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Manuscript Type: Essay, invited submission for special issue on Indigenous Data Sovereignty

Manuscript Title: A Philosophical Framework for Indigenous Data Sovereignty and Biobanking

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The manuscript has not been previously published and is not under review elsewhere.

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Abstract (164 words):

The premise of this paper is that philosophical questions about the nature of biological data have the power to help guide the implementation of Indigenous Data Sovereignty. I begin by considering two views of data: the correspondence view and the pragmatic view. Then, I argue that the pragmatic view is better suited to realizing Indigenous Data Sovereignty than the correspondence view for two reasons. First, the pragmatic view shares more affinities with North American Indigenous philosophies than the correspondence view. Second, the pragmatic view helps translate scientists' generically virtuous goals of "understanding" and "improving" the world with biodata into practical goals fit for the judgement of Indigenous communities. Next, I argue that the creation of Indigenous-led biobanks is a promising strategy for realizing Indigenous Data Sovereignty because such institutions have the potential to reshape the trajectory of the biological sciences. Finally, I suggest a two-leveled governance structure and policies that Indigenous-led biobanks can adopt to realize the goals of Indigenous Data Sovereignty.

A Philosophical Framework for Indigenous Data Sovereignty and Biobanking

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1. Introduction

The premise of this paper is that philosophical questions about data have the power to help guide the implementation of Indigenous Data Sovereignty (IDS). IDS is an intellectual-political movement whose aim is to organize Indigenous communities' sovereign power to use their data in ways that benefit their people. This paper focuses on implementing IDS in the biological sciences and so is concerned with biological data, or biodata.

The phrase "Indigenous biodata" is likely to conjure images of samples taken from the bodies of Indigenous people. While these are certainly instances of Indigenous biodata, the category is much more expansive.[1] Insofar as Indigenous communities retain sovereign power over land, data about living processes on that land also constitute Indigenous biodata (e.g. animals, plants, community wastewater, soil microbiomes). Additionally, traditional knowledge held by Indigenous peoples about the living world is Indigenous biodata.

These many manifestations of Indigenous biodata are becoming increasingly valuable to the Western scientific-industrial complex. Whether it's genetic data from Indigenous populations with historically low admixture, plant specimens found only on Indigenous lands, traditional medicinal knowledge, or the ancient remains of Indigenous ancestors, Western scientists and companies value Indigenous biodata for reasons that are orthogonal to the wellbeing of Indigenous peoples. Indeed, Indigenous peoples have historically received little benefit and much harm from Western science and industry.

Thus, a familiar scene is set. Indigenous communities ostensibly control a valuable resource. Indigenous communities express a common aspiration to use that resource to improve their lives. Yet, this aspiration is thwarted, not just by a history of settler-colonial domination that has limited their capacity to use the resource, but also by outside forces who desire the resource for their own purposes. The goal of this paper is to tailor a philosophical framework to the task of implementing IDS so this familiar scene does not end in a familiar way.

Specifically, I argue that the philosophical stance one adopts toward *the concept of data* matters for realizing IDS. Many proponents of IDS have noted that the concept of data is contested, value-laden, and philosophically complex without fully engaging with the question of what an IDS view of data ought to look like. For example, they make statements such as "The concept of data is imbued with a host of meanings within and across contexts. To some, it is simply information, while, for others, it is the very pulse of a revolution,"[2] "The idea of data is a broad concept, but in the context of this chapter, we define data as information that may be recorded in various forms,"[3] "A particularly salient concern is the concept of 'data', which is itself a socially constructed field with epistemologically diverse underpinnings and corresponding issues of validity, relevance, application and dissemination."[4] In what follows, I compare different philosophical approaches to the concept of data to show how some approaches are better suited to being adapted to the goals of the IDS movement.

Western philosophy is messy, but practitioners generally agree that it currently encompasses three broad traditions: analytic, continental, and pragmatic. It is hard to draw general comparisons between these traditions because each school encompasses such diverse views. Still, painting in broad strokes, analytic philosophy has distinguished itself through the use of formal logic and its ability to build and scrutinize arguments in terms of logical

inferences. Continental philosophy stands out for its historical self-awareness, attention to lived experience, and engagement with cultural and political problems. Pragmatic philosophy emphasizes the practical consequences of abstract ideas, the value of empirical inquiry, and metaphysical skepticism.

