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Tangled Visions:

Changing Scientific Understandings of the North Queensland Rainforests, 1770 – 1990

Thesis submitted by

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ABSTRACT

Tangled Visions: Changing Scientific Understandings of the North Queensland Rainforests, 1770 – 1990

Science and scientists have played key roles in shaping popular perceptions of the rainforest environment, and their work has directed both the development and preservation of rainforest areas in North Queensland. This thesis examines the broad development of scientific understandings of, and interactions with, the rainforests of North Queensland from the period of early European exploration to the emergence of powerful scientific support for rainforest conservation in the 1980s. The thesis focuses on four distinct but interrelated scientific approaches: taxonomic botany, ecology, palaeoecology and biogeography. In particular, it argues that two shifts in scientific understanding have been of critical importance in re-shaping perceptions of rainforest. The first was the emergence of an ecological view of the rainforests, which saw them not as conglomerations of species, but as complex living systems. The second was the revision of the evolutionary history of Australian rainforests, from the belief that they were an 'alien and invasive' form of vegetation, to the understanding that these forests were of ancient and indigenous origin. Further, this thesis argues that scientists' attempts to understand the rainforest have led them to consider the complex and interconnected environmental and human histories of the region. The thesis explores the way scientific texts can act as historical documents, both because of the evidence they provide about land-use and environmental change, and because of the ways in which they reflect in content and form the changing environmental values and visions of a settler society.

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DECLARATION

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

Signature Date

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ABBREVIATIONS

ACF Australian Conservation Foundation

ANZAAS Australian and New Zealand Association for the Advancement of Science

CAFNEC Cairns and Far North Environment Centre

CSIR Council for Scientific and Industrial Research

CSIRO Commonwealth Scientific and Industrial Research Organisation

CT Conservation of Terrestrial Ecosystems Section of the IBP

DSWAG Douglas Shire Wilderness Action Group

IBP International Biological Programme

IUCN International Union for the Conservation of Nature and Natural Resources

IUPN International Union for the Protection of Nature

NQNC North Queensland Naturalists' Club

RCS Rainforest Conservation Society

UNESCO United Nations Educational, Scientific and Cultural Organisation

UNEP United Nations Environment Programme

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LIST OF ILLUSTATIONS

Introduction

From the beginnings of European settlement to the present, perceptions of the North Queensland rainforests have been fundamentally transformed. The northern 'scrub' was regarded by colonial observers primarily as a local resource, a lure for investors, an indicator of the fertility of the land and an obstacle to settlement. The 'tropical rainforest' is now considered to be a fragile environment of great beauty and intrinsic value, worthy of international attention and protection. This thesis examines the relationship between changing scientific understandings and this broad shift in perceptions of the North Queensland rainforests. Although political and economic circumstances have also played an important role, I argue that science and scientists have been critical to the changes which have taken place.

Throughout the history of scientific investigations of the rainforests of North Queensland, two fundamental shifts in understanding have been of great importance. First, there has been a movement away from a primarily taxonomic approach, which focuses on the naming and description of species, to an ecological view, which investigates the rainforest as a system. Ecologists suggest that in a state of health this system is characterised by its diversity, complexity, relative stability, and the interdependence of its living and non-living components. While the taxonomic view was ideally suited to the needs of a colonial society concerned with acclimatization and resource utilisation, the ecological view necessarily brought to the fore questions of natural laws and limits, and of the right relationship between human communities and the natural environment. Although ecologists rely on the work of taxonomic botanists, and a taxonomic approach is by no means incompatible with a concern for conservation, the importance of ecology in re-shaping twentieth century evaluations of rainforest is undeniable.

The second significant transition has been the re-writing of the evolutionary history of rainforest in North Queensland. Up until the late 1970s, these rainforests were regarded (some would say dismissed) as an alien and invasive form of vegetation which had entered the Australian landmass from south-east Asia. As a result of developments across a range of scientific disciplines, the rainforests of North Queensland were re-configured as an ancient and indigenous landscape, whose origins can be traced back to the period when Australia was part of the super-continent Gondwana. Some scientists suggested that, rather than being a recent invader, rainforest was in fact the evolutionary predecessor of the dominant sclerophyll vegetation regarded as so uniquely Australian. This vision of the North Queensland rainforests as a truly Australian landscape with an unimaginably long history was both scientifically and politically significant, and was central to arguments for their World Heritage listing.

More generally, this thesis explores the diverse ways of seeing the rainforest which have been offered by taxonomic botany, ecology, bio-geography and palaeoecology. Early scientific inquiries were primarily taxonomic, and were based on the collection of botanical specimens, often by amateur local collectors, and their description and classification by botanists with access to resources such as herbaria, and taxonomic literature. Taxonomic knowledge of rainforest species accumulated only very gradually due to a range of factors, including the limited supported offered by colonial governments, the rainforests' high level of species diversity, and the remoteness of North Queensland from scientific centres. Although taxonomic knowledge remained limited, by the mid-twentieth century scientists were asking a range of more detailed questions about the relationship between the rainforest's structure and species composition, and factors such as soil, climate, and topography. Where early observers had seen an undifferentiated and complicated mass of vegetation, ecologists began to see 'rainforests' – a range of distinctive, identifiable forest types exhibiting different structural formations and composed of different characteristic species.

Ecologists found that in order to explain the present composition, extent and structure of the rainforests, it was necessary to explore their history in a way that encompassed both their long evolutionary past, and the more recent impacts of human actions. Bio-geographers expanded the spatial stage of this exploration to the breadth of the continent and beyond, and considered both the geological evidence and current species distribution in their attempts to discover the rainforests' origins. They presented a vision of the North Queensland rainforest as a biotic diaspora, related in various ways to populations elsewhere in Australia and around the world. Palaeoecologists offered a range of tools which allowed the tentative reconstruction of past landscapes on the basis of the examination of fossilised pollen and charcoal remains. Research at sites on the Atherton Tablelands revealed that, for thousands of years, the rainforest had changed continually: its area had expanded and contracted, and the range of species present had shifted dramatically over time. Palaeoecologists argued that connections could be seen between these patterns of change and peaks and troughs in the charcoal record, and suggested that the use of fire by Aborigines may have substantially shaped the rainforests' history. The ways of seeing the rainforest offered by taxonomic botanists, ecologists, bio-geographers and palaeoecologists have been both connected and distinct; the insights of each have built upon and contributed to the perspectives of the others, and have led to an overall vision of the rainforests of North Queensland as a diverse and complex historical entity.

'Tropical rainforest' is a vegetation-type which has occupied a very restricted area in Australia. (**Figure 2**) At the commencement of European colonisation its range extended in patches along the coastal lowlands and onto the ranges and tablelands of north-eastern Queensland, from near Ingham to south of Cooktown, although there were scattered outliers to the north and south. My designation of these as the 'North Queensland rainforests' refers primarily to a biogeographical rather than political region, and is intended to differentiate these forests from the sub-tropical and temperate rainforests which occur further south.

While this thesis adopts a regional focus, it is not a regional history. Because

of the organisational structures of scientific research in a settler society, much that is central to my thesis has necessarily taken place outside North Queensland. The time-frame of my study extends from earliest European exploration in the late eighteenth century to World Heritage listing of the wet tropics in the late twentieth century. During this period, science within Australia became increasingly professionalised and specialised; however, the lines between amateur and professional, between science and natural history, were often blurred. To the degree that distinctions between the

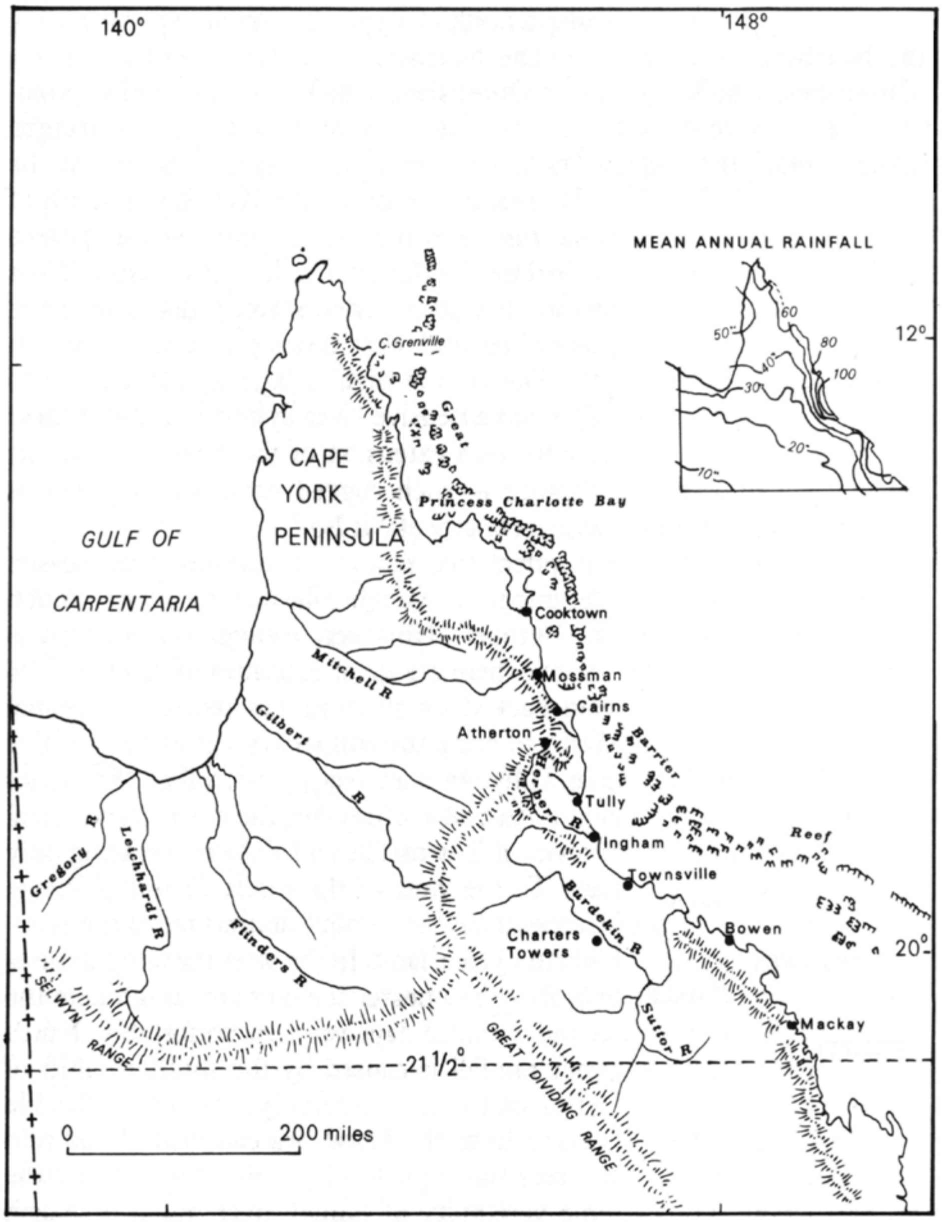

Figure 1 **Map of North Queensland**

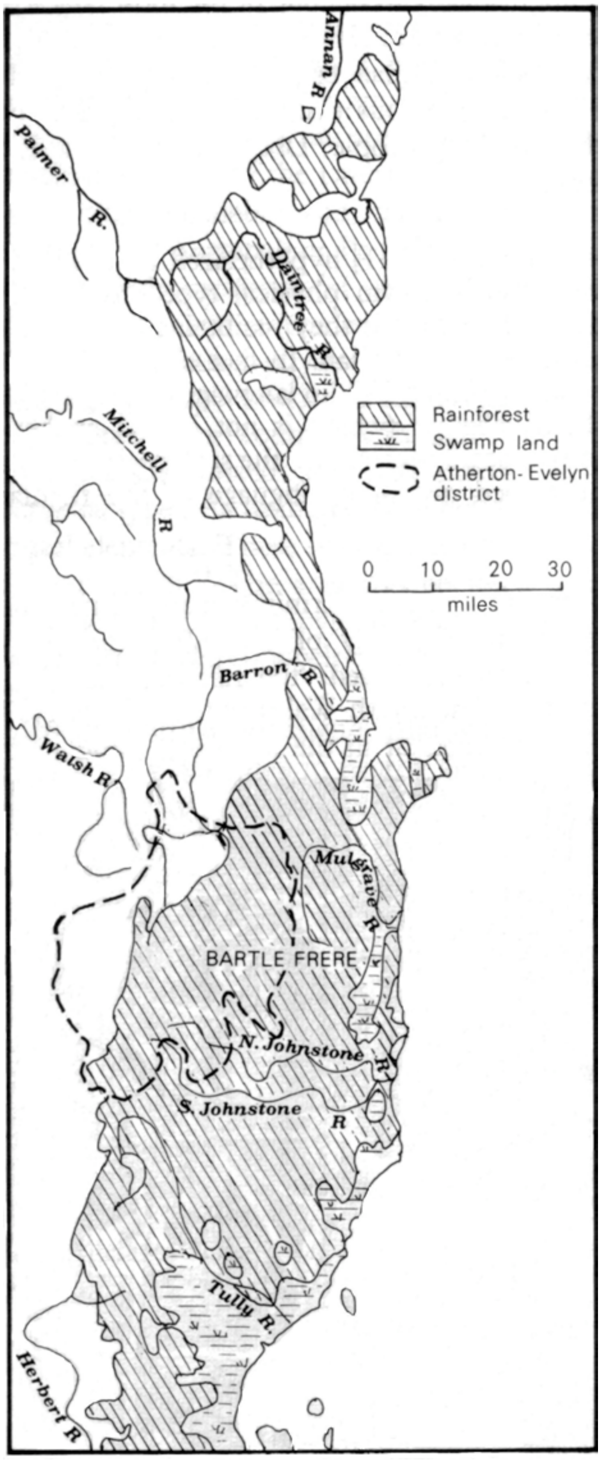

Figure 2 Approximate distribution of tropical rainforest in north-east Queensland before European occupation.

Source: T.G. Birtle, 'Land Use, Settlement and Society in the Atherton-Evelyn District North Queensland, 1880 – 1914.'

two can be made, each has drawn upon the expertise and inspiration provided by the other.

I have focused my examination of the history of scientific understandings of rainforest on the connections – practical, institutional and imaginative – between science and the European colonisation of North Queensland. The expansion of scientific knowledge of the rainforests has been intimately and directly linked to the history of colonial expansion. Scientists played a significant role in assisting to transform the North Queensland landscape; however in attempting to understand the rainforests, they were also led to more critically observe and examine the impacts of that colonial endeavour. Further, in the late twentieth century, scientists found the rainforest to be an ancient and ever-changing environment whose evolutionary history dwarfs the scale of all human history. This expansive historical vision provided some scientists with a new moral perspective against which to assess the ambitions and achievements of the colonising society.

This thesis also explores the changing significance, to these various visions, of Aboriginal presence in the region and of the rainforest as a part of traditional Aboriginal lands, intimately known and long-occupied. This presence is written into botanical and ecological accounts in a range of ways – including through discussions of Aboriginal naming practices and use of particular plants, through debates over the role of fire in determining rainforest boundaries, and through the use of Aboriginal paths and guides in exploring the rainforests. In a more fundamental – though less explicit – sense, science itself has been seen as a method and mode of thought particular to Western civilization. The notion of scientific progress has been central to the idea of historical progress, and was regarded as an important way in which the colonisers were distinguished from, and (for many) superior to, the indigenes of this continent.

There has been a long-standing uneasiness about the full implications of the ‘progress’ which was so central to colonisation and the colonial imagination; however it was only in the late twentieth century that the notion of progress itself was widely criticised. This criticism often involved a complicated intersection of scientific and historical views, and arose in part from concerns about the environmental costs of development, and from an awareness of the natural world as finite. Conservationists utilised scientific arguments in an attempt to prevent the further development of rainforest lands. This rejection of a particular vision of progress allowed the re-valuation of rainforest: rainforest came to be seen not as a resource but as an entity with an intrinsic value which, for many, was most aptly spoken of in the language of science. World Heritage listing – in which scientists and scientific knowledge played a primary role – was regarded by environmentalists as a means of halting what they saw as the destructive forces of development, the continuing history of colonisation. Some Aboriginal communities, however, saw World Heritage listing and the scientific management regime which was to follow as extensions of the historical process of colonisation, and a further diminishment of Aboriginal people's control over their own lands and future.

The 'Tangled Visions' of my title carries multiple meanings. Scientists have experienced the rainforest, both physically and intellectually, as a difficult environment. The physical experience of the rainforest – of entanglement in barbed vines, feet tripping on the snaking roots of rainforest trees, vision hemmed in by the density of vegetation – has corresponded with the difficulties of finding an intellectual footing, a clear scientific view. Further, science has never been a monolithic discourse offering a singular vision, but rather scientific visions have been shaped both by personal experiences, institutional structures, and by the competing and connected range of concepts, tools, and questions offered by different scientific disciplines. Above all, attempts to understand the rainforest have involved a profound intertwining of historical and scientific concerns; scientists have sought new ways of seeing the rainforest, and in doing so have offered new perspectives on the history of the region and visions for its future.

Chapter One locates my work within the field of environmental history. I outline the literature which has been relevant to my thesis, including works examining the history of science, conservation, and environmental perceptions, and the history of North Queensland more specifically. I also consider the role which science and scientific evidence plays in environmental history.

Chapter Two examines a century-long history of European exploration of the North Queensland rainforests, as recorded in the narratives and reports of explorers from Banks and Cook on the *Endeavour* in 1770, through to George Elphinstone Dalrymple in 1874. I focus in particular on the role of botanical collectors in expeditions of exploration, and the importance of botanical assessments of plant-life and soil to the unfolding of future settlement.

In Chapter Three I consider the role the colonial botanists played in elucidating and re-shaping the nature of the North Queensland rainforests between 1860 and 1915. The colonial botanists were based at a distance from the Northern rainforests, and relied on local collectors to supply them with specimens that they would then identify, name and describe. They were also part of a network which assisted in the circulation of plants to North Queensland from other tropical locations for acclimatisation purposes, and they worked to promote the development of tropical agriculture in the region. Colonial botanists recorded and commented on the processes of environmental change which they observed.

In Chapter Four I explore the emergence of rainforest ecology in North Queensland, focusing on the work of Len Webb and Geoff Tracey in the CSIRO's Rainforest Ecology Unit, from 1958 to 1980. Their work drew on international developments within the biological sciences, and began to reveal the complexity and diversity of the rainforests as a system. Their attempts to understand the current extent and characteristics of rainforests led them to consider the history of those forests – both on an evolutionary timescale and within the recorded history of European settlement.

In Chapter Five I examine the ways in which scientific understandings of the history of rainforest have shifted in the twentieth century as a result of the acceptance of the theory of continental drift, and the development of more sophisticated archaeological techniques which have led to a re-estimation of the length of Aboriginal occupancy of the Australian continent. Investigations have revealed the rainforest to be a dynamic environment, varying in both extent and composition in response to climatic changes and human actions.

In Chapter Six I consider the way in which arguments for the preservation of rainforest have drawn on a changing array of scientific and historical visions. I examine how these visions have been refracted through the idea of the rainforest as 'a living museum', a notion which achieved legal recognition with the World Heritage listing of the Wet Tropics in 1988.

This thesis draws extensively on a range of scientific literature, including the reports of botanical collectors from the eighteenth and nineteenth century, the reports and publications of the colonial botanists, the *Proceedings of the Royal Society of Queensland* and the *North Queensland Naturalist*, and articles on rainforest ecology, biogeography and palaeoecology published in specialised periodicals. While relevant works on the history of science have been helpful in allowing me to contextualise my research, the scientific literature itself often offered both a primary and secondary source. Whether as a result of necessity or interest, scientists commonly discuss the academic, personal and institutional history of their field in some detail. I have adopted the spellings used in my source materials both for scientific terminology and for Aboriginal words, although at times these may differ from current convention. All italics which appear in quotations are from the original source unless otherwise stated. I have also drawn on contemporary usage in my discussions of the 'scrub', 'jungle' or 'rainforest'. While I have retained 'rainforest' as a useful neutral descriptor, I recognise that the term is historically determined and richly connotative, and elaborate on its changing meanings through the course of this thesis.

I do not trace in detail the environmental changes which have occurred in North Queensland during the period under consideration. Many of the scientists whose work I examine discussed the clearing of rainforest, soil erosion, the spread of exotic species and weeds, and the restriction or loss of indigenous plants and animals. However, an examination of the literature reveals the lack of scientific knowledge of the exact nature and extent of environmental degradation which has taken place. In some cases this is because areas such as the coastal lowlands have been cleared so thoroughly that it is difficult to determine what form of vegetation preceded the endless fields of sugar cane which now greet the eye; in others it is because remoteness or rugged topography long made detailed surveying and fieldwork almost impossible. While I recognise the significance of the physical processes which have occurred, my primary concern has been to explore the complex relationship between cultural, scientific and environmental change by examining the ways in which individuals and organisations have responded to the loss of extensive areas of rainforest.

Chapter 1 Science and Environmental History

In 1967, a young National Parks and Wildlife Officer, Peter Stanton, was working in the Iron Range, a remote region near the tip of the Cape York Peninsula regarded by conservationists as one of the most biologically significant areas in Australia.[1] As Stanton traversed the ridges and slopes of the range, he noticed that pockets of open forest which had been surrounded by rainforest were in the process of being overgrown – the landscape was changing, and changing quickly. He reasoned that the scale and rapidity of environmental change he saw could only have resulted from the cessation of a fire regime which had previously maintained the boundaries of the more fire-resistant open forest. He believed he was witnessing the consequences of the end of a system of land-use which, in order for such strict boundaries to have been maintained, must have been meticulously practised without cessation for, in his estimation, 10,000 years or more. In an oral history interview conducted for the National Library of Australia decades later Stanton recalled the trip, and described this realisation as vitally important. He said:

> It must have been intensively managed country, and if it was intensively managed it must have been owned, occupied, known, named … immediately the conclusions of that came to mind. You know, good God, what happened to the people who kept it this way? Where are they?… I've been reluctant to use the world "wilderness" for any part of Australia since then because I feel it is a denigration of the lives and efforts of hundreds of generations of people.[2]

As he walked the ground of the Iron Range, Peter Stanton saw the history that was written into the soil, the scrub, the trees; a history that was both natural and

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[1] R.A. Hynes & J.G. Tracey, 'Vegetation of the Iron Range Area, Cape York Peninsula', in N.C. Stevens & A. Bailey (eds), *Contemporary Cape York Peninsula: The Proceedings of a Symposium held at the Kindler Lecture Theatre, Queensland Institute of Technology, 29 October 1979,* Royal Society of Queensland, Brisbane, 1980, p. 11.

