

Re-boot: the crash of DSI-the-neologism and where to go on ABS

Response to request for "Submission of views and new information on policy approaches,
options or modalities for digital sequence information on genetic resources"

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Classical rhetoric weights heavily the conclusion to any argument. Final words can arouse emotion and inspire action. Would that be so for the Note by the Executive Secretary of the Convention on Biological Diversity (CBD), titled "Digital Sequence Information on Genetic Resources" (DSI) of 5 July 2021.¹ My fear is that delegates to the fifteenth Conference of the Parties (COP15) will stop reading the 22-page Note well before the caption "**Issues to be further explored**" at the bottom of page 21 (bold in original). This submission addresses how economics can arouse emotion and inspire delegates to explore those issues. A caveat is in order: Economics is not diplomacy.

More requests for submissions on DSI? Yet another submission? Such impertinent questions are utterly reasonable. Parties and stakeholders have grown tired of commissioned studies, global dialogs, interminable webinars and several hundred texts on digital sequence information.² More submissions for consideration will further wear down many a worn-out delegate. Surreal is the fact that the scientific community never used "digital sequence information" before COP13 ordained the neologism placeholder status.³ DSI is the brainchild of the meeting of the 2015 Ad

¹ CBD/WG2020/3/4 5 July 2021, <https://www.cbd.int/doc/c/707f/6565/1b79a3df3aea669e19078615/wg2020-03-04-en.pdf>

² Hits on Google Scholar Search of "digital sequence information" on 27 September 2021L 496.

³ See J. Heinemann, et al, 2019 (18-22 February), "Digital Sequence Information on Genetic Resources for Food and Agriculture and its Relevance for Food Security", Item 4 of the Provisional Agenda, Seventeenth Regular Session, Rome, <https://ir.canterbury.ac.nz/handle/10092/101057>, p. 4.

Hoc Technical Expert Group (AHTEG) on Synthetic Biology.⁴ Tellingly, no individual from that event has ever come forward to claim parenthood.⁵

Chronology matters. In February 2018, the AHTEG on DSI found that DSI was "not the appropriate term".⁶ Despite a consensus, nine months later, COP14 commissioned four studies on DSI: Study#1 on Concept, the Combined Study#2&3 on Traceability and Databases and Study#4 on Domestic Measures.⁷ COP14 put the cart in front of the horse. The authors of the Combined Study#2&3 and Study#4 proceeded as if the policy implications of the "appropriate term" were irrelevant. Study#1 on Concept is explicit: "This study is scientific in scope and does not cover associated policy implications" (p. 8). The only alternative term not cited in Study#1 is the one with sweeping policy implications for ABS. I refer to "natural information" and the logic of rents in the sharing of benefits, as reiterated in my interlocking peer reviews to the four studies, as well as in my peer reviews to the studies of transboundary situations, synthetic biology and financial security mechanisms.⁸

The Report from the 2018 AHTEG on DSI closes with this thought: "...'bounded openness over natural information' may merit consideration" (p. 10). Emotion is aroused yet classical rhetoric damned. None of the authors of the four commissioned studies were inspired to consider "natural information" much less act on the policy implication of "bounded openness". Similarly brushed off was the 2017 submission on DSI by Ethiopia on behalf of the African Group:

⁴The Report from the 2015 AHTEG meeting refers to "digital genetic information" and "digital genetic resource information" but not to "digital sequence information", <https://www.cbd.int/doc/meetings/synbio/synbioahteg-2015-01/official/synbioahteg-2015-01-03-en.pdf>. The term "digital sequence information" may have been heard but not recorded. See, Edward Hammond, 2019 (1 June), "Comments of Third World Network on Digital Sequence Information", SCBD/NPU/DC/VN/KG/RKi/87804, p. 3, <https://www.cbd.int/abs/DSI-views/2019/TWN-DSI.pdf>.