Maggie Walter and Michele Suina have drawn on the continental tradition, and the work of Edmund Husserl in particular, to argue that Indigenous data must be framed through the "Indigenous Lifeworld".[5] In keeping with the continental tradition, their proposal emphasizes the importance of subjective experience and humanity's capacity to produce radically different experiences based on historical, social, political, and cultural contexts. I do not engage with the continental tradition in this essay, but I believe the position I develop is compatible with Walter and Suina's proposal. I see us as engaged in the common project of selectively adapting the tools of Western philosophy to the ends of IDS. In pursing this project, a strength of continental philosophy is its sensitivity to facets of human life—like politics, society, and culture—that are necessary for articulating an Indigenous perspective on anything. These aspects of human experience are often ignored by the pragmatic and (especially) the analytic traditions. However, a weakness of continental philosophy is its vagueness. It tends to furnish itself with extraordinarily ambiguous ideas that are difficult to connect to more practical, action-guiding policy concepts. As a result, there always seem to be many competing interpretations of how to apply the insights of continental-style philosophizing. As I argue below, the pragmatic tradition provides tools that can compensate for this weakness.

Before continuing, it is important to be explicit about how this paper fits into the intersection of Indigenous and Western philosophy. Dale Turner proposed a three-way division of Indigenous philosophy that is useful for demarcating what this paper does and does not

attempt to accomplish.[6] First, Indigenous peoples can study Indigenous philosophy "from the inside" as an inherently valuable exercise that needs no connection to the dominant Western culture of academic philosophy. Second, Indigenous peoples can bring Indigenous philosophy into conversation with Western philosophy to explore cross-cultural comparisons. Third, Indigenous intellectuals can "engage European ideas as both a philosophical exercise and political activity" to defend "the legal and political status of indigenous nationhood." In this third mode of Indigenous philosophy, Turner emphasizes the problem of articulating how Indigenous worldviews are different and why those differences ought to matter for the way Indigenous peoples engage in the dominant culture's political and legal practices. Turner writes,

"[H]ow do we explain our differences and in the process empower ourselves to actually change the state's legal and political practices? Indigenous peoples have been consistent throughout the five-hundred years since contact when explaining their world views, but far less successful at bringing about change in the Eurocentric philosophical theories and practices of justice. It is one kind of activity to speak or write about indigenous philosophy; it is quite another to weave indigenous thinking into Western philosophical thinking (or vice versa). To complicate matters epistemologically and politically (or at least it ought to complicate matters), any hopes for a rich dialogue must be articulated in the language of the dominant culture."

This paper contributes to the third style of Indigenous philosophizing by arguing that IDS proponents should adopt a pragmatic stance to the concept of data. They should adopt this stance because within the Western philosophical tradition, pragmatism is uniquely well suited to the task of explaining how different Indigenous worldviews should lead to different political and legal practices. In other words, this paper is about locating a tradition within the Western

philosophical landscape that is most fertile for growing an Indigenous philosophy that furthers IDS while remaining intelligible to the dominant culture.

In the next section, I introduce two different philosophical approaches to thinking about the resource of biodata, and I endorse the pragmatic approach over the more analytic correspondence approach in section three. In section four, I argue that the pragmatic view of data supports the creation of Indigenous-led biobanks to achieve IDS. In section five, I show how the pragmatic view of biodata can guide Indigenous biobanking policy.

2. **Two Ways of Thinking about Biodata**

Consider these questions:

I. What makes something data?

II. What determines the meaning of data?

The answers to (I) and (II) are fundamental to any philosophical account of data. But as is common in philosophy, consensus breaks down quickly. Thinkers from different times and places have proposed radically disparate approaches to these questions. So, the first point to appreciate is that despite the popularity of phrases like "data science", "big data", and "data-driven decision making", the nature of data remains an open question.

