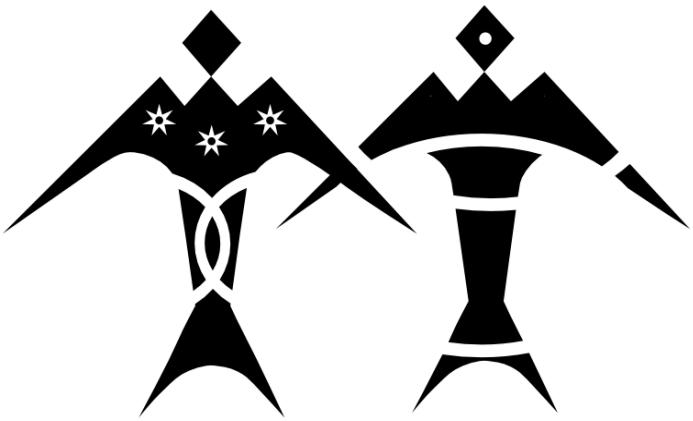
Ocean Diffraction



Ocean Diffraction:

Indigenous Practices, Quantum Theory, Electronic Art and the Anthropocene

By

Dr Mahutoa Pasha Clothier

Cambridge Scholars Publishing

Ocean Diffraction: Indigenous Practices, Quantum Theory, Electronic Art and the Anthropocene

By Dr Mahutoa Pasha Clothier

This book first published 2025

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-0364-5617-7
ISBN (Ebook): 978-1-0364-5618-4

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

In keeping with a whakapapa (genealogical) theme to this book, a veritable extended *whanau* (family) has been part of putting all of this together. Thanks go to Associate Professor Amanda Yates, Dr James Charlton, Dr Kathy Waghorn and Associate Professor Janine Randerson for their detailed critique and the excellent prompt toward navigation from Amanda. Professor Albert Refiti provided an important guide to ongoing whakapapa or heritage related practices. Kawaihululani provided the first touch point for traditional navigation, and we have wayfound our way through an ocean of related topics and ethical approaches.

Maata Wharehoka has been a significant influence in my life and provided a strong and clear hand on pronunciation, and on engaging in Moana themes for living. Some of our collaboration formed the basis for reflecting on how electronic art might fit into the global issues of the day. Dr Te Huirangi Eruera Waikerepuru and Te Matahiapo Indigenous Research Organisation played, and continues to play, an influence upon my mahi (work), with lessons from Te Huirangi extending to this day and contained in this book.

Of whanau (family), it is important to acknowledge Meralda Warren, who re-established ahu (tapa) making on Hitiaurevareva (Pitcairn) in 2007. Pauline Reynolds has completed decades of research into the Tahitian wahine (women) of HMAV *Bounty* and their ahu, with many publications on the subject that have provided key waypoints in my creative journey. Sue Pearson contributed an image to the museum exhibition and was a great debater of points. My mother Irene "Weetie" Clothier, father Ron Clothier, grandmother Aunt Lil of Cascades, and Tūpuna (ancestors) from the 1830s all appeared in the museum show, and their energies inspired and accompanied me at all times. So too did my brother Gary Clothier, sister Chris Stephens, and brother Rocky Clothier.

The environment outside my studio, with its lively bird visitors, extensive trees, and stunning light, provided a place to engage with the Anthropocene and submit myself to natural energies in the time of the pandemic isolation. This has been an extraordinary resource, reaching at night up to the moon and stars.

I must express gratitude to the Kaiwhakatere (traditional navigators) who risked their lives in re-establishing traditional navigation. The authors

of books on the subject and the archive at Hokula.com have provided extensive and detailed information, without which this book could not have been written.

Finally, the research *Ocean Diffraction* is based on was completed with a Vice Chancellor Scholarship from the Auckland University of Technology. This allowed for full-time research on my PhD, so I would like to acknowledge the office of the Vice Chancellor. The three-and-a-half-year scholarship enabled an unparalleled freedom and depth of research for which I am extremely grateful.

Dr Mahutoa Pasha Clothier
Ngāmotu New Plymouth
Taranaki
Aotearoa New Zealand

GLOSSARY OF TERMS

Ngaru Whenua: This refers to a wave (ngaru) pattern made by a current passing an island (whenua) which splits in two around the island, then reconnects and overlaps downstream, creating a distinctive wave pattern which directly rocks the waka or canoe in a distinctive way. This pattern can be felt by lying on the hull of the waka, allowing finding an island from 56km away in total darkness.