⁵ The earliest in-print appearance of "digital sequence information" is a December 2015 monograph by Margo A. Bagley, who is also the lead author of Study#4. The title of the monograph is "Digital DNA: The Nagoya Protocol, Intellectual Property Treaties, and Synthetic Biology", Wilson Center, <https://www.wilsoncenter.org/publication/digital-dna-the-nagoya-protocol-intellectual-property-treaties-and-synthetic-biology>

⁶ "Report of the Ad Hoc Technical Expert Group on Digital Sequence Information on Genetic Resources", CBD/DSI/AHTEG/2018/1/4/, 2018 (20 February), p. 5, <https://www.cbd.int/doc/c/4f53/a660/20273cadac313787b058a7b6/dsi-ahteg-2018-01-04-en.pdf>

⁷ Respectively, <https://www.cbd.int/doc/c/fe9/2f90/70f037ccc5da885dfb293e88/dsi-ahteg-2020-01-03-en.pdf>, <https://www.cbd.int/doc/c/1f8f/d793/57cb114ca40cb6468f479584/dsi-ahteg-2020-01-04-en.pdf>, <https://www.cbd.int/doc/c/428d/017b/1b0c60b47af50c81a1a34d52/dsi-ahteg-2020-01-05-en.pdf>

⁸ Respectively, <https://www.cbd.int/abs/DSI-peer/2019/Study1/JosephHenryVogel.pdf>, <https://www.cbd.int/abs/DSI-peer/2019/Study2-3/JosephHenryVogel.pdf>, <https://www.cbd.int/abs/DSI-peer/2019/Study4/JosephHenryVogel.pdf>, <https://www.cbd.int/abs/Art-10/Peer-review/Vogel.pdf>, https://bch.cbd.int/synbio/peer_review/ (University of Puerto Rico-Rio Piedras) and <http://bch.cbd.int/protocol/supplementary/Study.shtml> (University of Puerto Rico-Rio Piedras)

To avoid a situation in which emerging biodiversity governance policy is (again) overtaken by rapid technological innovation and change we favor the use of a neutral and wide term like “natural information”, while remaining open to discussing the possibility that different types of natural information might eventually be subject to different governance regimes.⁹

The elision of "natural information" from Study#1 is not only unscientific but also undiplomatic. The elision is an affront to 2018 AHTEG on DSI, the African Group and the goodwill of the knowledgeable public (peer reviewers may ask themselves "why bother?"). Seen in this light, the Note by the Executive Secretary is a feeble attempt to mend fences. The Note breaks the natural-information taboo but adroitly sets the fracture in a rock-hard cast.

Table 2 of the Note is titled "Options for terminology to describe DSI". Eight alternatives to DSI are crammed into two lines of the second row, while the first row comprises sixteen lines for the four groups elaborated in Study#1. The visual difference is reflected in the narrative: discussion of the Groups occupy pages 7-13, whereas "natural information" remains almost undiscussed. Lip service is paid in one sentence on page 16 and then again on pages 20 and 22, where "natural information" is classified as a "pertinent remark" and in "need [of being] considered/studied".¹⁰ The asymmetry speaks loudly.

This submission will discuss briefly what the Note does not. "Natural information" was crafted with equity and efficiency in mind, and predates presentation of the CBD at the Earth Summit

⁹ Ethiopia, 2017 (8 September), “Potential implications of the use of "digital sequence information on genetic resources”, p. 2. <https://www.cbd.int/abs/DSI-views/Ethiopia-AU-DSI.pdf>