The second point to appreciate is why the nature of data remains an open question. Building a philosophical account of data is difficult because the concept of "data" is deeply tied to two of the of the most recalcitrant and perplexing problems in philosophy. Namely, the problems of truth and meaning. On the face of it, one of the defining characteristics of data seems to be its capacity to *represent* things. Put differently, data are always data *about* something. Or to use more modern technocratic language, data carry *information about* things.

As evidenced by the quotes in section 1, a popular way of defining data is to invoke the concept of information by saying something like, "Indigenous data is information about Indigenous phenomena". The problem with these definitions is that the concept of information does not provide any answers to the problems of meaning or truth. So, in the context of trying to answer these questions, defining data in terms of information is like trying to clean up pasta sauce with Kool-Aid. Progress is illusory, and one is likely to end up with a larger mess than one started with.[7] Whether one articulates the meaningful nature of data in terms of *representation*, *about-ness*, or *information*, the result is the same: to build a philosophical account of data, one must face the problem of clarifying what meaning is. How can one thing mean another thing? Providing a good answer to this question has proven difficult for philosophers.

When philosophizing about data, the problem of meaning is connected to the problem of truth because another important characteristic of data is that its meaning can be true or false. Data vary in quality. Data can represent the world accurately or inaccurately. But clarifying what makes the meaning of a datum true or false has also proven difficult for philosophers because the distinction between truth and falsity is one of the most basic distinctions in the philosopher's conceptual toolkit. Western philosophers tend to value consistency and generality. If they build an account of truth/falsity in one context, they want it to apply to all other contexts that appeal to the distinction. Thus, any answer to the question of what makes something true or false will have repercussions affecting many other philosophical endeavors. Building an account of truth that makes sense in all these contexts is hard. In this section, I focus on two broadly popular and influential approaches to answering these difficult questions: the correspondence way and the pragmatic way.

The correspondence way is popular within the analytic tradition. It answers these questions by emphasizing a special kind of correspondence relationship between a datum and some aspect of the world.[8] For example, a picture of a hand produced by x-ray imaging is biodata. What makes the x-ray image an instance of data is its special relationship with the hand. The configuration of light and dark in the x-ray image are such that they *represent* or *reflect* some aspect of the world. In this case, the structure of bones in the hand. Put differently, the image is data because it was created in such a way that it *captures*, *preserves*, or *reveals* some aspects of *the way things are* in the world. In this example, the data *carry meaning about* the hand because that is the specific aspect of the world the data represent or correspond to. When philosophers try to articulate the defining features of this special correspondence relationship, they sometimes invoke the mathematical notion of isomorphism because it gets at the intuition that data are things that preserve the structure of the world. On the correspondence view, data are like little mirrors reflecting things in the world. The more faithfully these mirrors reflect the world, the better or more true the data.

Alternatively, the pragmatic way says that the x-ray image only becomes data when someone *uses it as evidence* to support claims or actions. See Sabina Leonelli's work for a well-developed pragmatic account of data in the biological sciences.[9] Whereas the correspondence way presents a dyad between data and the world, the pragmatic way presents a triadic relationship between data, aspects of the world the data are supposed to represent, and an agent who uses the data to do something. On the pragmatic view, the x-ray picture of the hand is not necessarily about the hand. The meaning of the data—what the data are about—is determined by the role it plays in human action. If someone uses the picture to justify claims about how x-ray radiation interacts with the various materials the picture is printed on, then that is what the data

are about, not the bone structure of the hand. Human desire plays an ineliminable role in making something data and determining its meaning. The analogy here is not that of little mirrors reflecting the world, it is of a person improvising a tool to complete a specific job. The better the improvised tool at accomplishing the job, the better or more true the data.

	Correspondence View	Pragmatic View
(I) What makes something data?	It has a special correspondence relationship with some aspect of the world.	Someone uses it to justify a claim or action.
(II) What determines the meaning of data?	The aspect of the world the data corresponds to.	The claim or action the data is used to support.

Big, broad questions like (I) and (II) have attracted diverse thinkers over the millennia. When people come to these questions via different lines of inquiry, they carry different prior commitments that bias them toward one way of thinking over another. I originally came to these questions as a historian and philosopher of science interested in explicating the concept of meaning in neurophysiological experiments, and that journey has led me to endorse the pragmatic way of thinking about data and meaning. However, the reasons I discovered for believing the pragmatic way over the correspondence way are mostly outside the scope of this paper. Instead of diving into a philosophical defense of the pragmatic tradition, I will now argue that the pragmatic way is more conducive to realizing IDS than the correspondence way. This is a pragmatic argument for adopting a pragmatic way of thinking about Indigenous biodata.

