Opinion Piece: Indigenous Science and the Science Curriculum: The New Zealand Debate

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Publications here.
A pen-picture here.

Everywhere there is rightful concern to understand the relationship between on the one hand indigenous knowledge systems (IKS) and traditional ecological knowledge (TEK) and on the other orthodox 'Western' science. And, especially, how to address this relationship in education. More specifically: Should indigenous, or cultural, knowledge about the natural world be taught *inside* science programmes or *alongside* them in separate social science, geography, religion, or cultural studies programmes? In the learning of an ethnoscience, there are gains, but also pains. This should be acknowledged by all. No one should underestimate the difficulty and time involved in seriously learning any ethnoscience. Trite learning comes cheap but has minimal cultural or personal benefit.

If mentioned, inside science programmes, teachers could elicit, or introduce, local indigenous understandings of some events or processes, and then progressively show scientific explanations of the same. In this latter option, IKS and TEK basically serve *instrumental* purposes in the teaching of science; they are not in the curriculum on their own *intrinsic* account but are there to serve another purpose. For instance, the comparing and contrasting of indigenous knowledge and scientific knowledge is a way of elucidating the nature of science (NOS) curriculum topic (McComas 2020). A great deal hinges on the difference between instrumental and intrinsic incorporation of indigenous science.

In New Zealand, in the middle of 2021, a large public and national debate erupted over the correct, and incorrect, aligning of traditional Māori knowledge (Mātauranga Māori) and science. The Royal Society New Zealand was asked to take 'grave action' against three esteemed Society Fellows on account of the instrumentalist views they expressed on the matter in a national magazine.

In 2019 an Opinion Piece in this NEWSLETTER – 'The Defence of Science and the Status of Māori Knowledge' – written by Auckland professors Michael Corballis, Elizabeth Rata and Robert Nola,

surveyed the NZ educational and cultural landscape prior to the current controversy. They argued:

> while Mātauranga Māori has much to offer in terms of culture and values, it also subverts those aspects of science – namely objectivity, universality, and dedication to progress – that can further advance the understanding of nature and help find solutions to the major problems afflicting the planet.

As New Zealand is a relatively small country, with a population of 5 million (much the same as Norway), about one-fifth of whom are Māori, it is easy for educational, philosophical and political debate about school curricula to become public and national.

Initial Engagement with Indigenous Science Debate

I first encountered the issues thirty years ago, when in early 1992, as the newly appointed Foundation Professor of Science Education at the University of Auckland, I attended my first University Faculty meeting. A motion before the meeting was to allow completion of the Anthropology Department's 'Māori Knowledge' (Mātauranga Māori) course to count as meeting the decades-old 'one science course' requirement for students enrolled in the University's Primary Education degree. One statement of the case had been made by Graham Smith, a Māori educator and later an influential professor:

> There is a need to struggle to assert the equal validity of Māori knowledge and frameworks and conversely to critically engage ideologies which reify Western knowledge (science) as being superior, more scientific, and therefore more legitimate. (Smith 1992, p.7)

I spoke against the motion saying, among other things, that Māori Knowledge was not science. I said there were good national and cultural grounds for making the anthropology course compulsory. There might also be legal grounds anchored in the 1840 Treaty of Waitangi, signed between the British Crown and the Māori chiefs, that required the new government to 'maintain and support' Māori culture. But, nevertheless, the 'one science subject' requirement should be retained. My arguments failed to convince. The motion was passed: New Zealand primary teachers, at least Auckland-trained ones, could thereafter happily teach with zero orthodox or Western scientific knowledge.

I was dismayed by this decision but should not have been surprised. The decision was just part of a general turn against science in New Zealand education circles; a turn that had been going on for a decade or more. The 'equivalence doctrine' had growing support in schools, in universities, in politics, and in the state bureaucracy. The powerful, Waikato University-based constructivist group in New Zealand education were the strongest supporters of equivalence. Additionally, the Kuhn-inspired constructivist side of the 'Science Wars', being waged in philosophy and HPS departments through the 1970s and '80s, provided seemingly powerful arguments for their cause (Brown 2001). Notions of constructivism, theory dependence, paradigms, incommensurability, multi-worlds, and much else of the same kind, were everywhere in the educational, philosophical, and social science landscapes. All of this prepared the ground for 'alternative facts' which were, with Donald Trump and Vladimir Putin, coming around the corner.

