

# Against Defending Science: Asking Better Questions About Indigenous Knowledge and Science

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PREPRINT—forthcoming 2024 in *Philosophy of Science* (accepted 6 October 2023)

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## **Abstract:**

This paper addresses problems with a defensive turn in discussions of science and Indigenous ways of knowing, being and doing. Philosophers and practitioners of science have focused recent discussions on coarse-grained questions of demarcation, epistemic parity and identity—asking questions such as “Is Indigenous knowledge science?” Using representative examples from Aotearoa New Zealand, we expose rampant ambiguities in these arguments, and show that this combative framing can overlook what is actually at stake. We provide a framework for analyzing these problems and suggest better ways forward.

## 1. Introduction

In 2021 seven senior academics in Aotearoa New Zealand, including scientists and a philosopher of science, published a letter “In Defence of Science” in *The Listener*, a national current affairs magazine (Clements et al. 2021). Science’s alleged combatant was mātauranga Māori and its inclusion in the school science curriculum. Māori are the indigenous peoples of Aotearoa New Zealand, and mātauranga Māori (henceforth mātauranga) is Māori knowledge, culture, values and worldview. The letter fueled heated ongoing discussions within and beyond academia, gaining international attention when scientists overseas weighed in on blogs and social media in support of the letter’s claim that mātauranga is not science (Coyne 2021; Dawkins 2021). Most local academics and practitioners do not see what the issue is, and are comfortable with science, mātauranga and their relationship. But those seeking to defend science continue to drive these discussions, often publicly and loudly, and to frame them around coarse-grained identity questions such as “Is mātauranga science?”.

These discussions wrap together many issues, to the detriment of giving any of them precise attention. As a result participants end up talking past each other. We present a framework for mitigating ambiguities with greater conceptual clarity. Using this framework, we argue that (1) these discussions should abandon focusing on demarcation, coarse-grained identity questions and contests of epistemic merit, and (2) their combative framing has led to overlooking what is actually at stake. We offer foundations for more constructive attention to nuance, from the joint perspectives of an Indigenous scientist and a non-Indigenous philosopher of science seeking better ways forward in these discussions.

These local discussions sit in the context of similar ones in North America, Australia, and elsewhere, examining the relationships between science and Indigenous ways of knowing, being and doing (henceforth IKBD).<sup>1</sup> Discussions of IKBD and science have been happening for decades, and the majority are fruitful, often addressing the weaving of IKBD and science in practice to address ecological, environmental and climate concerns (e.g., McGregor 2004; Kimmerer 2013; Whyte et al. 2016).

With notable exceptions (including Wylie 2015; Ludwig et al. 2021; El-Hani et al. 2022), contributions from academic philosophers of science have been part of a recent combative turn in these discussions towards questions of demarcation and relative epistemic merit (e.g., Corballis et al. 2019; Clements et al. 2021; Pigliucci 2021). We seek to refocus what philosophy of science has to contribute to these discussions.

Discussions of IKBD and science must take social, cultural, ethical and political contexts into account (Smith 1999; McGregor 2004; Smith et al. 2016). We repeatedly see those seeking to defend science approaching the topic as “purely academic”, as if the epistemic questions could be abstracted away from their contexts. They can’t. In showing how the current framing of these discussions is on shaky grounds, we urge those inclined towards such framing to shift their focus.

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<sup>1</sup> Other discussions use related terms, including ‘Indigenous knowledge’, ‘traditional ecological knowledge’ and ‘Indigenous expertise’. We use this plural umbrella term while acknowledging that no such term is ideal (see Smith et al. 2016, 137; El-Hani et al. 2022, 296). With ‘IKBD’ we aim to avoid connotations that we can abstract bodies of knowledge from their sociocultural context, or that the knowledge systems in question are monolithic or static things of the past.

In the spirit of one of our key messages—more fine-grained attention to detail and less high-level generalizations about IKBD and science—we focus primarily on the case of mātauranga and science. We will use ‘mātauranga/science discussions’ as shorthand for *comparative or competitive discussions of the similarities, differences, and other relationships between mātauranga and science*. Most of what we say about mātauranga/science discussions, however, speaks to a broader message about analogous global IKBD/science discussions.

## **2. Mātauranga**

‘Mātauranga’ is often, but inaccurately, translated as ‘Māori knowledge’. Mātauranga spans Māori knowledge, culture, values and worldview, its foundations brought to Aotearoa New Zealand by Polynesian ancestors of Māori around a thousand years ago and continuing in the present and future (Clapcott et al. 2018). Mātauranga is dynamic, not static; it “has accrued over millennia... [and] continues to be applied and adapted to a variety of contemporary contexts” (Hudson et al. 2020, 43).