[2] Interview with Peter Stanton, conservation officer and national park administrator, interviewer: Gregg Borschmann, May 1997, 'My Country – A Living History of the Australian Landscape', National Library of Australia, TRC-3077, p. 94.

human. The experience changed his view of what that land meant, of his own relationship to it, and of how it should be managed in the future.

In 1976, Peter Stanton authored, and the Australian Conservation Foundation published, a monograph *National Parks for the Cape York Peninsula*. In it Stanton wrote that the Cape York Peninsula

> represents what is biologically the richest and least disturbed of the few large wildernesses left on the face of the Australian continent. In a world fast becoming subdued by expanding human hordes, it is an oasis of note, and an asset to cherish… The vastness of its landscape and the atmosphere of a land essentially unchanging through eons of time, invoke emotions of awe in all but the few insensitive to such things… [3]

The contradiction between Stanton's scientific assessment of the history of the region, and his promotion of it as in some sense a 'timeless wilderness' reveals the symbolic power of the concept of wilderness in the late twentieth-century. Under Queensland's development-oriented Bjelke-Petersen government, arguments for the reservation of land in national parks had to be politically potent rather than historically accurate. It has taken both conservationists and government organisations decades to begin to grasp the difficult historical resonances of landscapes which are far from being 'wildernesses', and even now their grasp is incomplete.

In this chapter I offer an overview of the broad concerns and insights which have shaped my approach to my topic through an examination of the relevant literature within environmental history, history of science, and the history of North Queensland. While I have drawn on a diverse and sometimes conflicting range of studies, I have continually returned to the philosophical and historiographical concerns of environmental history, and it is these which have most deeply informed my own work.

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[3] P. Stanton, *National Parks for Cape York Peninsula*, Australian Conservation Foundation, Melbourne, 1976, quoted in Bruce Rigsby, 'Introduction to the Symposium', in *Contemporary Cape York Peninsula,* p. 3.

Road through Giant Fig Tree, Atherton Tableland, 1890s.

Roads and trails played a central role in the early European exploration and settlement of rainforest areas.

Giant Fig Tree, Atherton Tableland, 1890s.

The luxuriant rainforest vegetation was regarded as an indication of rich and productive soils.

The rider is just visible at the bottom right of the tree.

Source: Courtesy John Oxley Library

The question of the relation between humans and their environments is not new, but has been posed in various forms over millennia. In his account of the history of environmental thought in Western culture, Clarence Glacken argues that three themes have been recurrent from ancient Greece onwards: Has the earth been purposefully made or designed? Has the environment influenced humankind? And has humankind changed the earth from its pristine condition?[4] These were questions which until recently were almost unthinkable outside a framework of religious belief. Since the mid-nineteenth century they have been questions in part asked and answered by evolutionary science, sometimes in deterministic or racist ways which historians today hesitate to adopt. However, historians have traditionally shown interest in such questions,[5] addressing them within a dichotomy which saw Nature as 'mundane and mindless, history the sublime theatre of human will,'[6] or Nature as the colourful and static backdrop on which human action has taken place.[7] The novelty of environmental history lies in its undermining of traditional historical views which have drawn a strict separation between the natural and cultural worlds. One difficulty (or advantage!) of environmental history is that it is therefore dangerously inter-disciplinary. Such history combines a wide range of influences: cultural history and cultural theory; a reliance on material and scientific evidence, combined with an attentiveness to changing scientific understandings; an ethic of environmental concern; and an openness to indigenous perspectives and histories.

In his discussion of environmental history, David Lowenthal points to

> the volatility of the term environment itself. It originally meant surroundings of all kinds, embracing ideas and feelings along with nature, artefacts and other people… Not until the nineteenth century did environment stress features external to

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[4] C.J. Glacken, *Traces on the Rhodian shore: Nature and culture in Western thought, from ancient times to the end of the eighteenth century*, University of California Press, Berkeley, 1967.
[5] Lowenthal likewise asserts that 'At least since Herodotus, historians have invoked landscape and terrain, climate and soils to explain why peoples and nations differ.' D. Lowenthal, 'Environmental History: From Genesis to Apocalypse', *History Today*, vol. 51, no. 4, (April 2001), p. 37.
[6] *Ibid.*
[7] T. Griffiths, 'The nature of culture and the culture of nature,' in H. Teo and R. White (eds), *Cultural History in Australia*, UNSW Press, Sydney, 2003, p. 67.

> persons, only in the twentieth century the circumstances of nature as opposed to culture.[8]

This shift in meaning took place simultaneously with the increasing specialisation and professionalisation of both historical and scientific inquiries in the late nineteenth and early twentieth centuries. While many historians aimed to attain a 'scientific' level of accuracy and objectivity in their own field, turning away from earlier conceptions in which history was more closely aligned to literature, such ambitions were linked primarily to what they perceived as the 'scientific method' and not to a legitimate overlapping of subject-matter between scientists and historians.[9]

But, as Tom Griffiths points out, 'history became professional and self-consciously "scientific"… just at the moment when science shuddered at its core and became uncertain – and reluctantly and irredeemably cultural.'[10] Griffiths, in line with Peter Novick and others, points to the revolutionary impact of Einstein's theory of relativity and subsequent developments in physics in destabilising 'Newton's clockwork universe,' and undermining mechanism and materialism.[11] The insights of twentieth century physicists have led to the conclusion that 'being is inescapably relational, and knowledge is always partial, always contingent, always historical.'[12] This perceived unsettling of scientific thought was one important catalyst for the king-tide of relativism and uncertainty that overwhelmed the humanities later in the twentieth century.

Some of the strongest recent critiques of 'history as science', of history as the telling of 'what actually happened',[13] are based on the work of postmodernists and literary theorists. Such critics have pointed to the fragmentary and positioned textual

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[8] Lowenthal, 'Environmental History: From Genesis to Apocalypse', p. 42.
[9] A classic statement of this viewpoint is made by J.B. Bury: 'history is a science, no less and no more'. Harold Temperley (ed.), *Selected Essays of J.B. Bury,* Cambridge University Press, 1930, p. 4.
[10] Griffiths, 'The nature of culture and the culture of nature', p. 69.
[11] Peter Novick, *That Noble Dream: The "Objectivity Question" and the American Historical Profession,* Cambridge University Press, Cambridge, 1988. See especially Chapter 6 'A changed climate'.
[12] Griffiths, 'The nature of culture and the culture of nature', p. 68.
[13] In the famous phrase of nineteenth-century historian Leopold von Ranke, from Georg Iggers and Konrad von Moltke (eds), *The Theory and Practise of History,* Bobbs-Merrill Company Inc., Indianapolis, 1973, p. xix.

nature of historical sources, the ungroundedness of language, and the way in which historians make subjective choices in how they frame and direct historical narratives.[14] Such critiques, far from overcoming the division between nature and culture implicit in much traditional historiography, deepen it further through a focus on the primacy of language, and questions of authorship and narrative structure drawn from literary theory. As Griffiths observes,

> one of the influences of postmodernism and deconstructionism in the humanities in the late twentieth century – and an incidental and unnecessary one – was a turning away from the earth and nature at a time of public environmental crisis.[15]

While the observations of postmodernist critics are at times incisive and have usefully drawn some historians to a more critical and open awareness of the nature of their own historical practice, they nonetheless fail to recognise that all history, and environmental history in particular, makes claims about the 'external world' which are based on evidence different to and distinct from the purely textual constructs of literature.

Alfred W. Crosby writes of environmental historians that they

> tend to be more interested in dirt than in perceptions, per se, of dirt. They have no doubts about the reality of what they deal with, nor about their ability to come to grips with it… They do not suffer from epistemological malaise.[16]

While Crosby overstates his case, he is correct in the sense that the underlying assumption behind most work in environmental history is an epistemological and ethical belief in the independent existence of the historian's objects of study – landscapes and biota as unique and valuable historical realities that exist beyond human perceptions of them. Environmental history is also founded on the expectation

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[14] For example, see Hayden White, *Metahistory: the historical imagination in nineteenth-century Europe*, Johns Hopkins University Press, Baltimore, 1973.
[15] Griffiths, 'The nature of culture and the culture of nature,' p. 69.
[16] Alfred W. Crosby, 'The Past and Present of Environmental History', *American Historical Review*, vol. 100, no. 4, (October 1995), pp. 1188 – 1189.

that such realities can be explored in a meaningful and productive way through the use of both more traditional documentary historical sources and a wide range of scientific evidence. Nonetheless a key concern in environmental history is the supposed opposition between nature and culture, and in probing that opposition deeply, environmental historians utilise the tools and insights, and encounter the epistemological difficulties, of cultural and literary theory and anthropology. William Cronon for one has grappled with the genuine challenges of the 'epistemological crisis' posed by postmodernism and deconstruction.[17] Further, much recent work in environmental history, (this thesis included), is vitally interested in the significance of environmental perceptions as a key and sometimes submerged component in historical awareness, and as an active factor in processes of environmental change.

Australian environmental history, while being influenced by work emanating from the United States and elsewhere, has developed its own characteristic flavour. As a relatively newly-settled and diverse nation seeking for unifying symbols and values, the environment has become key to what it means to be 'Australian', and images of the bush or outback form nationalistic icons utilised for a range of purposes, conservative and radical alike.[18] However, while elements of environmental history in the United States have been patriotic in tone – as epitomised in the glowing promise of the western frontier and the national character and values which it was regarded as building – Australian environmental history more often examines the failures, the unmet expectations, the natural and human disasters, and the sometimes tragic misunderstandings of the continent by its European colonists.[19]

Much work in environmental history, and I would suggest all work in Australian environmental history, grapples in some sense with the legacies of

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[17] William Cronon, 'A Place for Stories: Nature, History, and Narrative', *Journal of American History,* March 1992, pp. 1347 - 1376.

[18] For a comparative discussion of the role of environmental imagery in the nationalist visions of Australia and the United States, see Lyn Spillman, *Nation and Commemoration: Creating National Identities in the United States and Australia,* Cambridge University Press, Cambridge, 1997. For an Australian perspective see Libby Robin, 'Nationalising Nature: Wattle Days in Australia', *Journal of Australian Studies,* vol. 73, (2002), pp. 13 - 26.

[19] For instance, G. Bolton, *Spoils and Spoilers*: *a history of Australians shaping their environment*, Allen & Unwin, Sydney, 1981; E. Rolls, *They All Ran Wild: The story of pests on the land in Australia*, Angus & Robertson, Sydney, 1969; J. Marshall (ed.), *The Great Extermination: a guide to Anglo-Australian cupidity, wickedness and waste*, Heinemann, Melbourne, 1966.

colonisation and empire. In *Ecological Imperialism*, Alfred Crosby presents the process of imperial expansion as a movement not only of cultural, political and economic systems, but also, and importantly, of eco-systems.[20] Crosby argues that the biota which were intentionally and unintentionally transported around the world were key to the success (or otherwise) of the imperial project. Crosby's work encouraged historians to re-evaluate what constitute the vital elements of the historical narrative of empire, and to re-orientate their assessments of the significance of modes of agriculture, domesticated animals, weeds, diseases and the like, to encompass an ecological as well as economic perspective.

Although the historiography of empire has traditionally focused on its cultural, political and economic aspects, indigenous peoples have often been written into that history as 'aspects of nature, not of culture.'[21] For many years the absence of written records, and the consequent lack of knowledge of the continent's pre-settlement past, led to the presentation by historians of Aboriginal societies as static, timeless, and passively dependent on the cycles of the natural world. However work undertaken by historians, archaeologists and anthropologists in the past half century has offered a very different vision. As well as dramatically extending the period of known Aboriginal occupation of Australia, researchers now also argue that Aborigines have played a dynamic role in shaping and managing the natural world;[22] that Aboriginal societies interacted both among themselves and with visiting traders from the Pacific and south-east Asia;[23] that Aboriginal cultures were and are innovative and have adapted to and embraced changes in technology, art forms, and resources.[24] Some consequences of these changing visions have been the re-examination of historical material by many historians, the re-assessment of the role of Aborigines in the environmental history of Australia, and the serious questioning of notions of

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[20] Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900 – 1900*, Cambridge University Press, Cambridge, 1986.
[21] Lowenthal, 'Environmental History: from Genesis to Apocalypse', p. 37.
[22] See, for instance, Sylvia Hallam, *Fire and Hearth: a study of Aboriginal usage and European usurpation in south-western Australia,* Australian Institute of Aboriginal Studies, Canberra, 1975.
[23] See, for instance, Charles C. Macknight, *The Voyage to Marege: Macassan trepangers in northern Australia,* Melbourne University Press, Carlton, Vic., 1976.
[24] See, for instance, Geoffrey Blainey, *Triumph of the Nomads: a history of ancient Australia*, Macmillan, South Melbourne, Vic., 1975.

'wilderness' and the 'balance of nature' which are implicit in some historical narratives, and embraced by some elements of the environmental movement.

In the words of William Cronon, 'environmental history is a child of environmentalism and cannot be understood apart from it.'[25] Environmental history as a research area has grown up alongside the emergence of a broadly-based conservation movement within Australia, and its development reflects that shared growth. Initially, Australian environmental historians focused on the ecological devastation of a pristine Australian nature through colonisation.[26] While such 'apocalyptic'[27] work continues to be written,[28] the focus of environmental historians has broadened. As the environmental movement has matured, historians have begun to write its history too, looking both for positive progenitors for current concerns, and also at times presenting the tactics and culture of environmentalists more critically.[29] Commitment to the narrative form, and to uncovering the complexity and manifold detail of the past leads environment historians to tell different stories than those told in the main by environmental activists. Under the gaze of the historian the past both becomes a more complicated place, and the responses of the individuals who inhabited it more recognizable and comprehensible. While for those concerned primarily with current environmental politics the past might indeed be 'a foreign country' and those who lived there strange and blameworthy, the role of the historian is to examine and illuminate the actions, attitudes and identities of past peoples. In doing so the moral balance between past and present sometimes shifts uneasily away from us.

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[25] Cronon quoted in Lowenthal , 'Environmental History: from Genesis to Apocalypse', p. 40.
[26] For instance, see G. Bolton, *Spoils and Spoilers*; E. Rolls, *They All Ran Wild*; J. Marshall (ed.), *The Great Extermination*.
[27] John Mackenzie, 'Empire and the ecological apocalypse: the historiography of the imperial environment', in Tom Griffiths & Libby Robin (eds) *Ecology and Empire: Environmental History of Settler Societies,* Melbourne University Press, Carlton South, 1997, pp. 215 - 228.
[28] For instance, William J. Lines, *Taming the great south land: a history of the conquest of nature in Australia,* Allen & Unwin, Sydney, 1991.
[29] For examples see Martin Mulligan & Stuart Hill, *Ecological Pioneers: A Social History of Australian Ecological Thought and Action,* Cambridge University Press, Cambridge, 2001; Ian Watson, *Fighting over the Forests,* Allen & Unwin, Sydney, 1990; Libby Robin, *Defending the Little Desert: the rise of ecological consciousness in Australia*, Melbourne University Press, Carlton, Vic., 1998; and Drew Hutton and Libby Connors, *A history of the Australian environmental movement*, Cambridge University Press, Melbourne, 1999.

Environmental history has also grown up alongside a shift within the historical profession from the production of 'social' to 'cultural' histories. As Jardine and Spary point out: few historians nowadays 'feel entirely comfortable saying that they *don't* do cultural history.'[30] Under the influence of cultural history and cultural theory, environmental historians have become attentive to the processes of colonisation as not just matters of material environmental change, but as involving the fundamental transformation of the perceptions and cultural practices of colonial society and individuals, in response to exposure to radically new and different environments and societies.[31] As a field for the study of colonial environmental visions, and for the often ambiguous first encounters between colonisers and locals, much attention has been given to exploration and travel literature.[32] The role of vision and imagination has also been highlighted by a number of authors who have linked the history of environmental visions with art history.[33]

When images of Australia are evoked in literature and art, they most commonly focus on the gum tree and grass of the pastoral lands, or the vivid soils and open skies of the desert – which is geographically and, some have suggested, emotionally the Centre of both continent and nation. While Dorothy Mackellar, in her 'aesthetic declaration of independence'[34] in 1908 may have written of –

Green tangle of the brushes,
Where the lithe lianas coil,
And orchids deck the tree-tops,
And ferns the warm dark soil.

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[30] N. Jardine & E. Spary, 'The natures of cultural history', from N. Jardine, J.A. Secord & E.C. Spary (eds), *Cultures of Natural History*, Cambridge University Press, Cambridge, 1996, p. 7.
[31] For a discussion of histories of cultural practices see Jardine & Spary, 'The natures of cultural history', pp. 7 - 10.
[32] While some of these authors would not identify themselves as 'environmental historians' , their work has been influential. For example, Paul Carter, *The Road to Botany Bay: An essay in spatial history,* Faber and Faber, 1987, London; and Simon Ryan, *The Cartographic Eye: How explorers saw Australia,* Cambridge University Press, Cambridge, 1996.
[33] For example Bernard Smith, *European Vision and the South Pacific,* Oxford University Press, London, 1960; and more recently Tim Bonyhady, *The Colonial Earth*, Melbourne University Press, Melbourne, 2000.
[34] Thomas Dunlap, *Nature and the English Diaspora: Environment and History in the United States, Canada, Australia and New Zealand*, Cambridge University Press, Cambridge, 1999, p. 100.

– it is her ‘sunburnt country’ and ‘sweeping plains’ that come quickest to mind. Similarly the Heidelberg school’s paintings, often presented as iconic images of Australia, ‘were celebrations of light, heat, and space as elements of the country.’[35] In contrast to the vast spaciousness which is often said to characterise the Australian national landscape, the rainforests are both limited in extent (although they did not necessarily seem so to early European explorers and settlers), and from within their denseness, vision of horizon and sky is blocked.

The continent of Australia is characterised by its geological stability, flatness, low rainfall and very old and infertile soils. Rainforest clings to Australia’s eastern coast: to the tablelands and fire-protected slopes and gullies of the Eastern Highlands, and to the coastal lowlands where geological activity has led to younger, more fertile soils, and where there is a relatively high annual rainfall (by Australian standards). Tropical rainforest is found now in patches between Ingham and Cooktown, with some smaller pockets occurring north and south of that zone. Although accurate figures are impossible to ascertain, it is estimated that before European settlement, rainforest of all types occupied only about one per cent of Australia’s total land surface. Tropical rainforest has been extensively cleared for agriculture and residential development, and it is believed it has been reduced to around a quarter of its previous extent.[36]

In a sense, most of the histories which have been written about North Queensland are environmental histories. North Queensland is a region in which culture and economy have been profoundly shaped by environmental factors, not only in the ‘submerged’ way which environmental historians uncover in all regional histories, but as a subject of active and ongoing debate and controversy. The most important text on the settlement history of the region continues to be Geoffrey Bolton’s *A Thousand Miles Away: A History of North Queensland to 1920,* first published in 1963.[37] Bolton focuses on the ways in which patterns of colonial

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[35] *Ibid.*, p. 101.
[36] L.J. Webb & J.G. Tracey, ‘Australian rainforests: patterns and change’, in A. Keast (ed.), *Ecological Biogeography of Australia*, W. Junk, The Hague, 1981, p. 607.
[37] G. Bolton, *A Thousand Miles Away: A History of North Queensland to 1920,* Jacaranda Press in association with the Australian National University, Brisbane, 1963.

settlement in the North were directed by its distance from Brisbane, and by the rigours of the tropical climate and environment, at a time when it was widely believed that 'white men' could not live and work in the tropics. Another important text on North Queensland history, Noel Loos' *Invasion and Resistance: Aboriginal – European relations on the North Queensland frontier 1861 – 1897*, highlights the specific ways in which the North Queensland environment shaped the colonial encounter. In particular, Loos focuses in one chapter on the role played by the rainforest as a base for Aboriginal resistance, which continued late into the nineteenth century. The rainforest offered a terrain suited to guerrilla-warfare tactics, in which the invaders' superior weaponry was for a time undermined by local Aborigines' superior knowledge of, and ability to move through – and disappear into – a physically and visually impenetrable terrain.[38] Loos argues that the Queensland colonial government's policy towards Aborigines, which was primarily shaped by experiences on the pastoral frontier, had to be modified in response to the challenges posed by the rainforests.

A range of studies have focused more explicitly on the history of environmental perceptions of rainforest areas in North Queensland. The most important have been by Terry Birtles and Kevin Frawley, who have each placed the early European conceptions of North Queensland and other Australian rainforests within the context of the wider geographical beliefs and aesthetic values of the colonisers. In an unpublished Masters thesis, Birtles examines in detail the history of settlement and land-use on the Atherton-Evelyn Tablelands during the first decades of the twentieth century.[39] He concludes, on the basis of this and later research, that 'the early history of European settlement [in North Queensland] can best be described as the last phase of a frontier culture that advanced northward from New South Wales with the cedar-getters and which, with only isolated exceptions, demonstrated a remarkable insensitivity towards the 'jungle' environment and its people.'[40] Birtles

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[38] N. Loos, *Invasion and Resistance: Aboriginal – European relations on the North Queensland frontier 1861 – 1897,* Australian National University Press, Canberra, 1982, pp. 88 - 117.
[39] Terry G. Birtles, 'A Survey of Land Use, Settlement and Society in the Atherton-Evelyn District, 1880 – 1914', M.A. Thesis, University of Sydney, 1967.
[40] T. G. Birtles, 'European interpretations of the Atherton-Evelyn Vine Scrub of Tropical North Queensland, 1880 – 1920' in Dargavel, Dixon & Semple (eds), *Changing Tropical Forests: Historical Perspectives on Today's Challenges in Asia, Australasia and Oceania*, CRES, 1988, pp. 209 - 210.

highlights the colonial vision of forests generally, and rainforests particularly, as obstacles to agriculture and closer settlement, which must be removed as quickly and completely as practicable to allow the continued expansion of the colonial economy.[41] In a more recent paper, Birtles has examined the ways in which the actions, preconceptions and perceptions of the explorers shaped the course of settlement of rainforest areas in North Queensland.[42]

Kevin Frawley has written a number of articles focusing on the ‘environmental visions’ of European explorers and early settlers, and has also examined the history of forestry and land-management in North Queensland. In his paper, ‘European Exploration and Early Images of Northeast Queensland’, Frawley focuses on the role of the geographical imagination in the exploration of North Queensland rainforest, and on the ways in which imagination and past experience together combine to shape the observation and description of ‘new’ lands.[43] In a later paper he continues with these concerns, and discusses in more detail the role rainforests played in nineteenth century European consciousness, considering in particular the writings of Alexander von Humboldt.[44] In his studies of the history of environmental management, Frawley examines the ways in which rainforests have been evaluated on the basis of their potential for agricultural and timber production, as well as more recently for their scientific value and scenic, aesthetic and recreational qualities. In particular, Frawley highlights the conflict between the aims of agricultural development, as pursued by the powerful Queensland Lands Department, and the attempts of foresters (who up until 1957 were also part of the Lands Department) to ensure preservation of forested areas for timber production. He argues that this conflict has been central to the history of land-use in North Queensland.[45] Frawley also points to the importance of science as a factor in shaping both the early visions of rainforest and later decision-making regarding its use and management. He suggests that new scientific understandings of

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[41] Birtles, ‘European Interpretations’, p. 197.