An explicitly constructivist Draft National School Science Curriculum bringing Mātauranga Māori into the New Zealand curriculum had been written and circulated in the 1980s. The writing was overseen by Beverley Bell of Waikato University (Bell 1990, 1991). She wrote: 'my promotion of the constructivist view of learning and of the curriculum is well known' (Bell 1986, p.9). The Draft engendered much debate. Warwick Don (1933-2014), a senior lecturer in Zoology at the University of Otago, spoke for many scientists and traditional educators when he wrote:

> …science is conducted irrespective of the cultural milieu of its participants. The recognition of any 'cultural context' in a science syllabus only introduces an irrelevance which will inevitably distort and could even destroy the very fabric of science education. Lysenkoism
>
> $in the former$ USSR
>
> and 'scientific creationism' graphically illustrate what can happen when non-scientific ingredients permeate the process. (Don, 1989)

And:

> It is most regrettable that for the sake of satisfying certain political or social requirements, the integrity of science education at Forms 1-5 level is being compromised. An aim of science education is surely to produce an informed student body, not add to the high level of misunderstanding already rife in the community where science is concerned. (Don, 1989)

Advocates of history and philosophy in science teaching decidedly do not follow Don in asserting that cultural context is irrelevant either to the progress of science or to the enlightened learning of science. It is crucial for both (Matthews 2015). For example, there were elements in the broad culture of Europe in the sixteenth century that enabled the blossoming of modern science and there were elements in the broad culture of China at the same time that inhibited science. It is illuminating for teachers and students to appreciate this. Philosophy and history deepens scientific learning; they do not distract from it; history, philosophy, and political economy can contribute to exposing corruptions of science and of scientists.

Jack Dodd (1922-2005), the then national president of the Royal Society New Zealand (RSNZ) and internationally known quantum physicist (Dodd 1991), said in a statement to the Society, that:

> Parts of the draft can only be written by people who do not understand what science is, let alone what science is about …there are patronising remarks about Māori and girls …science is universal. The observations and laws are the same whether you live here or on the moon …whether you are male or female, rich or poor, Jew or Gentile, black or white, Māori or Pakeha [non-Māori], whether European or Asian. (In Dobson, 1989)

When I arrived in New Zealand in 1992 the debate was on-going, but not very public; it was conducted through official government and university channels. After the 1992 Faculty endorsement of the Equivalence thesis, I became an energetic

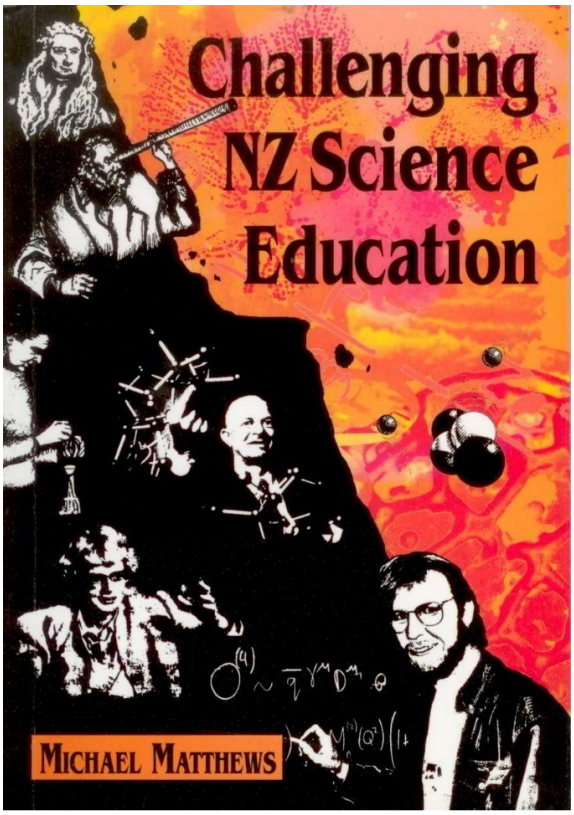
contributor to the debate, moving it into the public domain: Giving public lectures up and down the country, radio interviews, and writing newspaper opinion-pieces. In a lengthy, and much-reproduced, Opinion Piece for the New Zealand Herald (26 August 1993), I said, in part, that:

> Science in the National Curriculum identifies scientific thinking as: being curious, being creative, having hunches, clarifying ideas and feelings, thinking about your own thinking. All of these traits are laudable, but they are not uniquely scientific. The national curriculum document holds that scientific thinking is anything but knowing science, anything but mastering the special conceptual tools of science. (Matthews 1995, p.13)

Concluding:

> Science, and science education, can play a powerful role in the general improvement of culture. But it can only do this if it is seen as seeking the truth about the world, and as being partially successful in its efforts. It can play its much-needed role if it inculcates an attitude of humility before the world: The world judges our claims to knowledge of it, we cannot just construct whatever suits our fancy, our interests, or our culture, and call it knowledge. (Matthews 1995, p.14)

I subsequently published a book documenting and appraising the cultural, political, educational, and philosophical underpinnings of the affair (Matthews 1995).



National Embrace of Mātauranga Māori

In 1994 I returned to the University of New South Wales. Meanwhile, the under currents of the debate flowed on unabated, indeed were strengthened. Mātauranga Māori was formally introduced in the government's Vision Mātauranga policy in 2005. Vision Mātauranga is now deeply embedded in New Zealand's research institutions. The Ministry of Business, Innovation and Employment (MBIE) includes Mātauranga Māori among its investment priority areas, as do the Crown Research Institutes.

