Value Judgements and the Management of Digital Sequence Information under the International Access and Benefit Sharing Regime

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Introduction

The debate about how to deal with Digital Sequence Information (DSI) under access and benefit-sharing (ABS) laws came out of the discussions on synthetic biology under the *Convention on Biological Diversity* (CBD)[1] and its *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* (Nagoya Protocol).[2,3] When physical samples of genetic resources are taken from the environment, they are very often sequenced (their genetic code is determined) and that genetic sequence data is uploaded to open access sequence databases.[4] The concern of many biodiverse nations is that it is now possible to synthesise parts of genetic resources using that genetic sequence data (hence DSI), thereby accessing a version of the genetic resources without having to comply with the ABS laws and regulations that a country of origin has put in place for accessing the original physical genetic resource.[5]

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[1] (1992) 1760 U.N.T.S. 79 (CBD).

[2] Conference of the Parties to the Convention on Biological Diversity, *Report of the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity* (2010) UNEP/CBD/COP/10/27, [103] and Annex (Decision X/1, Annex 1, pp. 89-109) (Nagoya Protocol).

[3] *Ad Hoc* Technical Expert Group on Synthetic Biology, *Report of the Ad Hoc Technical Expert Group on Synthetic Biology* (2015) UNEP/CBD/SYNBIO/AHTEG/2015/1/3. This report states that one of the '[p]otential adverse effects of synthetic biology' under Objective 3 of the CBD (the fair and equitable sharing of benefits associated with the use of genetic resources) is the '[i]nappropriate access [to genetic resources] without benefit sharing due to the use of sequenced data without material transfer agreements' (p. 9).

[4] Charles Lawson and Michelle Rourke, 'Open Access DNA, RNA and Amino Acid Sequences: The Consequences and Solutions for the International Regulation of Access and Benefit-Sharing' (2016) 24(1) *Journal of Law and Medicine* 96, 97-99.

[5] See Charles Lawson, Michelle Rourke and Fran Humphries, 'Information as the Latest Site of Conflict in the Ongoing Contests about Access to and Sharing the Benefits from Exploiting Genetic Resources' (2020) 10 *Queen Mary Journal of Intellectual Property* 7, 19-26.

The positions on the DSI issue have largely split along similar lines as the North-South divide that informed the original negotiations for the CBD in the late 1980s.[6] As a generalisation, the biodiverse nations of the global South (generally providers of genetic resources) would like to see this DSI loophole closed in order to garner maximum benefits from the use of their genetic resources in scientific research and development (R&D), while the technologically advanced countries of the global North (predominantly users of genetic resources) would prefer that DSI remain open access, allowing for greater access for all parties and therefore greater innovation using those open access resources.[7] Negotiations about what types of information are covered by the term DSI, whether DSI is the appropriate term, and whether DSI should be subject to ABS regulations under the CBD and Nagoya Protocol are ongoing at the time of writing and without the serious consideration of multilateral benefit-sharing options, resolution of this issue seems unlikely.[8]

This chapter examines the assumption that some types of property rights over some R&D inputs encourage innovation, while property rights over other inputs can hinder scientific innovation, and how to determine the difference between the two. This is but one assumption that underlies the positions for and against the inclusion of DSI within the current ABS regime. In 1996, intellectual property scholar, James Boyle examined multiple legal issues of information control through the lens of what he termed 'the romantic vision of authorship' in his book *Shamans, Software, & Spleens: Law and the Construction of the Information Society*.

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[6] See Ranee Panjabi, *The Earth Summit at Rio: Politics, Economics and the Environment* (Northeastern University Press, 1997). Also, '[w]here the developed countries/users believe that DSI is not covered/excluded, provider countries, mostly developing, stick to their argument that genetic material includes genetic information and thereby DSI falls within the definition of genetic resources. The mismatch in ownership and technological capacity has given rise to a dichotomy': Deepa Kharb, 'The Legal Conundrum over Regulation of Access and Benefit Sharing Obligations in Digital Sequence Information over Genetic Resources - Assessing Indian Position' (2021) 24 *Journal of World Intellectual Property* 152, 158.

