBSM	Global Multilateral Benefit-Sharing Mechanism
IPRs	Intellectual Property Rights
NP	Nagoya Protocol
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UN	United Nations
UNSCBD	United Nations Secretariat of the Convention on Biological Diversity



Mount Washington Hotel, Bretton Woods, New Hampshire, USA. Source: Georgio 2006.

1. INTRODUCTION AND MISE-EN-SCÈNE

Theory compacts information and reveals the essential. This was the opinion of the famed ecologist Garrett Hardin.¹ Compaction is now urgently needed in the discussion about the 1992 Convention on Biological Diversity (CBD)² and 2010 Nagoya Protocol (NP).³ "Information overload" describes the literature on "ABS", which is the acronym for "access to genetic resources" and the "fair and equitable sharing of benefits arising [from their] utilization". ABS is the third of three interrelated objectives of the CBD; conservation and sustainable use, are the first and second. With ratification of the CBD in 1993, ABS took off as did its antonym, viz. biopiracy.

Parties to the CBD addressed ABS and biopiracy in the Tenth Conference of the Parties held in Nagoya, Japan, in October 2010. Haste in the drafting of the CBD in 1992 was also evident in the drafting of the NP.⁴ Parties imported definitions from the Convention into the Protocol without revision. Thus "material" in "genetic material" of Article 2 of the CBD remained undefined in Article 2 of the NP. Is the object of access tangible or intangible for R&D? Technology answers decisively.

¹ Garrett Hardin, *Living within Limits* (Oxford 1993), p. 102.

² United Nations Convention on Biological Diversity (5 June 1992). Available from <https://www.cbd.int/convention/text/>.

³ Nagoya Protocol on Access to Genetic Resources and Fair and Equitable Sharing of Benefits Arising from their Utilization. (29 October 2010). Available from <https://www.cbd.int/abs/text/>.

⁴ M. Chandler, "The Biodiversity Convention: Selected issues of interest to the international lawyer", *Colorado Journal of International Law & Policy*, vol. 141, No. 4 (1993), pp. 141-175, 174.

Some specimens cannot only be dematerialized but also rematerialized in the ongoing Fourth Industrial Revolution. In the second half of the Fifteenth COP, scheduled from 5 to 17 December 2022 in Montreal, Canada, scientists must disabuse Northern delegates who insist that the undefined "material" be interpreted as only tangible.⁵ Parties should interpret the object of access for what it is, viz. an intangible for R&D. Only then can theory be applied to ABS and compaction ensue.

2. GLOBAL MULTILATERAL BENEFIT-SHARING MECHANISM

The compactor for ABS is the economics of information.⁶ As will be shortly explained, modern economies require that the State either produce information as a public good or institutionalize a regime that enables a market in information. Given globalization, the latter solution also requires the multilateral approach of intellectual property agreements.

By COP9 in 2008, the African Group of Provider Parties intuited that fairness and equity in ABS would require a multilateral approach. What they did not intuit is that a *quid pro quo* with intellectual property would also be efficient. At COP10, the African Group insisted that multilateralism be included in the negotiation. User Parties acquiesced at the eleventh hour.⁷ Article 10 of the NP is titled the Global Multilateral Benefit-Sharing Mechanism (GMBSM). Defenders of bilateralism may have consoled themselves that the article requires only that Parties "shall consider" a GMBSM and not actually do anything.

Due consideration of the GMBSM has not transpired in the intersessional periods from COP10 to COP15.⁸ The principal-agent problem looms large.⁹ The principals are the citizens of the Parties and the agents, the delegates to the COP. For the principals, logic dictates that investment in a wrong decision does not justify continued investment.¹⁰ Fearing accountability for the failure of bilateralism, the same deduction does not hold for the agents. To understand how to move the discussion forward in COP15, the previous paragraphs require unpacking in the context of COP13 and COP14.

⁵ See: submission from Japan to Note from Executive Secretary. Submission of views and new information on policy approaches, options or modalities for digital sequence information on genetic resources, SCBD/NPU/TS/CGA/AC/89861 (5 July 2021). Available from <https://www.cbd.int/conferences/post2020/submissions/2021-063>.

⁶ Pioneers in the field have won the Memorial Nobel Prize in Economics: Friedrich Hayek (1974), George Stigler (1982), Ronald Coase (1991), and Joseph Stiglitz, Michael Spence and George Akerlof (2001). Available from <https://www.nobelprize.org/prizes/lists/all-prizes-in-economic-sciences/>.