Michael Corballis (1936-2021) pointed out that the case for incorporating Mātauranga Māori (MM) into New Zealand science gained extra impetus late in 2019 with two publications in prominent New Zealand science journals. One was a supplement of the *Journal of the Royal Society of New Zealand* entitled "Ngā Ahua o te Ao Hurihuri - Rethinking our shared futures," and the other a

special issue of the *New Zealand Science Review* entitled "Mātauranga and Science." The latter includes a proposal entitled "Towards building an indigenous science tertiary curriculum," with 16 co-authors, among whom 13 claim tribal affiliation (Jackson et al., 2019). This is a blueprint for the re-focusing and development of New Zealand science faculties.

Researchers seeking funding, for example to the Royal Society Marsden Fund, must state how they will include Mātauranga Māori in their research. There are Australian and Canadian equivalents of this 'incorporation' policy. A 2020 advertisement for a lecturer in Zoology at Otago University required:

> Advancing Mātauranga Māori/Te Ao Māori perspectives in the study of Zoology with the position affording an exciting opportunity for an emerging scholar to research and teach from a kaupapa Māori perspective (Corballis, Rata & Nola 2020).

A comparable advertisement in a state university in the US giving preference for someone who could incorporate Creationist Science into their biology classes would draw wide philosophical, educational, and political outrage. And this notwithstanding that 30+ percent of citizens believe in special creation.

There has been a strong and successful campaign to have Māori knowledge, specifically science, incorporated into the National Certificate of Educational Attainment (NCEA) at all school levels (Hikuroa 2017). A 2015 article on 'Mātauranga Māori and the Future of NZ Science' published in The Journal of the Royal Society of New Zealand, and that has had 15,000+ views, was explicit regarding the autonomy or equal status of Māori Science:

> Although there will be opportunities to work together, that is not the goal of revitalising mātauranga. The goal is not partnership; it is tino rangatiratanga and instituting mātauranga as a primary and independent knowledge system. …We are calling for Western academics to support mātauranga revitalisation, with the vision of two functional knowledge systems operating that are unique to New Zealand. (Broughton & McBreen, 2015, pp.83, 86)

A Māori science educator pushed this position to its logical limits:

> Since Māori knowledge includes 'the gods' or knowledge of spiritual realms, while science does not, I drew [for a class] a diagram in which Mātauranga Māori is a large circle, and science is a smaller circle inside it. This differs from the more typical 'Venn diagram' model with two intersecting circles used to show the overlap between science and Māori knowledge (Roberts 1998; Simon 2003). The benefit of my 'superset' model of the relationship between science and mātauranga Māori is that it makes all of science, not only in some domains such as ecology, relevant to Māori and Māori school students. (Stewart, 2019, p.66)

This might sound nice and inclusive, but it is at the cost of missed learning opportunities: A great deal of scientific method, epistemology and ontology is inconsistent with Mātauranga Māori. Open debate, public criticism, provisional acceptance of institutionalised authority, inclusive participation – are the hallmarks of science, as Robert Merton classically stated the matter (Merton 1942/1973). To sweep this under the 'inclusive' carpet with a Venn diagram having 'science' within 'MM' means that serious, critical learning of neither will occur.

Tane Mahuta

For example, currently the magnificent kauri trees of New Zealand are being destroyed by microscopic fungi infecting their root systems and causing widespread kauri dieback. The trees figure powerfully in Māori creation stories. It is said of the largest tree, named Tāne Mahuta and thought to be 2,000+ years old, that at its birth God opened out the sky so as to give it room to grow. It is more than legitimate to consider the role of kauri forests in Māori culture when making decisions about the allocation of university biological/botanical research money. There may be trade-offs about priority of Māori culture versus the economic returns from curing riesling vineyard diseases in the upper South Island. These are normal and legitimate decisions.

Kauri dieback

It needs be acknowledged that too often the latter considerations took precedence over the former. Nick Waipara, a scientist who specialises in kauri dieback, said that the competitive system for scientific funding had directed money toward the priorities of non-Māori researchers. For a decade, work on the disease was "problematic, underfunded, piecemeal and ad hoc". The lag had devastating consequences. "I've seen with my own eyes, when we've been doing long-term monitoring of plots, places where in some years we haven't found a single seedling that was alive," Waipara said.

But once research has been decided upon and funded, understanding, and hopefully curing the dieback, will be a scientific matter. Ideally with maximum Māori participation at all stages, including the research itself. Introducing MM-based hypotheses or evidence, will be a distraction, if not a corruption of the science.

Such acceptance of Māori science as being science is now just part of mainstream New Zealand thinking, from primary school, through secondary school, all the way up to university departments. It is seldom publicly remarked upon, much less publicly debated or contested. The government's *Education and Training Act 2020* mandates that Boards of Trustees of all schools must allocate equal priority to 'giving effect to Te Tiriti o Waitangi'. Schools must ensure their curriculum reflects local tikanga Māori and mātauranga Māori. The University of Waikato's *Strategy*

2022-2024 document lays out its Strategic Priorities:

1. Embed mātauranga Māori into teaching, learning and the curriculum.

2. Ensure that academic appointment, advancement and promotion processes require staff to reflect on their engagement with mātauranga Māori,

3. Provide support and opportunities for staff to engage with matauranga Māori within their areas of academic expertise, and to ensure that matauranga Māori is embedded as part of the curriculum.