[7] In one recent study of stakeholders' opinions, Sirkaya found: 'while the majority of the users do not favor the inclusion of DSI within the material scope, the majority of the provider countries do. This of course does not come as a surprise; however, an interesting point noted during the discussions is that even some of the provider country representatives admit that the inclusion would likely hamper the research, also for the local researchers in provider countries': Aysegul Sirakaya, 'Balanced Options for Access and Benefit-Sharing: Stakeholder Insights on Provider Country Legislation' (2019) 10 *Frontiers in Plant Science* 1175, p. 13.

[8] See Open-Ended Working Group on the Post 2020 Global Biodiversity Framework, *Digital Sequence Information on Genetic Resources* (2021) CBD/WG2020/3/4, Annex II.

His analysis of the famous case of *Moore v Regents of the University of California* (1990)[9] may be informative to those involved in the DSI debate, particularly members of the global North, as it asks us to examine our attitudes on the role of property rights in the biological sciences and the history and assumptions that underlie them. Boyle argues that:

> … the *Moore* case may indicate both the contentious value judgements loaded into the conceptual structure of authorship and the way that discussions of entitlement to control information are carried out through the metaphor of 'authorship', even in fields far from copyright.[10]

One of those fields, arguably not *that* far from copyright, is the DSI debate. As this chapter will show, like the *Moore* case, the DSI debate deals with both the sources (providers) of genetic information and the users of genetic information, and how each party sees their own role in the R&D process. In both the *Moore* case and the DSI debate, users of genetic information tend to devalue the sources of that information, often arguing that assigning property rights to sources would discourage innovation. Those same users, however, are happy to assign property rights to the information *they* produce on the basis that it will encourage research and innovation. This is because, as Boyle puts it, 'we are driven to confer property rights in information on those who come closest to the image of the romantic author, those whose contributions to information production are most easily seen as original and transformative'.[11]

The DSI debate is about Nation States being able to exercise their sovereign authority over not only their physical genetic resources but also the DSI derived from or associated with their genetic resources. DSI is a placeholder term, the scope of which is yet to be determined.[12] While not technically a property right, sovereign authority extended to genetic resources can

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[9] 793 P.2d 479 (Supreme Court of California, 1990).

[10] James Boyle, *Shamans, Software, & Spleens: Law and the Construction of the Information Society* (Harvard University Press, 1996) p. 107.

[11] Ibid., p. x.

[12] 'The term "digital sequence information" is introduced in decisions CBD XIII/16 and Nagoya Protocol NP-2/14. Terms more commonly employed by the scientific community and databases include genetic sequence data, nucleotide sequence data, nucleotide sequence information, and genetic sequences': *Ad Hoc* Technical Expert Group on Digital Sequence Information on Genetic Resources, *A Fact-finding and Scoping Study on Digital Sequence Information on Genetic Resources in the Context of the Convention on Biological Diversity and the Nagoya Protocol* (2018) CBD/DSI/AHTEG/2018/1/3, [4].

be considered 'akin to a *form* of private property rights' (emphasis added).[13] The relationship between intellectual property and sovereign rights in the CBD and Nagoya Protocol is a complicated one. For starters, the assertion of sovereign rights over genetic resources by the global South during the negotiations for the CBD can be viewed as a backlash to the expansion of intellectual property rights over genetic resources by the global North in the preceding decades.[14] Additionally, the CBD 'recogniz[es] that patents and other intellectual property rights may have an influence on the implementation of this [CBD]' and asks Contracting Parties to 'cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its [the CBD's] objectives'.[15] Even so, these two forms of property (intellectual property and sovereign authority) over genetic resources can form overlapping and conflicting claims,[16] but they are presented as separate rights in this chapter to simplify the discussion. The chapter will start with an outline of *Moore v Regents of the University of California* (Supreme Court of California, 1990), followed by a brief summary of Boyle's 1996 analysis of that case using the paradigm of authorship, and finally highlight some of the assumptions present in both the *Moore* case and the current DSI debate.