The weaving of mātauranga and scientific practice is steadily increasing in Aotearoa New Zealand. One signal of this is the Vision Mātauranga Policy, launched by the government to explore the distinctive research, science and technology potential arising from Māori knowledge, resources and people (MoRST 2007). Another signal is a series of special issues of science journals (including *Journal of the Royal Society of New Zealand*, *New Zealand Science Review*, and *New Zealand Journal of Ecology*) on mātauranga and science, in contexts including marine management, invasive predator control and ecosystem restoration (Stephenson and Moller 2009;

McAllister et al. 2019; Mercier and Jackson 2019/2020). This trend is paralleled in international journals (including Johnson et al. 2020; Stephens 2023).

### **3. Mātauranga/Science Discussions: Three Variables**

Here are some representative claims from mātauranga/science discussions:

“Some mātauranga Māori has been generated according to the scientific method, and can therefore be considered as science.” (Hikuroa 2017, 9)

“Mātauranga may indeed help advance scientific knowledge in some ways, but it is not science.” (Clements et al. 2021, 4)

“Mātauranga includes aspects of what we might understand as a modern scientific nature.” (Mercier 2018, 84)

“Science and mātauranga Māori cannot in any good sense be regarded as equivalent bodies of belief.” (Corballis et al. 2019, 3)

These claims are ambiguous: their details could be cashed out in different ways. Of course, these are one-line quotations removed from their contexts. But the surrounding contexts do not always fully disambiguate.

As a starting point for disambiguation we can think of these claims as containing three variables: *mātauranga*, *science*, and the *relationships* between them. To assess ambiguous *mātauranga/science* claims we must first fill in the blanks of these variables. We sketch a framework for doing so, developed in detail in (Hikuroa and Parke, manuscript). The resulting possibility space for interpretations of such claims is huge, illustrating how people have ended up talking past each other.

The following are *not* exhaustive lists of attributes of *mātauranga* or science, nor are they lists of those we endorse (in fact, we think some are useful and some problematic). Instead, these are lists of understandings of each variable which we see recurrently at stake, explicitly or implicitly, in *mātauranga/science* discussions.

**The *mātauranga* variable** can be filled in with:

1. Māori knowledge, culture, values and worldview as a whole.
2. A body of codified knowledge claims (for issues with reducing *mātauranga*/IKBD in this way see McGregor 2004; Mercier 2018; Barber 2021).
3. Specific forms or aspects, such as *pūrākau* (narrative) (Hikuroa 2017) or creation stories (Dawkins 2021).
4. Specific practices or methodologies, such as celestial navigation (Whaanga et al. 2020).
5. Specific concepts or values, such as *kaitiakitanga* (customary values and ethics expressed as practices of care for the environment) (McAllister et al. 2023).

Zooming in on specific features (options 3–5) allows us to focus on fine-grained synergies and differences between epistemic, ontological or methodological frameworks (more on this below). Problems arise when mātauranga/science discussions run together several understandings (e.g., Corballis et al. 2019; Clements et al. 2021) or engage in rampant induction, considering one aspect, zooming out and treating the whole as if it can be summarized by that aspect (e.g., Dawkins 2021).

**The science variable** can also be filled in in many ways, including understanding science:

1. as a demarcation exercise, in terms of science’s methodologies (such as falsification or hypothesis testing) or epistemic aims (such as generalizability or causal or mechanistic knowledge of the natural world).
2. as a generic high-level honorific: e.g., science is our current best understanding of the natural world.
3. as a specific body of empirical and theoretical claims about the natural world, shared by a specific epistemic community.
4. as a universal way to investigate the world which can be done by anyone, anywhere, anytime.
5. as inextricable from the history, trajectory, legacy, and values of a particular (especially Western/European) cultural tradition.
6. as a tool of colonization; the face of science can be “[t]he ways in which scientific research is implicated in the worst excesses of colonialism” (Smith 1999, 1).
7. ostensibly: science is what professionally trained or employed scientists do.

8. Finally, some discussions zoom in on a specific methodology or field, rather than science as a whole; for example, computational modelling or chemistry (Kilmartin 2022). We do not see much of this, and in section 7 call for more of it.

For the most part, these are not mutually exclusive characterizations. Many discussions combine several of them (e.g., Corballis et al. 2019; Clements et al. 2021; Pigliucci 2021).