Diffraction: The Ngaru Whenua pattern known by traditional navigators is called "diffraction" in Western Science and by writers in the Humanities.

Ngaru Whenua Ocean Diffraction Method: This book proposes an evolution of the diffractive method initiated by Donna Haraway (1997) and extended into a multi-disciplinary discussion by Karen Barad (2007). The evolution moves the diffractive method into a multi-cultural discussion. Based on traditional navigator awareness of wave patterning in the ocean, the Ngaru Whenua Diffractive Method consists of citing full sentences of authors across cultural borders rather than paraphrasing, utilising a notion of knowledge as dimensional, citing precedence in Indigenous awareness, and considering the local and broader community.

Indigenous Practices: "Practices" is used here as a broader term than "knowledge" or "awareness," as an emphasis is placed on how knowledge and awareness in Indigenous societies map out *in practice* rather than simply forming constituents of a theoretical model. Also underlined is an associated ethical dimension. "Indigenous Practices" encompasses ontological, epistemological, spiritual, customary and contemporary approaches to living, art-making, material practices, and in the case of this book specifically includes life practice, creativity, digital artefacts and curation.

West: This book uses the common term West to reference the Western European Cultural Hemisphere, which shares an alphabet and extends from Russia to the United Kingdom, and with Colonisation, out to North and South America, Australia, New Zealand and Te Moana Nui a Kiwa (Pacific Ocean). The term Western Science refers to a post-Enlightenment

set of positivist, rationalist values and approaches to reality. The West is not intended as a binary with the East, particularly as this research originates in the so-called "Global South," rather West is used as a shorthand for particular Euro-American ideological processes, particularly those commencing with the rise of Capitalism and Cartesian Duality following the Renaissance.

Polynesian and Moana peoples: The Polynesian triangle is a Western cartographical notion imposed on an open ocean that has no natural boundaries. In current discourse among Polynesians, the term Moana is frequently used to self-describe the region of origin. Consequently, 'Moana peoples' is used in this book.

Moana (Ocean) Dimension: Also proposed is the notion of knowledge as dimensional, rather than knowledge acquisition solely being a linear process based on deductive reasoning. Dimensional knowledge involves looking from multiple sides and perspectives. "Moana" refers to the ocean, and the Moana Dimension consists of local knowledge and intergenerational knowledge, both of which are key to Moana awareness.

Rā (Interconnectivity) Dimension: Rā is widely used by Moana peoples as a reference to the Sun**.** The Rā Dimension measures the degree of interconnectivity of an idea. Interconnectivity is a major theme across Te Moana Nui a Kiwa (the Pacific Ocean) and in contemporary Western academia in several disciplines.

Tangata (People) Dimension: Tangata Dimension measures the extent of an idea in terms of its spread across cultures. Extent is the key measure, rather than finding single solutions to issues. This dimension includes whakapapa (see below), tūpuna or ancestors, and can also involve analysing from the point of view of the impact on people, of an idea.

Aotearoa: This is the Māori name for New Zealand and is in common usage. In general, with Moana terms, words do not have a singular meaning but rather are multifaceted and depend for their meaning on context. "Aotearoa" is a term that can be expressed in its constituent parts: "Aotea" for example can refer to an island or a traditional waka (canoe). This needs to be borne in mind throughout the text when Māori terms are referred to in English.

Te Moana Nui a Kiwa: This is the Moana and Māori term for the Pacific Ocean (Moana people refer to Kiva). A literal translation gives "The Great

Ocean of Kiwa." Kiwa (or Kiva) was an important navigator. An older name for the ocean is Te Moana Nui o Tangaroa, referring to the Atua or Energy of Water Life (as translated by Dr Te Huirangi Waikerepuru).

Whakapapa: This is often translated as genealogy, which it is. However, in Moana terms, whakapapa is greatly extended and involves relationships to buildings, plants, rocks, and birds – these facets are stored in the oral tradition of a person's whakapapa. In addition, all things can have whakapapa, so whales, plants, and buildings for example can have their own whakapapa. The trees used to make a canoe have whakapapa. Legal recognition as a person has been granted to the Whanganui River (New Zealand Parliament, 2017) and Mount Taranaki (New Zealand Parliament, 2024), reflecting this world view.

Hitiaurevareva: This is the traditional Tahitian name for Pitcairn Island, and means 'the island far, far away.'.

Kōhatu: This term is used to describe a wide range of rocks, with particular emphasis here on laser etched and painted river stones, to be located across Te Moana Nui a Kiwa.