⁷ M.B. Buck and C. Hamilton, "The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity", *RECIEL* vol. 20, No. 1 (2011), pp. 47-61, 59-60.

⁸ J.H. Vogel, K. Angerer, M. Ruiz Muller and O. Oduardo-Sierra, "Bounded openness as the Global Multilateral Benefit-Sharing Mechanism for the Nagoya Protocol", in *Routledge Handbook on Biodiversity and the Law*, C. R. McManis and B. Ong, eds. (Routledge, 2018), pp. 377-394.

⁹ See Comment # 5148, Discussion Forum Article 10 Nagoya Protocol (2013) and Discussion Forum on DSI Policy Issues (UNSCBD, 2021). Available respectively from https://absch.cbd.int/forums/art10_groups and <https://www.cbd.int/dsi-gr/forum.shtml?threadid=2044>.

¹⁰ Should they continue investment, principals will be committing the fallacy of sunk costs. See: Hal R Arkes and Catherine Blumer, "The psychology of sunk cost", *Organizational Behavior and Human Decision Processes*, vol. 35, No. 1 (1985), pp. 124-140.

3. IS THE CART BEFORE THE HORSE?

The naturalist E.O. Wilson often cites the Chinese saying that "the first step to wisdom... is getting things by their right names".¹¹ COP13 commissioned a fact-finding study on "digital sequence information on genetic resources" (DSI) even though interpreting "material" as information would have obviated the commission and invited the relevant economics.¹² Undeterred by the mixed reviews of the fact-finding study,¹³ COP14 persevered in putting the cart, not just in front of the horse, but out of sight. The metaphor merits explanation: the cart is the policy options for access; the horse, the object of access; and the destination, fair and equitable benefit sharing. What is the right name for the horse? An Ad Hoc Technical Expert Group (AHTEG) from the United Nations (UN) Secretariat of the CBD took up that question in 2018. They reached consensus: "digital sequence information is not the appropriate term".¹⁴ Nevertheless, they hoped to use DSI "without prejudice to future consideration of alternative terms".¹⁵ That hope proved forlorn.

Nine months after the 2018 AHTEG Report, COP14 commissioned four more studies on DSI: Concept and Scope (#1); Traceability and Databases (#2&3); and Domestic Measures (#4).¹⁶ Novella-length drafts were published in 2019 for "peer review" via a template more appropriate for copyediting than for critique.¹⁷ Absent were the boxes that academics usually tick: "accept as is", "accept with revisions" or "reject". No matter what the reviewers opined, the studies would be published. The wheels of the cart were greased. DSI was a placeholder in name only. Reification was in full gear. As of this writing (7 July 2022), Google generates 80,700 hits for "digital sequence information" and Google Scholar, some 702, yet the placeholder DSI remains undefined!

Because DSI was not defined, the Combined Study#2&3 and Study#4 were impossible to execute as commissioned. The authors of the former study rolled the dice and assumed that Nucleotide Sequence Data would displace DSI; those of the latter deployed several alternatives in surveying national legislations and then went in all directions. The authors of Study#1 were spared the agony inflicted on the authors of the Combined Study#2&3 and Study#4. The commission of Study#1 constituted the horse, viz. concept and scope. To execute it *properly*, however, the authors would have to grapple with the question of origins. Wherefore DSI?

E.O. Wilson is also fond of distinguishing ultimate from proximate causation. Answering the why and how of DSI can clarify the concept and scope. Pat Mooney coined "biopiracy" in 1993 and later updated his *j'accuse* for the new millennium.¹⁸ "Digital biopiracy" roiled the meetings

¹¹ E.O. Wilson, *Consilience* (Alfred A. Knopf, Inc., 1998), p. 4

¹² S. Laird and R. Wynberg, "Fact Finding and Scoping Study on Digital Sequence Information on Genetic Resources in the Context of the Convention on Biological Diversity and Nagoya Protocol", (CBD/DSI/AHTEG/2018/1/3, 2018). Available from <https://www.cbd.int/doc/c/e95a/4ddd/4baea2ec772be28edcd10358/dsi-ahteg-2018-01-03-en.pdf>.