Common ways to fill in **the relationships variable** include focusing on:

1. Identity: Is mātauranga (or IKBD) science? (Clements et al. 2021; Pigliucci 2021).
2. Epistemic parity, signaled with terms like “on a par”, “equivalent,” or “equal status” (e.g., Corballis et al. 2019).
3. Overlap and compatibility (Durie 2004; Hikuroa 2017).
4. Relative worthiness of respect or value, beyond epistemic value. This understanding is often tied to the second, “generic honorific” option for the science variable.
5. Relative worthiness of inclusion in science curricula (Clements et al. 2021; Widdowson 2021).

The options in each of the three lists above are umbrella concepts whose details need fuller elaboration for optimal precision. But together the lists provide an initial roadmap for disambiguating mātauranga/science claims.

The remaining sections build on this framework with some critical interventions in mātauranga/science discussions: we call for abandoning focus on demarcation, coarse-grained



identity claims, and contests of epistemic merit, and bringing clarity and accuracy to discussions of the science curriculum.

#### **4. Identity and Demarcation Problems**

The first options for filling in the respective ‘science’ and ‘relationships’ variables, demarcation and identity, tend to co-occur in mātauranga/science discussions. We raise several problems with framing these discussions around defending the boundaries of science.

Coarse-grained identity claims, such as “mātauranga is (not) science”, are ambiguous. Filling in the blanks generates myriad ways to interpret such claims. For example: If a speaker has in mind any option from the mātauranga list in section 3, and science as a tool of colonization, then it is obvious that mātauranga *is not* science. If they have in mind a specific practice from mātauranga, such as celestial navigation used to voyage across the Pacific a thousand years ago, and a generic universal characterization of science, such as “science is our best knowledge of the natural world at a given time in a given domain”, then we could easily say that mātauranga (that aspect, anyway) *is* science. If they have in mind bodies of specific propositional and practical knowledge claims on both the mātauranga and science sides, then mātauranga *is not* science. And so on.

People talk past each other when these variables are left ambiguous, or when authors equivocate and run together multiple understandings. Coarse-grained identity claims are poor grounds for productive discussion.

Relatedly, demarcation is a poor framing for discussions of IKBD and science (see Ludwig et al. in press for related discussion). A recurring theme in mātauranga/science discussions, which we will call *the demarcation problem problem*, is summarized in a pair of arguments below.

Participants frame these discussions defensively as demarcation exercises, reaching conclusions in the form of coarse-grained identity claims. Problems arise when these discussions stay coarse-grained and fail to attend to nuances, or use single examples as bases for generalization about mātauranga and science at large.

The core of the negative demarcation argument looks like this:

1. \_\_\_\_\_ is a hallmark of science.
2. Mātauranga, in contrast, is/does \_\_\_\_\_.

Hence, mātauranga is not science.

For example, Corballis and colleagues (2019) argue that universality is a hallmark of scientific knowledge, and because mātauranga is local (not universal) knowledge, it is not science. There are different ways to understand ‘universal’ here. We might understand it in terms of external validity: is knowledge confined to practitioners’ immediate object of inquiry, or can we infer something about relevantly similar cases or a broader target class? A subtly different understanding regards the spatiotemporal extent of a knowledge system’s coverage: does it apply only within its practitioners’ geographical and temporal bounds, or does it support global or universal inductions?

On either understanding, there are clear counterexamples. Plenty of work in ecology, biogeography and conservation science generates “local” knowledge aiming to understand, explain or predict things about spatiotemporally confined and specific phenomena, such as island endemics. And knowledge initially developed locally can become a basis for wider application and generalization (see Whaanga et al. 2020 for an example from mātauranga, and countless examples from the history of science).

A second example of the negative demarcation argument regards a decision to exclude recounting a historic massacre of Moriori by Māori from a national museum exhibit on Moriori history, designed by Moriori.<sup>2</sup> Corballis and colleagues say that this omission is inconsistent with a system that claims compatibility with science: “this approach to truth could not be tolerated in science” (2019, 5). Here they fill in the first premise of the negative demarcation argument with representing the truth, the second premise with willingness to distort the truth.

Barber (2021) discusses several problems with Corballis and colleagues’ take on this story, including their ignorance of the values motivating the omission. To raise a further problem: scientific representation is not in the business of including all the details and always capturing the whole truth. Suggestions otherwise ignore the centrality of abstraction and idealization in science (Potochnik 2017). Our point is not that museum curation is identical to other representational settings, nor mātauranga to science, with respect to practices of idealization or associated epistemic agendas. Our point, instead, is that arguments about identity and demarcation lead us off track.

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<sup>2</sup> Moriori are the Indigenous people of Rēkohu and Rangihau (the Chatham Islands).