Other New Zealand universities have, or are producing, comparable statements. The crucial cultural and philosophical issue is whether 'engagement with' allows 'criticism of'. There are disturbing signs that it does not so allow.

The Health of NZ Scientific and Humanities Research

In 2021 the Ministry of Business Innovation and Employment (MBIE) released a draft *Research, Science and Innovation* plan saying:

> more work needs to be done to explore how the research system can best uphold Te Tiriti [Treaty of Waitangi] obligations and opportunities. We aim to reimagine how to give life to Māori research aspirations, and create better ways to enable and protect mātauranga Māori. …Open and genuine engagement with Māori will be vitally important to the development of a research system that gives effect to Te Tiriti. (p.4)

If engagement is to be seriously open and genuine then it must allow criticism. This policy document does not. The feedback that it asks for is:

> What are your thoughts on how to enable and protect mātauranga Māori in the research system? (p.5)

The Māori creation story of the primal couple Rangi, the sky father, and Papa, the earth mother, and their subsequent 70 children is widely read and elaborated. It has significant cultural value. But it is just a story. It is a myth. It is no different from the Creation Stories in thousands of other cultures in which most connect their present selves to the Creation. Is the MBIE expecting this story to be protected and beyond examination? The genocide of the Moriori people on Chatham Island in the 1860s was a dark chapter in Māori history. There are serious historical questions about what happened and why (Piper 2012). These need to be addressed and answered without consideration of the impact on mātauranga Māori. In one exhibit on the Moriori, in a major museum, the genocide did not figure. Presumably because the story would be disturbing.

The NZ national research programme is moving inexorably into the non-scientific camp: Enabling and protecting any ideological system is not part of science. The near-national lack of comment and public debate on this matter is noteworthy. It is the new normal. The situation for NZ research is akin to the poor frog in slowly heating water: They are not aware of what is happening till it is too late. That 'no criticism here' is also the disturbing normal in other illiberal countries should cause a pause and rethinking of the policy in NZ.

In Pakistan, Turkey, Indonesia, Afghanistan and other Muslim countries, advertisements seeking staff who can incorporate Koranic Science into

their classes are also not remarked upon. Nor, in these Muslim countries, are university policies embedding promotion of Islamic faith into university strategies. Equally un-remarked upon, at least publicly, is the situation in China where completion of a course on Marxist Dialectics of Nature is a part of all higher degrees, and where university professorships are devoted to teaching this subject.

In India, the Hinduising of Indian science has progressed at full steam under the Bharatiya Janata Party (BJP) national government of Narendra Modi, and in the 17 state governments where the BJP is in power. In 2018, India's Minister for Higher Education, Satyapal Singh, claimed Darwin's theory of evolution was wrong and vowed to change the national school curriculum so as to avoid spreading the falsehood. At the 2019 Indian Science Congress, G. Nageshwar Rao, the vice-chancellor of Andhra University, claimed that stem-cell research was conducted in India thousands of years ago: 'We had 100 Kauravas from one mother because of stem cell and test tube technology'. At the same congress, a professor of inorganic chemistry asserted that: 'Hindu Lord Vishnu used guided missiles known as 'Vishnu Chakra' and chased moving targets'.

To the credit of Indian scientists, there has been push-back against these claims. The claims are plainly ridiculous, though making this value judgement does depend on accepting that there is some truth of the matter; and that not all accounts of any matter are equally true or radically incommensurable. Without such realist assumptions, evaluative scientific, or indeed ethical, judgements are impossible. In a 'Post-Truth' world (McIntyre 2018) where Donald Trump's spokesperson talked glibly of 'alternative facts' – these consequences are on 24/7 display. This well prepares the ground for the Russian bombing of a Mariupul Maternity Hospital being described by President Putin's spokesperson as an 'inside job'. If there are no facts of the matter, why cannot it be an inside job?

The only people consistently objecting to Christian Science, Islamic Science, Hindu Science or Marxist Science being made part of a nation's science programme are liberals who believe that culture and politics should be kept out of scientific theorising, decision making and teaching. Culture and politics can rightly, to a point, influence research directions and research funding, but not scientific theorising and theory testing. The examples of Franco's Spain, Mao's China, Hitler's Germany and Stalin's Soviet Union, to say nothing of contemporary examples of the corruption of science in Big Pharma, Big Petro, and Big Tobacco research–should give pause to anyone thinking it is good for science to serve social or cultural interest at the expense of truth. When there is a clash, the latter must prevail. This surely was the lesson of the Enlightenment (Matthews 2015, chap.2).

Historians and philosophers of science used argue the liberal case for keeping politics out of scientific decision making, but with the rise of constructivism and Kuhn-inspired anti-realism, their voices are less heard.