Waka, va'a: "Waka" is Māori for canoe and "va'a" is the Tahitian term.

Mana: In this book "mana" is often used in the sense of prestige or integrity: for example, maintaining the mana of Indigenous writers' words on a subject by using block quotations that cite them in complete paragraphs. There is also a metaphysical side to mana, though the emphasis here is not on that usage.

Ahu: The Tahitian term for tapa, a cloth made from the inner bark of trees and widely produced across Te Moana Nui a Kiwa.

Dr Te Huirangi Eruera Waikerepuru (1929–2020): It can be difficult for Western academics to understand the importance of key Indigenous figures. Te Huirangi Eruera Waikerepuru, now passed, is a major figure in national and international Indigenous affairs who spearheaded the campaign to have Māori language legally acknowledged as a second language.

Wayfinding: This is a term used by traditional navigators to describe their practice. This involves the nightly activity of navigating from one star to the next as they rise, traverse, and descend in the sky. The fuller sense of

wayfinding involves greater considerations – nurturing the community on board the waka *and* the community on shore, for example, while honouring ancestors. Creative wayfinding is used here to identify a practice that acknowledges these approaches. Creative wayfinding does not involve sailing in the open sea, but rather navigating life and creativity; hence it is not the majestic enterprise of traditional navigators, but the humbler enterprise of living each day, traversing from one point to another then another and literally finding the way, with a particular emphasis on doing things that might not be done usually in life and the studio.

Te Pō: This concept has several meanings: it can mean The Nothing, The Dark, or The Night and is mentioned in regard to the *Black Hole* works discussed in Chapter Six, and the ceremony around the placement of a Kōhatu on Taputapuātea Marae, Ra'iātea. An important concept among Moana peoples, it refers to a world of dark, often contrasted to Te Ao Marama (the World of Light). There is a Karakia that refers to twelve states of Te Pō which at appropriate times Te Huirangi Eruera Waikerepuru would refer to.

Tohunga, Tohu'a: Often translated as Priest, the term refers to expert knowledge held in any field. Tohu'a is the Tahitian term, which is the same word as the Māori however the 'ng' sound is not used in Tahitian, and a glottal stop (which involves a very short gap when spoken) is used instead.

PREFACE

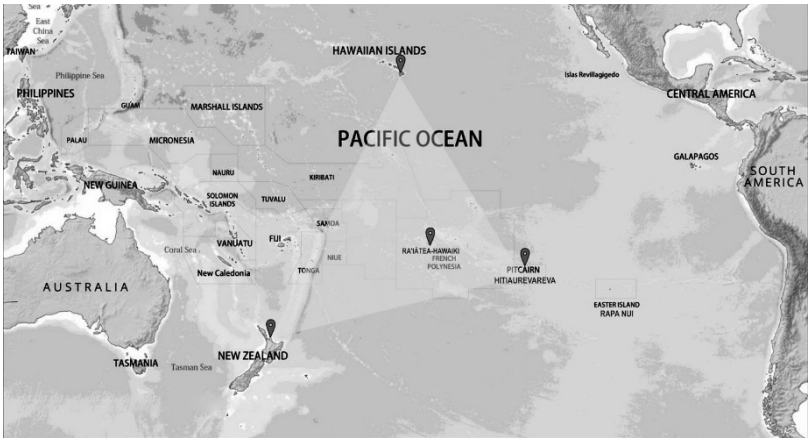


Figure 1. *Map of the project area.* Adapted from freeworldmaps.net. Public domain.

This book is an exploration of Indigenous Practices, Quantum Theory, Electronic Art and the Anthropocene using an approach I call Ngaru Whenua Ocean Diffraction. It is a journey founded in the very real transit to the islands indicated above, covering thousands of kilometres of Te Moana Nui a Kiwa, the South Pacific Ocean. In the text, I propose an evolution of the diffractive method of Donna Haraway (1997) and Karen Barad (2007) from feminist sci-tech studies and interdisciplinary Quantum Theory-based writing into multi-cultural discussion. My approach is deeply rooted in Moana or Polynesian awareness of whakapapa (genealogy), creative wayfinding and a diffractive method that protects the mana and integrity of authors' words on all sides of cultural debates.