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[13] '"Sovereign rights" must be examined in two different contexts. At the international level, sovereignty implies that there is no authority superior to that of the state and that all states are juridically equal. It constitutes the basic principle around which international relations are organised. At the domestic level, the state is the repository of sovereign rights and their assertion is akin to a form of private property rights as the state acquires all the rights over a given resource when it asserts direct ownership of the same': Philippe Cullet, 'Property Rights Regimes over Biological Resources' (2001) 19 *Environment and Planning C: Government and Policy* 651, 652. See also the chapter in this volume by Todd Berry on the term 'sovereign rights' in the CBD.

[14] Sabrina Safrin, 'Hyperownership in a Time of Biotechnological Promise: The International Conflict to Control the Building Blocks of Life' (2004) 98 *The American Journal of International Law* 641, 644-652.

[15] CBD, Art. 16.5.

[16] For instance, a company may hold a patent for a drug where the active ingredient is a modified version of a biochemical compound found only in a particular plant. That plant and its derivatives are subject to the sovereign authority of the nation state from which it was collected. In this instance, it may not be entirely clear where the rights of the nation state end and those of the patent holder begin, and indeed, their interests may overlap.

***Moore v Regents of the University of California* (1990)**

The *Moore v Regents of the University of California* (1990) case is a staple of intellectual property law classes in the United States and other common law jurisdictions.[17] The 1990 ruling has been examined at length elsewhere[18] so the details of the case will be kept short here. This, of course, omits a lot of details that are pertinent to the case as a whole, keeping only the detail necessary for our purposes.

In 1976, John Moore was treated for hairy cell leukaemia by a cancer physician and researcher, Dr David Golde, at the University of California, Los Angeles (UCLA) Medical Centre. As part of his treatment, Moore consented to have his spleen removed on 8 October 1976. However, Moore was not aware that Dr Golde had arranged to have the spleen taken to a research unit at UCLA where his cells were used to develop the Mo cell line (for which a United States patent was issued in 1984).[19] The Mo cell line was useful because Moore's cancer had transformed these cells into efficient producers of various proteins, 'including colony-stimulating growth factor and human immune interferon'.[20] The UCLA researchers, including Dr Golde, had negotiated deals for the development of the cell line with two commercial entities, for which UCLA and the researchers were paid.[21]

Moore found out about the commercial use of his cells in 1983 and decided to file suit against his physician, the Regents of the University of California and the two companies,[22] for multiple

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[17] The issues raised by this case are also worthy of medical ethics (issues of consent) and philosophy classes. Ward states that 'the newness of the technology and procedures involved made it difficult to explain exactly what the issues [encompassed by the *Moore* case] were. In the end, *Moore* was primarily about patent law': Priscilla Ward, 'What's in a Cell?: John Moore's Spleen and the Language of Bioslavery' (2005) 36 *New Literary History* 205, 206.

[18] See, for examples, Benjamin Applebaum, 'Moore v. Regents of the University of California: Now that the California Supreme Court has Spoken, What has it Really Said?' (1992) 9 *NYLS Journal of Human Rights* 495; Michelle Bray, 'Personalizing Personality: Toward a Property Right in Human Bodies' (1990) 69 *Texas Law Review* 209.

[19] David Golde and Shirley Quan, *Unique T-lymphocyte line and products derived therefrom*, US4438032A, United States of America Patent (1984).

[20] Mark Crawford, 'Court Rules Cells are the Patient's Property' (1988) 241 *Science* 653, 653.

[21] Ibid.