¹³ M. Ruiz Muller, K. Angerer, J.H. Vogel and J.C. Acabá-Torres, "Common Ground, Cause and Sense for Users, Providers and Agents: Bounded Openness over Genetic Resources," (Food and Agricultural Organisation of the United Nations. International Treaty on Plant Genetic Resources for Food and Agriculture Submissions on digital sequence information, 2019). Available from <http://www.fao.org/3/ca4018en/ca4018en.pdf>.

¹⁴ Report of the Ad Hoc Technical Expert Group on Digital Sequence Information on Genetic Resources. CBD/DSI/AHTEG/2018/1/4/ (UNSCBD, 2018), p. 5. Available from <https://www.cbd.int/doc/c/4f53/a660/20273ca-dac313787b058a7b6/dsi-ahteg-2018-01-04-en.pdf>.

¹⁵ Ibid.

¹⁶ Inter-sessional period Studies on Digital Sequence Information on Genetic Resources (UNSCBD. 2019-2021). Available from <https://www.cbd.int/dsi-gr/2019-2021/studies/>.

¹⁷ Ibid.

¹⁸ J. Martinez Alter, "International biopiracy versus the value of local knowledge", *Capitalism Nature Socialism* vol. 11, No. 2 (2000), pp. 59-66, DOI: 10.1080/10455750009358913.

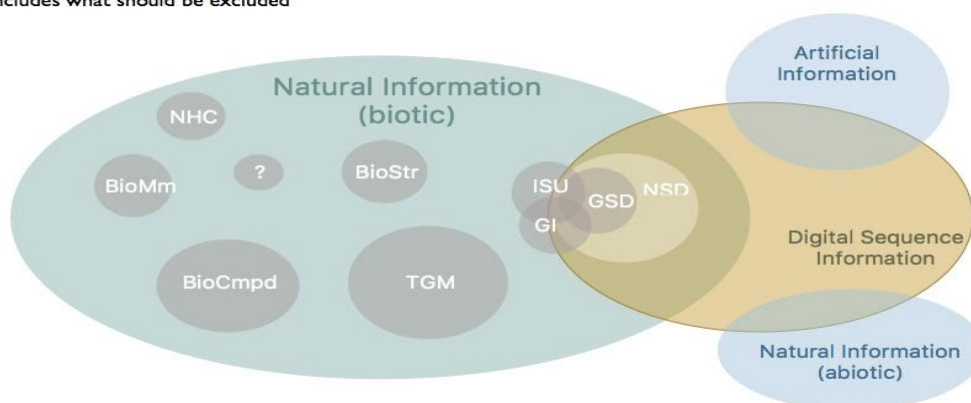
at COP10,¹⁹ where delegates learned how synthetic biology was fueling exponential growth in open-access databases. The 2015 UNSCBD meeting of experts on synthetic biology was the crucible in which "digital sequence information" was first heard.²⁰ No one present at the meeting has ever identified who uttered it.

4. NAMING THE OBJECT OF ACCESS

Parsing the three words of DSI conveys a meaning which violates the criteria of breadth and discrimination in the crafting of definitions.²¹ For the object of access in R&D, DSI includes that which should be excluded and excludes that which should be included (Figure 1). The resilience of the term is thus all the more stunning. Through a Venn diagram, one can conceptualize the relationship of DSI to alternative terms. Figure 1 is titled "The Phenom" in deference to what will be the right name for the object of access.

Figure 1: "The Phenom"

"DSI" excludes what should be included
and includes what should be excluded



KEY

Natural Information (biotic) = Any unintentional distinction, non-uniformity or difference extracted from matter that is living or was once alive.

Natural Information (abiotic) = Complement of Natural Information (biotic) with respect to that which is not living and was never alive.

Artificial Information = Any human-made distinction, non-uniformity or difference that is intentional.

Digital Sequence Information = Placeholder for the "Phenom"

NHC = Non-human cultures

BioStr = Biomolecular structures

BioMm = Biomimicry

BioCmpd = Formula of biochemical compounds

¹⁹ "Synthetic Biology: Creating Artificial Life Forms - Briefing and Recommendations for CBD Delegates to COP10" (ETC Group, 2010). Available from http://www.etcgroup.org/files/publication/pdf_file/ETC_COP10SynbioBriefing081010.pdf.