The 2021 Controversy

In New Zealand, this issue came to national, and then international, attention in mid-2021 when seven University of Auckland professors – Kendall Clements (Biology), Garth Cooper (Biology), Michael Corballis (Psychology), Douglas Eliffe (Psychology), Robert Nola (Philosophy), Elizabeth Rata (Education) and John Werry (Medicine) –

published, on 23 July 2021, a 400 word 'Defence of Science' letter in the popular *New Zealand Listener* weekly magazine. They were moved by the seemingly inexorable incorporation of MM into the National Certificate of Educational Attainment, and its consequences for the teaching of science in universities. A fuller and more routinely academic version of the letter had earlier been rejected by the Royal Society New Zealand (RSNZ) journal. The *Listener* version, among other things, maintained:

> Indigenous knowledge is critical for the preservation and perpetuation of culture and local practices, and plays key roles in management and policy. However, in the discovery of empirical, universal truths, it falls far short of what we can define as science itself.
>
> To accept it as the equivalent of science is to patronise and fail indigenous populations; better to ensure that everyone participates in the world's scientific enterprises. Indigenous knowledge may indeed help advance scientific knowledge in some ways, but it is not science. (Nola et al 2021)

Within four days of publication, the letter and its writers were condemned by the New Zealand Association of Scientists who, among other things, claimed:

> No useful science can be done in a vacuum, artificially disconnected from its context. We cannot make meaningful progress on doing better science now and in the future if we allow the continued treatment of mātauranga as unproven or lesser by Pākehā and other Western scientists. Instead, we acknowledge its equal importance and role in scientific work.

Within two weeks of its publication, an Open Letter (petition) 'Against the Professors' was penned by professors Shaun Hendy (Physics, University of Auckland) and Siouxsie Wiles (Biology, University of Auckland). It was circulated and signed by 2,000+ academics, school principals, teachers and graduate students. The signatories included 250 New Zealand professors and associate professors. The number of signatories garnered in such short time is no small thing given there are just eight universities in the country, having a total of 20,000 academic staff.

The multi-signed 'Against the Professors' petition affirmed, among other things, that:

> …while the Professors describe science as 'universal', they fail to acknowledge that science has long excluded indigenous peoples from participation, preferring them as subjects for study and exploitation. Diminishing the role of indigenous knowledge systems is simply another tool for exclusion and exploitation.
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> Indigenous knowledges – in this case, Mātauranga – are not lesser to other knowledge systems. …However, Mātauranga is far more than just equivalent to or equal to 'Western' science. It offers ways of viewing the world that are unique and complementary to other knowledge systems. (Hendy et al, September 2021)

The School of Biological Sciences formally labelled as 'Unsafe' those of its members who were among the seven public 'Defenders'. Being so labelled warns students that they might be disturbed or unsettled if they enroll in the professors' courses. The undertone is that those so labelled are racists. In the light of its 'unsafe' designations, the school made adjustments to its teaching and administration duties.

The Auckland University Vice-Chancellor, Dawn Freshwater, divorced herself, and the University,

from the 'Defenders of Science'. In a communication to all staff and students, she said that the 'Defenders Letter' had 'caused considerable hurt and dismay among our staff, students and alumni'. An associate communicated that the letter pointed to 'major problems with some of our colleagues'.

The Royal Society New Zealand (RSNZ) is the country's peak scientific and humanities organization and voice. Within days of *The Listener* letter being published the society's president and the chair of its academy executive committee issued a joint response:

> The recent suggestion by a group of University of Auckland academics that Mātauranga Māori is not a valid truth is utterly rejected by Royal Society Te Aparangi. The society strongly upholds the value of Mātauranga Māori and rejects the [writers'] narrow and out moded definition of science.

This statement is in stark contrast to that made thirty years earlier, and reproduced above, by the then president of the RSNZ in response to the inclusion of MM in the Draft School Curriculum. Clearly a lot will hinge on whether definitions of science are out-moded or otherwise. Good philosophy and clear thinking is central to this debate.

Shortly after the Defenders' letter, five complaints were made to the RSNZ by fellow members, asking that the Society 'take a strong stance' against three of the seven professors, who were members of the RSNZ. The five complaints were reduced to two when it was pointed out that authorship of formal complaints needed to be public. The two remaining accusers – a professor of biology and a professor of biomedical science – variously maintained some or all of the following reasons for their sanctions request:

> They expressed racist and uneducated views, brought the RSNZ into disrepute, did not behave with honesty, integrity and professionalism, demonstrated poor research abilities, exhibited no understanding of Mātauranga Māori and other forms of indigenous knowledge, lacked critical thinking capacity, had no insight into the ever-changing nature of science, failed to protect vulnerable people and prevent harm, negatively impacted on the mental wellbeing of researchers in the community, both indigenous and non-indigenous. and did not meet their obligations arising from the Treaty of Waitangi.

The RSNZ convened an Investigation Panel in order to ascertain whether the complaints should be forwarded to the Society's formal Complaints Committee for an appropriate punishment, which may or may not have included expulsion. There was a problem at the outset as two members of the proposed panel were among the 2,000+ signatories of the 'Against the Professors' letter. Not a good judicial look. The two were replaced.