¹⁰ "Natural information", "bounded openness" and "bounded openness over natural information" are unattributed in the Note from the Executive Secretary. Non-attribution of well elaborated concepts undermines the whole academic enterprise which lends intellectual support to the COP. For the importance of due attribution, even over just two words, see Stanley Fish, 2016 (5 August) "How to Win an Academic Argument", *The Chronicle of Higher Education*, <https://www.chronicle.com/article/how-to-win-an-academic-argument/>. Just as expressions go unattributed, so too can policy proposals packaged under distinct nomenclatures. Such is the complaint acknowledged in the "Addendum to the WiLDSI white paper: Finding Compromise on ABS & DSI in the CBD: requirements & policy ideas from a scientific perspective", 2021 (1 February), https://www.dsmz.de/fileadmin/user_upload/Presse/WILDSI/WiLDSI_ADDENDUM_to_white_paper_Feb_2021.pdf. Because the unpublicized 34-page Addendum is also unpaginated and "does not support or express agreement...with... the feedback", curious readers should use the search key for "insufficient attribution" and click onto the embedded links. Non-attribution ties into the Principal-Agent Problem through the dictum "the right answer cannot come from the wrong person", see Joseph Henry Vogel, 2010, "Primate Economics 101", *Evolutionary Psychology*, www.epjournal.net - 8(2): 189-193, p 192, <https://journals.sagepub.com/doi/full/10.1177/147470491000800204>

Rio'92.¹¹ A refereed literature explores the policy implications of applying economics to genetic resources, when the latter is interpreted as "natural information".¹² Worthy of repetition is this fact: the authors of the four commissioned studies were aware of the literature through the peer reviews, which they chose to ignore.¹³ Apparently they believed that they could do so without peril. Unlike academic venues, dismissal of negative peer reviews of commissioned studies does not hazard non-publication.

Given the scope of ABS, the paucity of peer reviews is also stunning. For Study#1 only 25 participants submitted a peer review, for the Combined Study#2&3, also 25, and for Study #4, 18.¹⁴ One infers that precious goodwill has been squandered on DSI, an indisputable misnomer. The continued discussion of DSI is displacing important issues. For example, the deftly crafted "Draft Study on Financial Security Mechanisms under the Nagoya-Kuala Lumpur Supplementary Protocol (NKLSP)", received a scant nine reviews.¹⁵ I write these words during the fourth wave of the Covid pandemic and cannot help but draw an analogy. Willfully unvaccinated Americans fill hospital Emergency Rooms and crowd out those who suffer non-Covid illnesses, life-threatening accidents and weapon violence. The safe and effective vaccine is freely available. Tragic are the

¹¹ For the trajectory of the concept, see Joseph Henry Vogel, Foreword "On the Silver Jubilee of "Intellectual Property and Information Markets: Preliminaries to a New Conservation Policy" in Manuel Ruiz Miller, 2015, pp xii-xxv, *Genetic Resources as Natural Information: Policy Implications for the Convention on Biological Diversity*, London: Routledge, https://s3-us-west-2.amazonaws.com/tandfbis/rt-files/docs/9781138801943_foreword.pdf. Also available in open-access Spanish translation on pages xi to xxvi in Manuel Ruiz Muller, 2017, *Recursos genéticos como información natural: Implicancias para el Convenio de Biodiversidad y el Protocolo de Nagoya*, segunda edición, Lima, Peru: SwissAid, SPDA, https://spda.org.pe/?wpfb_dl=4131

¹² For a succinct overview, see Manuel Ruiz Muller et al, 2019 (11 December) "Access to Genetic Resources and Benefit-Sharing' in the Post-2020 Global Biodiversity Framework", Op-Ed, *Enhanced Integrated Framework* (EIF), English: <https://trade4devnews.enhancedif.org/en/op-ed/access-genetic-resources-and-benefit-sharing-post-2020-global-biodiversity-framework>, French: <https://trade4devnews.enhancedif.org/fr/op-ed/laces-aux-ressources-genetiques-et-le-partage-des-avantages-dans-le-cadre-mondial-de-la>, Portuguese: <https://trade4devnews.enhancedif.org/pt/op-ed/acesso-recursos-geneticos-e-partilha-de-beneficios-no-quadro-global-para-biodiversidade-pos>

¹³ See footnote 8.