²⁰ E. Hammond, "Comments of Third World Network on Digital Sequence Information", (SCBD/NPU/DC/VN/KG/RKi/87804, 2019). Available from <https://www.cbd.int/abs/DSI-views/2019/TWN-DSI.pdf>.

²¹ "A definition must be neither too broad nor too narrow", Irving M. Copi Carl Cohen. Kenneth McMahon, *Introduction to Logic*. 14th ed. (Routledge, 2014), p. 101, Available from <https://dorshon.com/wp-content/uploads/2018/03/Introduction-to-Logic.pdf>.

TGM = Tangible genetic material
GI = Genetic information
GSD = Genetic sequence data
ISU = *In silico* utilization (of genetic resources)
NSD = Nucleotide Sequence Data
? = Unidentified natural information (biotic)

Image Credit: Valeria M. Berríos-Arroyo

Source: Adapted from J.H. Vogel, Peer Review of Combined Study#2&3 (2019). Available from <https://www.cbd.int/abs/DSI-peer/2019/Study2-3/JosephHenryVogel.pdf>.

Natural information (biotic) was not cited once in either Study#1 or the Combined Study#2&3 and was mentioned only *en passant* in the Annex of Study#4. One cannot say that the marginalization was oversight. The African Group had requested consideration of "natural information" ever since the online discussions about the GMBSM in 2013.²² The aforementioned fact-finding Report on DSI also referenced "natural information" five times.²³ Most significantly, peer reviews of all four studies highlighted in italics the importance of "natural information" in opening key messages.²⁴

Study#1 on Concept and Scope states in the introduction "[t]his study is scientific in scope and does not cover associated policy implications".²⁵ Why not? ABS gave rise not only to DSI but also to "natural information" **decades earlier**.²⁶ Fully aware of "natural information", the authors omitted the term from an otherwise comprehensive list of alternative terms. Inasmuch as science militates against elision, COP15 should reject Study#1 as an apparent attempt to winnow the policy implications for ABS. But will COP15? Sunk costs are very real.²⁷ A conflict of interest with the pharmaceutical industry was also disclosed at the end of Study#1.²⁸

5. RENTS AS RAISON D'ÊTRE

Psychology is seldom broached in the discussion about ABS. Yet the dynamics of the COPs lend themselves to behavioral analysis.²⁹ Nested dominance hierarchies are an apt description of relationships within and among delegations. Outside ideas expose egregious errors, undermine authority and hazard accountability. Cognitive dissonance preserves the *status quo*. Nowhere is this more evident than in the studied ignorance of the economics of

²² See, Note 8 p 387; Note 9, Comment, [#5298]; and Ethiopia, "Potential implications of the use of "digital sequence information on genetic resources", (UNSCBD, 2017), p. 2. Available from <https://www.cbd.int/abs/DSI-views/Ethiopia-AU-DSI.pdf>.

²³ See Note 12.

²⁴ See Note 16.

²⁵ Wael Houssen, Rodrigo Sara, Marcel Jaspars, "Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use", (UNSCBD, 2020), p. 10. Available from <https://www.cbd.int/doc/c/fe9/2f90/70f037ccc5da885dfb293e88/dsi-ahteg-2020-01-03-en.pdf>.

²⁶ J.H. Vogel, "The intellectual property of natural and artificial information", *CIRCI/T Newsletter* (Centre for International Research on Communication and Information Technologies, June 1991), p. 7.

²⁷ See note 10.

²⁸ See Note 25, p. 48.

²⁹ J. H. Vogel, "Peer Review of the "Study on Concept and Scope", (UNSCBD, 2019). Available from <https://www.cbd.int/abs/DSI-peer/2019/Study1/JosephHenryVogel.pdf>.

information applied to the Nagoya Protocol.³⁰ The power of economic abstraction renders a solution for ABS which rests on the highly abstract notion of "rent" (Textbox 1).

Questions about rent were repeatedly asked and not answered in the 2020-2021 Webinar Series on DSI, hosted by the UNCBD and The ABS Capacity Development Initiative.³¹ Such avoidance cannot be attributed to the format of video-conferencing. Long before Zoom, Teams, and similar platforms facilitated participation, rents had entered COP9 as one of four questions to be addressed "at the appropriate time" in preparation for COP10.³² Perhaps advocates of bilateralism will claim that the appropriate time never arose in COP10...or in any of the subsequent COPs, online discussions or webinars. The ancient wisdom "If not now, when?" remains propitious for COP15.