[42] T. G. Birtles, ‘First Contact: Colonial Preconceptions of Tropical Queensland Rainforest and its People’, *Journal of Historical Geography,* vol. 23, no. 4, (1997), pp. 393 - 417.

[43] Kevin Frawley, ‘European Exploration and Early Images of Northeast Queensland, 1770 – 1880’, *Journal of Australian Studies*, no. 10, (June 1982), pp. 2 - 16.

[44] K. Frawley, ‘An Ancient Assemblage: The Australian Rainforests in European Conceptions of Nature’, *Continuum: The Australian Journal of Media & Culture*, vol. 3, no. 1, (1990), pp. 137 – 167.

[45] K. Frawley, ‘The inexhaustible scrub and the closer settlement ideal: the northern rainforests in Queensland development’, *Queensland Geographical Journal*, 4th series, vol. 3, (1988), pp. 20 – 41.

rainforest have been a potent force in the rapid development of a national conservation movement focused on the North Queensland rainforests, and have led to a radical shift in the politics and practice of rainforest management.[46]

As well as drawing on work in environmental history and existing literature on North Queensland, I have also relied on studies in the history of science to contextualise and broaden my research into scientific understandings of rainforest. Traditionally, many studies in the history of science have focused on the 'hard' sciences (physics, chemistry), and have been concerned with the processes of scientific revolutions – the development, advancement and acceptance of sometimes radical new theories. My topic is somewhat peripheral to such work, dealing with the 'softer' sciences of botany, ecology and biogeography, and with a location far from the centres of scientific authority. However, my thesis does build on work in the history of Australian science, which has become a subject of increasing debate and analysis since the late 1960s when George Basalla provided a model for the study of 'colonial science'.[47] Basalla suggested that in making the transition from the European 'centre' to the colonial 'periphery', the institutions and research foci of science pass through a number of transitional stages. He argued that initially imperial scientists visit the colonies, collect specimens and data and return with them to Europe. Over time resident colonial scientists emerge and while they are at first dependent on the resources of European centres, and focus their attention on applied work, they eventually develop the skills and resources required for in situ, novel, higher-level research. Recent authors have criticised Basalla's analysis of the apparent power imbalance and consequent intellectual imbalance between centre and periphery, and have suggested that in fact the relations between the two are much more complicated and interdependent than his presentation allows.[48]

Regardless (and perhaps in part because) of its shortcomings, Basalla's model has provided historians with a useful, adaptable, and eminently debatable framework

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[46] Frawley, 'An ancient assemblage', p. 137.

[47] G. Bassalla, ''The Spread of Western Science', *Science*, vol. 156, (5 May 1967), pp. 611 – 622.

[48] See, for instance, Ian Inkster, 'Scientific Enterprise and the Colonial "Model": Observations on Australian Experience in Historical Context', *Social Studies of Science*, vol. 15, no. 4, (Nov. 1985), pp. 677 – 704; and Roy Macleod, 'On visiting the "Moving Metropolis"', *Historical Records of Australian Science*, vol. 5, (1982), pp. 1 – 16.

for the study of colonial science. More importantly, it has given an added impetus and vitality to that study, and it has been applied, adapted and criticised by a range of historians of Australian science. A number of the Australian studies have focused on botany, zoology, applied biology and ecology: these have been the sciences of exploration and settlement.[49] Their development was made urgent by the economic needs of a settler society attempting to adapt European farming methods to a drastically different environment; and their pursuit was made enticing by the presence of unfamiliar fauna and flora, which challenged existing classificatory systems and raised a range of novel scientific dilemmas. R.W. Home's edited volume *Australian Science in the Making*, published in 1988, provided an overview of work in the history of science in Australia, and highlighted the extent of ground still to be covered in understanding the complexities of the development of diverse scientific disciplines and the institutional frameworks in which they have operated.[50]

While such explicitly historical approaches have been of great importance in shaping my own analysis, I have also been influenced by the broader literature on 'science studies', which encompass the history, philosophy, sociology and anthropology of science, and in particular by Bruno Latour's idiosyncratic response to the traditional history of science. Latour suggests that the history of science has sometimes been written as primarily a history of disembodied but metaphysically-connected ideas, according to which scientists do not primarily require resources, allies, laboratories and so on, but 'a sound mind and a sound method.'[51] Latour objects to the way this traditional view renders the distinction (the 'Great Divide') between 'science' and 'non-science' (or scientific and non-scientific societies) as primarily a distinction between rationality and irrationality, knowledge and belief. He caricatures this distinction as implying that 'In every one of us there is a scientist who is asleep, and who will not wake up until social and cultural conditions are pushed *aside.*'[52]

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[49] L. Robin, 'Ecology: a science of empire?', in Griffiths & Robin (eds), *Ecology and Empire*, p. 65.
[50] R.W. Home (ed.), *Australian Science in the Making*, Cambridge University Press, Cambridge, 1988.
[51] Bruno Latour, *Science in Action: How to follow scientists and engineers through society*, Harvard University Press, Cambridge, Massachusetts, 1987, p. 184.
[52] *Ibid.*, p. 185.

Ultimately Latour suggests that the development of a 'universal' science is fundamentally and materially linked to the development of empire:

> Belief by the rationalists in the existence of the Great Divide, as well as the denial of its existence by the relativists, both depend on forgetting the *movement* of the observer moving away from home to come back heavily armed in order to strengthen the facts.[53]

Expanding on this sense of the importance of movement and return, of connection and accumulation, Latour develops the concept of science as having the characteristics of a network:

> The word network indicates that resources are concentrated in a few places – the knot and the nodes – which are connected with one another – the links and the mesh: these connections transform the scattered resources into a net that may seem to extend everywhere.[54]

He presents the development of taxonomic botanical studies as a clear example of a network of this type, as well as an illustration of the fallacy of the notion that an absolute contrast exists between 'local' or folk-knowledge, and 'universal' or scientific knowledge. Latour argues that through the connections of the imperial network, botanical knowledge is developed not as a universal knowledge but as a local knowledge 'generated inside gathering institutions like the Jardin des Plantes or Kew Gardens.'[55]

In his article 'The crisis of nature' in *Cultures of Natural History,* James A. Secord argues that

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[53] *Ibid.*, p. 211.
[54] *Ibid.*, p. 180.
[55] *Ibid.*, p. 229.

> The development of the sciences belongs in a history that locates human actions in nature, and not apart from it. … *The history of natural history needs to become part of environmental history.*[56]

From the mid-1990s, the history of natural history and of the biological and environmental sciences emerged from the realms of specialised study by historians and sociologists of science, and became an increasingly important focus for historians interested more generally in the intersections between environment and culture in a colonial setting. Such historians have, necessarily, brought new insights and approaches to bear on the topic, and their work has ranged across a wide temporal scale, and has intertwined the particularities of local experience with the currents of international scientific discourse.[57] Much of this work has been central to my own understandings, and is discussed and referred to in detail at relevant points in my thesis.

Environmental historians find evidence and inspiration not only in texts, but also in landscapes, in scientific studies, in microscopic examination of pollen spores or charcoal remains, in long-held specimens, sketches, maps. Such material remains are both natural and cultural, are mediated and meaningful, and link powerfully back not only to their networks of production and distribution, but also to the earth itself. William Cronon touches on these issues in his article 'A Place for Stories: Nature, History and Narrative', which he wrote in order to explore the challenges posed by postmodernism. Cronon examines the varying ways historians have narrated the history of the American Dustbowl, and the way in which narrative form shapes meaning. He argues that, in writing environmental history, very particular limits are placed on what can and cannot be said: 'You can't put dust in the air – or tell stories about putting dust in the air – if the dust isn't there.'[58] While narrative form might direct the moral reading of a historical episode in line with particular visions of, for example, the right relation between humans and their environments, Crosby suggests

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[56] James A. Secord, 'The crisis of nature', in Jardine, Secord & Spary (eds), *Cultures of Natural History,* pp. 457 - 458, italics added.
[57] For instance, see Richard H. Grove, *Green Imperialism: Colonial expansion, tropical island Edens, and the origins of environmentalism, 1600 – 1860*, Cambridge University Press, Cambridge, 1995; Thomas Dunlap, *Nature and the English Diaspora*; Libby Robin, *Defending the Little Desert*; and Tom Griffiths & Libby Robin (eds) *Ecology and Empire*.
[58] Cronon, 'A Place for Stories', p. 1372.

that the reality of the historical episode itself can be traced back through physical as well as textual evidence.

As Crosby's article makes clear, the relationship between scientific and historical thought is central to the work of environmental historians. On one view, this relationship involves a separation of 'brute fact' from narrative – and moral – interpretation. This posits scientists as the providers of 'what actually happened' and historians as the story-tellers, meaning-makers and, perhaps, moral judges. It also suggests that the 'scientific' fact is primary, reliable, solid, while the 'historical' narrative offers a secondary and less certain layer superimposed on top. This view rests upon, among other things, an implicit acceptance of the prohibitive power of the 'naturalistic fallacy', which states that one cannot move with logical integrity from 'what is' to 'what ought to be': that questions of ethics stand outside the realm of scientific or logical thought.[59]

In contrast to this vision of the relation between science and history Stephen Pyne wrote in 1998:

> Ecological science is far too unstable to serve as a foundation for history. Rather it furnishes convenient scaffoldings to be erected, torn down and reassembled on the hard pilings of philosophy and art. The rest will be swept away in the next storm of discovery and paradigm shifts.[60]

Pyne is pointing (eagerly!) to a fundamental paradox in the history of science. Science aims to provide sound, objective explanations of the material world and scientific explanations are often accepted as 'facts' of the highest epistemological calibre, particularly by non-scientists. At the same time, dominant scientific views change, sometimes radically and quickly. Furthermore, the physical evidence which is observed and interpreted by scientists is itself recorded as text, and is interpreted through linguistic and visual representation, with all the qualities of metaphor and

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[59] Ecologist Len Webb discusses this notion in L.J. Webb, 'After-dinner peroration', in Stevens & Bailey (eds), *Contemporary Cape York Peninsula*, pp. 95 - 99.
[60] Stephen J. Pyne, preface to new edition of *Burning Bush: A Fire History of Australia,* University of Washington Press, Seattle, 1998.

nuances of meaning which such representations invoke. These aspects of science have long provided a research focus for philosophers, historians and sociologists of science.

Scientific views, like historical views, are open to the possibility of change – sometimes sudden and radical, at other times, by a creeping evolution. Such changes are based primarily on shifts in the interpretation or availability of evidence, both of which are open to scrutiny and criticism. To a significant degree, therefore, change is both open-ended and self-correcting within the disciplinary community in which it occurs.[61] I would reject any absolute distinctions being drawn between the concerns and methodologies of history and of the environmental and biological sciences. Ecology, palaeoecology and biogeography are disciplines which explore and explain the present through evidence of the past, and which write histories of the past on the basis of material remains existing in the present. The objects of study of the biological sciences are themselves living things which grow, change, reproduce, die, and which form communities and interact in diverse ways both with each other and with human societies: that is, which take part in a unique historical trajectory. And, as Peter Stanton's observations indicated at the opening of this chapter, in attempting to understand the natural and human histories of the world around them, scientists, like historians, tell stories, make meaning, and at times cast moral judgement.

Tom Griffiths' *Hunters and Collectors: The Antiquarian Imagination in Australia,* addresses these issues from a slightly different angle. While concerned more broadly with the history of popular engagements with the Australian past through the collection, preservation and display of 'antiquities', both natural and cultural, Griffiths' work is a 'cultural history that is alert to the metaphorical dimensions of science'.[62] He argues that antiquarianism, which encompassed natural history, was because of its focus on field skills, attention to locale, breadth of vision and engagement with memory and material objects, 'more exposed [than professional

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[61] As is suggested for history by Cronon in 'A place for stories', p. 1373. See also George Seddon's discussion of botanical naming practices. G. Seddon, *Landprints: Reflections on Place and Landscape*, Cambridge University Press, Melbourne, 1997, pp. 42 - 43.
[62] Tom Griffiths, *Hunters and Collectors: The Antiquarian Imagination in Australia,* Cambridge University Press, Cambridge, 1996, p. 2.

history] to the primary historical challenge of Australian settlement, the knowledge that the land had been – perhaps still was – someone else's.'[63]

I believe that an examination of the ways in which a range of scientific works focusing on the North Queensland rainforests have incorporated historical observations, visions and narratives will lead to a broader understanding of the responses of both past and present societies to environmental change. By historical observations, I refer to the intended and unintended record scientific texts provide of the processes of environmental change in the region. By historical visions, I mean those large visions which tend to see in the shape of history a progressive or declensionist trajectory, often linked to different understandings of the right relationship between human societies and the natural world. By historical narratives, I refer to the recounting of the history of plants or vegetation communities in such a way as to, implicitly or explicitly, resonate with human histories, an aspect of scientific texts which often involves the use of metaphor and narrative structure.

When presenting the Rede Lecture at Cambridge University in 1959, C.P. Snow, physicist and novelist, famously pointed to the 'two cultures' of science and the humanities. He stated that 'the intellectual life of the whole of western society is increasingly being split into two polar groups', and suggested that there was 'between the two a gulf of mutual incomprehension – sometimes… hostility and dislike, but most of all a lack of understanding.'[64] However, briefly in the original lecture, and more pointedly in his 1963 revision of it, Snow also conceded that in fact there ought at least to be three cultures, and that the third could be seen developing in the fields of social history, the social sciences, economics, and all those subjects 'concerned with how human beings are living or have lived – and concerned, not in terms of legend, but of fact. Such a culture,' Snow suggested, 'has, just to do its job, to be on speaking terms with the scientific one.'[65]

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[63] *Ibid.*, p. 3.
[64] C.P. Snow, *The Two Cultures: and A Second Look: An Expanded Version of the Two Cultures and the Scientific Revolution*, 2nd ed., Cambridge University Press, Cambridge, 1965, pp. 3 - 4.
[65] *Ibid.*, pp. 70 - 71.

Snow's lecture is of historical interest for a number of reasons. One aspect of Snow's argument which is noteworthy fifty years later is his deep faith in the potential of the industrial and scientific revolutions to ultimately and necessarily change for the better the living conditions of the world's poorest peoples – a vision from which is missing the sense of overwhelming environmental catastrophe that is almost inevitable when such subjects are discussed today. It is harder, now, to speak simply as Snow did then of the good of humanity, without also considering the good of the myriad plants and animals, waterways and soils within which humanity is enmeshed, and on which the wellbeing of humans depends. Snow describes scientists as having 'the future in their bones', by which he means that they are oriented towards possibilities, transformations, and are committed to social improvements.[66] He contrasts this with what he saw as the disengaged nature of much mid-twentieth century literature, a modernism which expressed a sense of alienation with both the past in the form of the industrial revolution, and the future in which that revolution would make its way across the globe.

Snow wrote that the polarisation occurring between the sciences and the humanities:

> is sheer loss to us all. To us as people and to our society. It is at the same time practical and intellectual and creative loss … it is false to imagine that those three considerations are clearly separable.[67]

Conversely, Snow suggested, 'the clashing point of two subjects, two disciplines, two cultures … ought to produce creative chances.'[68] Environmental history is a discipline in which those cultures meet acutely and often creatively. In my thesis I explore the extent to which that meeting has also taken place, though sometimes clandestinely, in the work of scientists concerned to investigate and describe the rainforests of North Queensland. These scientists have been both observers of and participants in a massive historical transformation: not only of a landscape, but also of the environmental values of their society.

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[66] *Ibid.*, p. 10..
[67] *Ibid.*, p. 11.
[68] *Ibid.*, p. 16.

Chapter 2 'Cutting Through the Scrub'

In a recent article entitled 'Jungles of the Mind: The Invention of "Tropical Rain Forest"', Philip Stott examines accounts of what would now be regarded as tropical rainforest written by European observers, ranging chronologically from Columbus to Darwin and beyond. Stott suggests, on the basis of this examination, that 'the idea of "tropical rain forest" had to be created in the European mind *before* it could be seen on the ground.'[69] He argues that this 'creation' did not occur until 1898, when plant geographer and ecologist Schimper coined the term 'tropischer Regenwald' (tropical rain forest), and used it to refer to a holistic and clearly defined ecological entity.[70] Before that time, Stott suggests, 'European observers of the tropics saw little but a riot of individuality, or alternatively a gloomy area of highly generalised "forest."'[71]

Stott's observations have been supported by my own examination of the depictions of the 'scrub' or 'jungle' of north-eastern Australia in eighteenth and nineteenth-century narratives of exploration. While botanists were often included as members of expeditions, and the explorers themselves sometimes also offered scientific interpretations of the environment they encountered, no clear picture of 'rainforest' emerges from these accounts. Most describe the 'scrub' as monotonous and overwhelming and do not distinguish, in their use of the term, between a wide range of environments (except by adding the descriptor 'thick'). The application of a taxonomic framework by botanists led to a sense of the novelty and variety of individual plants, but not to the clear observation of a distinctive or coherent form of vegetation. What appears to a modern reader as a failure of vision seems, as Stott suggests, to have been related to the linguistic tools and classificatory concepts available to these explorers.

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[69] Philip Stott, 'Jungles of the Mind: The Invention of the "Tropical Rain Forest"', *History Today*, May 2001, p. 40.
[70] I discuss Schimper's definition in further detail in Chapter Four.
[71] Stott, 'Jungles of the Mind', p. 39.

What does emerge clearly from these accounts, however, is a vision of the 'scrub' or 'jungle' as an environment closely inhabited and intimately known by the Aboriginal people who lived there. The explorers recorded finding Aboriginal settlements in clearings in the forest; they described and sometimes 'collected' objects such as spears and shields, fish hooks, or human remains; they saw Aboriginal people travelling along rivers by canoe; and sometimes met them at close range in the 'scrub', or caught glimpses of them as they seemed to disappear into the gloom and dense vegetation. William Carron, the botanist who accompanied Edmund Kennedy on his 1848 expedition, noted Aboriginal uses of a number of the species he described, and gave a detailed account of the detoxification process used in preparing rainforest plants for human consumption. At times the explorers received assistance from Aboriginal people who welcomed them to their lands, gave them food, helped carry their equipment across rivers, and directed them along the intricate network of trails which enabled movement through the 'scrub'. At other times they found themselves under attack, or made the attack themselves. While the killings of Kennedy and others in his party are widely known, it is not possible to tell how many deaths occurred at the hands of expedition members, who were well-armed and nervous. While the exploration narratives might be seen by a modern reader[72] as failing to capture the nature of 'rainforest' as later elaborated by Schimper, they do provide a vision of a complex historical environment. This vision undermines the notion underlying some more recent discussion of rainforest, which regards it as an unpeopled and a-historical 'wilderness'.[73]

In a chapter entitled 'Visions of Australia', geographer R.L. Heathcote discusses the ways in which the Australian environment has been perceived and represented from 1770 to 1970.[74] He argues that these diverse visions were the result of the interplay of three elements: the nature of the environment itself, the nature of the assessor, and the means by which the assessments were made – primarily, the

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[72] To some extent Frawley offers such a reading in 'European Exploration and Early Images of North-East Queensland', pp. 2 - 16.
[73] Stott, 'Jungles of the Mind', p. 43.
[74] R.L. Heathcote, 'Visions of Australia' in A. Rapoport (ed.), *Australia as Human Setting*, Angus and Robertson Education, Sydney, 1972, pp. 77 - 98.

mode and media of communication. Of five main trends which he identifies in the envisioning of Australia, Heathcote lists the 'scientific' vision first.[75] He suggests that

> The initial vision of the continental landscape was derived from the European scientific expeditions in the Southern Pacific from the late eighteenth century. …(N)ot until Cook's voyages and their French, Spanish and Russian equivalents was a body of knowledge assembled which was to stimulate interest in the continent and its landscapes. That interest from the outset was scientifically oriented.

Heathcote further suggests that the scientific vision which developed revealed 'a spirit of enquiry into the natural phenomena of the continent for their own sake, as objects of novelty and curiosity to European eyes.'[76] However, he also recognises that

> in all scientific interest and descriptions there seems to have been, and still is, a dichotomy of view. On the one hand there is what might be called the 'pure science' view of data for their own sake, seen as part of the world patterns and to provide clues for those general patterns, while on the other hand there is the 'applied science' view, which sees data in the light of their contribution to man's well being – as potential resources.[77]

The rainforests of North Queensland were the location of a number of expeditions of exploration during the nineteenth century, conducted by sea, river and land. Some, such as the hydrographical expeditions, passed through the region briefly and saw it only from a distance; others, such as the Kennedy expedition, found themselves mired in the 'scrubs' and struggled to escape. Expedition members made observations of the plant and animal life, the geology and climate of the areas traversed, as well as the technologies and societies of the Aboriginal people who inhabited them. Specimens of novel plants and animals were collected and, where accidents were avoided, were transported for more detailed description and

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[75] The others were the romantic vision, the colonial vision, the national vision and the ecological vision. Heathcote stresses that these are not to be considered as mutually exclusive, and that although one may be predominant in a particular time and communicative context, most representations of the Australian environment combine a complex mixture of all or some of these 'ideal types'. *Ibid.* p. 84.
[76] *Ibid.*
[77] *Ibid.*, p. 86.

classification to institutional centres such as the Royal Botanic Gardens at Kew, London.