3. **The Pragmatic Way Is Better Suited to IDS than the Correspondence Way**

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The first reason the pragmatic way is well-suited to realizing IDS is that it foregrounds human agency in ways that expose scientists' attempts to launder their intentions and values out of the scientific process. The correspondence account of data, on the other hand, supports narratives wherein scientists are innocent passengers being carried along a line of inquiry by "the facts". A clear view of the intentions and values that drive science is important for IDS because IDS requires Indigenous peoples to pass judgement on potential uses of their biodata so that they can promote projects that benefit their polities.

Consider the case of an especially drought-resistant plant varietal found only on sovereign Indigenous lands. Upon learning of the purported existence of such a plant, an outside scientist begins drawing up research plans to collect samples of the plant for analysis, thereby extracting potentially valuable biodata from the Indigenous community. Supposing the scientist goes through the work of obtaining permission from the community to perform such research, what narrative will the scientist use to justify their plans to the Indigenous community, their funders, their colleagues, and the IRB? They are likely to present a narrative wherein all humanity faces the common challenge of global warming. One danger of global warming is food shortages caused by the failure of traditional agricultural crops. This drought-resistance plant varietal may be key to creating new agricultural crops that can thrive in the changing climate. In this narrative, *it just happens to be the case* that the solution to a big problem requires an outsider to extract biodata from an Indigenous community. One can imagine the scientist exclaiming, "Look, it's not my fault this plant that happens to be a solution to agricultural problems caused by global warming just happens to exist only on Indigenous lands. I'm only trying to understand the living world in ways that help us improve it." The onus is now on the Indigenous community.

The situation has been framed in such a way that retaining control of biodata is tantamount to impeding scientific progress that might help everyone.[10]

On the pragmatic view, the narrative shifts. Instead of saying, "This plant happens to be a solution to a problem," one must say, "I want to use this plant as a solution to a problem". This small change has big consequences. The plant specimen biodata is not inherently about drought-resistant agriculture. It assumes that meaning when someone uses it for that purpose. The inclusion of "I want" opens the door to a series of questions that highlight the concerns of IDS.

First, it emphasizes contingency in the scientific process. If the plant only becomes a solution when someone wants to use it as a solution, then perhaps there are other things a person could want to use as a solution that would work just as well or better. The situation no longer seems so fixedly predetermined. The emphasis on contingency facilitates questions like, "Why does this particular person want to make this biodata solve that problem at this time?" More on this in section 3.

Second, the scientist's "I want" invites us to assess how likely the scientist is to achieve their stated goals. Scientists are forever claiming the seemingly unassailable motives of "understanding the world" and "improving the world". A pragmatic examination of these goals reveals how slippery they are.

"Understanding the world" may feel like a familiar and unproblematic goal. Yet, philosophers of science continue to work at clarifying the notion of "scientific understanding" by defining it in terms of other, better-theorized concepts like "explanation".[11] Much of this work involves a balance between fitting the concept of "understanding" into existing philosophical theories of science and using intuitions about what constitutes genuine "understanding" to explicate the norms implicitly guiding people's everyday use of the concept of "understanding".

For example, some philosophers take the intuition that good "explanations" impart "understanding" to motivate cognitive-psychological accounts of "understanding" that can be used to evaluate the success of scientific explanations.[12]

Thanks to their emphasis on action and practical consequences, pragmatists need not rescue the idea of "scientific understanding" in this way. Rather, the pragmatist can deflate the idea of understanding by pointing out that any good answer to the question of, "How do we know whether X understands Y?" eventually bottoms out to our evaluation of whether X is able to successfully do something relevant to Y. Returning to the plant example, suppose the scientist specifies that they want to extract Indigenous biodata to realize their goal of "understanding the genetic basis of drought-resistant traits." On the pragmatic view, this stated goal is like a pithy summary that skips over all the tangible details of more concrete goals. To answer the question, "How will we know whether the scientist has succeeded in understanding the genetic basis of drought resistant traits?" one must evaluate whether the scientist is able to achieve more practical goals, like controlling the expression of drought-resistant traits by manipulating plant genetics. The point is that the pragmatic view of data highlights the way people use data for specific purposes, thereby puncturing the veil of vague, generically virtuous goals like "understanding". Indigenous communities need this penetrating vision to exercise sovereignty over their data in well informed ways.