[22] Applebaum, above n. 18. Ward notes the circumstances of Moore's discovery: 'Growing suspicious about the real nature of his semi-annual required trips to the UCLA Medical Center to have his blood drawn, as well as for

breaches including the property offence of conversion of Moore's cells.[23] The property issues in the case could be interpreted in different ways: 'Moore could be viewed as asking to commodify his own body part or seen as the victim of theft of his most private and inalienable information. It depended on the framing of the account'.[24] The trial court dismissed the case on the ground that there was no cause of action, but in 1988 the appellate court stated there was a cause of action and decided that Moore had a general property right in his body. In 1990, the California Supreme Court reversed this decision 4-2, ruling that there was no course of action in conversion, and that Moore did not own his cells after they had been surgically removed from body.[25]

The 'romantic view of authorship' and the DSI debate

In *Shamans, Software, & Spleens: Law and the Construction of the Information Society,* Boyle delves deeply into the inconsistent logic about property found throughout the majority opinion.[26] Boyle's analysis shows that the court asserted that harm is done to innovation and R&D when the sources of genetic information (Moore in this case) are given property rights over the 'raw material' inputs to science,[27] yet innovation is somehow encouraged when those inputs are transformed into outputs by the 'ingenuity' of his doctors and protected through intellectual property.[28] Never mind that quite often those protected outputs are used as inputs

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other procedures, Moore questioned Golde [Moore's physician] about the purpose of those visits. When no satisfactory answer was forthcoming, he hired a lawyer': Ward, above n. 17, 208.

[23] 'To recognise that the tort of conversion is in part concerned with 'unauthorized use' is still to beg the question of whether Moore has a proprietary interest in his cells which will allow him to utilise the law of conversion at all': Debra Mortimer, 'Proprietary Rights in Body Parts: The Relevance of Moore's Case in Australia' (1993) 19 *Monash University Law Review* 217, 228-229.

[24] Ward, above n. 17, 209.

[25] Overturning a 1988 decision by the intermediate appellate court in California that stated a patient did have a right to control the use of his tissues after they had been surgically removed: see *Moore v Regents of the University of California*, 793 P.2d 479 (Cal. 1990).

[26] Boyle was not the first to highlight the inconsistency of the court's reasoning. Bray asserts '[t]he court expressed a cacophony of views through dissenting and concurring opinions. Even the majority sidestepped the issue of characterizing individuals' bodily interests and instead disposed of the case on public policy grounds', Bray, above n. 18, 234.

[27] 'When the court discussed genetic information, it viewed Moore as a "naturally occurring raw material," a public domain to be mined by inventive geniuses:' Boyle, above n. 7, p. 107.

[28] Ibid., p. 106.

to further R&D.[29] Boyle points out that these contradictions make no sense unless viewed through the lens of the romantic view of authorship. It is the 'hook on which to hang' information property rights:[30]

> Viewed through the lens of authorship, Moore's claim appears to be a dangerous attempt to privatize the public domain and inhibit research. The scientists, however, with their transformative, Faustian artistry, fit the model of original, creative, labor. For them, property rights are necessary to encourage research. Concern with the public domain fades away as if it had never existed. What should we think about this desire to cast around in every situation until we find the people who most resemble authors, whereupon we confer property rights on them?[31]

These same ideas can be found in the DSI debate (and its precursor debates about resource sovereignty and ABS under the CBD and Nagoya Protocol). The global North is (and its industries are) certain that any ABS restrictions on DSI would be detrimental to R&D.[32]

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[29] 'There are numerous costs associated with licensing patents. For example, there are costs in analyzing what patents apply or cover a commercial application and in determining ownership of upstream inputs': Michael Mireles, 'An Examination of Patents, Licensing, Research Tools, and the Tragedy of the Anticommons in Biotechnology Innovation' (2004) 38 *University of Michigan Journal of Law Reform* 141, 171.

[30] Boyle, above n. 7, p. 98.

[31] Ibid., p. 107.