While strategic and economic imperatives were often foremost, as Heathcote suggests, exploration was not an unmitigatedly mercenary exercise: it played a fundamental role in the grand Enlightenment project of developing a systematic natural history of the entire world. This was a task which had been ambitiously begun by Buffon and Linnaeus in the eighteenth century, at which time

> exploration was no longer simply a matter of travelling to unknown locations. Geographical discovery had become closely wedded to scientific enquiry… Where earlier explorers had merely observed, the aim of the new scientific traveller was to measure more precisely and to collect more comprehensively.[78]

The development by Linnaeus of the sexual system of classification of plants was important in this universalising process.[79] In the *Systema naturae*, first published in 1735, Linnaeus outlined a program for bringing order to natural history. He wrote:

> The first step in wisdom is to know the things in themselves… This notion consists in having a true idea of the objects; objects are distinguished and known by classifying them methodically and giving them appropriate names. Therefore, classification and name-giving will be the foundation of our science.[80]

The application of Linnaean classification was most successful in botany, where the reproductive organs of the plants provided a key to systematisation. Linnaeus arranged plants into twenty-four classes, according to their male reproductive characteristics (stamen), and divided those classes into sixty-five orders,

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[78] M. Nicholson, 'Historical Introduction', in Alexander von Humboldt, *Personal Narrative of a journey to the equinoctial regions the New Continent*, (trans. J Wilson), Penguin Classics, London, 1995, p. x.

[79] Although just how 'universal' a system it really was is debatable. In particular see George Seddon's discussion, which draws on the previous work of Max Walters, Director of the University of Cambridge Botanic Gardens, of the importance of European symbolism and myth in shaping taxonomic classifications. G. Seddon, 'Eurocentrism and Australian Science', in *Landprints: Reflections on Place and Landscape,* pp. 79 - 80.

[80] Carolus Linnaeus, *Systema naturae: Facsimile of the First Edition,* p. 19, quoted in Paul Lawrence Farber, *Finding Order in Nature: The Naturalist Tradition from Linnaeus to E.O. Wilson,* John Hopkins University Press, Baltimore, 2000, pp. 8 - 9.

primarily on the basis of the number and position of the female reproductive parts (pistils). From there, Linnaeus distinguished particular genera, consisting of groups of species with similar characteristics, and even more particular species.[81]

Linnaean classification was expressed through the use of a binomial (double-barelled name): the first name specified the generic group to which the organism belonged, the second identified the species. The simplicity and adaptability of Linnaeus' system was ideally suited to the needs of European science at a time when voyages of discovery and the spread of European empire were bringing more and more of the world under scientific scrutiny. This new system of classification provided a contrast to earlier methods, in which names were often just lengthy descriptions of the organisms being named, and in which lack of centralisation, and misidentification of the different sexes or of juveniles as different species, had led to a clumsy proliferation of names. Linnaean classification, and the portable language of botany which accompanied it, provided an important tool for travelling naturalists to describe and order new environments, and to incorporate unfamiliar aspects of the natural world into an existing system of knowledge.

It was with this tool at the ready that, in the winter of 1770, the *Endeavour* threaded its way along Australia's north-eastern coast, inside the Great Barrier Reef. Cook's instructions included that he should make observations of the soils, flora, fauna, minerals, and indigenous peoples; however 'priority was given to the charting which was carried out continuously, whereas detailed land observations were restricted to landings and were interspersed with brief descriptions of country in between.'[82] Such descriptions were limited by the necessity of often sailing well offshore to avoid shoals: they traversed most of the north-eastern coastline at a distance. Neither Cook's nor Banks' accounts offer any recognition of a significant qualitative change in the nature of the vegetation which they passed as they journeyed north. Between Hinchinbrook Island and Cape Grafton (Cairns), Banks wrote:

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[81] Farber, *Finding Order in Nature*, p. 9.
[82] Frawley, 'European Exploration and Early Images of North-East Queensland', p. 4.

> Countrey much the same as it was, hills near the sea high, lookd at a distance not unlike the mores or heaths in England but when you came nearer to them were covered with small trees; some few flats and valleys lookd tolerably fertile.[83]

Of Rockingham Bay, Cook wrote '… a little way back in the country is a continued ridge of high land, which appear'd to be barren and rocky…' [84] Frawley argues that these descriptions, as well as those of later hydrographical explorers in the region, were shaped by two main factors: the use of analogy from the known English landscape, which led to the description of dense tropical rainforest as being 'not unlike mores and heaths in England … but covered with small trees'; and the recent experience of the eucalypt forest of much of the east coast, which led to an expectation that the vegetation would be relatively open.[85] On 11 June the ship was grounded on a submerged reef off Cape Tribulation, named to commemorate that event. Cook was lucky to make a forced landing, and seven weeks were spent at what was named 'Endeavour River', later the site of Cooktown, repairing the vessel. The men's first introduction to the land of the northern peninsula was thus to an area well-grassed and watered, dominated by gum trees and large ant hills.[86]

When European settlement of Australia commenced in 1788, there were few trade routes connecting Sydney and south-east Asia. According to Raphael Cilento, in the early nineteenth century Great Britain

> emerged from long years of war as the greatest power in the world and the mistress of a huge, but almost accidental, colonial empire. India was largely hers; Ceylon and Cape Colony wholly so; the Straits settlements and Singapore (1819) were strategic points on an ever better-defined girdle round the new strategic world. *But there were no links between Australia and India, nor the markets and strong points of South and East Asia.*[87]

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[83] J.C. Beaglehole (ed.), *The Endeavour Journal of Joseph Banks 1768 – 1771,* Sydney, 1962, p. 76.
[84] J.C. Beaglehole (ed.), *The Journals of Captain James Cook on his Voyages of Discovery*, Vol. 1, Cambridge, 1955, p. 340.
[85] Frawley, 'European Exploration and Early Images of North-East Queensland', p. 5.
[86] Bolton, *A Thousand Miles Away*, p. 9.
[87] Sir Raphael Cilento, *Triumph in the Tropics: A Historical Sketch of Queensland*, Smith & Paterson, Brisbane, 1959, p. 79.

Whether accidental or not, the geography of empire made clear where British – and therefore Australian – interests lay in the first half of the nineteenth century.

> By the [eighteen] thirties Australian interest in trade with India was quickening. Australian horses were bred for the Indian cavalry; Australian pastoral products were exported in return for tea, rice, and cotton; and retired Anglo-Indian officers invested their savings and made their homes in New South Wales and Van Diemen's Land. The idea gained currency that trading posts with Asia should be opened up in northern and western Australia...[88]

A number of hydrographical expeditions were conducted by the British Admiralty to chart the north-eastern coastline in order to facilitate this trade. They also examined the coast for locations suitable for future settlement. The crew of such expeditions often included botanists. Matthew Flinders' party in 1802 included botanist Robert Brown and gardener Peter Good. Allan Cunningham, working as a botanical collector for the Royal Botanic Gardens, Kew, sailed the north-eastern coast with Captain Philip Parker King in 1819 and again in 1820. Between 1839 and 1841 Captain John Lort Stokes in H.M.S. *Beagle* surveyed the north coast in detail. His crew did not include a trained botanist, however he was instructed by the Admiralty that he and his medical officers should make such natural history collections as should strike an 'observant eye' as important and notable. Of the three expeditions, Allan Cunningham's collections and observations were the most extensive.

Flinders' instructions required that detailed surveying of features of the coastline be undertaken, but also that plant collecting was to be given special consideration. However, Flinders' examination of the north-eastern coast took him only as far as Broad Sound, south of present-day Mackay. At this point he decided, with the expected onset of the wet season approaching, that the *Investigator* should make rapidly for the Gulf of Carpentaria, where it was hoped a great river might be found running into what was then thought would be an inland sea. Flinders never returned to complete his investigation of the north-eastern coast.[89]

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[88] Bolton, *A Thousand Miles Away*, pp. 9 - 10.
[89] Frawley, 'European Exploration and Early Images of North-East Queensland', p. 6.

Captain P.P. King and his crew were to undertake 'detailed investigation of rivers, acclimatization experiments' and were given specific instructions 'to obtain information on climate, landforms, fauna, flora, wood products, minerals and the character of coastal tribes.'[90] To complement Cunningham's knowledge of natural history, King also employed Boongaree, an Aborigine local to the Sydney region, to accompany him on the voyage.[91] King's instructions were hurriedly compiled by the Admiralty in response to a renewed interest by the French in returning to Australia's north-west coast to complete the investigations begun by Baudin.[92] King was directed to stake out England's claim on the continent, particularly in harbours and river mouths:

> … you will take care to leave some evidence which cannot be mistaken of your having landed, either by erecting a flagstaff, or sowing some seeds, or by resorting to any other means which may at the time present themselves.[93]

Cunningham received further directions from Joseph Banks, who had instructed him to join the voyage:

> … this will give you an opportunity of collecting plants, which could by no other means be obtained; and of enriching the Royal Gardens at Kew with plants that could otherwise have been added to the Royal Gardens at Paris, and have tended to render their collection superior to ours…[94]

However, despite the prestige of such an important British institution being on the line, the north-eastern coast was rarely approached at close quarters, as safe anchorage was generally found at the scattered offshore islands. Cunningham's collections, while valuable, did not reflect in detail the vegetation of the mainland.

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[90] *Ibid*.

[91] Boongaree had earlier accompanied Flinders in the *Investigator*, and was valued also for his skills in spear-fishing. (Present-day spelling Bungaree).

[92] Marsden Hordern, *King of the Australian Coast: The Work of Phillip Parker King in the* Mermaid *and* Bathurst *1817 – 1822,* The Miegunyah Press, Carlton South, Victoria, 1997, pp. 19 - 20.

[93] *Ibid.*, p. 20.

[94] Letter from Banks to Cunningham, 13 Feb. 1817, quoted in Joan Webb, *The Botanical Endeavour: Journey Towards a Flora of Australia*, Surrey Beatty & Sons, Chipping Norton, NSW, 2003, p. 105.

On June 19, 1819, King anchored off Goold Island, two miles offshore from Rockingham Bay. He did not go ashore in the bay itself, and the coastal ranges extending behind Rockingham Bay were not marked on the map accompanying King's narrative – a point that was to be of vital importance when it came to the execution of the Kennedy expedition which set out from there, on foot. King established friendly contact with the Aborigines, who visited the ship in canoes and invited the crew to return the visit. The men did not go ashore until that evening, but when they did, Cunningham made the most of the opportunity to botanize, finding

> plants common to both Indies, Viz: *Sophora tomentosa*, *Guilandina bonduc*, and beautiful purple flowering Melastoma (*M. Banksii*) a splendid South American genus, of whose existence in Terra Australis I had not the most distant idea.[95]

Such finds would later play an important role in J.D. Hooker's assessment of the origins of the vegetation of north-eastern Australia.[96]

From Goold Island, they followed the route of the *Endeavour* by sailing for the Family Islands, landing on the north-easternmost of the group. Of that island King wrote that 'the face of the hill is so thickly covered with underwood and climbing plants as to render it perfectly inaccessible.'[97] King traced the coast carefully between Double Point and the Frankland Islands, (from around Mourilyan Harbour to the outlet of the Mulgrave River), as Cook had sailed that stretch of coast at night. However, he found 'nothing worth particular notice, being a continuity of sandy bays formed by projecting heads, in some of which the natives were observed walking.'[98] On Cunningham's request the 'summit of the back hills' was named Bellenden Ker,

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[95] Letter from Alan Cunningham to Joseph Banks, November 9, 1819, quoted in Ida (Lee) Marriott, *Early Explorers in Australia, from the log-books and journals, including the diary of Allan Cunningham, botanist, from March 1, 1817, to November 19, 1818*, Methuen, London, 1925, p. 428.
[96] Discussed in detail in Chapter Five.
[97] P.P. King, *Narrative of a Survey of the Intertropical and Western Coasts of Australia, performed between the years 1818 and 1822,by Captain Philip Parker King, R.N., F.R.S., F.L.S., and member of the Royal Asiatic Society of London, with an Appendix containing various subjects relating to hydrography and natural history, Vol. 1,* London, John Murray, Albemarle-street, Facsimile Copy by Libraries Board of South Australia, Adelaide, 1969, p. 204.
[98] *Ibid*., p. 205.

after the botanist John Bellenden Ker.[99] Specimens of coral and plant species were collected by Cunningham on Fitzroy Island, including

> a nutmeg tree, (*myristica cimicifera)*, two species of olive (*olea paniculate* and *notoloea punctata),* and three palms, viz. the *corypha australis* or large fan palm, the *seaforthia elegans,* and another, remarkable for its prickly leaves. We also found and procured seeds of *sophora tomentosa,* and a plant of the natural order *scimtamineae, hellenia coerulea,* Brown; two parasitical plants of *orchideae* were found growing upon the bark of trees in the shady place near our watering-place; one was *dendrobium caniculatum,* Brown; the other was also subsequently found at Cape Grafton, and is not yet described… we saw no quadrupeds, and but very few birds.[100]

After making collections at Fitzroy Island, around 5km off the coast of present-day Cairns, Cunningham wrote:

> My specimens now become weighty considerations… that require much attention. They afford me ample employment from an early hour in the morning until 10a.m. in their preparation before I could attempt to expose them to the drying air. I am never more happy than when I am shifting my plants…[101]

Although King hoped to examine Cape Tribulation, which Cook had only seen from 12 miles offshore, strong winds made the approach difficult and destroyed the expedition's whale boat. In looking for a safe anchorage to perform repairs to the ship King sent one of the crew to examine a possible landing site, which he named 'Bloomfield's Rivulet' (today Bloomfield River). As this proved unsuitable, King decided to follow Cook's example and continue to Endeavour River, 30 miles north.

As a consequence, Cunningham's onshore collecting efforts were focused primarily around the Endeavour River, and his records of that time reveal an awareness of the historical resonance of the locality: it was the place in which Cook, too, had found safe harbour, and in which naturalists Daniel Solander and Joseph Banks had collected. Cunningham wrote to Banks

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[99] *Ibid.*
[100] *Ibid.*, pp. 206 - 207.
[101] Hordern, *King of the Australian Coast,* p. 171.

> In my various daily walks in pursuit of flora which occupied my time during the first week of our stay there, much pleasure was derived in tracing your steps with those of your learned colleague Dr Solander and detecting many plants then discovered that in all probability have never been seen in living state since that period…[102]

Cunningham also complained to Banks of the difficulties in pursuing his collecting as widely as he had hoped, due to a 'rupture with the natives', which necessitated an armed guard at all times, and frustrated him in his botanical endeavours. Cunningham's second voyage up the north-east coast with King's *Mermaid* provided even fewer opportunities for botanizing than the first: they sailed directly from Port Bowen to Endeavour River, charting to the east of their previous route.[103]

Many of the specimens collected by Cunningham were described and named, and circulated widely in herbaria in Britain, Europe and beyond. However George Bentham, a leading British botanist and author of the *Flora Australiensis*, noted that the British Museum (Natural History), which obtained a large portion of Cunningham's collections, had allowed the valuable resource which they offered go to waste:

> The rich herbaria collected at the public expense by the late A. Cunningham in his various expeditions under Captain King and others… have been stored away, many of them from a quarter to half a century, unarranged in their original parcels, without any thought of providing the staff and funds necessary to render them of use to scientific botanists.[104]

Bentham's comment highlights the fact that, while the physical act of collection may be historically dramatic – bound up as it is so closely with exploration and with the symbolism of empire – the act alone is not of great scientific value. The

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[102] Letter from Cunningham to Banks, 9 November 1819, quoted in Webb, *The Botanical Endeavour*, p. 107.
[103] Hordern, *King of the Australian Coast*, pp. 229 - 230.
[104] Bentham quoted in Webb, *The Botanical Endeavour*, p. 110.

quieter and lengthier processes of taxonomic description and classification, which require not ships and guns, but books and other specimens, are in fact most integral to determining the scientific worth of such collections. As Lucille Brockway states, in response to the accusation that Kew Gardens was simply a place where men "attach barbarous binomials to dried foreign weeds": '*without classification there is chaos*.'[105] And to a taxonomist, a mass of unarranged specimens is an acute example of such chaos.

Between 1839 and 1841 Captain John Lort Stokes in H.M.S. *Beagle* surveyed the north coast in detail. His crew did not include a trained botanist, and his directions were to focus on coastal features, reefs, tides and rivers, in particular of the poorly-charted north-western coast. He was instructed to meet with Captain P.P. King and, if possible, Mr. Cunningham while in Sydney, to obtain advice on those areas of the coast with which they were familiar.[106] Further, his instructions from Captain Beaufort, Hydrographer to the Admiralty recognised that

> In such an extensive and distant survey, numerous subjects of inquiry, though not strictly nautical, will suggest themselves to your active mind; and though, from your transient stay at any one place, you will often experience the mortification of leaving them incomplete, yet that should not discourage you in the collection of every useful fact within your reach. Your example in this respect will stimulate the efforts of the younger officers under your command, and through them may even have a beneficial influence on the future character of the navy… Large collections of natural history cannot be expected… But to an observant eye, some facts will unavoidably present themselves, which will be well worth recording, and the medical officers will, no doubt, be anxious to contribute their share to the scientific character of the survey.[107]

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[105] L. Brockway, *Science and Colonial Expansion: The Role of the British Botanical Gardens*, Academic Press, New York, 1979, p. 6.

[106] John Lort Stokes, *Discoveries in Australia; with an account of the Coasts and Rivers Explored and Surveyed during the Voyage of the H.M.S. Beagle, In the Years 1837- 38-39-40-41-42-43, By Command of the Lords Commissioners of the Admiralty, Also A Narrative of Captain Owen Stanley's Visits to the Islands in the Arafura Sea.* Volume 1. London: T. & W. Boone, 29, New Bond Street, 1846; Reproduced by the Libraries Board of South Australia, Adelaide, 1969, p. 20.

[107] *Ibid.*, pp. 20 - 12, 24 - 25.

Stokes' observations, while limited, were important. He speculated, on the basis of the constant visibility of native fires, and the 'extreme abruptness' of the eastern face of Hinchinbrook Island from which no waters were seen emerging, that a land of great fertility lay to its west.[108] He wrote: 'we have every reason to believe that the discovery of fertile and therefore valuable land, will one day reward the labours of the explorer.'[109] He did not, however, give a clear indication of what kind of challenge that region would hold to one approaching it on foot, rather than by sea. The narrative of the rest of his journey was concerned primarily with hydrographical matters, and determining the correctness of Captain King's charting.[110]

As Frawley notes of the early voyagers:

> Understandably they were concerned with those features of interest to sailors – the configuration of the coast, water depths, significant landmarks, and dangers such as shoals and compass aberrations. Subsequent land exploration was to place great reliance on land features marked during these surveys.[111]

While some botanical specimens had been collected from the north-east coast and offshore islands during this period, particularly by Allan Cunningham, the descriptions which were given of the North Queensland landscape were necessarily limited by the nature and aims of the hydrographical expeditions. However, despite the best efforts of the hydrographers, the string of thousands of reefs which constitute the Great Barrier Reef continued to make the trade route to Asia north from Sydney a notoriously hazardous one. Stories of wrecks and the lengths gone to in order to survive them are numerous.[112] Preferable to a well-mapped but still dangerous sea-lane would be a connecting navigable river which could be used to transport goods directly to the northern outpost at Port Essington, to the Gulf of Carpentaria, or to

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[108] *Ibid.*, pp. 339 - 40.
[109] *Ibid.*, p. 340.
[110] *Ibid.*, pp. 340 - 345
[111] Frawley, 'European Exploration and Early Images of North-East Queensland', p. 4.
[112] See, for example, the colourful though historically dubious accounts in Hector Holthouse, *Ships in the Coral: Explorers, Wrecks and Traders of the Northern Australian Coast,* Angus and Robertson, North Ryde, NSW, 1986.

some other as-yet-unfounded strategic port on the Cape York Peninsula.[113] By the late eighteen thirties, the belief was widespread that

> … the deep bays known to indent a large portion of this [north-western] coast, received the waters of extensive rivers, the discovery of which would not only open a route to the interior, but afford facilities for colonizing a part of Australia, so near our East Indian territories, as to render its occupation an object of evident importance.[114]

While the hydrographers had searched for signs of such a river by ship, in 1846 Thomas Mitchell sought it unsuccessfully by land, on an expedition in which Edmund Kennedy was the second in command. In 1847 the New South Wales Government began to assemble an expeditionary party to explore the northern-eastern portion of the colony and to seek a route from the coast inland to Cape York. Kennedy was again enlisted.

In May 1848, an expedition of thirteen men, led by Kennedy, set out from Rockingham Bay for Cape York. They had been transported to their point of departure by H.M.S. *Rattlesnake* and the barque *Tam O'Shanter*, which were to make a marine survey of the far north-eastern coast. Among those on board was the young Thomas Henry Huxley, a naturalist who was later to achieve eminence both on his own account and for his championing of Charles Darwin's controversial theory of evolution by natural selection. Huxley accompanied Kennedy on a reconnaissance mission from Rockingham Bay, which he illustrated, showing clearly the tangled, swampy and enclosed environment that Kennedy would be venturing into. Beyond this, Huxley offered frustratingly little observation or discussion of the lands and natural products of North Queensland. The heat and humidity on board the *Rattlesnake* made him miserable, and worse, he had fallen in love whilst in Sydney, and was slumped in a romantic despair during this leg of his journey.[115]

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[113] By the time of Kennedy's expedition Port Essington had already begun to be abandoned, though there were thoughts of founding a coaling station elsewhere on the Cape York Peninsula to service steamers from Sydney en route to Singapore. E. Beale, *Kennedy, The Barcoo and Beyond: 1847,* Blubber Head Press, Hobart, 1983, p. 58.
[114] Stokes, *Discoveries in Australia,* p. 2.
[115] A.J. Marshall, *Darwin and Huxley in Australia,* Hodder and Stoughton, Sydney, 1970, pp. 84 - 89.