Similarly, the pragmatic view helps translate the scientist's goal of "improving the world" into more practical goals. My argument is not that scientists are dishonest about wanting to improve the world. The argument is that the pragmatic view's emphasis on action helps decompose generic goals into specific goals that can be measured against an agent's abilities. In the plant example, the scientist aims to improve the world by avoiding food scarcity caused by

climate change. But professional scientists cannot direct the forces of industrial agriculture, and they do not legislate trade agreements or control the international supply chains that most humanity relies on for food. A more realistic goal for scientists, a goal plausibly within their power to accomplish, would be to publish research findings that have the potential to mitigate food scarcity *if* multitudes of international actors decide to act in the right way. A scientist might get more directly involved by starting a biotech company to promote and sell drought-resistant technology to farmers. Notice how these more practical goals and their references to "publications" or "companies" bring a sociological lens to scientists' motives. Not only are these new goals more specific, they also allude to the self-interested and professional motives that scientists pursue alongside their epistemic motives. Again, the pragmatic way translates generically virtuous goals like "improving the world" into practical goals that must be unearthed and subjected to Indigenous judgement for the effective realization of IDS.

The second reason the pragmatic way of thinking is more conducive to realizing IDS than the correspondence way, at least in North America, is that it shares more affinities with North American Indigenous philosophies. These affinities are important insofar as IDS concerns both the execution of sovereign decisions and the means by which those decisions are reached. In response to a shared history of cultural genocide and forced assimilation, many Indigenous peoples share the goal of using their own non-Western philosophies to deliberate about how to exercise sovereign power.

The pragmatic way is amenable to North American Indigenous philosophies in that they share an affinity for relationships. They both tend to characterize and assess a thing in terms of its relationships to other things or processes. Of course, the correspondence way also emphasizes relationships, but it only emphasizes one peculiar kind of relationship called "correspondence".

The pragmatic way is less restrictive about the sorts of relationships that can define a thing. For instance, on the pragmatic view, things become data when they enter into *justificatory relationships* with human claims or actions. Data assume meaning depending on the *purposive, means-to-an-end relationships* between those claims or actions and the goals they are directed toward. Neither of those relationships are correspondence relationships.

For an example of North American Indigenous philosophies using non-correspondence relationships to define a thing, consider the concept of personhood. In the Western tradition, it has often been supposed that an essential, necessary property of human personhood is rationality. Something cannot be a human person unless it possesses the property of rational thought. By contrast, within many North American Indigenous philosophies, for a thing to be a human person, it must stand in proper relationships to other things and processes, such as the environment and other humans. Crucially, these relationships are not correspondence relationships.

For instance, Jay Miller, summarizing an ethnographic survey of Native North Americans, writes that "Strung together, [these ethnographic bits] speak of integrity and coherence across the continent for notions of personhood as mixings, infusions, and layerings to combine spark, bone, flesh, soul, shadow, immortal partner, and ghost into a living whole […] They also speak of flux and flow in ways that many Americans would take for ambiguity and confusion, but this is the incomprehension of outsiders."[13] Arstein-Kerslake et al. make a similar point when arguing that Indigenous notions of relational personhood can inspire legal conceptions of personhood that offer more protections for natural entities, like rivers, and groups of people who lack power and privilege. Arstein-Kerslake et al. write that they "acknowledge that Euro-Western ways of knowing and being have largely failed (so far) to learn from

Indigenous Peoples' laws and philosophies. In developing this concept of relational personhood, we hope to build a bridge between Euro-Western legal concepts (such as legal personhood) and Indignenous Peoples' law and protocol that governs the relationship between people and place."[14] In both of the above cases, the authors note how Western conceptual frameworks struggle to accommodate Indigenous conceptions of relational personhood. This paper argues that the Western philosophical tradition of pragmatism has the conceptual resources to articulate an Indigenous notion of relational personhood that is intelligible to the dominant culture and has the power to facilitate IDS.