Ngaru Whenua wave patterns are known by traditional oceanic navigators. They are called "diffractive" in the West and apply to light, water and sound. Acknowledging the precedence of diffraction in Indigenous awareness, the exploration of Indigenous Practices here is predominantly founded in traditional Moana navigational practices (Kawaharada, 1992) and whakapapa. The diffractive wave patterning found in the wave-particle duality of light is a subject that vexed Quantum

Theorists most of the twentieth century, which Barad (2007) writes about extensively. In diffracting Indigenous Practices and Quantum Theory, the writing of Samoan authors on the Vā, including Albert Wendt (1996), Albert Refiti (2014) and Lana Lopesi (2021) are put into exchange with the writing of Barad (2007) using direct quotations rather than paraphrasing. The contention is that this is necessary when engaging in multi-cultural, multi-disciplinary decolonised discourse, an essential core of Ngaru Whenua Ocean Diffraction. Paraphrasing Indigenous writing can unintentionally distort concepts when this occurs across a cultural border.

Given the sea is the origin of Ngaru Whenua Ocean Diffraction, my Moana whakapapa to Tahiti and Hitiaurevareva (Pitcairn Island) and the consequences for creative practice are discussed. I also introduce the key theme of wayfinding as an input into creative practices. Resolving to a personal level the issues of whakapapa and Moana diaspora provided important guides to developing a visual vocabulary, which I then take into diverse media and contexts. The consequences for creative practice are further reflected on in a diffraction of Electronic Art and the Anthropocene.

The projects that resulted from my wayfinding include a curated one-person and extended family or whanau exhibition at Aotea Utanganui Patea Museum exploring the critical Moana notion of an interconnected universe, a five-year window commission for the Govett-Brewster Art Gallery, the creation of *Arawhiti Āniwaniwa Rainbow Bridges* and *Black Holes* digital imagery, and Anthropocene explorations. The epitome of the project involved the placement of a laser-etched Kōhatu on the sacred navigator site of Taputapuātea Marae on Ra'iātea, and the return to Aotearoa with a Kōhatu (river stone), a process that necessitated the acknowledgment of Tapu and Noa, Sacred and Mundane. Within a framework of Indigenous ecological interconnections, a pathway to counter the Anthropocene can be charted. This is a considerable journey through previously uncharted waters, both ideological and actual. Above all, do enjoy the voyage.

CHAPTER ONE

INTRODUCTION

This book is the story of a journey through the Polynesian or Moana diaspora, with the primary aim of locating a personal context with which to proceed in the contemporary era, which has attendant issues of climate crisis and species exploitation. As such it brings into dialogue Indigenous Practices and Western knowledge. We will review knowledge across cultural borders, and Indigenous Practices are here founded within traditional Moana navigational wayfinding and whakapapa. Whakapapa is often translated as genealogy or ancestry, and as we will later see, the concept is much wider among Moana peoples.

Prior to writing this book, I had discovered that my whakapapa can be traced back eight generations to Hitiaurevareva (the traditional Tahitian name for Pitcairn Island) in 1790, and within this project I found I have whakapapa of a further thirty-three generations on Tahiti, something I am still reconciling myself to. My eighth-generation ancestors were makers of ahu or tapa cloth, and I trace my creative lineage to this generation of vahine (women). I am Māhū – on Tahiti, this refers to someone who both acknowledges and expresses masculine and feminine aspects of themselves, a middle gender. I did not grow up on the island of my ancestry, but in Ōtautahi (Christchurch, New Zealand), and have a daughter Kohana, who has a presence in this document. That is one consequence of Moana genealogies – they go forward into coming generations.

This was no simple intellectual journey and while I won't dwell on the point, it was a path that had all the hallmarks of a rite of passage. Before this story could be told, I had experienced six metre waves in the great Southern Ocean, scaled a cliff, and walked goat tracks with precipitous drops on either side. My daily protein source was fish caught by hand line from the rocks, I ate organic fruit and veges, and stayed in a non-electric hut metres from the sea where the shower was a cold hose sticking up out of the ground. I worked alongside a traditional Tahu'a or Tohunga, an expert or Priest, to place the art work that is the culmination of the project.

Previously, I was involved in national and international exhibiting, curating and publications, largely within Western conventions and utilising Electronic Art for projects (see Chapters Five and Six). Previous re-

search in the form of a Master of Arts *Hybrid Cultures, Nonlinearity and Creative Practice*, focused on cultural hybridity and nonlinearity in engaging with science and my hybrid cultural background. A major curatorial and residential project has been the co-founding of Solar Circuit Aotearoa New Zealand (SCANZ – every two years from 2006 to 2018). SCANZ was founded on themes of Environmental Response and Connection/Disconnection. As time passed, interaction with Indigenous Māori increased and deepened, while the environmental crisis has multiplied to the point of counting deaths from the impact of storms and fires worldwide. Clearly, the impact of Western multinational business practice and governance is resulting in significant events that impact people of all nations, often the least privileged.