The fate of the Kennedy expedition is well known: of the thirteen men, only three survived – the rest succumbed to hunger, illness and Aboriginal attacks. While Ludwig Leichhardt had successfully conducted an overland expedition from the Darling Downs, west through the gulf country to Port Essington only three years earlier, Kennedy and his men were the first Europeans to explore the densely-rainforested regions of the north-east. The expedition's botanist, William Carron, who was one of the three survivors, wrote the only existing first-hand record of the expedition. Edgar Beale, in his *Kennedy Workbook*, notes that Carron was paid £20 for writing his narrative and *Sydney Morning Herald* journalist E.K. Sylvester was paid £10 for editing it. In Beale's opinion, Sylvester 'should have been paid nothing, because although Carron's writing is not good, it is clear enough, and Sylvester's editing has not only dramatized certain passages, but his editing has changed Carron's meaning in some places, some of the changes, however innocent, being quite material.' [116] While Beale's minute examination of the remaining fragments of Kennedy's sketches, journal and notebook reveal inaccuracies in detail in Carron's narrative, particularly in his record of the exact dates of events, and the exact locations of camps, Beale concludes that 'on general details, unless otherwise proved wrong, there is every reason to accept his authority.'[117]

It is clear, in retrospect, that the expedition was destined to failure before it began by lack of knowledge of the land it would find itself in. It seemed, on the basis of available descriptions of the region, both rational and necessary for Kennedy to set out equipped with:

> …twenty-eight horses, a hundred sheep, three kangaroo dogs, and one sheep dog… one ton of flour, ninety lbs. of tea, and six hundred lbs. of sugar… twenty-four pack saddles, one heavy square cart, two spring carts with harness for nine horses, four tents, a canvas sheepfold, twenty-two pounds of gunpowder, one hundred and thirty lbs. shot, a quarter-cask of ammunition, twenty-eight tether ropes, each twenty-

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[116] Edgar Beale, *Kennedy Workbook: A Critical Analysis of the route of E.B. Kennedy's 1848 Exploration of Cape York Peninsular with a Transcript of Fragments of his Journal*, Wollongong University College, 1970, p. 7.
[117] Beale, *Workbook*, p. 9.

> one yards long, forty hobble chains and straps, together with boxes, paper, &c., for preserving specimens, firearms, cloaks, blankets, tomahawks and other minor requisites for such an expedition, not forgetting a supply of fish-hooks and other small articles, as presents for the natives.

Dorothy Jones dryly adds: 'The collapsible furniture for Kennedy's tent probably came under the heading of minor requisites.'[118]

Part of the rationale for this heavy travelling was the original aim of the expedition to journey north to Cape York, where they would be met by the *Rattlesnake* or *Bramble* for re-provisioning before turning south again and working their way down the western gulf country and then returning inland to Sydney.[119] However, the tragi-comic listing of what Kennedy and his men would attempt to carry through swamps and tangled forests, over mountains and across rivers, represents cultural as well as physical baggage. The descent of Carron's narrative into a tale of horror, as livestock died, supplies were lost, stolen or water-damaged, carts were abandoned, and specimens cast aside, reveals a lost grip not only on physical survival but also on the capacity to maintain those objects, attitudes and resources which marked the explorers as 'civilised'.

William Carron's Narrative of an Expedition commences loosely in the form of a novel – 'We left Sydney on the 29th April, 1848, in the barque "Tam O'Shanter"…' From the second chapter on, the narrative is self-consciously produced as a journal: the author indicates that he considers the expedition 'fairly begun', and thus the change in format is necessary 'for the sake of clearness and arrangement'. However, as most of his notes were lost before rescue, he adds the caveat that 'in narrating the particulars of our journey, I am obliged to trust largely to memory, and to very imperfect memoranda', and acknowledges that defects may result.120 Carron aimed to recount the course of the expedition with a precision and accuracy which reflected his scientific outlook as the expedition's botanist, as well as

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118 Dorothy Jones, *The Cardwell Shire Story,* Jacaranda Press, Brisbane, 1961, p. 31.
119 E. Beale, *Kennedy of Cape York*, Rigby Ltd., Adelaide, 1970, p. 143.
120 W.M. Carron, *Narrative of an Expedition undertaken under the direction of the late Mr Assistant Surveyor E.B. Kennedy for the exploration of the country lying between Rockingham Bay and Cape York,* (facs.), Libraries Board of South Australia, 1965, p. 11.

nineteenth-century conventions of journal keeping.121 Although Carron's initial role within the exploration party was as botanist, his responsibility, as almost-sole survivor of such a 'tragedy', was ultimately to be a story-teller, to give an account of the losses the party suffered. Throughout his narrative there is a sense of unease between his desire to provide a measured botanical report, and the necessity placed on him to tell a human-centred story. The torturous, step-by-step passage of the men through swamp and scrub, the obstacles they faced, and the barriers they crossed provide the content of the narrative, which is imbued with a powerful sense of disintegration.

Cutting through the scrub

Sketch by Thomas Huxley, 1848.

Held in Mitchell Library.

[121] Barbara Stafford, *Voyage into substance: art, science, nature, and the illustrated travel account, 1760-1840.* MIT Press, Cambridge, Massachusetts, c1984, p. 28.

In his descriptions of the environment they encountered, Carron refers to 'scrub'; or sometimes, to emphasise the point, 'thick scrub'. Such 'scrub' was an obstacle to the progress of the expedition, a seemingly poor source of food, and ultimately proved fatal to nine of the thirteen expedition members. However, what is notable about the narrative is Carron's failure – in line with Stott's description of other narratives of the same period – to describe the rainforest environment in any detail. Although Carron expressed a keen interest in the species he observed, and a strong desire to collect specimens of as many plants as possible, he showed little scientific or aesthetic concern for the whole formed by these parts.

Carron experienced the 'scrub' primarily in two ways: it was what must be cut through to make a path, and it was a place in which people and animals could lose or hide themselves. Early in the journey, Carron described the scrub as 'impossible to penetrate,'[122] and soon after told of how, when travelling inland, 'a man was always obliged to walk before the carts, to cut down small trees.'[123] Much of Carron's description of the expedition is summed up by the oft-repeated phrase: 'cutting through the scrub'.

Scrub was also the place from which the 'natives' often appeared and disappeared. Before the expedition had really begun, one member decamped with damper, tea, and sugar, and shared it with a group of Aborigines. When spotted by some of Kennedy's men he hid in the scrub, only to reappear the following morning begging forgiveness.[124] Aborigines not only appeared from the scrub, or were seen at its edges,[125] but on July 4th, when conflict first arose and Kennedy fired on a group, those who were not hurt carried the wounded quickly into the scrub. As a result, Kennedy did not know how many people he had killed.[126] The scrub clearly played a tactical role in determining the relations between the explorers and the indigenous inhabitants – at one stage a group of Aborigines with dogs rushed the expedition's

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[122] *Ibid.*, p. 17.
[123] *Ibid.*, p. 20.
[124] *Ibid.*, p. 18.
[125] *Ibid.*, p. 35.
[126] *Ibid.*, p. 26.

sheep and scattered them into the bushes. Carron noted: 'We had great difficulty in getting them together before dark.'[127] This role of the 'scrub' resembles what Simon Ryan describes as the fight for visual power which he argues often occurred between explorers and Aborigines – and which led explorers to attempt to 'take' strategic points, particularly raised sites such as hills.[128] A significant difference, however, to the examples discussed by Ryan, is that there were few physically-available strategic points in the rainforest. The ability to see without being seen rested primarily on intimate knowledge of, and capability within, the environment itself, a knowledge which the explorers could not attain and so supplemented with firepower.

While Carron offered only minimal descriptions of the 'scrub' he travelled through, he suggested that an early encounter with lawyer vine, a characteristic rainforest plant, provided a metonymic preview of the position the explorers would soon find themselves in:

> Here also I first found a strong growing climbing palm (*calamus)*, throwing up a number of shoots from its roots, many of them 100 feet long, and about the thickness of a man's finger… The growth of this plant forms one of the greatest obstacles to travelling in the bush in this district. It forms a dense thicket, into which it is impossible to penetrate without first cutting it away, and a person once entangled in its long tendrils has much difficulty in extricating himself, as they lay hold on everything they touch.[129]

However in a counterpoint to its menace, Carron also noted that the shoots were 'remarkably tough' and were used by Aborigines as a binding in making canoes – he optimistically concluded, with an eye to transposing the exotic vine into a more familiar product, that an 'abundance of the shoots… could be obtained, and would be useful for all the purposes to which common cane is now applied.'[130] The swamps, scrub and mountainous jungle around Rockingham Bay would soon entangle the explorers and force them into repeated disorienting retreat and redirection in an effort to 'extricate themselves'.

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[127] *Ibid.*, p. 18.
[128] Ryan, *The Cartographic Eye*, pp. 192 - 195.
[129] Carron, *Narrative of an Expedition*, p. 6.
[130] *Ibid.*, pp. 6 - 7.

Carron's observations of plant species during the journey relied on the use of botanical terminology and classification. Carron was primarily interested in collecting specimens of 'new and interesting species', and although the specimens themselves did not survive the journey, the narrative is made up to a large extent of botanical descriptions. These descriptions are composed of lists of generic names, '*genera flagellaria*, *Kennedya*, *bambusa* (bamboo), *smilax*, *cissus*, *mucuna'* broken by occasional admissions of failure of classificatory knowledge – 'and various climbing plants unknown to me' – and more detailed descriptions in technical terms laced with the language of aesthetic appreciation:

> also some beautiful epiphytal *orchidae*; one beautiful specimen of *dendrobium*, (rock lily,) with the habit of *D. speciosum* but of stronger growth, bearing long spikes of bright yellow flowers, the sepals spotted with rich purple.[131]

Flowers and blossoms attracted much of Carron's attention. As well as being necessary to determine species, Carron also found them noteworthy for their beauty, colouring, scent, and novelty; particularly those that seemed in some way emblematic of the tropical environment, such as the species of hibiscus he encountered,[132] and an unknown plant he found which resembled *hedychium*:

> …flowers, resembling a pineapple in shape and size, and of a beautiful crimson colour, are produced on the top of a strong flower-stem… This plant appears to be very local in its habits, as I only caught sight of it by the side of three creeks, and always in moist, shady places.[133]

There is a sense in which such flowers – beautiful, rare, and often hidden from sight within the dense rainforest – allowed Carron to appreciate a difficult and at times 'monotonous' environment. They were sudden, unique botanical visions which broke up his experience of the seemingly-unending 'scrub'.

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[131] *Ibid.*, p. 5.
[132] *Ibid.*, p. 33.
[133] *Ibid.*, p. 27.

Carron noted colour, size and structural characteristics of flowers, and, very occasionally, smell: the 'sweet-scented flowers' of the *verbenaceae* gained a mention.[134] The blossoms, which grew directly from the trunk of 'a beautiful tree belonging to the natural order *myrtacae*', were described as

> delightful, spreading perfume over a great distance around; I had noticed the fragrance of these blossoms before while passing through the scrub, but could never make out from whence it arose. It resembles the scent of a ripe pineapple, but is much more powerful.[135]

The incorporeality of scent suggested a beauty that transcended the reductive physicality of the botanist's gaze. Carron also described the way this 'most beautiful and curious tree' carried blossoms, unripe and ripe fruit all at once. He reported that the fruit was edible, though not good. He named it, hopefully, 'white apple.'

As the 'white apple' shows, Carron was not only interested in taxonomic novelty and ornamental beauty – he was also interested in edibility. He had reported, on his first collecting expedition, that: 'Growing on the beach was a species of *portulaca*, a quantity of the young shoots of which I collected, and we partook of them at our supper, boiled as a vegetable.'[136] His success in finding edible plants as the expedition continued was to be limited, and his interest became (naturally) less focused on the aesthetic properties of species and more on their suitability for consumption as the journey went on. As well as the *portulaca*, they found a fruit which Carron considered to be what Leichhardt had called 'nonda' – an 'oblong yellow fruit, having a rough stone inside… and a very good flavour … we all ate plentifully of it.'[137] On another occasion, Carron identified a *Brachychiton* and advised the men to eat the gum and roasted seeds, but they could not find much of either. And not all of their experiments in supplementing the expedition's supplies with native plants were successful: the men reported diahorrea after eating deciduous

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[134] *Ibid.*, p. 46.
[135] *Ibid.*, p. 25.
[136] *Ibid.*, p. 8.
[137] *Ibid.*, p. 53.

figs and other unfamiliar fruits, and pandanus fruit commonly caused painful headaches, and swellings around the eyes.

On a few occasions, Aborigines shared food with the explorers,[138] and once gave them advice on how to detoxify a particular plant. Carron learnt how to use *castanospermum* seeds to make a baked meal: the seeds must be soaked in water for five days, cut into thin slices, then sun dried, and finally pounded into a fine powder between two large stones – an endeavour that did not sit well with the ideally-linear mobility of the expedition. Carron commented that the meal 'was not very palatable'.[139]

As well as systematically categorising the plants he found, Carron was also interested in making the land productive and hospitable, if not to his party, at least for future travellers. Following well-established tradition, he noted that:

> when the horses were watered and fed, I commenced digging a piece of ground, in which I sowed seeds of cabbage, turnip, leek, pumpkin, rock and water melons, pomegranate, peach stones, and apple pips.[140]

While this does not seem a strange act at the commencement of the journey, it became a more interesting gesture when repeated at the base of the Seaview Range, amidst dense rainforest, when the men had begun to grow ill and weak.[141] The implication that the surrounding wilderness might in some way be transformed, civilised, into a productive garden must have been dwarfed by the range itself and the mass of vegetation through which they had fought to get there.

It was not only the men who had difficulty sustaining themselves. Carron also noted a number of times that the horses and sheep, though seeming to have access to plentiful grass and water, were nonetheless growing weak and thin. When one sheep died the men decided to conduct a mock autopsy to see if they could determine the

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[138] *Ibid.* pp. 48, 69, 73.
[139] *Ibid.*, p. 28.
[140] *Ibid.*, p. 9.
[141] *Ibid.*, p. 33.

cause of its death. Carron starkly noted: 'We found its entrails full of water.'[142] The effects on their animals of the unfamiliar environment at times seemed to indicate a deterioration of the proper order of things. For example, Carron described how, when crossing a creek, 'the sheep followed the horses like dogs.'[143] The experience of 'wilderness' seemed to exacerbate the domesticity of the expedition's animals. It was a more fundamental disruption of the natural order when, on August 16, they decided 'to make [the] horses, when too weak to travel, available for food.'[144] The disintegration seemed almost complete when, at Weymouth Bay, the few surviving men, at last weakened to near-death, found they no longer had the strength to bury their companions as they died.[145]

Fundamental to Kennedy's endeavour was the attempt to order the environment encountered according to accepted frameworks of surveyance, botany and natural history – that is, through application of European instrumental technology to map terrain, and through attempts to measure, categorise, name, and collect specimens. Implicit to this ordering was the assumption that, in both a physical and abstract sense, that environment would be brought 'home' with the explorers, to be shared with a wider public. Exploration would provide the knowledge of geography and terrain on which future white settlement might proceed. Botanical, zoological and ethnographic 'discoveries' would provide material for the education and entertainment of the colonial public. This required a process of 'rendering … a host of local particulars "universal"… "mobile," "stable," and "combinable." '[146] This rendering was done in a number of ways: through classification, technical description, measurement, and through collecting, preserving, and transporting appropriately chosen specimens.

However the focus in Carron's text on measurement was also a way of ordering and accounting for the journey itself. Carron's eagerness to measure was by

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[142] *Ibid.*, p. 35.
[143] *Ibid.*, p. 36.
[144] *Ibid.*, p. 38.
[145] *Ibid.*, p. 76.
[146] David Miller, 'Joseph Banks, empire and "centers of calculation" in late Hanoverian London', in David Miller & Peter Reill (eds), *Visions of Empire: Voyages, botany, and representations of nature*, Cambridge University Press, Cambridge, 1996, p. 23.

no means limited by the aim of providing scientific data or guidance to future travellers. Carron measured natural features such as the width of rivers and height of mountains; he also recorded the weight of sheep they killed for food and sporadically (and unreliably) noted the longitude and latitude of their campsites; he recorded the height of the party's tents, kept tally of the distances travelled, the height of trees and size of fruit and flowers; he noted the dimensions of the shields and swords found in an Aboriginal settlement, and the weight of daily rations. While the continual measurement of space and its contents gives the narrative an objective, report-like quality, Dorothy Jones notes:

> To try to relate Kennedy's actual route to physical features as now known is, at best, a speculative game… Directions and positions of rivers and ranges at times seem confused. However [Carron] judged these things from what the eye could see and the mind guess at… At times, his distances seem to have been estimated by a man, wet, footsore, achingly weary, whose last meal was more than twelve hours away.[147]

To the extent that this failure of measurement also reflected the lack, or failure, of appropriate instruments, the landscape itself played a role – the triangulations necessary for surveying required clear viewpoints from raised locations. The dense 'scrub' Kennedy's party found themselves in would have made any such measurements difficult and often impossible. There is only one reference, in the whole of Carron's narrative, to the group having a panoramic view from a hill-top across the country they were travelling through, and that was overlooking 'fine undulating forest land' composed of melaleuca, grevillea and banksia, not rainforest.[148]

It is notable that, unlike many expeditionary parties, Kennedy left no trace of names on the land he passed through.[149] While Kennedy's own journal and other records were destroyed, there is no instance mentioned in Carron's narrative of the

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[147] Jones, *Cardwell Shire Story*, p. 37.
[148] Carron, *Narrative of an Expedition*, p. 46. While Carron identifies the party's location a few days earlier as 'in the vicinity of Cape Tribulation', Beale argues that they were in fact around one degree south of that latitude, and by 9 September were well inland in the vicinity of the Walsh River. Beale, *Workbook*, pp. 46 - 47.
[149] This is in contrast to his previous expedition, see, for example, Edgar Beale, *Kennedy of Cape York*, Rigby, Adelaide, 1970, p. 54.

party naming a site. Rivers, although often tentatively or erroneously identified by Carron, had already been named by the many hydrographic expeditions which had mapped the coastline. The inland remained largely nameless. This failure to name suggests the confusion evoked by the difficult landscape, which often blocked any view of a horizon or of distinctive features which could be used to fix a point. It could also reflect Kennedy's adherence to Mitchell's view that naming is a legitimate act only when a land has been accurately and adequately surveyed.[150] The blankness which this lack of names reveals would have diminished the value of Carron's specimens, had they survived the journey. Without clear attributions to mapped locations, the information provided by the specimens is rootless: they might have been fitted into classificatory framework of class, genera and species, but this framework could not have been mapped back to the soil from which the plants grew.

The inclusion, at the end of Carron's narrative, of a table entitled 'State of the Weather at Weymouth Bay from November 14 to the December 14 1848'[151] reflects the tensions inherent between narrative and measurement, and the multiple meanings such measurement held. The table is significant not for its contents but for its symbolism: it is suggestive of the scientific ambitions of the expedition, and of Carron's attempts, against the odds, to fulfill the requirements placed on him as 'scientist'. It also speaks powerfully of the muteness of data. The measurements were taken after the expedition had split up, whilst Carron and his companions waited, first in hope and then despair, to be rescued by H.M.S. *Bramble*, which Kennedy had promised to send for them. Between November 14 and December 28, six of Carron's companions died of hunger. The thermometer which Kennedy had left in his keeping broke on December 15. Carron and Goddard were rescued on December 30, 'senseless with joy', skeletal, swollen-footed, and close to death. To Carron's regret, his specimens and most of his journal were left behind.

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[150] '…when a traveller takes the trouble to determine the true place of hills or other features, he might perhaps be at liberty to name them also. The covering of a map with names of rivers or hills, crossed or passed, merely in traversing unknown country amounts to little more than saying, that so many hills and rivers were seen there', Thomas L. Mitchell, *Three Expeditions into the interior of Eastern Australia: with descriptions of the recently explored region of Australia Felix, and of the present Colony of New South Wales,* (second edition, rev.) Boone, London, 1853, pp. 174 - 5.

[151] Carron, *Narrative of an Expedition*, p. 80.

Carron's perceptions of the rainforest environment were shaped by the framework of botanical science – he had a system by which to see and describe individual plants. Although the technical language he used seems dry to a lay-reader, his enthusiasm – particularly for the flowers he found – is made clear by the fact that he continued to appreciate interesting and beautiful species even when his own life, and the lives of others in the expedition, began to seem precarious. He was drawn to flowers by a sensual and aesthetic appreciation of their form, colour and sometimes scent. He was attracted to their 'novelty'– his role as botanist was to place that novelty within a schema of description and classification.

But Carron's perceptions were also clearly shaped by necessity. The need to find food ultimately overcame scientific and aesthetic interests. The apparent paucity of game meant that the men would often try consuming native plants to supplement the sheep and then horses that they killed. While the explorers had great trouble finding sustenance in the rainforest, any food offered to them by Aborigines was considered either inedible or suspicious. The lengthy techniques required to detoxify many rainforest species would have clashed with the explorers' aim to continually move toward their intended destination.

The 'scrub' itself was not described or categorised but experienced: as a barrier to be overcome, and as a site of danger and concealment. The difficulty of journeying through the rainforest with (initially) over a hundred animals, and heavy, clumsy equipment determined Carron's experience of the scrub as a barrier. The belief that the scrub was a site of danger was not only enhanced by the events as they occurred, but was predetermined by the fears and expectations of the explorers. For instance, Carron recorded how on one occasion:

> seven or eight natives appeared at the edge of the scrub, in the direction from which we had come. Just as they approached, an Australian magpie perched upon a tree and I shot it to show the effect of our fire-arms. On hearing the report of the gun they all ran into the scrub, and we saw them no more.[152]

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[152] *Ibid.*, p. 35.

Carron gives no indication that he had reason to believe that the Aborigines were doing other than observing strangers in their territory; however, because he was separated from the main group and had only two companions he felt the need to make a show of force. The scrub, which was a place of difficulty and threat for the Kennedy and his party, provided a haven of safety for the Aborigines encountering them.

Although the fate of Kennedy and his men received widespread publicity, and would play a role in shaping colonial views of the ferocity of the Aborigines of Cape York Peninsula, the region continued to beckon promisingly as pastoral settlement moved northward. According to Dorothy Jones,

> the history of the colonization of the new territory is the history of the movement of the squatters. The land was opened up, unknown regions explored, towns sprang up, ports were made, roads made to the ports, all as a direct outcome of this land-hungry class… This movement did not cease until the most northerly point of Queensland had been reached.[153]

Geoffrey Bolton agrees:

> …while the aim of opening a more felicitous trade route to India was a primary factor in the early push of exploration further north, underlying all Australian exploration at this period was the hope of finding good pastoral country.[154]

Botanists were important in such exploration with a view to settlement, because the character of plant-growth above the ground was regarded as providing the best indication of the quality of the soil, which would determine what forms of agriculture could successfully be pursued. Botanists were also on the look-out for species that might be of commercial value, particularly for familiar timber species such as red cedar.