The three defenders 'in the dock' were: Professor Garth Cooper FRSNZ, a Māori and one of the country's most prominent bio-medical researchers who had made massive contributions to understanding and addressing Māori health issues; Professor Robert Nola, an internationally known philosopher who has made considerable contributions to both philosophy of science and to science education research; and Professor Michael Corballis, a much-published and awarded neurocognitive scientist, who had published 400 papers and 14 books. All faced expulsion from the RSNZ. Sadly, Corballis died before the RSNZ Complaints Committee completed its determination. An undeserved ending to a wholly positive and productive life.

Not surprisingly, the actions of both the University of Auckland and of the RSNZ were condemned

in a number of quarters inside and outside of New Zealand. But not by as many as might have been expected. Disgracefully, the bulk of NZ academics looked the other way: there was no marching in the streets, or even marching in the quadrangles.

Among the minority of brave souls who did not look away, or go out to lunch, was Christian Karl Stead, an acclaimed NZ novelist, writer, Vietnam War critic, and Emeritus Professor of English. On 21 August 2021 his letter to *The Listener* was published:

> That Jesus of Nazareth was the Son of God, born to a virgin, performed miracles in his life time and rose from the dead after crucifixion is believed by some people, disbelieved by others. That one who breaks tapu, or on whom a mākutu (curse) is placed by a tohunga, will suffer illness or even death is likewise believed by some and not by others. These are matters of faith and neither is susceptible to scientific proof or disproof.
>
> That my university should have an official position on the Divinity of Jesus would be as surprising and shocking as it is to discover, from ViceChancellor Dawn Freshwater's recent statement, that it has an official position on the efficacy of matauranga Māori in the study of science in our schools. We won't correct our colonialist mistakes by making new ones.

Many, including myself, disagree with Stead and believe that the efficacy of curses or prayers can be scientifically assessed (Fishman 2009), they are after all claims about causal processes in the world, yet one can wholeheartedly endorse his disbelief and disappointment, if not disgust, with the pusillanimous behaviour of the Vice-Chancellor, and the university more generally.

Outside New Zealand, in the USA, Jerry A. Coyne criticised these actions, and helpfully provided documentation of NZ universities' policies that were advancing the MM programme. In the UK, Toby Young, Assistant Editor of *The Spectator* wrote a column (6 December 2021) titled: 'Why punish a scientist for defending science?' He wrote:

> In a rational world, this [Listener] letter would have been regarded as uncontroversial. Surely the argument about whether to teach schoolchildren scientific or religious explanations for the origins of the universe and the ascent of man was settled by the Scopes trial in 1925? Apart from the obvious difficulty of prioritising one religious viewpoint in an ethnically diverse society like New Zealand (what about Christianity, Islam and Hinduism?), there is the problem that Maori schoolchildren, already among the least privileged in the country, will be at an even greater disadvantage if their teachers patronise them by saying there's no need to learn the rudiments of scientific knowledge.

Richard Dawkins criticised the censure actions and rejected the arguments being advanced to support them. In his typically direct manner, he wrote to the President of the RSNZ:

> The world is full of thousands of creation myths and other colourful legends, any of which might be taught alongside Māori myths. …But no indigenous myths from anywhere in the world, no matter how poetic or hauntingly beautiful, belong in science classes. Science classes are emphatically not the place to teach scientific falsehoods alongside true science. Creationism is still bollocks even it is indigenous bollocks.

For any culture whose self-understanding and identity is tied to its creation stories and, more broadly, its ingrained and established worldview, Dawkins' charge amounts to 'fighting words'. They assuredly were for New Zealand Māori just as they

would be for fundamentalist Christians, Mormons, Australian aboriginals, most Muslims, and many others tied to 'unnatural', non-evolutionary, accounts of human origins. Before Darwin, this was the worldwide, cultural default position.

To the relief of many, on 11 March 2022, the RSNZ Investigation Panel determined that no further action would be taken in respect of the above listed 13 complaints because they 'demanded open-ended evaluation of contentious expert opinions or of contested scientific evidence amongst researchers and scholars'. Case closed.

Economic Consequences

The correct, clear-headed appraisal of Mātauranga Māori has not just cultural and educational consequences, but economic ones. Consider the once-routine monitoring of river, lake and drinking water quality. Local governments would periodically test for bacteria, acidity, nutrient levels, biochemical oxygen demand (BoD), oxygen levels and sundry other, up to 22, agreed upon and measurable factors. The Taranaki Regional Council, which includes Mt Egmont and the city of New Plymouth, has for decades done this monitoring at 13 sites. But as of last year, the Mātauranga Māori notion of Mauri has been added to the determinants of water quality and will be so monitored. With national government assistance, NZD4.95M has been set aside for the 5-year task.

Initially this might sound nice, and culturally sensitive, bringing Western science and Māori spirituality together. But what is mauri? The *Te Aka Māori Dictionary* provides this definition:

> **1. (noun)** life principle, life force, vital essence, special nature, a material symbol of a life principle, source of emotions - the essential quality and vitality of a being or entity. Also used for a physical object, individual, ecosystem or social group in which this essence is located.