[32] Some examples as follows: (1) Government of the United States: 'We consider that moves to force changes to procedures for information management within laboratories would also carry significant costs and have negative implications for innovation. In our view, these dynamics could stifle research, hindering progress in agriculture, human and animal health, and other sectors': *Ad Hoc* Technical Expert Working Group on Digital Sequence Information on Genetic Resources, *Compilation of Views and Information on Digital Sequence Information on Genetic Resources Submitted Pursuant to Paragraphs 9 and 10 of Decision 14/20* (2020) CBD/DSI/AHTEG/2020/1/INF/1, p. 44; (2) Wellcome Sanger Institute: 'The inclusion of DSI within scope of the Nagoya Protocol will exacerbate these issues [of legal uncertainty], cause delays to other research projects and hinder scientific progress': CBD/DSI/AHTEG/2020/1/INF/1, ibid., p. 106; (3) GlaxoSmithKline: 'Including DSI within Nagoya/CBD … would introduce excessive obligations which would deter potential users': GlaxoSmithKline, *GSK Public Policy Positions: The Convention on Biological Diversity (CBD)* (2018) p. 4 available at <https://www.gsk.com/media/2935/biological-diversity-policy.pdf>; (4) International Seed Federation: 'Regulating the access and utilization of DSI would have far-reaching negative effects on basic and applied research': International Seed Federation, *Position Paper on Digital Sequence Information,* (2018) p. 2 available at <https://www.worldseed.org/wp-content/uploads/2018/06/20180606_PositionPaper_Digital-Sequence-Information.pdf>; (5) 'European scientists are warning that a push to include "digital sequence information" in an international agreement against biopiracy could stifle research, hamper the fight against disease outbreaks, and even jeopardize food safety': Kai Kupferschmidt, 'Biologists Raise Alarm over Changes to

Meanwhile, the North is happy to tolerate some restrictions on other types of genetic information (even if they are tools that directly enable R&D) on the basis that this will encourage R&D.[33] Looking at the DSI debate through the lens of the romantic view of authorship, calls to include genetic information in the ABS regime created by the CBD and Nagoya Protocol look like 'dangerous attempt[s] to privatize the public domain and inhibit research'.[34] Just as Boyle wonders about the court in its majority opinion in *Moore,* we should be asking how the global North can tell 'when property rights will have the effect of stopping the flow of information and when they will be necessary to start that flow?'[35] The split of opinions on this issue therefore appears somewhat ideological and 'likely reflects attempt[s] to cloak self-interest in more palatable clothing'.[36]

To reiterate, the fact that positions on the DSI issue tend to break along the North/South divide should indicate that this is about interests and values, not about objective assessments of the impact sovereign rights over genetic resources and associated information will have on innovation. The exact argument has been made in opposition to the ABS policy proposal that country of origin disclosures be a requirement on patent applications, where 'developed countries that are opposed to a disclosure requirement in any form have argued that such a

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Biopiracy Rules' (2018) 361 *Science* 14. The corollary is that open access to DSI encourages innovation: 'The use of digital sequence information on genetic resources increases the value of biological diversity and enables scientific progress and innovation': Australian Government, *Digital Sequence Information on Genetic Resources: Submission of Views and Information and Call for Expression of Interest to Undertake Studies*, Australia's Submission to CBD Notification 2019-012 (2019) p. 3 available at <https://www.cbd.int/abs/DSI-views/2019/Australia-DSI.pdf>.

[33] In their 2008 book, Boldrin and Levine examine the question: 'Because innovators may be rewarded even without patents and copyright, we should ask, is it true that "intellectual property" achieves the intended purpose of creating incentives for innovation and creation that offset its considerable harm?', concluding that there is no evidence that intellectual property does increase innovation: Michele Boldrin and David Levine, *Against Intellectual Monopoly* (Cambridge University Press, 2008) p. 7.

[34] Boyle, above n. 7, p. 107 (original quote is in reference to the *Moore* case, not the DSI debate).

[35] Ibid., p. 101.