The prospect that an active engagement with "Indigenous Practices" might provide some form of solution, or at least a way out of the crisis, was suggested by Yuk Hui (2017) who wrote that it is important to consider how Indigenous Practices might enter into dialogue with technology and Western Metaphysics. Such a dialogue could contribute to resolving global issues such as the climate emergency. This paraphrase maintains the general thrust of the original text.[1]

With Hui's words as a guide, several issues immediately arise. Bringing Indigenous Practices into dialogue with Western Metaphysics raises concern, due to the damaging impact of Western colonisation on Indigenous Peoples.[2] The following information may be distressing to some readers; however, laying out the situation plainly is important, as it provides motivation for decolonisation in the West. Andrew Crowe (2018, p. 230) records the following loss of Indigenous populations since European contact: "Tahiti 93%; Hawai'ian Islands 83%; New Zealand 60%."[3] These are profound numbers and staggering losses, and they indicate the extent of the deleterious impact of colonisation on Moana and Māori peoples. These statistics are a driver of this project and underline the importance of

[1] This is the original text (Yuk 2017, p 20): "The major question for us is in what way indigenous ontology might enter into dialogue with Western technology and metaphysics and thereby transform the current trend of global technologies."

[2] Metaphysics is traditionally associated with Philosophy, examining concepts such as knowing, time and being. In current writing into Quantum Theory exemplified by Barad (2007), knowing (epistemology), the characteristics of spacetime, and an entanglement with ethics are all core concepts under discussion. Hence, this conception of Metaphysics is used here.

[3] Crowe (2018) also writes that while there was some doubt about early assessments of population numbers, current archaeological records align.

bringing knowledge bases together in a decolonised framework, of which my approach "Ngaru Whenua Ocean Diffraction" is an attempt.

Ngaru Whenua is a Kaiwhakatere (navigator) term for a type of wave produced downstream from an island. It is argued here that such wave patterning would have been known by Kaiwhakatere prior to the rapid settlement of Eastern Polynesia in 1190–1290 CE (Wilmshurst et al., 2011), as prevailing currents often come from the east.[4] This date, 1190, is important in providing a concise era for holding an understanding of an interconnected universe. Ngaru Whenua wave patterns can be drawn directly into dialogue with Quantum Theory, where this wave patterning is called diffraction. Diffractive wave patterns are found in light (wave-particle duality), sound, water and the ocean. The subject and understanding of diffraction have been further extended into a method of multidisciplinary analysis and critique by Donna Haraway (1997) and Karen Barad (2007).

Important contributions stem from Indigenous perspectives. Following Zoe Todd (2016), the first of these is a statement of intent to cite Indigenous Practices (Reynolds & Wheeler, 2022; Wilson, 2008; Wilson-Hokowhitu, 2019) first wherever reasonable ground for precedence to the West can be located, which is strictly followed. A second contribution is to cross-reference Moana philosophy with DNA (Deoxyribonucleic acid) (Ioannidis et al., 2020) and radiocarbon dating records, to ascertain when aspects of Māori and Moana worldviews were in place. As such, 1190–1290 (the period of the settlement of Eastern Polynesia) provides a firm date for when the notion of Interconnection (Waikerepuru, 2011) was with Moana peoples. This is seven hundred and ninety years before similar concepts entered Western academic discourse (Deleuze & Guattari, 1987; O'Sullivan, 2001).

A third contribution is to provide a basis for bringing Indigenous Practices into dialogue with Western Science outside of a solely Western knowledge framework, applying a diffractive method to intercultural dialogue, and basing a discussion of Indigenous Practices on a notion of "Knowledge as Dimensional." This enables the unlocking of Indigenous Practices for the reader, without necessarily requiring the dissemination of sacred knowledge itself.

Following Smith (2012), a colonial bias in Western academic method is acknowledged, before using a Ngaru Whenua Diffraction to diffract the Sāmoan concept of *Vā* and Quantum Theory. This approach maintains the

[4] Here this term is used to indicate traditional non-instrument Moana and Māori navigators.

mana of Sāmoan voices and Barad (2007) on Quantum Theory, by using block quotes and directly aligning text using quotations rather than author-composed paraphrasing. Paraphrasing in English can distort the meaning of terms used by Sāmoan authors. Importantly in diffractive wave patterning in the ocean and Quantum Science, the waveforms do not merge into one but keep their integrity.