Textbox 1

Rent in Economics

Economics inveighs against monopolies but makes an exception for information. Without protection from competition, much information would not exist. Producers will wait until a competitor creates information so that they can then copy it. Piracy is as inefficient as it is unfair. The analogy with genetic resources is actually a homology. Books, software and medicines are media of artificial information for which the fixed costs of creation can be staggering, although the marginal costs of reproduction are infinitesimal. Genes and their expressions are natural information for which the opportunity costs of conservation are also staggering, and the marginal costs of access, similarly infinitesimal. The salient difference between natural and artificial information lies in diffusion. Whereas artificial information is usually concentrated on one titleholder, the claims for natural information will be dispersed. For this reason, the counterpart to limited-in-time monopolies for intellectual property would be the limited-in-time oligopoly of a Global Multilateral Benefit-Sharing Mechanism.

Oligopolies disburse "rents", which is a word that risks equivocation. Rent in economics is not what a tenant owes the property owner at the end of the month. Rent is the difference between the price paid and the price which would have been paid had the market been perfectly competitive. A price war, or the **anticipation of one**, eliminates rents. An example of the latter hails from Brazil, which shares the Amazon basin with nine other countries. Anticipating the elimination of rents, Brazil went straight to the bottom in a metaphorical race-to-the-bottom. The 2015 Brazilian ABS legislation allows royalties as low as 0.1 per cent in sectoral agreements.³³ On a billion-dollar blockbuster commercialization, only one million dollars would be collected. And blockbusters are rare. If the modality of ABS is bilateral, the Parties must ask themselves: why bother?

³⁰ J.H. Vogel, N. Álvarez-Berrios, N. Quiñones-Vilche, J.L. Medina-Muñiz, J. Santiago-Rios, "The Economics of Information, Studiously Ignored in the Nagoya Protocol on Access and Benefit Sharing", *Law Environment and Development Journal* vol. 7, No. 1 (2011), pp. 51-65. Available from <http://www.lead-journal.org/content/11052.pdf>.

³¹ Denied were the requests to the UNSCBD that Q&As and Comments from the Chat be uploaded with the video (pers. communication 5 November 2021). See: Webinar Series on Digital Sequence Information on Genetic Resources (UNSCBD, 2021). Available from <https://www.cbd.int/article/dsi-webinar-series-2020>.

³² COP9 Decision IX/12: Access and benefit sharing, <https://www.cbd.int/decision/cop/default.shtml?id=11655> (UNSCBD, 2008)

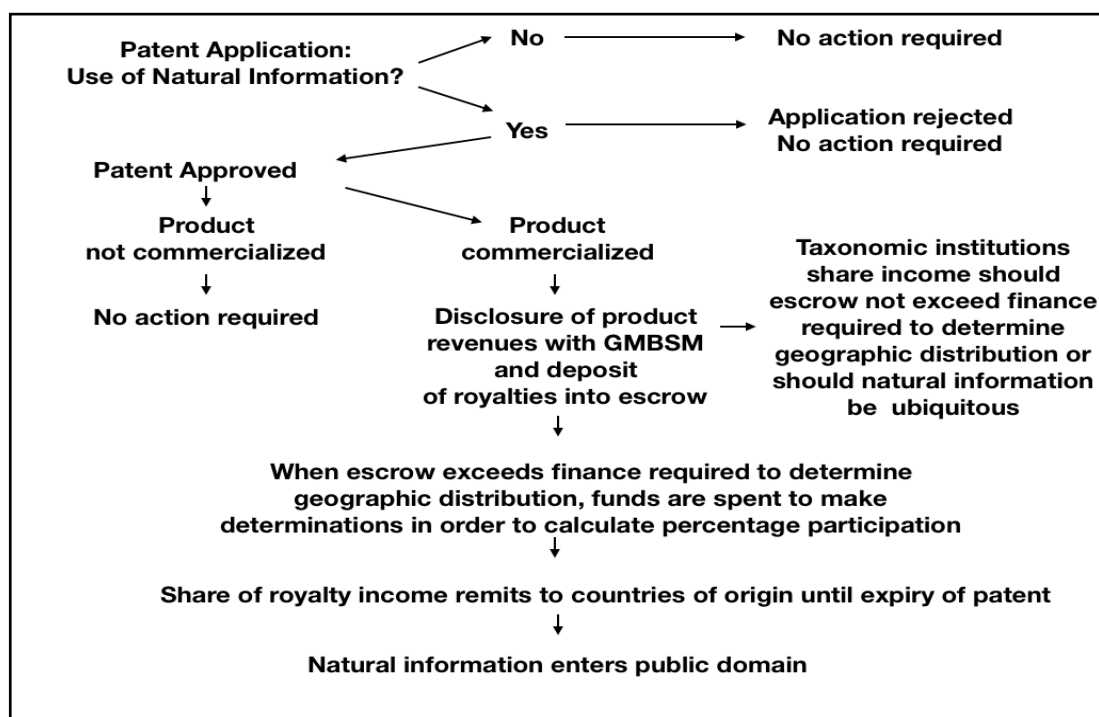
³³ Brazil: Law No. 13.123 (2015). Articles 20 & 21. Available from <http://www.wipo.int/edocs/lexdocs/laws/pt/br/br161pt.pdf>.