¹⁴ See, respectively, <https://www.cbd.int/dsi-gr/2019-2021/studies/>, <https://www.cbd.int/dsi-gr/2019-2021/studies/#tab=1> and <https://www.cbd.int/dsi-gr/2019-2021/studies/#tab=2>. Apathy is a two-way street. More than half of the authors and co-authors of the commissioned studies either did not participate or participated only on the last day of the online Discussion Forum on Policy Options (21 April - 2 May 2021), <https://www.cbd.int/dsi-gr/forum.shtml>. This fact belies the projection of the WiLDSI Project that "Our community is very heterogeneous and, frankly, scientists love debate as much as policymakers!", Scholz et al, 2021, "Finding Compromise on ABS & DSI in the CPD: requirements & policy ideas from a scientific perspective", p. 4, https://www.dsmz.de/fileadmin/user_upload/Collection_allg/Final_WiLDSI_White_Paper_Oct7_2020.pdf

¹⁵ Review of draft Study on Financial Security Mechanisms under the Nagoya-Kuala Lumpur Supplementary Protocol, UN Secretariat of the Convention on Biological Diversity, 2021 (June), <http://bch.cbd.int/protocol/supplementary/Study.shtml>

consequences when logic and evidence do not persuade.¹⁶ Sadly, this too human behavior is robust and applies to DSI and ABS.¹⁷

The opportunity costs of the two dozen peer reviewers pale against those of Parties to the CBD. *Elision forfeits the policy implications of the term elided.* The salient implication of "natural information" is rent due for successful utilization, especially when demand is inelastic for goods that enjoy monopoly intellectual-property protection.¹⁸ Pharmaceuticals top the list.¹⁹ Scroll down in Study#1 and stop just before the References on page 48: "Conflict of Interests: Marcel Jaspars is a co-founder of, has shares in, and consultant to GyreOx Ltd, a company that uses marine genetic resources from areas within national jurisdiction to develop potential drug molecules".

COP15 should reject Study#1 on Concept for two intertwined reasons: the elision of "natural information" disqualifies the work as scientific, while the conflict of interest is itself disqualifying. A third reason, viz., the aforementioned lack of diplomacy vis-a-vis the 2018 AHTEG on DSI, etc., is not sufficient but nevertheless noteworthy for being irksome.

I will now scroll down to the closing page of the Note, which alludes to "natural information" so assiduously suppressed in the commissioned studies. Italics have been added to each sentence quoted:

¹⁶ "The persuasive power of logic is surprisingly limited". Frans de Waal makes this dispiriting observation about human behavior from a lifetime of research on bonobos (*Pan pansicus*) at the Arnhem Zoo and Yerkes Primate Center. See, *Our inner ape: A leading primatologist explains why we are who we are*, New York: Riverhead Books. 2005, p. 197.

¹⁷ Joseph Henry Vogel, 2013 (December) "The Tragedy of Unpersuasive Power: The Convention on Biological Diversity as Exemplary," *International Journal of Biology*, 2013. Vol 5, No. 4, pp. 44-54, <http://www.ccsenet.org/journal/index.php/ijb/article/view/30097/18019>

¹⁸ The submission of the African Group was not the only one brushed off. See that of the Sociedad Peruana de Derecho Ambiental (SPDA), which had gone to great pains to explain rents in non-technical language. "Even best case for bilateralism supports need for a Global Multilateral Benefit-Sharing Mechanism: Common ground in 'bounded openness over natural information' as the modality for ABS", English: <https://www.cbd.int/abs/submissions/Art10/2019/SPDA-EN.pdf>, French: <https://www.cbd.int/abs/submissions/Art10/2019/SPDA-FR.pdf>, Portuguese: <https://www.cbd.int/abs/submissions/Art10/2019/SPDA-PT.pdf>, Spanish: <https://www.cbd.int/abs/submissions/Art10/2019/SPDA-ES.pdf>

¹⁹ Joseph Henry Vogel, transcript of "The salient implication of the economics of information for ABS: Bounded openness" in "New Approaches to Access and Benefit Sharing: The Case for Bounded Openness and Natural Information"/ Conference of the Parties XIII to the UN Convention on Biological Diversity, 2016 (9 December). Sociedad Peruana de Derecho Ambiental. <http://www.actualidadambiental.pe/wp-content/uploads/2017/12/TranscriptSideEventCOP13BoundedOpenness.pdf> , pp. 9-11.