In summary, the pragmatic way shares more affinities with North American Indigenous philosophies than the correspondence way, and that matters insofar as IDS is about Indigenous peoples using their own philosophies to guide their use of sovereign power. The pragmatic way also helps translate scientists' generically virtuous goals of "understanding" and "improving" the world with biodata into practical goals fit for the judgement of Indigenous communities.

4. Indigenous Biobanking and the Future Trajectory of Science

On the pragmatic view, biodata are mercurial resources with unknowable potential. They are mercurial because their meaning changes depending on how they are used. Their potential is unknowable because we cannot know how they will be used in the future. Indeed, as the history of the biological sciences has shown, we are often unable to conceive of the modes of action made possible by future scientific advances. By 1920, scientists had discovered a way to categorize human blood according to types (i.e. A, B, AB, and O). Blood sample biodata thus gained new potential meanings and concomitant uses. One hundred years later, scientists can build a genetic profile of someone using their blood. Again, the space of possible uses and

meanings expands. Who can say what meanings scientists will imbue in peoples' blood one hundred years from now? The question is not merely rhetorical. The correspondence way and the pragmatic way present different frameworks for thinking about the future trajectory of science.

On the correspondence way, all the data are already out there in the world with human-independent meanings. Scientists are engaged in the project of discovering those meanings. On this view, scientific inquiry is like a scavenger hunt. Each new discovery provides clues for making future discoveries. We cannot know the final outcome because we do not know where we are in the landscape of discovery. This view of science has two main variables: the complexity of the world and the cleverness of the investigator. Scientists progress through rounds of discoveries if their cleverness is commensurate with the complexity of the world. The future of science is opaque because we do not know where the human-independent meanings of data will lead scientists or whether scientists will be clever enough to follow that path.

The pragmatic way introduces more contingencies and degrees of freedom into the story. On this view, scientists do not discover human-independent meanings. They create meaning when they use something as data to accomplish goals they value. In addition to the complexity of the world and the cleverness of the investigator, the sorts of goals the investigator wants to achieve, the means by which they assess whether the goal has been achieved, and their ability to realize those criteria all become relevant variables. Two scientists trying to solve different problems may imbue different meanings on the same thing by using that thing in different ways. The same can be said for three, two hundred, or five thousand different scientists. The pragmatic way leads one to ask questions like, "How many problems could people possibly solve using the same datum?" It is an open question. Speculatively, I believe humanity's capacity to generate problems and accept solutions is infinite. Thus, data have an inexhaustible potential to assume

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different meanings given different contexts of use. The important point is that on the pragmatic view, the future of science is opaque not just because the world is complex and people are imperfect investigators, but because we do not know what values, problems, and desired solutions future scientists will bring to their work.

Given the pragmatic view on the trajectory of science, the goal of advancing IDS can be restated in a new way: Indigenous things and/or processes that have rich evidential potential must be managed such that they are used to solve problems that improve the lives of Indigenous peoples. Biological samples that contain genetic information are the current exemplar for such evidentially-rich things or processes. The horizon of possible uses for genetic biodata has been rapidly expanding since the modern synthesis united evolutionary theory with molecular genetics. The IDS movement needs strategies for controlling the way evidentially-rich Indigenous things or processes, like genetic samples, are used.

The creation of Indigenous-led biobanks is one such strategy. Biobanks are repositories for biodata. They preserve biodata so that it remains useful for future purposes. They also protect biodata by enforcing rules about who can and cannot access the data. Finally, they may facilitate the use of biodata by coordinating research projects or by performing research themselves with in-house investigators. Viewed through the pragmatic lens, biobanks control what the data under their purview means by controlling how it is used. By promoting uses of Indigenous biodata that serve Indigenous peoples and protecting Indigenous biodata from being used in ways that do not, Indigenous biobanks can bend the trajectory of science towards the ends of IDS. There is precedent for sovereign governments managing national biobanks on behalf of their citizens. Indigenous tribal nations can adopt this strategy to put Indigenous governance in control of Indigenous data.