In 1862 Walter Hill, the colonial botanist for Queensland, collected botanical specimens from Rockingham Bay and the Herbert River valley, and returned to the

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[153] Jones, *Cardwell Shire Story,* p. 62.
[154] Bolton, *A Thousand Miles Away,* p. 10.

same locations again three years later as Selector of Agricultural Reserves. Hill was impressed by what he saw. Of the banks of the Tully River, he wrote: 'I never witnessed in any of the colonies so dense or so luxuriant a growth of scrub trees and plants as was presented on the banks of this river. This fact alone testifies to the richness of the soil…'[155] Within a short period, his observations would begin to be put to the test. European settlement of North Queensland rainforest areas began with the founding by George Elphinstone Dalrymple, in 1864, of the port town of Cardwell at Rockingham Bay, which had been the landing site of Kennedy's party. However, as Frawley writes: 'Further to the north [of Cardwell] the rainforest remained terra incognita … but there was a hazy expectation of great agricultural potential that would need more detailed exploration to confirm.'[156] While European settlers based at Cardwell must have gained some knowledge of the surrounding areas, (this is certainly true of the botanical collector, John Dallachy, who was an early resident there[157]), the next significant expedition was to approach the region not from the coast, but from the inland.

In 1872, William Hann, a pastoralist, led an official expedition to Cape York Peninsula in search of gold and pastoral lands during the course of which, for three weeks, he entered and struggled through the dense rainforests between the Endeavour and Bloomfield Rivers, in the vicinity of Cape Tribulation. William Hann's 1872 Northern Expedition has not attracted a great deal of public or scholarly attention. He did not suffer the spectacular failures of Kennedy, nor did he make the spectacular claims that would soon be made by George Elphinstone Dalrymple. Hann was a competent bushman who recorded his journey methodically and sometimes eloquently and brought all his men back alive.

Records of Hann's expedition are provided by the four separate accounts he made of it, and further by the diary of Dr Thomas Tate, the expedition's botanist. As well as maintaining a diary during the trip, Hann kept two consecutive notebooks

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155 W. Hill, 'Report of the Selector of Agricultural Reserves upon Meunga Creek, Rockingham Bay, River Mackay, River Macalister, Valley of the Herbert, and the Sea View Range,' *Votes and Proceeding of the Queensland Legislative Assembly,* 1865, p. 1231.
156 Frawley, 'European Exploration and Early Images of North-East Queensland', p. 10.
157 Dallachy's work is discussed in detail in the following chapter.

which provided supplementary and occasionally contradictory details.[158] Hann drew on his diary and notebooks in writing the Official Report, published in the Queensland Parliament's *Votes and Proceedings* of 1873.[159] Further, a 'copy' of Hann's diary (a reworked, unified and sometimes modified version of the original materials) was produced by the Queensland Government Printer.[160] Tate's diary, although at times critical of Hann's methods and decisions, also contains sections which bear strong similarities to Hann's writings. For expedition members to collaborate to some degree in preparing their records of a trip is not uncommon, and this is what seems to have occurred in this instance, despite the criticisms each made of the other.

Hann and his party of seven men, including a geologist, a surveyor, botanist Thomas Tate, and an Aborigine known as Jerry, left Fossilbrook station on 26 June 1872. They began their journey many miles from the coast and well south of the rainforest at Junction Creek, near Mt Surprise. Hann was interested not only in gold, but – as a pastoralist himself – in locating good grazing lands, something which the densely vegetated, grassless, and often difficult terrain of the North Queensland rainforest did not seem to offer. Hann was Australian-born and an experienced bushman, who had lived and worked on cattle stations for most of his life; and Jerry not only spoke a language which was at least rudimentarily understood by some of the local people, but also had some level of local environmental knowledge.[161]

The party moved from the more open forests and plains and began passing intermittently through rainforest ('thick scrub') on steep ranges from camp 48 (26 September, three months after they set out) to camp 64 (13 October), while in the vicinity of the Endeavour and Bloomfield Rivers. In the diary and notebooks, Hann repeatedly remarked on the quality of the soil: 'The soil in the scrub is very good, of

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[158] W. Hann, 'Expedition of Exploration to the Endeavour River, Cape York Peninsula, 1872', Reconstructed from his diary and two notebooks by Harry Clarke, 1982. Held in James Cook University's North Queensland Collection. (Hereafter 'Expedition')
[159] W. Hann, 'Report from Mr. W. Hann, Leader of the Northern Expedition Party', *Votes and Proceedings of the Queensland Legislative Assembly*, 1873, pp 1031 – 1043. (Hereafter 'Report')
[160] *Copy of the diary of the Northern Expedition under the leadership of Mr. William Hann,* Queensland Government Printer, 1873. (Hereafter *Copy*) This is a later version which Helen Mays believes to have been compiled not only from Hann's records but also from the diaries of other members of the expedition, particularly William Nation, who Mays describes as a 'meticulous diarist.' H. Mays, 'Introduction' to 'Expedition'.
[161] For example he spoke of the existence of the tree-kangaroo before encountering it in the rainforest. 'Expedition', p. 56.

course …'[162] His view reflected the contemporary theory that the dense growth of rainforest vegetation indicated deep fertile soils. However the difficulty of the terrain, and the remoteness of the location, led Hann to doubt whether those 'rich' soils would ever be of any use.[163]

Unlike William Carron, Dr Thomas Tate – whether through lack of knowledge or lack of interest is unclear, though both seem likely – offered no descriptions of species, made no attempts to classify, even to the level of genera, and displayed little scientific enthusiasm or curiosity regarding the plant life he encountered during the journey. He did not make any reference to collecting botanical specimens while in the rainforest. However there are records of specimens deposited in the Queensland Herbarium marked 'Hann's Expedition', so it seems that some collecting took place on the trip, although exactly where and by whom is not stipulated.[164] The most detailed description Tate provided of rainforest vegetation was to complain of a scrub that was not an 'ordinary scrub', but 'a mass of foliage interlaced with loir (sic), supple jack, and all kinds of prickly abominations…'[165] He did not mention the nature or quality of the soil or other geographical features, other than as they provided obstacles to the travelling of the party. He was, however, an enthusiastic participant in the prospecting which the party undertook throughout the journey, and continually recorded his views on the mineral prospects of the land they passed over.

A recurring theme in Thomas Tate's diary is the lack or insufficiency of food available to the party: 'The amount of food we have received throughout the trip has been quite inadequate. Now that allowance is much smaller we are in a perpetual state of hunger.'[166] When Hann was considering, from within sight of Cape Tribulation, whether the party should attempt to make their way to the coast as was originally intended, Tate commented: 'I myself would have favoured the attempt but I did not think that we were properly provided with food for such an undertaking. Being

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[162] *Ibid.,* p. 53.
[163] Hann, *Copy,* p. 16.
[164] See C.T. White & W.D. Francis, 'Contributions to the Queensland Flora No. 2' *Proceedings of the Royal Society of Queensland,* vol. 35, (1923), p. 68 and 'Contributions to the Queensland Flora No. 7' *Proceedings of the Royal Society of Queensland*, vol. 53, (1941), p 202. Specimens have been listed under W. Hann (Queensland Govt Expedition), not under Dr. T. Tate.
[165] T.Tate and M. Ross, *Diary, 26 June – 10 November 1872 of Thomas Tate*, Bardon, Qld, 1989, p. 16.
[166] *Ibid.*, p. 14.

reduced to half the amount of food a man ought to get and with only sufficient of that for 4 weeks I could not but think it very risky…'[167] Hann responded to this accusation directly in his 'Report of the Northern Expedition', presented to the Queensland Parliament in 1873. He wrote:

> …if I had allowed rations to be used in the quantities that some desired, I should long ago have seen the last of them, but I was told that I should have brought more. My answer was, that it was evident that I had brought enough to keep all in strength and health; none were ailing or failing… For what are the objects and qualifications of exploration? First, the discovery of country, and secondly, the doing it upon as small means as is compatible with health and strength… Should not men, offering themselves for such work, examine themselves, and ascertain whether they can face the privations and hardships accompanying such work, and whether they can place a check upon their inordinate desire to be always eating? My opinion is that they should do so, if only for their own sakes.[168]

It is not hard to guess, then, to whom Hann is referring when he comments on 'one or two members' of his party who did not embrace the excitement and challenge offered by a journey of exploration on which, in Hann's view, 'there is not a creek or a river that does not lead the imagination to think where it may go… or what it may contain.' Rather, Hann wrote, these men

> considered exploring "monotonous"; they "ate their suppers and went to bed dreaming of their breakfast – they rose in the morning ate their breakfasts, and then passed the day thinking of their suppers!" Is comment on such men necessary?[169]

It seems that perhaps Dr Thomas Tate was not suited in either expertise or temperament to the role of botanist on a journey of exploration.

Despite a prime aim of the expedition being to assess the character of the country, and despite the discussion included in the diary Hann wrote while in the field, there was no description of rainforest soil or timber in the official Report – the

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[167] *Ibid.*, p. 15.
[168] Hann, 'Report', p. 1042.
[169] *Ibid.*, p. 1037.

official narrative focused entirely on the desperate efforts of the explorers to extricate themselves from the tangle of the scrub as their supplies diminished and their horses grew weak. The fate of Kennedy's party was not far from their minds, passing as they did over some of the same ground. It is significant, too, that in their attempts to gain a 'vision' of the rainforest environment, and a passage through and out of it, Hann and his men often relied on the extensive network of Aboriginal trails and clearings, and assistance from local people who at times acted as guides, something that Kennedy seemed to have made little attempt to utilise.[170]

Hann's descriptions of rainforest spoke of the absence rather than the presence of vision. This is in contrast to enthusiastic assessments he made of more open forest and river landscapes. Of the Mitchell River, he stated: 'This is without exception the prettiest river scenery I ever saw. What would Daintree have given for a photograph of this spot.' [171] On 28 September Hann described the effect of coming into a small clearing after following a native trail through dense rainforest – '… the glare of the sun is very trying on our eyes. It is like coming out of darkness to daylight.'[172] The following day Hann described their difficulties in losing horses that had hidden themselves in the scrub beside the track. In the *Copy,* the incident was used to give the reader a sense of the experience of travelling through the rainforest:

> Two horses left the track and hid in the scrub, and its closeness may be imagined, when they were passed by twice without being seen; the horses had bells, but they never moved to give notice of their whereabouts.[173]

On Thursday 3 October, the expedition was near the Bloomfield River. Again, the description of the surrounding environment focused on the difficulty of vision, both literally and metaphorically:

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[170] *Ibid.,* p. 1040.
[171] Hann, 'Expedition', p. 18.
[172] *Ibid.,* p. 54.
[173] Hann, *Copy,* p. 15.

> I now found myself hemmed in on all sides by hills and scrubs, and could not exactly see my way through them, but to remain stationary was impossible, to return was equally so; therefore, there was nothing for it but to bear on and cut through it.[174]

For Hann, the rainforest was an overwhelming hemming-in darkness which effectively blinded the traveller.

The rainforest was also a physical barrier to the progress of the expedition. In describing what was probably their first encounter with rainforest, Hann stated that 'We had great trouble crossing a creek today through the horses getting entangled in the vines, we had to cut several of them out.'[175] And this was to be the ongoing experience. The combination of thick rainforest laced with tearing lawyer vines, and impassably steep slopes, gave travelling, as recorded in the diaries and the *Copy*, a nightmare quality:

> As soon as we were up we were stopped by a very thick vine scrub... Warner and I ran the watershed along for 3 miles but could not see any end to this dense scrub. We were both knocked up, what with climbing these perpendicular ranges and getting caught every few yards with these confounded lawyer vines, it was very severe both on clothes and boots...[176]

The density of the vegetation often made it difficult to focus vision (and narrative) beyond the bodies of the explorers, and the resistance encountered to every step taken:

> The thorns and lawya scrubs irritated both men and beasts; at times it was difficult to get away from the close embrace of these latter; their long arms drawn across the face, the hands, the clothes…[177]

Two days later Hann noted: 'My hands are so sore from vine cuts that I can scarcely hold my pannikin.'[178] But the vegetation to be cut through was not the only

[174] *Ibid.,* p. 16.
[175] Hann, 'Expedition', p. 54.
[176] Hann, 'Expedition', p. 58.
[177] Hann, 'Report', p. 1040.

challenge – the ground itself resisted the progress of the party, as the interlacing surface roots characteristic of the rainforest 'literally afforded no footing'.[179]

In the official Report, Hann introduced a narrative element not found in the other accounts: he personified the rainforest ironically as a friend and neighbour. He twice described how the 'friendly' denseness of the vegetation prevented a horse that had lost its footing from falling into a ravine; he evoked the 'neighbourly aid' of vines and saplings in allowing the men to pull themselves up steep inclines; and he repeatedly described the experience of obstruction and entanglement as an 'embrace'.[180] It is as if, on reflection, a manly joviality made him unable to simply describe the position of weakness the expedition found itself in. So, as difficulties made painfully clear in the original accounts were made light of in the Report, a more ambiguous vision of rainforest emerged, in which the physicality of entanglement took on, in retrospect, an almost comical character. Further, rather than the ground providing a passive stage across which the party travelled, and on which a colonial future would be played out, the rainforest was presented as taking an active role in the expedition.

It is significant that, in their attempts to gain a 'vision' of the environment, and a passage through it, the explorers often relied on the extensive network of Aboriginal trails and clearings.[181] In the days prior to retreating from the rainforest, the accounts of the original diary and *Copy*, and of the Report, began to fracture. According to the original diary and *Copy*, on Friday 11 October, in a desperate attempt to find a way out of the scrub and to the coast, Hann took two native 'boys' as guides to trace a path from the ridge to the sea. However (according to the original diary) being impatient with the progress they were making and 'not having much faith in [their guides]', Hann and his men continued on without them, only to find themselves 'hemmed in on all sides by mountains'.[182] In the *Copy* the description was elaborated, and the shape of the entire journey made to hinge on this encounter:

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[178] Hann, 'Expedition', p. 59.
[179] Hann, 'Report', p. 1040.
[180] *Ibid.,* pp. 1040 - 1041.
[181] *Ibid.*, p. 1040.
[182] Hann, 'Expedition', p. 62.

> We took a ridge in front of the camp, and had not gone far before I saw reluctance on the part of the native boys to follow us; they wished to take us another direction, but we continued, when they dropt [sic] us, and we went on without them. In 3 miles we drew near the summit of the ridge, which was crowned with scrub, this we pierced and saw at one glance why the boys would not follow us; at our feet lay miles of thick and impenetrable scrub, covering ridges and gullies alike; to have ventured into it with or without horses would have been sheer madness, as the sea lay miles away – not even in sight – the prospect was worse than anything seen hitherto. Cape Tribulation and the country for miles around its base was a sea of scrub, which extended as far as our vision in a southerly direction. We turned away from the prospect with a dismal sensation of disappointment ...[183]

The following day the locals confirmed Hann's judgement – according to the original diary they said that it would be impossible to get the horses to the coast without canoes; according to the *Copy* an old man told Jerry that there was no road to the sea – the local people only ever reached it by canoe.[184] One last time, Hann and Tate climbed a very high peak above the Bloomfield River. What they saw led them to accept the impossibility of going on: they would retrace their steps and leave the rainforest behind.

> From this eminence I had a view of the whole country beneath me; towards the sea, stretched miles of broken country densely covered with scrub, of an impenetrable character. To the south, the dividing range towered to an immense height forbidding approach, and also covered with scrub, which seemed to spread over the whole country. … I have struggled hard, but to no purpose; all my endeavours have been frustrated by the completely impassable nature of the country for white men, with horses.[185]

Implicit in the final line was recognition of the passable nature of the country for the Aborigines who lived there.

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[183] Hann, *Copy*, p. 18.
[184] Hann, 'Expedition', p. 62; *Copy,* p. 19.
[185] Hann, *Copy,* p. 19.

Interestingly, a very different picture of events was given in the Report. There was no discussion at all of 11 October: the role of the Aboriginal guides was erased. Hann recorded that

> Two attempts were made by me to try and force a passage out of my present position, but I regret to say without avail; no reliance I found could be placed on any information from the natives, want of knowledge of the language would alone cause this to mislead travellers.[186]

The pivotal point of the expedition, according to the Report, came on 12 October, when Hann, Dr Tate and Jerry set off to 'examine' the country that faced them. The description given again contained some interesting variations on the original diary and *Copy*:

> From this hill I could see the sea to the east, at a distance of eight or nine miles, with a black and impenetrable patch between us, stretching over low and very broken country; this black patch was scrub. To the south, the Dividing Range reared its front, covered with the same vegetation and forbidding approach; the range hung over the sea as far as the eye could see south, all equally clothed in scrub. Cape Tribulation… revelled in scrub above; below and around it for miles; the eye rested on hills and scrub everywhere, there was not the ghost of a chance of finding a track to thread these mazes, and to endeavour to penetrate them would have been madness.[187]

The narrative form of the description mimicked the effect on the explorers' vision of this final view of the rainforest; though the scrub was seen, the 'black and impenetrable patch' resisted any vision of future progress – no way could be found through, and the very ground rejoiced in the vegetation which prevented the explorers' passage. Far from recognising the contingency of the impassability of the scrub to a party of exploration, in the Report, the vision of defeat was made ultimate – the land was presented as fundamentally hostile, rather than as simply blocking a particular mode of travelling. Accordingly, Hann and his party began their retreat,

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[186] Hann, 'Report', p. 1041.
[187] *Ibid*.

relieved at last when familiar landmarks 'if not actually bidding us welcome, at any rate [pointed] out to us our road home ...'[188]

Hann held no great hopes for the future development of the rainforest – any potential the environment may have held by virtue of its apparent fertility was overcome by its remoteness, and physical and topographical difficulty. Hann's vision was literally overwhelmed by the sheer physical density of the vegetation – he was not able to see the path ahead, let alone envision the environment's transformation into a site for the development of tropical agriculture and colonial settlement as Dalrymple soon would, from the relative safety of a sea-voyage. However, Hann's report was to be of great significance in the process of settlement that did ultimately eventuate. While his experience of the difficulties of the North Queensland environment led him to express his observations cautiously, Hann's published report was suggestive of gold-bearing country. In 1873, the prospector James Venture Mulligan made the payable find that Hann and his men had missed. The next official expedition of exploration, George Elphinstone Dalrymple's North-East Coast Expedition, was coincident with the rush that followed: Dalrymple literally saw the township of Cooktown spring up overnight.[189]

George Elphinstone Dalrymple was a Scottish aristocrat experienced in coffee-growing in Ceylon,[190] who earned the title of 'founding father of north Queensland'[191] for his efforts 'pioneering' the settlements of Bowen and Cardwell, and undertaking both official and private expeditions of exploration, including the North-East Coast Expedition of 1873. Dalrymple's time in Ceylon had given him both an aesthetic appreciation of the tropical rainforest environment, and a vision of the possible wealth to be gained from plantation agriculture. He saw the purpose of his North-East Coast

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[188] Hann, 'Report', p. 1042.
[189] Dalrymple's report was reproduced both in the Parliamentary *Votes and Proceedings*, and as a separate publication by the Government Printer. My references are to page numbers of the report, (which were the same in each case), rather than to the pagination of the *Votes and Proceedings*. G.E. Dalrymple, 'Narrative and Reports of the Queensland North-East Coast Expedition 1873', *Votes and Proceedings of the Queensland Legislative Assembly*, 1874, vol. 2; and G.E. Dalrymple, *Narrative and Reports of the Queensland North-East Coast Expedition 1873*, Government Printer, Brisbane, 1874, p. 20.
[190] J. Farnfield, *Frontiersman: A Biography of George Elphinstone Dalrymple,* Oxford University Press, Melbourne, 1968, p. 7.
[191] Bolton, *A Thousand Miles Away,* p. 15.

Expedition Report as to 'enlist British labour and capital in the speedy occupation and development of these new and rich agricultural lands'[192] and attempted to convey in vivid terms his own excitement and sense of the beauty and potential of the environment he encountered. Walter Hill, the botanist, accompanied Dalrymple, and prepared a separate report offering his assessment of the resource value of the region explored. As Dalrymple wrote in the letter accompanying his report,

> The great variety of interesting matter which this exploration has placed in my hands could not possibly be done justice to within the circumscribed limits of an ordinary official report; I have therefore adopted the narrative form, with the object of annexing to it the report of my second in command, Mr. Johnstone, and that of the Botanist, Mr. Hill, with charts and appendices.[193]

Both Dalrymple and Hill had prior experience of rainforest exploration – Dalrymple having a decade earlier taken part in an expedition to find a route from the Valley of Lagoons through to Rockingham Bay, and Hill having collected around Rockingham Bay at a similar time. While Hann had struggled with hungry men and horses through steep-jungled mountains, Dalrymple undertook almost all his North-East Coast Expedition from the water – observing the character of the mainland from islands off the coast, and then endeavouring to navigate inland as far upstream as possible, collecting botanical and geological specimens from river banks and other nearby areas. During the first half of the expedition he was forced to camp onshore each night, but was much happier when, for the second leg, a larger vessel was obtained in which all the party could sleep.[194] While Hann's encounter with the rainforest took the form of a continual hand-to-hand combat, Dalrymple sought and found commanding views – from boats, from islands, occasionally from mountain tops – whereby the jungle could be seen from a distance; its denseness read as a sign of wealth, not of active resistance; its distinctive features named, and the beauty of its grand sweep appreciated.

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[192] Dalrymple, *Narrative and Reports*, p. 3.
[193] *Ibid.*
[194] *Ibid.*, p. 22.