"More economic aspects of proposed policies need to be considered/studied" (p.22).

The determinative "more" is misleading: the COPs have never considered/studied how to apply economics to ABS.²⁰ Or was economics not the intended meaning of "economic aspects"? An appropriate edit would be "Published policies grounded in economics need to be considered/studied".

One anticipates this rejoinder: what about the 2009 TEEB Report which takes up ABS?²¹ The economists from TEEB passed off an interpretation of genetic resources as if the matter were settled as *matter*.²² Because the premise "genetic-resources-as-only-tangible" is wrong, the TEEB deduction "elimination-of-rents-is-inevitable" is also wrong. The TEEB Report concluded that royalties could not incentivize conservation and so dispatched ABS as quixotic.²³

"Clear/accessible definition of natural information and economic rent" (p. 22).

"Natural information" and "economic rent" are already accessible in the literature and the latter, ever since David Ricardo entered the House of Commons in 1819 and implored repeal the Corn Laws.²⁴ The two terms require, however, contextualization with other terms whose definitions may be unfamiliar. A lexicon is provided in the 100+page report "Fairness, Equity and Efficiency in the Convention on Biological Diversity and Nagoya Protocol: Analysis of a Rodent, a Snail, a

²⁰ Studied ignorance was first identified in Joseph Henry Vogel, et al, 2011, "The Economics of Information, Studiously Ignored in the Nagoya Protocol on Access and Benefit Sharing" 7/1 *Law Environment and Development (LEAD) Journal*, p. 51-65, also available in Arabic, Chinese, French, Portuguese and Spanish, <http://www.lead-journal.org/2011.htm>. Subsequent research corroborates. See Omar Oduardo-Sierra et al, 2012 (May), "Monitoring and Tracking the Economics of Information in the Convention on Biological Diversity: Studied Ignorance (2002-2011)" , *Journal of Politics and Law*, <http://dx.doi.org/10.5539/jpl.v5n2p29>

²¹ ten Brink, P. 2009, 'Chapter 5: Rewarding benefits through payments and markets', *TEEB – The Economics of Ecosystems and Biodiversity for National and International Policy Makers*, <https://www.cbd.int/doc/case-studies/inc/cs-inc-teeb.Chapter%205-en.pdf>

²² Joseph Henry Vogel, 2018 (September), "Not Just A Matter Of Matter: 'The Way Forward' For The UNCBD, NP And Half-Earth" Inside Views, second OP-ED of trilogy, *Intellectual Property Watch / International IP Policy News*, <http://www.ip-watch.org/2018/09/07/not-just-matter-matter-way-forward-uncbd-np-half-earth/> Available in Spanish: <https://www.ip-watch.org/2018/11/05/no-se-trata-solo-de-lo-material-el-camino-seguir-para-el-cdb-de-la-onu-el-pn-y-half-earth-mitad-de-la-tierra/>

²³ Although TEEB authors do not say "quixotic", the eponymous adjective best captures a reasonable interpretation of their conclusion. For a fuller explanation of the TEEB mistake, see pages 379-382 in Joseph Henry Vogel, et al, 2018, "Bounded Openness as the Modality for the Global Multilateral Benefit-Sharing Mechanism of the Nagoya Protocol", Chapter 26 of Charles R McManis and Burton Ong (eds), 2018, *Routledge Handbook of Biodiversity and the Law*, Routledge, London and New York. Available in Spanish open-access as Anexo 2, pages 132-135 in Manuel Ruiz Muller *Recursos genéticos como información natural*, see footnote 11. A creative-commons Chinese translation is also available from the author.