It is easy to endorse the goal of "promoting uses of Indigenous biodata that benefit Indigenous peoples and protecting Indigenous biodata from being used in ways that do not". In practice, it is often unclear what constitutes a benefit for Indigenous peoples. First, because the category of "Indigenous peoples" is heterogenous and applies to diverse groups with distinct histories, politics, cultures, ethnicities, economics, and philosophies. Second, because the seemingly simple "benefit/harm" binary is difficult to apply to messy, real-world situations where an action may produce different shades of benefits and harms affecting many things over different time scales. The devil is in the details. In the next section, I suggest that the pragmatic view of data can help Indigenous biobanks navigate this messiness by guiding Indigenous biobanking policy.

5. How the Pragmatic View of Biodata Can Guide Indigenous Biobanking Policy

One way of envisioning the realization of IDS in the biological sciences is to imagine every Indigenous group creating their own biobank for managing their own biodata. The problem with this vision is that many Indigenous groups lack the resources, not just for the material construction of a biobank, but for its upkeep and management. One solution would be to create fewer biobanks, or even a single biobank, that can be partitioned such that different Indigenous groups retain sovereign authority over the data they keep there. Assuming the resources for the construction and upkeep of such a biobank could be amassed, what kinds of policies would achieve the partitioning?

On the pragmatic view, the most important thing to partition is authority over the way data are used and the meanings they assume. One way to achieve this partitioning is by introducing two levels of biobank management. At the first level, each Indigenous group makes

decisions about how to use the data they keep at the biobank. The second level is general biobank-wide management that is responsible for maintaining infrastructure and executing the decisions of the first level. This scheme partitions control in a way that respects Indigenous groups' sovereign authority while allowing for collective resource pooling.

As argued in the last section, pairing the pragmatic view of data with the goal of IDS leads to the big picture goal of shaping the highly contingent trajectory of the biological sciences. At the moment, the most powerful shapers of science are nation state governments and private foundations sponsored by wealthy individuals. They shape science by selectively funding research projects that further their interests. Indigenous biobanks could pursue this strategy, but they are unlikely to have as much money, and therefore impact, as governments and foundations. Rather than shape science via funding, the biobank can shape Indigenous science by offering client groups the resource of expertise.

The demands on this expertise would be many and varied. Client groups face the problem of making specific decisions about how their data is used so that, in the long run, their data engenders and supports a tradition of biological inquiry guided by their values and concerns. In other words, client groups need a way of connecting the minutiae of specific research projects to the big picture trajectory of science. To advise client groups about making this connection, the second level of management would need a team with legal, administrative, scientific, historical, philosophical, and sociological expertise. Historians, philosophers, and sociologists of science know how to examine the process of science at different resolutions. They provide expertise about how science works, develops, and interacts with other areas of society. The second level of management would also need people who know how to navigate the increasingly large and complicated administrative hierarchies of colleges, universities, and funding bodies. Legal

experts provide templates for binding agreements between client groups and outside researchers as well as advice about intellectual property law and the commercialization of research findings. Finally, there would be advisors who can translate scientists' research proposals and stated goals (e.g. scientists' stated goal of achieving "understanding") into more concrete goals that can be subjected to the judgement of client groups.

This vision for Indigenous biobanking has precedent. For example, The Native Biodata Consortium is the first Indigenous-led, non-profit, biobank and research institution located on sovereign Indigenous lands within the United States. The policy description above roughly applies to the way The Native Biodata Consortium currently operates, and although this biobank has only been in operation for about six years, it has already made major inroads with Indigenous scientists, non-Indigenous scientists, and Tribal governments.[15]

As argued in section 3, IDS is also about Indigenous peoples using their own ways of thinking to deliberate about how to use their data. Presently, it is far from obvious how to connect the diverse philosophies of Indigenous peoples to the task of managing biodata. A final suggestion about the role of second level management is that they use scientific and philosophical expertise to help client groups make that connection. In section 3, I argued that the pragmatic view of data shares an affinity with North American Indigenous philosophies in that both tend to characterizing things in terms of relationships. Before concluding, I will give two examples of what it might look like to connect Indigenous philosophies with biodata management.