Gisborne Council defines mauri in their Tairawhiti Resource Management Plan as 'essential life force or principle, a metaphysical quality inherent in all things, both animate and inanimate'. The NZ Peak Body for Youth Development (AraTaiohi) elaborates:

> Mauri is the life spark or essence inherent in all living things that has been passed down from ancestors through whakapapa. Mauri affects and is affected by the surrounding environment. It is a motivating force and also encapsulates a process of change from Mauri moe, a state where potential is as yet unrealised; through Mauri oho, sparks of interest and the realisation that change is possible; to Mauri ora, an action-oriented stage of striving towards full potential.

Unlike the 22 generally accepted 'scientific' indices of water quality, all of which have appropriate measuring techniques and instruments, there are precisely zero techniques, much less instruments, available for measuring mauri in water or even in water environs. So, at the end of five years and with the expenditure of nearly five million NZD, how does anyone know whether mauri has gone up, down, or remained constant? And, of course, once Taranaki has succeeded in getting grant money, it would be expected that the other ten councils in the country will do the same thing. Why not test mauri levels in the waters of Otago, Southland, Auckland, and so on? There is nothing in MM to dissuade councils from seeking such funds, and indeed MM supporters, or lobby, can be expected to push for such research funds.

As close to an instrument as can be found is a recently developed mauri compass. But this is an 'instrument' in name only. The compass is no physical artifact; it is a set of conversation starters about water quality. Its developers say the talking guide is a way to discuss the mauri of a specific waterbody. It takes into account 12 different attributes, moving through tangata (people), tane (land) and tangaroa (sea) values, while including both Maori and Western science views. The attributes include tangata whenua, tikanga, wairua (spirit or soul), mahinga kai (food gathering), habitat, biodiversity, biology, chemistry, fish species, abundance, fish health and growth rates. The developers say:

> We are not trying to define mauri. But it [the compass] is a tool to help people articulate it, a good conversation starter with trigger questions for conversations with people around their waterways.

Such conversations do no harm and can do some good, but the process is a long way from scientific measurement. Feng Shui consultants charge money for ascertaining that a dwelling near water, in the sun, protected from wind, not overlooking a cemetery has good chi (Matthews 2019, chap.4). Manifestly, the chi appellation does not add anything to what is already known. Such a dwelling will be pleasant to live in. Indicators are that mauri is in the same situation.

It is a relatively easy task to show that mauri is in the same non-scientific league as Eastern, and increasingly Western, *chi* beliefs (Matthews 2019). And as with *chi*, the ever-present danger is that mauri commitment becomes pseudoscientific; an accessory for hucksters and rent seekers. 'Life sparks', 'life forces', and 'living essences' have all the hallmarks of well known, and discredited, Vitalism in the history of science.

As well as direct costs involved in monitoring mauri, there are oft-ignored 'lost opportunity costs'. What else in the Taranaki Council area could NZD4.95M be spent on: Women's shelters? Public housing? Community transport? Infant health clinics? Expanded library service? These are unfunded while a fantasy is pursued.

Projected nationally, lost opportunity costs are sobering. One claim is that more university research funds have gone into researching MM than have gone into clinical medicine or engineering research (David English, *The Listener* 28 August 2021). There are also immense lost education costs.

Integration or Separation?

The seemingly attractive option of integrating MM and science, bringing the former into the science programme, and teaching it as science is, on examination, not so attractive.

The ontology of many ethnoknowledge systems, including MM, include non- material, active, nonlawful entities such as angels, spirits, jinn, devils and the like. These irregularly intervene in the world, possess people, cause and cure illnesses, speak from 'the other side', respond to prayers and entreaties, and so on. The spirit world is omnipresent and active in most traditional worldviews (and a good many Western ones). Such ontologies allow for animism wherein trees, rocks and landforms are animate, they have their own spirits, life forces and, for some, consciousness. Such an ontology cannot be stirred together with scientific ontology. The latter is not materialist, but it must be naturalist.

During my 1992-93 period in Auckland, a Māori couple were charged and convicted of grievous

harm to their son. They had gauged his eyes out with a spoon. He was epileptic and they believed his spasms were being caused by an evil spirit that had possessed him. In their understanding of MM, such bad spirits can only leave through the eyes. Such spirit-based understanding of epilepsy was the historic norm right through to the nineteenth century. In many cultures untouched by science, it is still the norm. The issue for champions of MM is how to determine whether the boy was, or was not, possessed by a spirit?