[36] Edward Hammond's comments in Kupferschmidt, above n. 32.

requirement would stifle innovation, and have called for evidence on the impact of mandatory disclosure requirements on innovation'.[37]

There are restrictions to all sorts of inputs to the R&D process, so the arguments about stifling innovation simply come down to what inconveniences the global North is willing to tolerate. While the global North is prepared to accept the bureaucratic burden that is tracking and tracing patented inputs to foundational and commercial R&D in the biological sciences,[38] there is an unwillingness to entertain the idea of tracking and tracing DSI inputs for the purposes of ABS.[39] Both processes are inefficient,[40] but the former is accepted as just part of the costs of conducting R&D, while the latter is considered an intolerable burden.[41]

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[37] Nirmalya Syam and Thamara Romero, *Misappropriation of Genetic Resources and Associated Traditional Knowledge: Challenges Posed by Intellectual Property and Genetic Sequence Information*, Research Paper No. 130 (South Centre, 2021) p. 38.

[38] For example, cell lines, antibodies, plasmids, nucleic acids, laboratory machinery, laboratory animals: see Michael Mireles, 'An Examination of Patents, Licensing, Research Tools, and the Tragedy of the Anticommons in Biotechnology Innovation' (2005) 38 *University of Michigan Journal of Law Reform* 141, 148-150.

[39] 'The practicality of requiring [prior informed consent] for access to DSI is another aspect of the discussions that has generated strong reactions to date, especially from users of DSI, such as researchers in the academic and private sectors, as well as administrators of large publicly funded databases and a significant number of governments. They argue that the way in which DSI is produced, stored, transmitted and used make it impossible to control access to data and require [prior informed consent]': Elizabeth Karger, Pierre du Plessis and Hartmut Meyer, *Digital Sequence Information on Genetic Resources (DSI): An Introductory Guide for African Policymakers and Stakeholders* (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH, 2021) p. 7.

[40] 'The fact is that providing access in a timely manner would be challenging and track and trace [of DSI] would be inefficient for both the users and providers': Aysegul Sirakaya, Klaas De Brucker and Thomas Vanagt, 'Designing Regulatory Frameworks for Access to Genetic Resources: A Multi-Stakeholder Multi-Criteria Approach' (2020) 11 *Frontiers in Genetics* 549836, p. 14.

[41] 'In effect, what Moore is asking us to do is to impose a tort duty on scientists to investigate the consensual pedigree of each human cell sample used in research. To impose such a duty, which would affect medical research of importance to all of society': *Moore v The Regents of the University of California*, 793 P.2d 479, 135 (Cal. 1990). Mortimer counters that '[i]t is clear that all persons who deal with human tissue should be concerned that it was properly obtained. Granting or withholding property rights to the donor should not alter that concern': Mortimer, above n. 23, 227.

Conclusion

There are parallels between Boyle's analysis of the assumptions underpinning the legal control of information in the *Moore* case, and the current debates about the control of DSI through ABS law. There are echoes of the past here, where sources of genetic information (Moore himself, or provider nations of the global South) are devalued because the deeply held Western paradigm of authorship tells us that the only version of genetic information with value worthy of recognition is the version *created* by the genius of an author (or a scientist, as the case may be). We need to question the romantic view of authorship that tells us that:

> On the one hand, property rights given to those whose bodies can be mined for valuable genetic information will hamstring research because property is inimical to the free exchange of information. On the other hand, property rights *must* be given to those who do the mining, because property is an essential incentive to research (emphasis in original).[42]

This chapter is not an attempt to argue that the regulation of DSI under the current ABS scheme would encourage innovation.[43] It is simply an attempt to point out that the logic the North uses to justify some forms of property rights over information and deny sovereign rights over information is shaky, and that the global North are prepared to tolerate some impediments to R&D when it suits their interests, but not when it suits the interests of the global South.[44] Put simply, 'research is not an innocent or distant academic exercise but an activity that has something at stake and that occurs in a set of political and social conditions'.[45] And that means the North asking themselves some uncomfortable questions about how, despite their persistent

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[42] Boyle, above n. 7, p. 24.