Dalrymple continually emphasised the beauty of the 'jungle lands': a beauty found primarily in the 'tropical luxuriance of growth and greenery'.[195] He highlighted the exotic appearance of the landscape, to him reminiscent of Ceylon. Dalrymple was also the first of the explorers of North Queensland to make a clear distinction between scrub (wet/dry schlerophyll forest) and jungle (rainforest), and to consistently use the latter term with its overtones of lush exoticism. He stated of the forest he encountered on his North-East Coast Expedition: '*It is not scrub;* and to call it so misleads as to the luxuriance of a vegetation, which is Indian in its density and massiveness.' [196] His descriptions spoke of the extent of the complex tangle of plant-life, a boundless growth supported by a rich underlying soil. As he passed a river bank, tangled with, among other things, Hann's dreaded lawyer vine, Dalrymple saw

> … a dazzling commingling of shades, colors, and intricate minutiae of outline that would puzzle even a Millais to paint or a "Laureate" to describe; the deliciously scented arums, all in full bloom, and hanging moon flowers greeting us, as we passed, with whole greenhouses of rich perfume.[197]

Dalrymple revelled in the romantic, sensual disorder of the jungle, which for him was augmented by the presence of Aboriginal clearings and settlements. On encountering a clearing near the Johnstone River he wrote:

> The whole area of the top was swept perfectly clean over a space fifty yards by sixty-four yards, and beaten hard by the hundreds of stamping feet of many successive mobs of blacks who have here held their 'bora 'meetings and corrobories for many a day. To suddenly come in sight … of such a gathering in the dark night … would be a scene indescribably wild and picturesque.[198]

While Dalrymple imaginatively conjured up such 'primeval scenes' to add to his own romantic vision (and that of his readers), his ultimate satisfaction came in

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[195] *Ibid*., p. 6.
[196] *Ibid.,* p. 30.
[197] *Ibid*., p.13.
[198] *Ibid*. See also p. 26 for another use of 'wild and picturesque' with regards to Aborigines encountered at night.

inhabiting such spaces and rendering such gatherings past. A few days after his romantic reverie, Dalrymple decided to set up camp in the clearing, though he first had to remove the inhabitants, and send Native Police patrols into the surrounding areas. His action was a preamble to the ongoing use of Aboriginal clearings by settlers as entry-points into the rainforest, and as the nuclei of future townships. Dalrymple wrote with obvious satisfaction, and awareness of narrative effect, of their regular Sunday service being 'read under the pleasant shade of the large trees on this old scene of cannibalism and savage rites'.[199]

It is interesting to compare Dalrymple's enthusiastic descriptions of the jungle with his entirely unenthusiastic depiction of the land around Endeavour River:

> Even as pastoral country the region around us had not a single attractive feature, but appeared like the fallen-in wreck of a great primeval sandy desert plain clothed with coarse grasses and stunted, dirty green, open forest...[200]

For Dalrymple, aesthetic beauty was closely linked to utilitarian value: the visual aspects of the 'jungle' which he appreciated were those which he also read as signs of the productivity of its soils, signs which indicated the possibility of its transformation. As he scanned the landscape, he not only rhapsodised on its beauty, but he also noted locations for building sites and townships, foresaw plantations of coffee and sugar, mused on the benefits of canals and railways, and kept a look-out for suitable grazing land.[201]

Walter Hill, in his report, supplemented Dalrymple's poetic vision with his own, more systematic, assessment. Hill presented his report as a chronological account of the expedition. He commented, at each island, river, inlet or mountain examined, on the quality of the soil, and the type and extent of vegetation. He provided generic descriptions of the notable trees, shrubs or vines found in the area – of particular significance was his identification of red cedar – and finally, gave his suggestions as to what use he thought the land would be best suited to. He wrote

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[199] *Ibid.*, p. 14.
[200] *Ibid.*, p. 21.
[201] For example, *Ibid.*, pp. 8 - 10, 28.

favourably of Mourilyan Harbour, the Johnstone River, and the Mossman River, and was – like Dalrymple – most enthusiastic about the prospects offered by the Daintree River region.

Hill recommended the Johnstone River valley as a suitable site for closer settlement. He believed that the richness of the soil would ensure that even a small portion would 'make a plantation profitable enough to encourage small capitalists to invest their money on the land.'[202] Further, he suggested a location for a mill, and some 400 acres to be set aside for an experimental plantation.[203] While Hill passed over the Mossman with a brief but favourable description, he saved his highest praises for the Daintree River and the extensive rainforest lands which surrounded it. After describing the 'luxuriance' of the dense and magnificent vegetation, Hill wrote:

> From what I saw of the Daintree River, and of its upper valley… it appeared to me to be well adapted to support a large population, and to afford openings for prosecuting a greater variety of industrial pursuits than any other of these coast rivers. There is an abundance of land for the cultivation of sugar-cane and of other tropical productions; there is also a large quantity of pastoral land, and I feel convinced that from this river will be found the best and easiest route to the newly discovered mineral region beyond the ranges from which its head waters flow. Timber suitable for building is almost everywhere to be obtained…[204]

Hill not only noted what soils were likely to support which variety of crop, but also suggested where settlements in the form of small townships should be placed, in order to ensure a more settled population than would be possible if residents were sparsely spread. He recommended areas that should be made timber reserves, and suggested the use of small islands for experimental acclimatisation of animals such as deer and angora goats. Hill began this process himself by depositing a pair of Guinea fowl on Brooks Island, south of Cardwell.[205]

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[202] W. Hill, 'Report of Walter Hill, Esquire, Government Botanist', in Dalrymple, *Narrative and Reports*, p. 50.
[203] One of Hill's main interests as colonial botanist was in experimental agriculture and he worked intensively on acclimatisation of new species. During 1872 alone he distributed 60,000 cuttings for propagation throughout Queensland. Farnfield, *Frontiersman,* p. 126.
[204] Hill, 'Report of Government Botanist' in Dalrymple, *Narrative and Reports*, p. 51.
[205] *Ibid.,* p. 52.

The contradiction implicit in both Hill's and Dalrymple's appreciations of the beauty of the North Queensland 'jungle' – both as a romantic wilderness, and as an indication of rich soils – was highlighted in their discussions of the processes of environmental change that were already altering the region. On entering the bay of Fitzroy Island, which had for years been used as a beche-de-mer fishing station, Dalrymple commented on the destructive impact of the fishing crews:

> It is melancholy to see the ruthless manner in which [they] have destroyed magnificent calophyllum and fig trees, which originally formed a picturesque background to the beach, and grateful shade to the landing parties … There are many other places along the coast where these despoilers have not yet commenced their ruthless destruction but which will not long be safe if unprotected by legislative enactment …[206]

And while Dalrymple described the Daintree region as providing 'a more enjoyable feast of beautiful scenery' than any other location in Queensland, in his conclusion he wrote:[207]

> It is only to be regretted that it has not yet been thoroughly examined, as, doubtless, the six to eight hundred stalwart miners cooped up by the floods in enforced idleness at Cooktown would have much preferred sweeping down with axe and "cross-cut" a broad track through the Daintree jungles to the open country …[208]

The axe would soon be needed not only to clear or enlarge trails through the rainforest, but to remove it, and expose the soil.

While Hill provided the formally scientific report, underlying the descriptive elements of Dalrymple's narrative is similarly a framework of deductive reasoning by which surface appearances are interpreted according to geographical, geological and

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[206] Dalrymple, *Narrative and Reports*, p. 16. It is likely that his disapproval of the beche-de-mer fishers is also based on the 'disorderly' racial mix common in the industry.
[207] *Ibid.*, p. 31.
[208] *Ibid.*, p. 36.

biological theories; a reading of both the distant past and possible future from the observable present of the 'natural world'. Most common was the assumption that the denser the jungle, the richer the soil (and the future benefits of agriculture to the colony).[209] Dalrymple elaborated on this idea – he recognised that the soil itself was an historically-founded entity, formed by 'ages of deposit of decayed vegetable matter of primeval forests', combined with geological and climatic factors. He believed that wherever such factors occurred simultaneously, the same fertile soil supporting the same rich growth of vegetation would be found. [210] This notion of the repeatability of 'surface' phenomena given the same foundational factors expressed itself in the highly optimistic outlook Dalrymple held for the future of the rainforest region. The jungle could be cleared, coffee, sugar, and tea could be planted, and the luxuriance and immense growth sustained by the soil would be repeated endlessly, and bring forth a tropical bounty to enrich the colony. While this notion was based on contemporary geographical beliefs, it was also an act of the historical imagination. In the conclusion to the Report, Dalrymple wrote that

> The immediate throwing open to selection of the agricultural lands along this coast will complete the successful launching of this magnificent district upon a brilliant future, to be developed by the strong arms and indomitable energies that have, in less than a century, made Australia what it is …[211]

Dalrymple ultimately linked the development of North Queensland to a vision of progressive imperial history, which would see the British Empire continue to extend until it encompassed not only the entire northern region of the Australian continent, but Fiji and New Guinea as well.[212]

On 7 October, after travelling as far as possible up the Johnstone River by boat, Dalrymple and a small party cut their way to the peak of a 350 foot hill which

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[209] For example, '…the wild ginger, a plant which, further south, we can tread under foot, and here measured nineteen feet in height, are sufficient evidence of the capabilities of the soil, and permit of sanguine expectations for the future of this fine district.' *Ibid.*, p. 13.
[210] *Ibid.*, p. 15.
[211] *Ibid.*, p. 36. Dalrymple failed to mention that under his visions of plantation agriculture many of the strong arms that would develop the north would be black- rather than white-skinned.
[212] *Ibid.*

afforded a view of the surrounding areas. What they saw was recorded by Dalrymple with an air of revelation.

> … ranges beyond ranges bounded the great coast basin, the whole of the wide-spread floor of which presented one vast unbroken expanse of dense tropical jungles… At a rough computation, *not less than half-a-million of acres of a soil unsurpassed by any in this world* – all fitted for tropical agriculture, and fully 300,000 acres of which are suitable for sugar – spread far around us ... We had suddenly come face to face with a true tropical Australia …[213]

Though throughout the report he described the jungle vegetation in lyrical terms, when his view was at its widest, he was not, in fact, seeing jungle; he was seeing soil.

After expressing his fullest appreciation of the view he continued:

> We were loath to descend into the dark dank jungles again from the bright hill-top daylight, and from the grand and interesting view of a discovery with which our hearts bounded with gratitude to think that our names had become suddenly associated.[214]

The development unleashed on North Queensland by the explorers' reports was not Dalrymple's envisioned orderly, civilised colonial settlement. Rather, the movement of a large European population into the rainforest areas of North Queensland took the form of a quick-flowing, ephemeral rush to prospect for gold and to cut timber. Walter Hill's brief mentions of red-cedar were enough to fuel an interest by cedar-cutters, notwithstanding the difficulty of cutting at a profit in such an isolated and undeveloped region.[215]

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[213] *Ibid.*, p. 10. (My italics).
[214] *Ibid*.
[215] D. Jones, *Trinity Phoenix: A History of Cairns and District*, Cairns and District Centenary Committee, Cairns, 1976, p. 38. It is ironic that Hill himself would later give evidence to the Queensland Parliamentary Commission into Forest Conservancy, arguing for stricter government regulation of timber-cutting in North Queensland. This is discussed in detail in the following chapter.

The combination of the search for gold and later tin and other minerals, the rush to cut and claim the valuable red cedar, and the need for timber to build the overnight shanty towns of the goldfields and to line the mines, was the beginning of the devastation both of the North Queensland rainforest and its inhabitants. The gold rushes brought non-Aborigines and Aborigines into closer and more sustained contact than at any time previously in the history of North Queensland. The impact of mining forced many Aboriginal groups to move out of their traditional lands, which were now being occupied and cleared by the newcomers, and into the denser rainforest districts which provided a last shelter and a place from which attacks could be launched. In 1881, Mulligan himself wrote of the Daintree that:

> the blacks are there in their thousands; this is now their stronghold. Having been displaced from the Normanby, the Palmer, the Hodgkinson, Port Douglas etc., they have made the Daintree and Bloomfield their rendezvous, and are determined to hold it as such against all comers.[216]

The visions of North Queensland presented in the official reports of the explorers were significant in shaping processes of settlement, although the way in which settlement unfolded was largely outside official control. Botanical observation in particular provided both a framework for description and classification of an unfamiliar environment, and was also considered an important means of determining the quality and potential of rainforest soils. A fundamental aim of the scientific exploration which took place was to assist in the 'transformation' of the environment, in line with the explorers' vision of the inevitability of the expansion and progress of empire. While the difficulty of travelling in the 'scrub', and the hardships the explorers endured at times shadowed that vision, the ideal of transformation was not doubted, only the suitability of the tropical rainforest as a particular site for the development of agriculture, and healthy, orderly white settlement.

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[216] Quoted from *Queenslander,* 26 February 1881, in P. Savage, *Christie Palmerston Explorer*, Dept. of History and Politics, James Cook University of North Queensland, Townsville, 1989, p. 93.

Chapter 3 'Many Beautiful Things'

In his work *Ecological Imperialism*, historian Alfred Crosby re-envisioned the history of the extension of European settlement and empire throughout the world and argued that imperialism was, in a fundamental sense, ecological.[1] More recently, as I outlined in Chapter One, historians have focused on the two-fold nature of this process of ecological imperialism, and have explored the ways in which – along with the physical transformations associated with European empire – both radical changes and deep continuities can be traced in settlers' perceptions and understandings of nature. In this chapter I consider the work of the colonial botanists[2] in Queensland, whose official role placed them at the forefront of both the physical and cultural processes of ecological imperialism. Through the framework of botanical science, the colonial botanists elucidated the nature of the lands they worked in both to their local governments and public, and to the scientific authorities of Europe. They were responsible for exploring and documenting the existing plant-life of their region; and they assisted in, and promoted, the environmental transformations which made possible the continuing extension of European settlement of indigenous lands.

Colonial botanists played a key role in 'botanising' the North Queensland rainforests. They provided a centre to which specimens and inquiries could be sent, and they assembled and maintained as best they could the resources which were necessary to make taxonomic determinations. Their work required the support and cooperation of government departments, and the assistance of a multitude of individual collectors – amateur and professional, knowledgeable or simply eager. The classification of specimens involved, and added to, the resources of herbariums around the world and the experts who staffed them. The colonial botanists were linked into the networks of imperial science through formal organisations such as the Royal Societies, Linnaean Societies, and the Australasian Association for the Advancement

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[1] Crosby, *Ecological Imperialism.*

[2] The term as I am using it is not simply a descriptor for a botanist of the colonial period, but rather 'Colonial Botanist' or 'Government Botanist' was the title of an official scientific appointment of colonial or state governments in Australia. However in order to avoid floating capitals, I will use the lower case form except when doing otherwise seems strictly necessary.

of Science, and via informal networks of correspondence and exchange with authorities at Kew Gardens, and elsewhere. The processes of collection and classification led to the production of regional floras, identification guides, text-books, articles, maps and manuals.

The networks involved in the process of collection and classification of botanical specimens were often also vital to the work of acclimatisation and plant exchange, and to the display of plants in botanical and private gardens, and in exhibitions and museums. For the colonial Queensland governments, plants were a sign of the quality of the soil and potential of the land, and were a key to the promotion of Queensland – and North Queensland in particular – as a site for the investment of much-needed capital. In the words of one colonial botanist, Frederick Manson Bailey: 'the plants speak the truth, they have nothing to gain or lose, and from them the intending settler can easily judge if the country which he desires to settle in would grow the crops which he intends to cultivate or use in his trade.'[3] Colonial botanists were employed by the Queensland government under the auspices first of the Department of Public Lands, and then the Department of Agriculture. Under each of these departments, their prime responsibility was to assist the expansion of the area of land under settlement, and to advise on the form that settlement might take. The colonial botanists highlighted the potential of rainforest lands for development, and supplied the seeds and plants on which the processes of environmental transformation were founded. They also warned of possible environmental dangers awaiting settlers – from poisonous plants to soil erosion, from pests and diseases to scarcity of timber resulting from uncontrolled clearing of forests. While they were often under-funded by governments, and sometimes disregarded by the press, these men all asserted that their work was of central importance to the processes of settlement and development of Queensland.

For botanical studies to be undertaken of the rainforests of North Queensland, botanists had either to visit the region themselves with sufficient resources to collect and transport quantities of specimens, or to cultivate local correspondents who would

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[3] Frederick Manson Bailey, *Comprehensive Catalogue of Queensland Plants both Indigenous and Naturalised,* Government Printer, Brisbane, 1909, p. 9.

collect for them. Many Queensland botanists managed to do both. Initially, however, botanical description of the rainforest flora required the resources of more established scientists and scientific institutions than could be found in Queensland. Of particular importance was the Melbourne Herbarium, which had been established in 1853 by the Government Botanist of Victoria, Ferdinand von Mueller and which, by the close of the nineteenth century, housed the largest and most extensive collection of botanical specimens in Australia.[4] Mueller, as the leading Australian botanist of the period, collected widely during his travels around South Australia, Victoria and New South Wales, and in Queensland as botanist on A.C. Gregory's North West Australian Expedition. He also maintained numerous correspondents throughout Australia who regularly sent him specimens. When the port of Cardwell, the first township situated in close proximity to the tropical rainforests of North Queensland, was founded in the mid-1860s, Mueller sent a collector – John Dallachy – to work there, in anticipation of the many valuable and unknown species that he expected would be found.

Dallachy was a Scottish gardener who had trained at Kew Gardens and had been head gardener at Haddo House at a time when 'the grounds at Haddo were noted as the finest and most extensive in Scotland... and rare plants from all over the world were cultivated, those from New Holland being a special feature.'[5] Like a number of others who found their way to North Queensland in the second half of the nineteenth century, Dallachy came with some prior experience of the tropics: he had travelled to Australia after a period managing a coffee plantation in Ceylon. In 1849 he was appointed Curator of the Melbourne Botanic Gardens, a post which he held until Mueller took over the Directorship in 1857.[6] Home et al. suggest that Dallachy had fallen into personal difficulties and that Mueller 'sought to help by creating a position for him as a botanical collector in North Queensland, well away from the presumed source of his problems.'[7] From his arrival in Cardwell in 1864, until his death from fever in his tent at Herbert Vale in 1871, Dallachy ranged extensively through the largely unexplored region surrounding Cardwell. He collected in areas of rainforest

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[4] Mueller was Government Botanist of Victoria from 1853 to 1896 and Director of Melbourne's Botanic Garden from 1857 to 1873. R.W. Home et al. (eds), *Regardfully Yours: Selected Correspondence of Ferdinand von Mueller*, vol. 1, Peter Lang, New York, 1998, p. 9.
[5] Jones, *Cardwell Shire Story*, p. 89.
[6] Home, *Regardfully Yours*, vol. 1, p. 34.
[7] Home, *Regardfully Yours*, vol. 2, p. 11.

that would eventually fall to timber cutters, or be cleared to make way for plantations of sugar cane and other tropical produce.

Although Dallachy and Mueller must have had a long correspondence, (Mueller mentions '*thousands* of letters'[8]), unfortunately almost none of it seems to have been preserved.[9] A single letter to Mueller attributed to Dallachy has been located, stored with a specimen sheet in the Melbourne Herbarium.[10] However slight, it offers some impression both of the conditions in which Dallachy was collecting and of the relationship between himself and Mueller.

> Herbert River, November 1868.
>
> My Dear Sir,
> I was up on Mount Grahame of Saturday and returned to station last night I have inclosed a fragment of a tree Fern – the steam of the tree is from 12 to 14 feet high Clothed with dense Brown hairs at the base of the fronds the steam is rough – about 2 inches in diameter it I suppose is an Alsophila but think that I have not sent it to you before on the tope of the above mountain is covered with the most dense scrub and high trees some of them 150 to 200 feet in hight. I could not get to the highest Point of the mountain on account of the scrub – there are miles of it here and this mountain and scrub no white man has ever been in it but myself – I have got the Bowenia spectabilis in flower for you – it grows in a bundance on the tope in Scrub; I saw a tree of Dailinga [eds note: Darlingia?] a hundred feet or more in hight there was no traces in [... eds note: an unknown amount of text is missing][11]

Although it is, sadly, only a single and incomplete document, the letter is suggestive: it indicates the physical difficulties Dallachy faced, and hints at the sense of wonder he might have experienced as the first European to explore such a botanically-rich region. His description of the density, abundance, and extent of the vegetation reflects the belief of many early observers that the scrub was 'endless'. The letter also shows

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[8] Letter from von Mueller to G. Bentham, 20th March 1870, *ibid.*, p. 535.

[9] Much of Mueller's correspondence was lost or destroyed after his death. Home, *Regardfully Yours*, vol. 1, pp. 38 - 45.

[10] Home, *Regardfully Yours,* vol. 2, p. 11.

[11] The letter was attributed to Dallachy by the editors, as Mueller annotated the letter 'Alsophila Wollsii', and later described that species as discovered by Dallachy at Mt Graham. *Ibid.*, pp. 479 - 480.

the importance of his ongoing relationship with Mueller in guiding his choices as to what to collect and, despite the unconventional spelling, suggests that his activities were shaped by careful observation and a degree of botanical knowledge.

In the absence of detailed documentary evidence, a number of stories have circulated about Dallachy and his time in Cardwell. While discussing the violent conflicts which occurred there between Aborigines and the white invaders in the 1860s and 70s, Dorothy Jones writes:

> John Dallachy seems to have been the only settler who could roam the swamps and the jungles with impunity. The native police were at his disposal should he need them but he never was in a position to have to call upon their assistance as he carried his own protection more dependable than any snider rifle. Concealed blacks had doubtless often watched him and their universal opinion was that he was quite mad. As such he was sacrosanct. He always wore a white panama hat on his grey head and carried a small type of gun which he used to shoot down specimens from high trees. To shoot at nothing but trees was curious enough, but to pick up a fallen leaf or berry, study it and carefully stow it in a box full of similar 'game' was convincing proof that the elderly white man was far from normal. So he was left severely alone according to the aboriginal code.[12]

I was told another version of the Dallachy story by a botanist at James Cook University, who suggested that as Dallachy had white hair, the Aborigines left him alone out of a respect and caution they felt towards old people.[13] Whatever the provenance of these stories, they do reveal the strangeness of a lone, elderly Scottish gardener quietly attempting to catalogue the plant life near Cardwell, while around him other Europeans were more concerned with the immediate requirements of survival in a new land, and Aborigines with the consequences of the invasion of their country.

These stories reveal the ambiguous place which figures such as Dallachy occupy in histories of colonisation. While intimately involved in the first settlement of

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[12] Jones, *Cardwell Shire Story*, p. 93.
[13] Betsy Jackes, personal communication, 3rd June, 2004.

the region, he was nonetheless at a remove from the historical processes of colonisation taking place around him. Dallachy travelled alone to places no other European had seen, not with the aim of finding trails or opening up the land, but to see what was there, and to bring back just a fragment of what he saw. His was a different kind of vision to that of men like George Elphinstone Dalrymple: while Dalrymple looked, proprietarily, to see what might be, Dallachy tried to observe what was, to find the missing pieces to his botanical puzzles. However in doing so, and in collecting and shipping specimens to the waiting and distant Mueller, he was in fact taking part in a process fundamental to the colonial endeavour. Through his work, he helped to construct the rainforest as an object of scientific interest and value – a notion radically alien to the Aborigines who lived there[14] – and enabled its plant-life to be drawn into the universal classificatory framework of taxonomy, allowing it to be compared systematically with the botanical products of distant lands, and burdened with Latin binomials.