Some North American Indigenous philosophies see the world as complex networks of relationships such that a change in one thing can have consequences for many other things. Such philosophies often maintain that some configurations of relationships are more right or more

beautiful than others. These configurations are said to exhibit harmony or balance, and actions or events that maintain these harmonious configurations have positive normative valence. Because the world is constantly changing, harmonious relations are dynamic in the sense that what constitutes a harmonious configuration of relations today may not be harmonious tomorrow. This view of the world has implications for biodata management.

First, it provides a framework for taking more relationships into consideration when deliberating about the proper use of Indigenous biodata. The Western standard of informed consent implies that individuals own whatever data is derived from them, and that so long as they are not individually harmed or deceived when they agree to give up their data, the use of that data is ethical. But if the material source of biodata, like a blood sample, is conceived of as having many relationships to other things outside the donor, it stands to reason that those other things may be relevant when deciding whether some use of the biodata is ethical. When applied to data use, Indigenous philosophies can provide a framework for expanding the individualistic concerns implicit in Western bioethics.

Second, both the pragmatic view of data and the Indigenous notion of dynamic harmony emphasize the changing nature of biodata. On the pragmatic view, the meaning of data changes depending on context of use. In a world of dynamic harmony, a change in relations between biodata and others things can change the nature of biodata and how it ought to be used. These dynamic views of biodata suggest an appropriately dynamic notion of consent. Whether dealing with individuals or collectives, people(s) who have the authority to consent to particular uses of their data ought to retain the ability to change their consent depending on future conditions.

6. **Conclusion**

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The premise of this paper was that philosophical questions about data have the power to help guide the implementation of IDS. I began by considering two views of data: the correspondence view and the pragmatic view. Then, I argued that the pragmatic view is better suited to realizing IDS than the correspondence view for two reasons. First, the pragmatic view shares more affinities with North American Indigenous philosophies than the correspondence view. Second, the pragmatic view helps translate scientists' generically virtuous goals of "understanding" and "improving" the world with biodata into practical goals fit for the judgement of Indigenous communities. Next, I argued that the creation of Indigenous-led biobanks is a promising strategy for realizing IDS because such institutions have the potential to reshape the trajectory of the biological sciences. Finally, I suggested a two-leveled governance structure and policies that Indigenous-led biobanks can adopt to realize IDS.

Notes

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[2] Rodriguez-Lonebear, Desi. "Building a data revolution in Indian country." *Indigenous data sovereignty: Toward an agenda* 14 (2016): 253-72, 257.

[3] Lovett, Raymond, Vanessa Lee, Tahu Kukutai, Donna Cormack, Stephanie Carroll Rainie, and Jennifer Walker. "Good data practices for Indigenous data sovereignty and governance." *Good data* (2019): 26-36, 27.

[4] Smith, Diane E. "Governing data and data for governance: the everyday practice of Indigenous sovereignty." *Indigenous data sovereignty: Toward an agenda* (2016): 117-135, 119.

[5] Walter, Maggie, and Michele Suina. "Indigenous data, indigenous methodologies and indigenous data sovereignty." In *Educational Research Practice in Southern Contexts*, pp. 207-220. Routledge, 2023.

[6] Turner, Dale. *This is not a peace pipe: Towards a critical Indigenous philosophy*. University of Toronto Press, 2006.

[7] In the 20th century, mathematicians and communication engineers developed a quantitative theory of information that revolutionized human technology. This historical event likely motivates the pervasive sense that "information" is an objective, well-defined concept that can be used to define "data". The mathematical theory of information is powerful despite (or perhaps because) of the way it side steps the problems of truth and meaning.

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[9] Leonelli, Sabina. "What counts as scientific data? A relational framework." *Philosophy of Science* 82, no. 5 (2015): 810-821.

[10] For a similar (though messier) real life example, see the story of the anti-cancer drug Taxol. Like my example, it involves scientists justifying their exploitation of Indigenous people's traditional knowledge and land stewardship practices to "understand" and "improve" the world through means that have generated multi-billion dollar profits that have never been shared with Indigneous peoples.

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