²⁴ David Ricardo, 1815, "Essay on the Influence of a Low Price of Corn on the Profits of Stock", London: John Murray. <https://la.utexas.edu/users/hcleaver/368/368RicardoCornLawstable.pdf>

Sponge and a Virus", forthcoming in 2021 from the ABS Capacity Development Initiative.²⁵ Entries include:

Bounded openness: Legal enclosures which default to, yet depart, from *res nullius* to the extent the departures enhance efficiency and equity, which must be balanced when in conflict (Peruvian Society of Environmental Law / SPDA, 2016).

Cognitive Dissonance: Confusion of low probability of an event as if the mathematical expectation were also low (probability multiplied by the value of the event). With respect to hits from bioprospecting, Providers and Users ignore modalities that would address the distribution of expectations.

Economics: Common to the many definitions is "resource allocation". The three objectives of the CBD and the very title of the Nagoya Protocol lend themselves to abstract reasoning about resource allocation.

Economics of Information: "Analysis of economic situations that involve information as a commodity. Because information is costly to produce but cheap to reproduce, market failures are common in markets for information goods and services as invention, publishing and software" (S&N). Classification of "genetic resources" as **natural information** triggers application of the **economics of information**.

Economic Rents: Payment in excess of the price that would obtain if markets were perfectly competitive. *See Price-equals-marginal cost.*

Efficiency: "Absence of waste, or the use of economic resources that produces the maximum level of satisfaction possible with the given inputs and technology" (S&N). The non-discussion of efficiency in the COP may reflect the **principal-agent problem**.

Fungibility: "Fungibility is a central notion in economics, though often unnoticed and unnamed. It means merely 'substitutable' and is in origin a Latin legal term meaning 'such that any unit is substitutable for another' (from fungor meaning 'do, discharge'). *A debt can be discharged with any money, not merely moneys from a particular account*" (italics added, abstract, McCloskey).

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

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

Nested Dominance Hierarchies: "Societies...are partitioned into units [and] can exhibit dominance both within and between the components...Team play and competition between human tribes, businesses, and institutions are also based upon nested hierarchies, sometimes tightly organized through several more or less autonomous levels..." (Wilson 1975, p. 287). Thirty-seven years after publishing those words, Wilson would double down: "In its power and universality, the tendency to form groups and then favor in-group members has the earmarks of instinct" (Wilson 2012, p. 59)

²⁵ Sociedad Peruana de Derecho Ambiental, 2021 (forthcoming in open access). "Fairness, Equity and Efficiency in the Convention on Biological Diversity and Nagoya Protocol: Analysis of a Rodent, a Snail, a Sponge and a Virus", Eschborn, Germany: ABS Capacity Development Initiative.

Principal-Agent Problem: “In a situation where one person (the principal) wants another person (the agent) to perform a task, the principal may find it difficult to monitor the agent’s behavior. The principal-agent problem is to design the agent’s incentives so that the principal’s expected gain is as high as possible.” (HSR).

Price-equals-marginal-cost: The rule derives from the marginalist revolution of the 1860s, associated with Stanley Jevons, Leon Walras and Alfred Marshall. In competitive markets, price is driven down to marginal cost of production, which approaches zero for information goods. *See economics of information.*

Race to the Bottom: A metaphor for fierce competition among Providers, where the bottom is the price paid for genetic resources expressed as a royalty percentage. Because the cost of physically accessing genetic resources may be as low as filling a zip-lock bag with scooped-up soil or gathering a few kilos of dry leaves, the price of genetic resources is largely the transaction costs of Material Transfer Agreements and other ABS agreements.

Ramsey Rule: "To minimize total excess burden, tax rates should be set so that the percentage reduction in the quantity demanded of each commodity induced by the taxes is the same" (HSR)

Sunk costs: The situation where future marginal costs exceed future benefits. The rational choice is to abandon the decision previously made. However, **cognitive dissonance** often kicks in. People do not lightly abandon costly decisions. Neither do ants. E.O. Wilson observes “*the more elaborate and expensive the nest is in energy and time, the greater the fierceness of the ants that defend it*” (italics in original) (Wilson 2012, p. 130).