6. BOUNDED OPENNESS OVER NATURAL INFORMATION

Any enthusiasm for intellectual property must be tempered by the transaction costs of rendering information into property. The Creative Commons movement offers a nuanced version in which boundaries are drawn on ownership with a greater sensitivity to efficiency and equity, which are balanced when in conflict. "Bounded openness" emerges as an overarching concept for the continuum between enclosure and open access, where the focus shifts toward openness.³⁴ The concept uses the norms established in the realm of intellectual property and embedded in the TRIPS Agreement.

Robustness of "bounded openness" requires a modifying clause for treaties with ABS provisions,³⁵ hence "bounded openness over natural information". The provenance and prospects of the modality have been elaborated elsewhere;³⁶ suffice it to say here that unencumbered access will increase innovation for which limited-in-time monopoly Intellectual Property Rights (IPRs) are sought. Should an IPR be successfully commercialized, royalty income from ABS would remit to the countries of origin, proportional to the habitat of terrestrial species (plural) that contain the natural information utilized. Figure 3 is a flow diagram of how ABS would work.

Figure 2
Disclosures and Disbursements



Source: Adapted from M. Ruiz Muller, *Genetic Resources as Natural Information* (Routledge, 2015)

³⁴ C. May, "Why IPRs are a global political issue", *European Intellectual Property Review*, vol. 25, No. 1 (2003), pp. 1-6.

³⁵ J.H. Vogel, M. Ruiz Muller, K. Angerer, D. Delgado Gutiérrez, A. Gálvez Ballón, "Bounded Openness: A Robust Modality of Access to Genetic Resources and the Sharing of Benefits", *Plants People Planet* (2021). DOI: 10.1002/ppp3.10239.

³⁶ J. H. Vogel, M. E. Santori-Aymat, O. Tomaiconza, .B. S, Cortés-Lumbi, M. Fernandez-Maldonado, "Bounded Openness over Natural Information", *Elgar Encyclopedia of Ecological Economics* (Edward Elgar, forthcoming 2023).

7. WHO GETS WHAT?

The GMBSM would levy a royalty according to the type of utilization. Goods and services which exhibit high elasticity of demand, would have a low percentage royalty; those with a low elasticity, a high percentage. This asymmetry owes to the Ramsey Rule in Public Finance,³⁷ which derives from criteria of efficiency. Rents are embedded in the percentages. Parties will be able to spend the income on whatever activity yields the highest social return, thereby respecting sovereignty, achieving efficiency, and averting the problem of fungibility, also known as adverse selection. The GMBSM is also self-financing. Operational costs are covered by royalties on ubiquitous natural information. With global annual sales in biotechnology approaching one trillion US dollars, ABS could become the chief mechanism to align incentives for conservation as well as mobilize resources for taxonomy, which is an international public good that has long been underfunded (see the right-hand side of Figure 2).