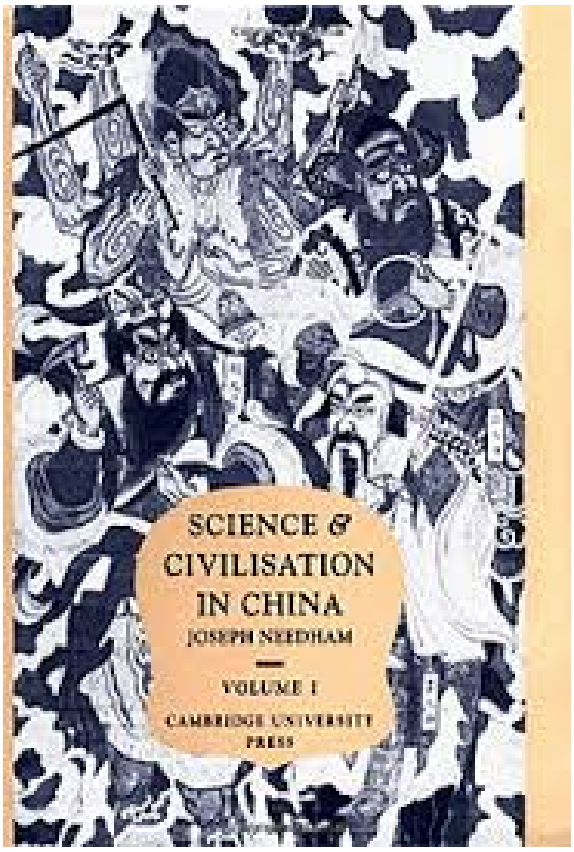
Merely asking the question suffices to show it cannot be unambiguously answered within MM. Either a YES or NO answer can be accepted or rejected; there is no way to settle the matter. In a naturalist worldview, there simply are no spirits causally active in the world whether they be good or bad (Shimony 1993a,b). So natural, scientific explanations of epilepsy (and everything else) need be found.

Epistemologies vary between TEKs with some having a frankly authoritarian epistemology: Truth is sought in sacred books or Scriptures, in the tradition of cultural teaching, and in the judgement of elders or authority figures. And where this does not happen, there is an over reliance on empiricism, on how things look, as the determiner of truth. Measurement, and conducting controlled experiments, is not a priority.

Joseph Needham (1900-1995) famously wrote in his 24-volume study of *Science and Civilisation in China* (Needham 1954-2004) that although China had unmatched technologies, at least two-thousand years of recorded observations, and trial and error procedures across a multitude of domestic, commercial, and industrial practices including pottery, ceramics, iron making, canal building and much more – China had no science (Matthews 2019, chap.10). It had technics and advanced technology, but not science (Needham 1969, chap.1). For Needham, science was defined by:

> The application of mathematical hypotheses to Nature, the full understanding and use of the experimental method, the distinction between primary and secondary qualities, the geometrization of space, and the acceptance of the mechanical model of reality. Hypotheses of primitive or medieval type distinguish themselves quite clearly from those of modern type. Their intrinsic and essential vagueness always made them incapable of proof or disproof, and they were prone to combine in fanciful systems of gnostic correlation. (Needham 1969, p.15)

Needham's arguments about historic Chinese science, or lack thereof, can equally be made about Mātauranga Māori.



With good reason, Simon Winchester's biography of Needham was titled: *The Man Who Loved China* (Winchester 2008). Needham was a Fellow of the Royal Society yet his clear-headed, exhaustively-informed, publicly-stated views on the failure of China to develop modern science – were never thought to be grounds for taking 'staunch action' against him or charging him with racism. Those who brought charges against the three Auckland 'defenders of science' would have done well to learn from the Needham case.

Conclusion

Charbel El-Hani, a Brazilian biologist and philosopher of science who for decades has worked with a NE Brazilian traditional fishing community documenting their native knowledge and practices, comprehensively addressed this matter in a co-authored paper aptly titled 'Valuing indigenous knowledge: To call it "science" will not help' (El-Hani & de Ferreira Bandeira 2008). The 2,000+ signatories of the 'Against the Professors' letter would have done well to have read the paper.

There are educational, cultural, ethical, and political reasons for the teaching and learning of local ethnosciences. But these reasons are all independent of the scientificity, or otherwise, of Māori or any other ethnoscience. The placement of ethnosciences in the school or university science programme depends upon confusing the first sets of reasons with scientificity. Indigenous knowledge systems or, more loosely, ways of knowing can be respected, championed, and learnt from without them needing to be called 'science'. Much less deemed the equivalent of science. This should be a simple matter to understand, but the influence of constructivism in NZ education and philosophy, and the extension of post modernism in so many academic and cultural areas, has meant that this simple point has not been widely understood.

In New Zealand there are, additionally, legal reasons for promotion of Mātauranga Māori: As previously mentioned, the 1840 Treaty of Waitangi, signed between the British Crown and Māori chieftains, required, on one reading, that the new British country being established 'maintain and protect Māori culture and beliefs' (Palmer 2008). How the Treaty obligations bear upon science is vexing question. It cannot protect all purported MM beliefs and claims. It did not protect the parents in the sad epilepsy case referred to above. As so much of MM its ontology, epistemology, methodology and institutionalised structure, or lack thereof, is inconsistent with science, there is, to put it mildly, a tension between the protection of MM and the promotion of science. Often, recognition of tension is the precursor to growth and development. Hopefully this will be the case in

New Zealand.

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