Transaction costs: “The costs that arise beyond the point of production of a good to effect its allocation” (Marneffe). In the context of ABS, think lawyers. MTAs will never be sufficiently standardized to eliminate the need for counsel.

Value in exchange: The price paid for a good or service.

Value in use: Two distinct meanings of the term appear in the economic literature. The meaning for this Report refers to the utility derived from consumption of a good and service, and not to the present net worth of an asset. To complicate matters even more, value in use should not be confused with use value of biodiversity, which is measured by the values in exchange in consumption and production.²⁶

²⁶ References for lexicon: Garrett Hardin, 1993, *Living Within Limits*, New York: Oxford University Press; W., Marneffe, Bielen, C., Vereeck, L., 2015, “Transaction Costs” in Backhaus, J. (eds) *Encyclopedia of Law and Economics*, New York: Springer, https://doi.org/10.1007/978-1-4614-7883-6_484-1; Donald McCloskey, 1987, “Fungibility” in *The New Palgrave Dictionary of Economics*, London: Palgrave Macmillan, https://www.deirdremccloskey.com/docs/pdf/Article_280.pdf; Harvey S. Rosen, 1992, *Public Finance* 3rd Edition, New York: McGraw-Hill; Paul A. Samuelson and William D. Nordhaus, 2006, *ECONOMICS*, 18th ed, New York: McGraw-Hill; UN CBD Secretariat. Portal on Synthetic Biology. “Synthetic Biology”, <https://bch.cbd.int/synbio/>; —, Convention on Biological Diversity: ABS, “Introduction to Access and Benefit-Sharing”, <https://www.cbd.int/abs/infokit/all-files-en.pdf>; E. O. Wilson, 1975, *Sociobiology*, Belknap Press of Harvard University Press, Cambridge, MA; —, 2012, *The Social Conquest of Earth*, W.W. Norton, New York.

"The theory of the economics of information are [sic] relevant for natural information, but need to integrate the generation of information and its reproduction" (p. 22).

The wording is reminiscent of how creationists dismiss evolution as "Darwin's theory".²⁷ Technically yes, the economics of information, like evolution, is a theory. However, the theory is also an edifice.²⁸ To my knowledge, no economist refers to the "theory of economics of information". For all intents and purposes, one could substitute "economics" for the "the theory of economics of information" in the sentence above.

"Modelling of monetary benefits and costs of implementation (set up and maintenance) of each or a subset of policy options" (p. 22).

First-year students of economics believe that they will learn how to quantify value with the precision of an accountant. Professors of economics must disabuse them. The abstract concept of utility is subjective. Similarly, non-economists in the ABS discussion have routinely mistaken the market price of (unprotected) information as a proxy for value in use and so wrongly infer that any expectation of significant royalties through a multilateral mechanism is "speculative".²⁹

"Value of the information associated with GR and DSI should be considered/evaluated" (p. 22).

Value in exchange or value in use? The conflation frustrates ABS and goes back to the issue of value being subjective. Tremendous value in use exists even though the value in exchange may be a tiny fraction (think of life-saving drugs or vaccines whose patents have expired). How does the Note by the Executive Secretary get this so wrong? The economic literature relevant to ABS is not only ignored, but so too is the whole discipline.

²⁷ Stephen Jay Gould, 1981 (May), "Evolution as Fact and Theory", *Discover* 2: 34-37.

²⁸ Nobel Memorial Laureate Joseph E. Stiglitz classifies the economics of information as "a new paradigm [which] provides a markedly different, and better, lens for looking at the economy than the older perfect markets competitive paradigm". See "The Revolution of Information Economics: The Past and the Future", *NBER Working Paper No. 23780*, 2017 (September), JEL No. B21,D82,D83, https://www.nber.org/system/files/working_papers/w23780/w23780.pdf

²⁹ Joseph Henry Vogel, 2017, Peer Review of "The emergence and growth of digital sequence information in research and development: implications for the conservation and sustainable use of biodiversity, and fair and equitable benefit-sharing – a fact-finding and scoping study undertaken for the Secretariat of the Convention on Biological Diversity", p. 2, <https://www.cbd.int/abs/DSI-peer/Vogel,%20UPR.pdf>