Chapter Five considers the ways in which a Ngaru Whenua Ocean Diffraction might provide a counter-Anthropocene model for making art and culture utilising technology at this time of complex ecological dislocation. Hui (2017) argues that science and technology have been complicit in bringing about the current environmental issues facing humanity, as the Industrial Revolution removed the "meta" from "metaphysics," thereby releasing ethical practices from being considered when engaging with the environment and Indigenous peoples. Writers such as J. W. Moore (2017) place the schism of ethics and physics as a consequence of Cartesian Duality, and dissolving Cartesian Duality as fundamental is supported by Quantum Theory.[5] Davis and Todd (2017) unite an Indigenous perspective with Western author Moore in placing the start of the Anthropocene epoch with the "Capitalocene." It is proposed that specific discursive structures are required when bringing Indigenous Practices into dialogue with Western Science. Interestingly, Moana and Māori notions of relationality may well provide a way forward out of the Cartesian chasm that Western author Jason W Moore (2017) writes of. A deeper look into the issues surrounding the Anthropocene may well provide contexts for ethical electronic art production.

Following a wayfinding creative practice, a single final solution to these issues is not sought, but rather a suite of islands in an ocean of knowledge is offered, through which individuals and groups can wayfind solutions relevant to their lives and locations. Some of the islands in this ocean are documented in this text, while detailed and close-up images can be found on the project website.[6]

[5] Cartesian Duality is so called to distinguish it from other forms of Dualism in philosophy. See Bristow, 2017. In regard to Descartes, it specifically refers to the distinction between subject and object.

[6] See pashaclothier.com/interconnecting

1.1 Ocean Diffraction, Precedence and Subject-Object

This book directly engages with several critical elements: the relational practices of Indigenous and Moana peoples, Western Science in the form of Quantum and Complexity Science, art mediated by electronic media, and the central issue of the day – human-forced climate change. In a relational space, relationality is non-dualistic. This is to say, reality is not understood as external to the individual or group; rather individuals, groups and reality are entangled in multiple ways. Therefore, Indigenous Practices are predicated on being located within a dimensional web that spans Wā (Te Reo Māori, Māori language) or Vā (Sāmoan): both space and time. To look across from one cultural group to another while maintaining the mana of each is referred to here as Ngaru Whenua Diffraction, acknowledging the precedence in Moana peoples' understandings of ocean currents some six hundred years before the same patterns were found by Western science, where they are called "diffractive." This was initially applied in science to water, sound, and light, and subsequently from science to the humanities.

As this understanding of wave patterning precedes the development of a physics of waves in the West, the Reo Māori phrase "Ngaru Whenua" is added to "Ocean Diffraction" to acknowledge the term's origin in Moana navigation.[7] *Ngaru* is a term used for local wind waves, its use extending from Aotearoa New Zealand to Hawai'i and the Marquesas. *Whenua* refers to land, in this case also defining the waves as not caused by wind or current, but by land. While my whakapapa (genealogy in the Moana sense) extends to several islands in Te Moana Nui a Kiwa (Pacific Ocean) I am standing on the whenua of Aotearoa and will use Māori terms here, in part to honour my association with Kaumatua (Elders), and which will be discussed further regarding Dr Te Huirangi Eruera Waikerepuru (Taranaki Whānui, Ngā Puhi) and Maata Wharehoka (Ngati Tahinga, Ngati Apakura, Ngati Kuia).

Precedence emerges as a critical trajectory in this book. More precisely, this means acknowledging precedence in Moana understanding where it can be established that the same notion was discussed later in the West. This follows Métis woman Zoe Todd's (2016) experience of hearing Bruno Latour speak about the sentient environment while failing to acknowledge this notion has existed in Indigenous thought for millennia. Reflecting on this has led to taking a stance, such that wherever I found

[7] See Crowe (2018, p. 88).

that Indigenous and Moana practices preceded the equivalent Western understanding, then I acknowledge this first, before giving the Western context. This is not a conventional approach currently, and nearly all academic publishing forces the adoption of a Western context, even for Indigenous writers.