The demarcation problem problem also applies to a positive argument:

1. \_\_\_\_\_ is a hallmark of science.
2. \_\_\_\_\_ is a hallmark of (some) mātauranga as well.

Hence, (some) mātauranga is science.

Hikuroa (2017) argues that some forms of mātauranga (such as maramataka, the lunar calendar) can be seen in the light of a methodological framework of hypothesis testing, and can in that particular sense be considered scientific. This is in the context of a larger discussion focused on overlap and compatibility, not demarcation and identity. But the broader form of argument, as above, has been a recurring rhetorical move in popular mātauranga/science discussions.

This runs into the same problems as the negative demarcation argument. We could respond, for example, that not all science is in the business of testing hypotheses (Franklin-Hall 2005). More generally: the counterexamples and complexities don't support the generalizations at stake.

Neither version of the demarcation argument works. Framing these discussions around demarcation also leads us off track in other problematic ways: by implicitly lumping IKBD with pseudoscience and by obscuring the complexities of how IKBD and science can both differ and intersect (Ludwig et al. in press).

## 5. Epistemic Parity and Exploring the Interface

Epistemic parity is a recurring theme in mātauranga/science discussions and related IKBD/science discussions (Corballis et al. 2019; Widdowson 2021). These take for granted that knowledge systems described at a high level—mātauranga, science, Indigenous knowledge—are sufficiently monolithic to be comparable on some scale of epistemic value.

High-level epistemic contests between mātauranga as a whole (first option for the ‘mātauranga’ variable) and science as a whole (on any of options 1–7 for the ‘science’ variable) are untenable. This is because mātauranga is not a homogeneous system with an internally level epistemic playing field. There is variation across Māori tribal and sub-tribal groups in forms and aspects of mātauranga, spanning diverse bodies of knowledge, methodologies, practices and values (see Mercier 2018; Mercier and Jackson 2019/2020; Hudson et al. 2020)—to say nothing of the variation in IKBD globally. The same is true of science: it is not monolithic, and it includes a whole complex web of bodies of knowledge, methodologies, practices and values.

We can clarify the problem by looking at how poorly high-level contests of epistemic value pan out within science. From the literature on scientific modeling it is a familiar idea that we do not get very far by asking questions like “Is this model (as such) better than that one?” or “Are experiments epistemically superior to models?” Judgments about the epistemic value of a given approach must take into account finer-grained contextual details, including the aims of the practitioner (Weisberg 2013; Parke 2014).

Mātauranga/science discussions invoking contests of epistemic value ignore these nuances and attempt impossible high-level comparisons. Terms like “on a par” or “equal status” suggest something like equally epistemically fit-for-purpose, but what this could mean depends crucially on the context and the intentions at stake. It could have to do with parity of causal explanatory power, predictive power, external validity, or any number of other epistemic desiderata. For any of those options, we need more precision about what we are comparing and why.

One way to do so is to talk about the epistemic value of specific approaches with respect to specific aims. This can work for comparative discussions of scientific methodologies, such as examples of simulations versus experiments in a given field with respect to a given aim (Parke 2014). This level of precision could also help guide certain mātauranga/science discussions. But here we must be careful: not just any question about relative epistemic value will make sense or be a constructive discussion starter. For example, here is a question zooming in on specific methodologies: are randomized control trials on an epistemic par with rāhui (customary restrictions of access to enable ecological regeneration)? This question is unproductive because the aims being compared are epistemic apples and oranges. Is the aim to check the efficacy of a new drug, or to protect treasured endemic birds from predation by stoats? Randomized control trials are inappropriate tools for the latter aim; rāhui for the former. Only by zooming in on one of those contexts can we have something reasonable to say about the epistemic value of relevant approaches from mātauranga, science, or their intersection. Rather than comparing the two on some implied high-level epistemic scale, we can look to the details of their long-standing and ongoing successful weaving in practice (see McAllister et al. 2019; Mercier and Jackson 2019/2020; Wehi et al. 2021).

This points to a better way forward. Instead of contests of epistemic value, we should focus on overlap, compatibility and partnership: “While there is considerable debate about their relative merits [IKBD and science], contests about the validities of the two systems distract from explorations of the interface, and the subsequent opportunities for creating new knowledge that reflects the dual persuasions” (Durie 2004, 2). Different knowledge systems might conceptualize, generate, and validate knowledge in different ways, but can also overlap substantially in the sorts of epistemic resources used to understand the world (such as causal reasoning, observation and prediction; see El-Hani et al. 2022). Mātauranga and science can be brought together without trying to fit one into the whole epistemic framework of the other (Durie 2004).