"The phase of obtention of DSI from GR is more analogue while DSI access and reuse is more digital and will behave like information" (p. 22)

This is so wrong that it is not even wrong, to translate and paraphrase the Nobel physicist Wolfgang Ernst Pauli.³⁰ Even when a genetic resource cannot be dematerialized, the object of access is information. In writing *Fairness, Equity and Efficiency*, my co-authors and I were inspired by another Austrian Nobel physicist, Erwin Schrödinger:

A synthesis of economics and chemistry invites a thought experiment: denature the material transferred in an MTA [Material Transfer Agreement] and then perform R&D. By the First Law of Thermodynamics, the sample will have retained all of its matter, but by the Second, much of the associated information will be lost. One deduces that the 'material' in an MTA should not be interpreted as matter, though legally it is. The value lies in the information as the matter would still be there upon denaturation. A corollary exists: a sample returned in a pristine state to the property owner can also have lost all value in exchange, similar to denaturation, as the owner no longer has any leverage over granting access to the information therein.³¹

"The past 30 years' worth of literature on GR should bring answers on feasibility, challenges, values or markets of DSI" (p. 22).

The subject of the sentence is misidentified and the syntax, wrong. The past 30 years' worth of *applying economics to genetic resources has brought* answers on feasibility, challenges, values or markets of *natural information* (italics added to emphasize errors in the sentence above).

Economics has also moved forward over those past 30 years. Its frontier is behavioral for which two Nobel Memorial Prizes have been awarded in 2002 and 2017. The system failure of the fourteen Conferences of the Parties should remind all economists of the tremendous importance of psychology. The fallacy of sunk costs, the taboo over "natural information" and nested dominance hierarchies have all conspired against resolution of ABS. To move forward on ABS and deploy state-of-the-art economics, the COP must look this Gorgon in the face. Cold realism is required. Diplomacy is not.

³⁰ "Das ist nicht nur nicht richtig; es ist nicht einmal falsch!" Cambridge Forecast Group, <https://cambridgeforecast.wordpress.com/2010/12/15/wolfgang-pauli-the-truth-of-science-and-the-phrase-its-not-even-weong/>

³¹ See "Box 5: A Grand Bargain with Ex Situ Collections?" in Sociedad Peruana de Derecho Ambiental, 2021 forthcoming, *Fairness, Equity and Efficiency*, see footnote 22. The closing thought of this passage inheres to Arrow's Information Paradox, *Audiopedia*, <https://www.youtube.com/watch?v=PxbmkdAAIjc>

Where do we go now? The answer lies in Decision IX/12, which established "economic rent" as one of four questions for COP10. Despairingly but not totally unexpectedly, the question was deep-sixed en route to Nagoya:

Requests the Executive Secretary to invite, in consultation with the Co-Chairs of the Working Group, relevant experts to address the Working Group on Access and Benefit-sharing, *at the appropriate time*, on the following issues: Should economic rent be charged for access to genetic resources and what is the justification for such a rent or against such a rent? What should be the basis for the valuation of such rent?" (italics added).³²

DSI-the-neologism crashed with the AHTEG Report in February 2018. By commissioning four studies on DSI in November 2018, COP14 declared the term undead. The can. The kick. The road.³³ Attention was thus further diverted from the issue of rent expressed in Decision IX/12 of 2008.

The object of access for R&D is natural information, no matter what COP15 or future COPs decide. Reality exists. Re-boot is a fitting metaphor for perseverance with ABS.

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

³³ "Kick it down the road" was the metaphor heard at COP13. See Molly R. Bond and Deborah Scott, 2020 (December) "Digital biopiracy and the (dis)assembling of the Nagoya Protocol", *Geoforum*, vol. 117, <https://www.sciencedirect.com/science/article/pii/S001671852030227X#fn10>