Recognising precedence is entirely suitable for a project that aims to apply Ngaru Whenua practices to diffract Indigenous Practices and Quantum Theory, for example. In terms of Indigenous Practices, the keynote speaker for *SCANZ 2011: Eco sapiens* was Te Huirangi Waikerepuru, an internationally and nationally renowned proponent of Indigenous rights, who spoke about the multiple meanings of Wai, which often is translated as "Water." Dr Waikerepuru translated Wai as also meaning "flow," a more pre-colonial, philosophical and poetic interpretation. He spoke of Wai o Tapu (sacred water); Ika Tangata (fish people); and Ara (the waters of birth). He talked about clouds gathering in the sky, raining in the mountains, and then flowing down the Awa (river) to the sea. Here it evaporates and is breathed in, intermingling with Hā, the breath. From there, the evaporation gathers to form clouds and the whole cycle commences again. You may have noticed that is a multi-definition context which is basically the Western hydrological cycle, but with one critical difference: the human is embedded in the scenario. This distinction is crucial to understanding the core difference between Moana and Western understandings of reality, which it turns out are critical to understanding the way out of the climate crisis.

Regarding Quantum Theory and Science as will be shown later, quantum theorists in the 20th century constructed an argument for the dissolution of the subject-object distinction as fundamental to reality. This has been extended in quantum science experiments such as those performed on CERN's (The European Organization for Nuclear Research) Large Hadron Collider, where the scientist establishes pre-experiment parameters such as the type and speed of particle collisions; these must be taken into account in the experiment equations. Then from a large data set, interesting collisions are selected: "data selection criteria are to be applied to collision events so as to select interesting events" (Karaca, 2018, p. 5437). As such, the experimenter is intimately involved in the experiment and subsequent interpretation, so that they cannot be separated from the experiment. Barad (2007) has much to say about this entangled condition, discussed in Chapter Three.

Consequently, in this relational space, "I", rather than being excluded for the sake of objectivity, is understood as integrated into relationality. While this is conventional in several contexts, in the context of this work, it is based in both Moana cosmology and Quantum Science. Henceforth, "I" will appear within this entangled web of practice, and that means

"you" the reader are likewise entangled here; together, "we" shall undertake this journey. This is founded in both Moana worldview and Quantum Theory. The subject-object distinction will be discussed with some surprising consequences in Chapter Three "Ocean Diffraction: Navigating Indigenous Practices and Quantum Theory."

This relational practice explains the use of "Indigenous Practices" in the title, rather than "Indigenous Knowledge" or "Indigenous Awareness." The concepts of "knowledge" and "awareness" have often, up to the 21st century, been largely based on Western assumptions, within which Cartesian Duality (i.e. the subject-object distinction) is embedded. Of primary importance is that Moana cosmology is the inherited result of intergenerational knowledge-transfer, which has been reinforced through practical application across generations. As such, the practical application of Moana cosmology is crucial, critical and characteristic. The term "Indigenous Practices" refers to the active application and renewal through experience that is central to Indigenous and Moana philosophy and living. Thus, thought and action are united in a transformative praxis.

1.2 Engaging Indigenous Practices

Indigenous Practices are introduced in Chapter Two, where Shawn Wilson's (2008) emphasis on relationality and reciprocity as central to Indigenous cosmologies, is highlighted. The contribution from Todd (2016) is discussed further. While many in the West feel positively towards Indigenous cultures, the means by which reality is understood, the energy flows that exist within and between all things, and the way understandings of these flows are articulated in daily life and cosmology are less well understood. While anecdotally there has been a significant upswing in Indigenous academics publishing work, by and large this has not resulted in an improvement of Western intuition around Indigenous matters and energies, perhaps due to lack of exposure over time. In addition, the strong bias toward evidence-based assumptions often excludes a consideration of oral heritage. One of the primary aims of this work is to place oral histories as confirmed by evidence in the hands of readers; in particular, cross-referenced to the DNA record as recently as 2020 (Ioannidis et al., 2020). The goal here is to provide Western writers with firm and citable timing, as the phrase "for thousands of years" lacks sufficient precision to be cited strongly and conclusively.

Simply locating information in a matrix of cosmology, DNA and radiocarbon dating will not be sufficient to elucidate Moana peoples' comprehension of Ke Ao (Hawai'ian), or Te Ao (Māori) - the world around us. This is

mainly due to the complete difference in framing and articulation between Indigeneity and the West. In addition, there has been a substantial and nearly overwhelming momentum towards Western academic frameworks, which have largely functioned to silence the Indigenous voice, not by design, but by the exclusion of Indigenous forms of knowledge transmission such as oral heritage, a different working understanding of knowledge acquisition, and a failure to recognises the mana of particular voices.