## **6. The Science Curriculum**

As a final illustration of disambiguating mātauranga/science claims, we turn to the fifth understanding of the ‘relationships’ variable, worthiness of inclusion in science curricula, and return to the “Defence of Science” letter from the introduction. Equivocation on the meaning of ‘parity’ and other misrepresentations have steered ensuing discussions off course. We suggest a shift to sturdier grounds going forward.

Clements and colleagues (2021) (henceforth “the letter”) targeted their defense of science specifically at a draft report from the Ministry of Education (MoE 2021) (henceforth “the report”) on efforts to better incorporate mātauranga into the national school curriculum. The letter expresses concern about the report’s quoted aim “to ensure parity for mātauranga with other bodies of knowledge” in the curriculum, specifically science.

The broader context matters. The report regards specifically the Māori-medium school curriculum, which is taught in te reo Māori (Māori language), which is one of the country's two official languages, along with New Zealand Sign Language. The norm for that curriculum has been to translate English curriculum materials directly into te reo Māori, resulting in insufficiently accessible science classes and made-up-for-purpose technical terms. The report is part of a larger ongoing effort to develop a better Māori-medium curriculum, making sense of science with the Māori language and worldview as a starting point.

The letter implies that the parity at stake is epistemic. But the initial mention of “parity” from the report, quoted in the letter, is ambiguous. If one reads beyond the quoted passage, the report goes on to clarify that the parity in question regards upholding the worth of mātauranga as a pathway supported by the national curriculum alongside science—in this case, a pathway towards making science accessible to all students while sustaining commitments as a bicultural nation (MoE 2021, 3). Contests of epistemic merit are not at stake here, at least for the authors of the report. Nothing in this or any other national curriculum review report we have seen (the review is a work in progress at the time of writing) proposes teaching mātauranga to counter or undermine the factual claims, epistemic standards, or methodologies of science as currently taught. Instead, concepts and values from mātauranga are framed as compatible, complementary ways to view the world alongside the natural and social sciences, and as entry points into science aiming to resonate especially with Māori and Pacific students. By drawing this to the surface we are on more solid grounds for a discussion of what is actually at stake.



## 7. Towards More Constructive Discussions

A final point about the letter reinforces our call for conceptual clarity and attention to nuance, and the value of a more constructive role for philosophy of science in discussions of mātauranga/IKBD and science.

The letter is framed around opposing the report’s description of a proposed new course in the science curriculum, which “promotes discussion and analysis of ways in which science has been used to support the dominance of Eurocentric views (among which, its use as a rationale for colonisation of Māori and the suppression of Māori knowledge)” (quoting MoE 2021, 21). The letter says the proposed course “perpetuates disturbing misunderstandings of science”, before running together several understandings of science from our list in section 3 and sketching a negative demarcation argument.

In doing so, the letter overlooked or omitted a crucial detail. The Māori-medium science curriculum already includes biology, earth science, astronomy, physics and chemistry courses. The report proposes adding a new subject to that lineup: history and philosophy of science. The quoted excerpt from the report, which the letter objects to, is *not* from a proposal for what to cover in, say, the first lecture of a new astronomy or biology course. It is from the description of the proposed new history and philosophy of science course. This, among many other topics, is exactly what should be discussed in such a course in Aotearoa New Zealand: local histories of epistemic injustice in the context of settler-colonialism, and how they fit with science in practice in the past, present and future. The erasure of that key context was a disservice to everyone reacting to the letter who did not take the time to read the original report carefully.

This latest iteration of mātauranga/science discussions could have been more constructively shaped by attention to the value of looking at science critically through the lens of its history and philosophy—which, as any reader of this journal knows, is fully consistent with respecting science’s epistemic status.

In closing: those inclined to weigh in on discussions of mātauranga/IKBD and science should work to understand the full context and details first. Participants in these discussions should avoid ambiguities, always fill in the blanks, and abandon framing arguments around demarcation, epistemic parity and coarse-grained identity questions. Instead, we can ask more fine-grained questions and look to the details of "exploring the interface" in practice. This means zooming in on specific understandings and giving them more precise attention—such as options 3–5 in the “mātauranga” list and option 8 in the “science” list from section 3. Resulting more fine-grained questions include: Which particular concepts from mātauranga might work well in the national high-school chemistry curriculum (Kilmartin 2022)? What do mutually rewarding partnerships weaving mātauranga and ecology look like in practice (McAllister et al. 2019)? Those are just some examples among many.

## **Acknowledgments**

We thank Brett Calcott, Juliet Gerrard, and Charles Royal for helpful discussion, and the Marsden Fund of Te Apāranagi | Royal Society of New Zealand for funding.

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