[43] The author is not aware of anyone who has attempted to make such an argument.

[44] The African Group points out: 'In the same way that the public benefits from many patented technologies, yet the patent holders are still entitled to monetary benefits, providers of genetic resources and the "DSI" obtained from their utilization, are still entitled to the possibility of monetary and specific non-monetary benefits DSI utilization': African Group of Negotiators, *Digital Sequence Information on Genetic Resources: Submission of Views and Information on Terminology, Scope, and Domestic Measures on Access and Benefit Sharing,* African Group of Negotiators' Submission to CBD Notification 2019-012 (2019) p. 8 available at <https://www.cbd.int/abs/DSI-views/2019/AfricanGroup-DSI.pdf>.

[45] Linda Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous Peoples* (2nd Edition, Zed Books, 2012) p. 5.

claims that open access to DSI is a form of benefit sharing,[46] there remains a huge gap between how technologically advanced countries of the global North and the biodiverse nations of the global South can capitalise on that open access.[47] But the answer is not then to lock up DSI within an inefficient and ineffective form of regulation because access to DSI does remain important for R&D. It is to ensure that countries of the global South have enhanced opportunities to capitalise on that open access so it truly is beneficial for all.

The CBD was about biodiversity conservation, sustainable use, and equity and fairness, but ABS was not designed as the sole means of achieving these goals. The North need to think more seriously about enhancing capacity building and technology transfer efforts while continuing to argue for DSI to remain open access. We are in the midst of an ecological catastrophe and ABS has not helped thus far. Putting any faith in its ability to generate benefits from DSI (and to distribute those benefits in a fair and equitable way) would be a folly. But drawing the battle lines between North and South with the high stakes set as biodiversity conservation as planned in the Post-2020 Global Biodiversity Framework and a negotiated settlement on DSI and ABS *or* neither, is also a poor outcome for everyone. As Boyle might

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[46] 'Japan believes that open access to DSI/GSD [Genetic Sequence Data] is a form of benefit-sharing': Government of Japan, *Digital Sequence Information on Genetic Resources: Submission of Views and Information and Call for Expression of Interest to Undertake Studies*, Government of Japan's Submission to CBD Notification 2019-012 (2019) p. 2 available at <https://www.cbd.int/abs/DSI-views/2019/Japan-DSI.pdf>; '[P]ublic databases and open access to their data are a form of non-monetary benefit sharing and contribute to the fair and equitable sharing of benefits': European Union and its Member States, *Submission by the EU and its Member States to CBD Notification 2019-012: Digital Sequence Information on Genetic Resources: Submission of Views and Information and Call for Expression of Interest to Undertake Studies,* European Union and its Member States' Submission to CBD Notification 2019-012 (2019) p. 2 available at <https://www.cbd.int/abs/DSI-views/2019/EU-MS-DSI.pdf; Government of Canada, *Digital Sequence Information on Genetic Resources: Submission of Views and Information and Call for Expression of Interest to Undertake Studies,* Government of Canada's Submission to CBD Notification 2019-012 (2019) p. 7 available at <https://www.cbd.int/abs/DSI-views/2019/Canada-DSI.pdf>.

[47] 'The research community is also in the favor of open access and no regulation model. The argument put forth by them is that the open access model constitutes a sufficient benefit sharing but for the developing counties without technical capacity to use such DSI, this type of benefit sharing is of no use', Kharb, above n. 6, 7. In fairness, the EU has a more nuanced view than most in the global North about who is able to enjoy access to open science: 'the EU and its Member States acknowledge that many countries may lack capacity to generate, access and use digital sequence information on genetic resources. Lack of capacity in this regard can hinder the successful implementation of the three objectives of the CBD': European Union and its Member States, ibid., p. 2.

have cautioned, the global North need to revisit their conceptual structure of authorship and review their contentious value judgements in seeking to control information, recognising that those controls and subsequent benefits need to be settled fairly and equitably.