Biomes afford a rough approximation of how to ascertain who will get what for ABS on terrestrial species (Figure 3). The enduring hope is that the incentives created will help societies transition to the limits of half-Earth.³⁸ For marine species, acidification from atmospheric CO₂ is the chief threat of ecosystem collapse (e.g., species of the phyla Arthropoda and Mollusca). ABS would thus be tied to beyond-agreed-target reductions of CO₂ emissions by Parties to the United Nations Framework Convention on Climate Change.³⁹

Figure 3

Terrestrial Biomes

8. FINAL REMARKS, RECOMMENDATIONS AND A CALL FOR SUBMISSIONS

Economics is not diplomacy. In 1997 former Federal Reserve Bank economist and Princeton University professor Alan S. Blinder published an article in *Foreign Affairs* titled "Is Government too Political?"⁴⁰ The theoretician and practitioner answers in the affirmative and explains what to do: delegate authority or at least, follow more closely the advice of experts. The counsel of the former may be arguable, but the latter seems unassailable. Although Blinder had the US Congress in mind, he presents the argument as potentially robust. For ABS, relevant antecedents exist in the 1944 Bretton Woods Conference which established the international monetary system for post-war recovery.

Lord John Maynard Keynes led the British delegation and proposed a supranational currency, called the bancor. His proposal would have solved the problem of trade imbalances, which led to the collapse of Bretton Woods in 1971. The bancor would have also solved the debt crises that have bedeviled flexible exchange rates ever since.⁴¹

The economic argument for "bounded openness over natural information" has a trajectory as long the 1992 CBD and fourteen COPs. An up-to-date analysis can be found in the 2021 Report from The ABS Capacity Development Initiative, titled *Fairness, Equity and Efficiency for the Convention on Biological Diversity and the Nagoya Protocol: Analysis of a Rodent, a Snail, a Sponge and a Virus*.⁴² Other multilateral systems have also been proposed, some quite recently, that are similar but distinct.⁴³ Theory mercifully compacts. Rival systems distinguish themselves by disregarding rents. Only through rents can ABS enable conservation and sustainable use. COP15 must not cherry pick. Such is the lesson of Bretton Woods.

How to get from here to there? Delegates should consider the proposal "Legal Elements for the 'Global Multilateral Benefit-sharing Mechanism' as contemplated in the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization."⁴⁴ The 25 articles reflect "thought experiments" had bounded openness been the modality for iconic cases of utilizations. Submission of more such experiments is the call for a 2023 Special Issue of *PLANTS*,⁴⁵ titled "Nothing in 'Access and Benefit-Sharing Makes Sense Except in the Light of Economics'".⁴⁶ An extended and refined Version 4.0 of "Legal Elements" will result and provide a framework for a fair, equitable and efficient solution.

The point remains to change the system.

⁴⁰ A.S. Blinder, "Is Government too Political?", *Foreign Affairs* (November/December 1997).

⁴¹ T. Hirai, M. C. Marcuzzo and P. Mehrling. 2013. *Keynesian Reflections: Effective Demand, Money, Finance and Policies in the Crisis*. (Oxford University Press 2013).

⁴² See Note 39.

⁴³ They include "common pools", "Mare Geneticum" and "Option 2 of the WiLDSI Project" with Addendum. See, respectively: E. C. Chege-Kamau and G. Winter, *Common Pools of Genetic Resources: Equity and Innovation in International Biodiversity Law* (Routledge, 2013); A. Broggiato, T. Vanagt, L.E. Lallier, M. Jaspers, D. Muyldermans, "Mare Geneticum: Balancing Governance of Marine Genetic Resources in International Waters", *The International Journal of Marine and Coastal Law* vol. 33, No. 1 (2018): pp. 3-33; A. Scholz, U. Hillebrand, J. Freitag, I. Cancio, E. van Zimmeren, 2020, "Finding Compromise on ABS and DSI in the CBD: Requirements & Policy Ideas from a Scientific Perspective" and Addendum, half as long as the Report. Available from, respectively, <https://doi.org/10.1163/15718085-13310030>, https://www.dsmz.de/fileadmin/user_upload/Collection_all/Final_WiLDSI_White_Paper_Oct7_2020.pdf, and https://www.dsmz.de/fileadmin/user_upload/Presse/WiLDSI/WiLDSI_ADDENDUM_to_white_paper_Feb_2021.pdf.

⁴⁴ See Note 39, Appendix VI, Version 3.0., pp. 110-114.

⁴⁵ Deadline for submission is 15 October 2022; author enquires are welcome. Call for submissions, *PLANTS*: https://www.mdpi.com/journal/plants/special_issues/ABS_economics#info.

⁴⁶ Theodosius Dobzhansky, "Nothing in Biology Makes Sense Except in the Light of Evolution", *American Biology Teacher*, 35:125-129 (1973)

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