In academic writing, as Linda Tuhiwai Smith (2012) wrote, "the academic centre of knowledge is either in Britain, the United States or Western Europe … which actually exclude me" p. 37. There have been several ways to attempt to do something about the problem of Western dominance in academia. Promulgation of Moana notions has resulted in substantial academic research around the Sāmoan notion of Vā (Lopesi, 2021; Refiti, 2014; Wendt, 1996). Shawn Wilson (2008) influentially wrote of providing an Indigenous Research Methodology in his book *Research as Ceremony*. A Moana context for research is provided in terms of Hawai'ian Mo'okū'auhau (whakapapa or genealogy) as a framework for academic research method by Wilson-Hokowhitu (2019). Reynolds and Wheeler's (2022) Tahitian orientated research method 'For Mā'oli by Mā'oli' repositions the notion of author. All of this work is relevant to my cultural context. These examples echo Tuhiwai Smith's ground-breaking recognition of Indigenous voices in the second half of *Decolonising methodologies* (2012).

The work of these writers has been an excellent and empowering step for Indigenous, Moana and Māori authors worldwide. Unfortunately, it is not proving fruitful in terms of Western academics citing this research in their papers. It can be speculated that this may be due to a lack of familiarity with, and intuition around, Indigenous and Moana frameworks. Another factor might be that Western academics are discussing different issues, and where issues might be similar, the discussion is often within Western frameworks.

In order to bring Indigenous Practices into dialogue with technology and Western sciences, while avoiding Western bias in a decolonised framework, I am proposing three *Knowledge Dimensions*, which function to explicate the processes of knowledge construction and articulation while not transmitting sacred knowledge itself. These dimensions – Moana (Ocean) Dimension, Rā (Interconnectivity) Dimension, and Tangata (People) Dimension – are woven to form a cultural bridge and constitute an active expression of Ngaru Whenua Ocean Diffraction. Considering knowledge as having dimensionality assists in discussing the relationality of Moana *Ao* (worldview), as it escapes a notion of knowledge that is

bounded by deductive reasoning. Deductive reasoning is part of the picture, but does not adequately capture Moana cosmological awareness. *Knowledge as Dimensional* recognises that knowledge is not simply a linear process and that it can be multifaceted and viewed in a variety of ways as if it had a shape, hence is dimensional. Knowledge as Dimensional is also critical to bringing Indigenous Practices into dialogue with Quantum Theory, as it decolonises the notion of knowledge as held in the West. The Western notion has privileged the West and excluded Indigenous contexts.

1.3 Cultural Diversity

Some readers may have noticed that Māori, Hawai'ian and Sāmoan terms are being used, but with more emphasis on Reo Māori. We are sailing in the choppy waters of a multicultural ocean diaspora, where Ngaru Whenua Ocean waves sometimes bifurcate into three or more woven plaits. "Chapter Four: Before the Beginning" provides an entry point into the dynamic cultural spacetime within which I am located, and surveys precedent artworks in a nonlinear history. I am a forty-first generation descendant of tapamakers from the islands of Hitiaurevareva (Pitcairn Island) and Tahiti, part of the Society Islands group.[8] We call tapa "ahu," following the Tahitian language spoken throughout the Society Islands. My Tūpuna settled on Hitiaurevareva in 1790 (Reynolds, 2008), along with the mutineers of HMAV *Bounty*. The society that developed subsequently outgrew the island and in 1856 the entire community moved to Norfolk Island after the abandoned penal colony was gifted to them by Queen Victoria (Clarke, 1986).

There are two complexities in this cultural background. The first is the impact of two hundred years of colonisation, Christianity, commercialism, and patriarchy, which directly attempted to quash the expression of Moana identity. Tapa making (on Sāmoa it is called "siapo;" on Hawai'i, "kapa;" in Aotearoa, "aute") for example, was banned by church authorities. This has led to revitalising traditional practices such as ahu making on Hitiaurevareva by Meralda Warren in 2007 (Reynolds, 2008, p. 52), and annual Heiva games on Norfolk Island. The second complexity is that it was not my honour to grow up on an island of my descent. Instead, I grew up in Ōtautahi (Christchurch) New Zealand, as my parents who had met on

[8] The discovery of my whakapapa extending this far only recently occurred, however, based on Orsmond and Smith (1893, p. 30) I may have whangaunga (common ancestor) linkages to Hawai'i in the distant past, and several to Māori iwi (tribes) in the far past.