Mueller clearly held great hopes for the results of Dallachy's endeavours. It had been Mueller's ambition throughout his career as government botanist to 'work up' the flora not just of Victoria, but of the whole of the Australian continent, and beyond to the lands of New Guinea also. North Queensland was important to this project, as it was an area which was climatically distinctive, and which was regarded in Mueller's time as a supporting a foreign, Asiatic element within the flora of Australia.[15] On 25 October 1863, before Dallachy had even reached Cardwell, Mueller wrote to a waiting correspondent:

> I have a collector in the high mountain areas of northern Australia who will bring back many beautiful things, which will also be of value for comparison with the vegetation of India or the islands of the Pacific Ocean, and of which I shall be happy to send a portion to you.[16]

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[14] This point also comes through clearly in Lumholtz's description of his time collecting zoological specimens in North Queensland. Carl Lumholtz, *Among Cannibals: Account of Four Years Travels in Australia, and of Camp Life with the Aborigines of Queensland,* Caliban Books, Sussex, 1979 (facsimile reprint of 1st ed., London, 1889).
[15] This is discussed in detail in Chapter Five.
[16] Letter from F. von Mueller to E. Fenzl, 25 October, 1863, quoted in Home, *Regardfully Yours*, vol. 2, pp. 223 - 224.

And in a letter in 1864 to Munich-based botanist Carl von Martius, famous for his exploits as a young man in Brazil, and founder and editor of the *Flora brasiliensis*, Mueller wrote:

> I would have liked very much to accede to your wish to sort my notes for a paper covering the whole phytogeography of Australia, if the work were not too voluminous to be completed quickly. I must reserve such a work for a later date for a communication for your venerable academy, [editors' note: Royal Bavarian Academy of Sciences] and in the meantime hope to acquire important supplementary material from the mountain ranges and jungle gorges of north-eastern Australia now accessible to my collector. Very likely that area still hides unknown palms, which are evidently sparsely represented in Australia, even though this noble family of plants reaches its southern limit here at the southern latitude of 37 ° 30.[17]

At the time of establishment of the Melbourne Herbarium, Mueller had expressed his intention to write a universal 'Flora of Australia', and when Kew Gardens announced that such a work would be commenced, Mueller made every effort to gain authorship.[18] This task ultimately went to a British botanist, George Bentham, who had direct access to the most valuable collections from the eighteenth and early nineteenth-century voyages, which were held at Kew and at the British Museum of Natural History. However Dallachy's specimens, which were collected at around the time the *Flora* was being compiled (a process begun in 1861), were also included.[19] As Mueller wrote, regarding work on the Flora of Australia, to Bentham in 1863: 'Occasionally some novelties will come in, especially as we have a collector in N.E. Australia ...'[20] And 'come in' they did. Testament to Dallachy's efforts are the many specimens recorded from 'Rockingham Bay', some of which researchers believe actually came from up to 220 miles from their specified location.[21] Thirty

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[17] Letter from F. von Mueller to Carl von Martius, 25 March 1864, quoted in *Ibid.*, pp. 250 - 251.
[18] Webb, *The Botanical Endeavour*, p. 236.
[19] Home, *Regardfully Yours*, vol. 2, pp. 21 - 22.
[20] *Ibid.*, p. 189.
[21] S.T. Blake, 'Some Pioneers in Plant Exploration and Classification,' *Proceedings of the Royal Society of Queensland*, vol. 66, (1954), p. 13.

species have been named for Dallachy, and thousands of sheets of his specimens are held in the Melbourne Herbarium.[22]

In 1870, shortly before Dallachy's death, Mueller wrote somewhat sourly to Bentham:

> Mr Dallachy's plants, as you remark, are always, or at least often instructive and frequently completer than those of other collectors. But I wish to point out in justice to others, that *no one* ever in Australia enjoyed such facilities to explore a jungle district, than Mr Dallachy. He is now half a dozen years quietly, and *purposely* settled at Rockingham's Bay and his plants cost me from that district alone over 1000 pounds sterling! He has nothing in the world else to do, then [sic] to collect, as he is a kind of pensioner of my department. As he is no botanist in the true sense of the word, he incurs no loss of time in any minute examinations. Besides he is stationary at R's B., has a *cottage* to dry and keep his collections in, and commands the sea-port & the dense forest in one hours walk.
>
> Look how I was placed for years. Sleeping under the canopy of heaven, I had to shelter myself and my plants with a bid [eds note: bit?] of light calico, and often had to carry my collections for *thousands* of miles on pack horses! Passing through a country I could only take a few specimens of any plant just as I found it at a time, while Mr Dallachy could comfortably watch the same trees for years, until he finally found flowers and fruit of most. I have ordered him to move to Cape York. Let us not *discourage amateur collectors* like Bowman, O'Shanesy &c., who first must toil for their daily bread, in cattle driving or gardening &c., & who deserve far higher praise for what they do without remuneration and under greater difficulty, than what a paid collector carries out as his daily routine work and under special Local advantages...

Mueller continued in the postscript: 'In the *thousands* of letters written to Dallachy I always directed him to what flowers & what fruits in each special wanting case to look!'.[23]

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[22] Jones, *Cardwell Shire Story*, p. 90.
[23] Letter from F. von Mueller to G. Bentham, 5 February 1866, quoted in Home, *Regardfully Yours,* vol. 2, pp. 532 - 535.

Without the infrastructure of settlement, basic though it was – without postal steamers, stations, tracks, huts and horses, and a regular supply of writing and drying paper – Dallachy could not have undertaken the work that he did. This infrastructure allowed him, as Mueller pointed out, to collect methodically, regularly, all year round; to collect as resident not explorer, and to gain a view of the botany of the region deepened by the passing of time. As someone who worked as a paid collector and in no other capacity, Dallachy was almost unique in the early history of the botanical study of North Queensland.[24] The expense of his upkeep, as well as the cost of transportation of specimens, was repaid by the quantity and quality of new plant species he made accessible to botanists throughout the world. Centres such as Melbourne and Kew gained their scientific authority to a considerable extent through the work of 'non-scientific' collectors such as Dallachy. And his collection, enabled as it was by the process of colonisation, also stands now as a record of the plant life of the region at a time when the impact of colonisation was still minimal: before the spread of introduced species, and the extensive clearing of land.

In the late nineteenth and early twentieth centuries there was much debate about the ideal form that future settlement in Queensland should take. Large areas of land had been taken up as pastoral leases from the 1860s – in fact, 'by 1885 Queensland carried a greater number of cattle than any other Australian colony.'[25] However, liberal politicians initially saw pastoralism as a primitive and therefore temporary form of settlement which should be replaced as soon as possible by the development of agriculture and more intensive utilisation and occupation of the land.[26] These calls for 'closer settlement' were not based on the immediate economic value of a particular type of land-use so much as they were on a vision of morally-sound and politically-stable rural communities. Debates about the form of society to be aimed for revealed that governments were by no means hoping to simply replicate the social structures of 'home' in a new land – though some aspects of the discourse

[24] Certainly, the Queensland colonial botanists could not provide that sort of support for any of their collectors.
[25] G. Lewis, *A History of the Ports of Queensland: A study in economic nationalism*, University of Queensland Press, St. Lucia, Queensland, 1973, p. 25.
[26] W. H. Richmond, 'Government and Economic Development in Queensland 1883 – 1914: A Study of Policy Making,' PhD Thesis, Dept. History, University of Queensland, 1987, pp. 25 - 27. While this view came in and out of favour, it continued to be reiterated by Queensland politicians into the twentieth century. See *ibid.* p. 70 for example.

about yeoman farmers seems to suggest this – but, rather, were intending to provide opportunities for material success and access to land which could not be found in Britain.[27] The geographically dispersed character of pastoralism, in which individuals or families amassed leasehold over large areas to the exclusion, many believed, of the 'smaller man', did not meet such moral or political criteria. Similarly, it was widely hoped that the transitory communities formed around extraction of mineral and timber wealth, however lucrative such endeavours might be, would ultimately provide the nucleus of permanent, viable agricultural settlements. Successive governments' actions, in promoting the colony of Queensland to potential immigrants from Great Britain and in regulating the use of land through the Crown Lands Act and other laws intended to encourage closer settlement, were directed towards realising this vision.[28]

However, as Glen Lewis makes clear, the history of Queensland has been characterised both by unbalanced economic development, in which pastoralism and mineral exploitation were of prime importance, and by fierce regionalism. Southern Queensland was the only region to begin to successfully diversify its economy in the nineteenth century, while Central and Northern Queensland remained almost entirely dependent on pastoralism and mining respectively – a state of affairs which left the colony vulnerable to cyclic instability due to droughts, diseases, and market fluctuations.[29] Despite the popular rhetoric of closer agricultural settlement, Lewis argues that in the late nineteenth century 'colonial agriculture barely managed to get off the ground. In 1884 Queensland cultivated less acreage per head of population than any other Australian colony. Agriculture in the colony managed to confine itself almost entirely to the South; the South's share of production between 1860 and 1885 on a quinquennial basis varied between 92 per cent and 98 per cent.'[30] Lewis continues:

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[27] G. Lewis, *A History of the Ports of Queensland*, pp. 30 - 31.
[28] W.H. Richmond notes that 'There was a high degree of consensus among political groupings about both the ends and means of immigration policy', which was primarily to enable settlement of land by 'yeoman farmers and their families, settlement at this time still being conceived largely in terms of the development of agriculture.' However the degree of enthusiasm for promoting European immigration proved to be highly vulnerable to swings in the labour market caused by sporadic economic depression. Richmond, 'Government and Economic Development in Queensland', pp. 115 - 123.
[29] G. Lewis, *A History of the Ports of Queensland*, p. 29.
[30] *Ibid.*, pp. 25 - 26.

> There was no shortage of explanations for failure. High transport costs, a shortage of markets, comparative capital disadvantages, and technological difficulties were the obstacles to agricultural success. Lacking navigable rivers, let alone an efficient road and rail system, the farmer faced insurmountable problems. When a transport network began to function creakily in the eighties the capital structure was tied to the pastoral and construction industries and, to a lesser extent, to mining... Queenslanders were also hampered by the novelties of a tropical climate. By the end of the period [i.e. 1885] the early agrarian ideals were beginning to wear thin.[31]

This uneven development was worsened by the uncertain financial situation of Queensland governments which, during the late nineteenth century, largely depended on borrowed overseas capital to construct public works such as railways, ports and other infrastructure. According to Donald Denoon, by 1890

> the Australasian colonies had accumulated more debts per head than anywhere else in the world... The *Bankers' Magazine*, torn between awe and alarm, calculated that the Australasian colonies had public debts of over £50 per head, Queensland leading the way with nearly £70... [32]

As well as operating in circumstances of sometimes crippling financial vulnerability, Queensland governments were also attempting to come to grips with an unfamiliar tropical environment. While the latter ensured that scientific examinations of plant and animal life, soils and climate would be important in informing both the government and settlers about the varied lands encompassed by the colony, the former necessitated that Queensland's colonial botanists, and other scientific workers and societies, would provide such information with minimal financial support from the government.

The Queensland government appointed its first colonial botanist on separation from New South Wales in 1859. Walter Hill, like Dallachy, was a Scottish gardener: Hill had trained at the Royal Botanic Gardens at Edinburgh, and held an appointment

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[31] *Ibid.*, p. 26.
[32] Donald Denoon, *Settler Capitalism: The Dynamics of Dependent Development in the Southern Hemisphere*, Clarendon Press, Oxford, 1983, p. 52.

at Kew from 1843 to 1851. As well as being Colonial Botanist, Hill was also Director of the Brisbane Botanic Gardens, Selector of Agricultural Reserves from 1863 to 1868, and was in charge of the Forest Nursery Reserves from 1877 to 1881. Hill had neither the scientific ambitions, nor the resources and connections enjoyed by Ferdinand von Mueller. However, as a participant in George Elphinstone Dalrymple's North-East Coast Expedition in 1873, and on later official visits to the north, he had the opportunity to both see and collect for himself specimens of the botanical life of the rainforest. And from his first encounter with the North Queensland rainforest, he maintained a great enthusiasm for it – both on account of its scientific interest, and for what he regarded as its rich potential for development. While giving evidence to a Select Committee of the Queensland Parliament, he declared the Daintree his 'favourite river', and he continued to whole-heartedly promote the whole region as a site for tropical agriculture throughout his long career in Queensland.[33]

As his annual reports to the Queensland Parliament reveal, Hill's botanical ambitions were continually frustrated by the lack of financial support provided him by the government and the ever-increasing demands of his job. Hill lamented bitterly the limited resources available to him in comparison to those allowed by other colonies for botanical pursuits: expenditure by the Queensland government on the Botanic Garden and Colonial Botanist during the 1860s and 1870s had been on average £1400 – £1600 per annum, compared with the Melbourne Botanic Garden's budget of £10,000 – £12,000, or Adelaide's of £6,050. Hill argued that demographically Queensland could best be compared with South Australia and that, because of the wide climatic and environmental range encompassed by the colony, as settlement expanded 'the consequent demands therefore upon the Botanic Gardens for the necessary requirements of all these varied climates calls for even a much larger expenditure than that of South Australia.'[34] His continuing requests went unheeded; in the inquiry surrounding the circumstances of his dismissal from the Garden, it became

[33] 'Report from the Select Committee on Forest Conservancy; together with the Proceedings of the Committee and the Minutes of evidence', *Queensland Legislative Assembly Votes and Proceedings*, (hereafter *V&P*), 1875, vol. 2, p. 1253.
[34] W. Hill, 'Report on the Brisbane Botanic Gardens', *V&P,* 1875, vol. 2, p. 1197.

clear that during his post as Director and Colonial Botanist, Hill substantially subsidised his official activities from his own income.[35]

Fern Island, Brisbane Botanic Garden, ca 1878.
Source: Courtesy Pictures Queensland.

Alongside the Queensland Acclimatisation Society and the private network of nurserymen and seedsmen, the Colonial Botanist, with the Brisbane Botanic Garden at his disposal, played a key role in the 1860s and 1870s in materially assisting the transformation of the Queensland landscape. According to D.A. Herbert, under the administration of Walter Hill, the Garden 'functioned as a sort of Department of Agriculture for the colony.'[36] The astounding quantities and varieties of plants received by and despatched from the Garden bears that assessment out. The bulk of

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[35] 'Mr. Walter Hill, Late Curator of the Botanic Gardens, Brisbane. (Papers Relating to Charges Against)', *V&P*, 1881, vol. 2, pp. 945 - 946.
[36] D.A. Herbert, 'A Story of Queensland's Scientific Achievement, 1859 - 1959', *Proceedings of the Royal Society of Queensland*, vol. 72, no. 1, (1959), p. 6

the exchange was made up of economic plants – particularly varieties of sugar cane, tropical fruit, textiles such as jute and hemp, medicinal plants such as cinchona, and timber species. If experimental plantings proved successful, seeds or plants would be made available wherever possible to be distributed to settlers in geographically appropriate parts of the colony. Over time, indigenous Queensland species were also drawn into the networks of exchange. Queensland plants – from timber trees to indigenous grasses, from the macadamia to ferns, palms and orchids – were sought for their economic, ornamental, or curiosity-value by Botanic Gardens and nurserymen around the world. There was also internal exchange within Queensland – shade trees and ornamental trees from the northern districts were particularly sought after for planting around Brisbane and other southern settlements, and a number were grown in the Botanic Garden itself and Bowen Park, the garden of the Acclimatisation Society of Queensland.[37]

As well as undertaking regular exchanges with the Directors of the Melbourne, Adelaide and Sydney Botanic Gardens, Hill also made transfers of plants with Botanic Gardens within and beyond the British Empire, including Calcutta, Cape Town, Ceylon, Chicago, Hong Kong, Hull, Java, Kew, Mauritius, Natal, Paris, Singapore, and Trinidad. [38] A strong network of exchange of botanical materials, specimens and literature existed which was not mediated by the imperial 'centre' – Kew Gardens – but which often operated independently of it. Links between climatically similar locations were particularly important in this network, in particular between sugar-growing regions. Further, Hill established a system of 'branch Botanic Gardens' (often known as 'Queen's Gardens') throughout Queensland to facilitate acclimatisation and exchanges of plants with settlers – these included Gardens at Rockhampton, Maryborough, Ipswich, Warwick, and Toowoomba. Private nurserymen, particularly from the larger colonial firms, also took part in plant exchanges with the Gardens.[39] Such nurserymen engaged in an international trade in

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[37] F.M. Bailey, *Catalogue of Plants in the Two Metropolitan Gardens: The Brisbane Botanic Garden and Bowen Park (The garden of the Queensland Acclimatisation Society)*, James C. Beale, Government Printer, Brisbane, 1885.

[38] All details on plant exchanges, and the individuals and organisations involved, are from Reports on the Brisbane Botanic Garden published annually in *V&P* during Hill's Directorship (1861 – 1880).

[39] Among them Messrs Harris, G. Brunning, and T. & V. Lang in Melbourne, and Henderson, L.P. Shepherd, Guilfoyle and Son, and Baptist and Son, in Sydney.

which they acted as conduits for a range of novel species and varieties of both ornamental and economic plants sourced from throughout the world,[40] as well as meeting a market for exotic 'antipodean' species in Britain. Hill also exchanged timber seeds, publications, and correspondence with the Commissioner of the Washington Department of Agriculture at a time when there was not yet a Department of Agriculture established in the colony of Queensland. He sent seeds and cuttings to Agricultural and Horticultural Societies in Madras and Lahore, India, as well as to their closer cousins in Toowoomba, Ipswich and Warwick. While this already substantial list provides the broader institutional framework of Hill's activities, the largest part of his work involved transferring the plants, seeds, roots, or cuttings that he received to interested individual settlers throughout the colony.

After his participation in the North-East Coast Expedition in 1873, Walter Hill's efforts towards acclimatisation were aimed in particular at tropical northern Queensland.[41] Despite the limited governmental support he received, the work he undertook was monumental. In his Annual Reports, as well as through his personal correspondence, Hill promoted the potential of the rainforest lands, in particular for tropical horticulture: he listed coffee and cocoa, coconuts and cassava, indigo and hemp, tropical fruits, sugar and tea and spices as all suitable for cultivation, particularly in the vicinity of the Daintree and Johnstone Rivers. As well as fanning the demand for tropical plants, he also attempted to meet it. At the height of applications for plants to be supplied by the Brisbane Botanic Gardens, in 1880, Hill recorded that:

> Upwards of twenty tons weight of twenty-five varieties of sugar-cane have been distributed, and I have sent out, in compliance with applications, 12,000 plants [tropical fruit listed]... 2,000 suckers of twenty-six varieties of Pineapples; 400

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[40] For instance, George Brunning (1830 – 1893) migrated to Australia from Suffolk, England in 1853, and after a shaky start set up his own nursery business based on novelties imported from England – he made sure he carried the best and most recent plant varieties, especially in florist's flowers. Brunning used Thomas Lang as a city agent, and became one of Australia's most important nurserymen and seed merchants. Richard Aitken & Michael Looker (eds), *The Oxford companion to Australian gardens*, Oxford University Press published in association with the Australian Garden History Society, South Melbourne, Victoria, 2002, pp. 111 - 112.

[41] In reports from the 1860s, Hill makes little mention of North Queensland and almost none of particular localities there – from the early 1870s onwards Hill enthusiastically promotes the virtues of the Johnstone and Daintree Rivers, Cairns, Cardwell, and Port Douglas for tropical agriculture.

> Cocoanuts; 4,000 roots [including ginger, yam, turmeric and arrowroots]... 18,000 plants of timber trees... 2,000 ornamental trees; 200 Stag-horn ferns; 900 of Queensland trees and shrubs... also numerous packages of grass seeds...

He concluded that 'Should there be any cultivators endeavouring to introduce new economic plants who have not derived a direct benefit from the existence of the Botanic Garden, it must be owing to their not having made application for what they wanted.'[42]

Once the gold rushes to the north commenced in 1873, and regular shipping routes were established, the Australian Steam Navigation Company provided Hill with free shipment of seeds and plants to and from the 'Northern Ports'.[43] Perhaps more importantly for Hill, the establishment of the Torres Strait route that year afforded a 'speedy means of communication' which linked the Brisbane Botanic Garden directly with similar institutions throughout East Asia and beyond. Hill wrote in 1875:

> As was anticipated in my last report, the opening up of the Torres Strait mail service, as well as the California Service, has caused great attention to be drawn to the Queensland Botanic Gardens, and to the plants cultivated and capable of being cultivated in this colony, as well as to our indigenous plants. Every one of these mails brings me numerous letters from botanists, curators of public gardens, and the proprietors of private establishments ... [44]

In meeting the demand from abroad for seeds of indigenous Queensland trees and shrubs, Hill was assisted by the Secretary for Public Works, who instructed road parties throughout the colony, 'to collect and preserve such seeds and plants as may be conveniently procured on their various routes, without unduly interfering with their

[42] Walter Hill 'Brisbane Botanic Gardens. (Report from the Director)', *V&P,* 1880, vol. 2, p. 1292.
[43] ASN had not yet done so, as Hill complained, in 'Report on the Brisbane Botanic Gardens', *V&P*, 1871, p. 969. However by 1873 the situation had been remedied. 'Report on the Brisbane Botanic Gardens' *V&P*, 1873, p. 1320.
[44] Hill, 'Report on the Brisbane Botanic Gardens', 1875, p. 1197.

duties.'[45] He also occasionally received donations of seeds and plants, and specimens of rainforest timber, from settlers in the Cardwell, Cairns and Port Douglas districts.[46]

In response to the rapid increase in the quantity of exchanges of tropical plants, Hill requested (and eventually received) further government expenditure on the Garden: the erection of a glass-house, heated with hot-water, was vital if the tropical plants received by the Garden were to survive in Brisbane's sub-tropical climate. Hill wrote:

> A considerable portion of the colony being in the tropics, large portions of which will soon be in the occupation of planters and other cultivators, it is therefore necessary that there should be appliances and conveniences in the Botanic Gardens for the acclimatisation, preservation, and propagation of tropical and inter-tropical plants sent us as exchanges from other parts of the world, as well as to bring to cultivated perfection our own indigenous plants of the far North.[47]

While such an artificial means of enabling plants to flourish during the process of exchange seemed immediately necessary to Hill, in the longer term he saw the role of the Brisbane Botanic Gardens in attending to the requirements of the North receding. He envisaged a series of managed reserves and regional Botanic Gardens (similar to those already established further south) to be established in Cardwell, on the Johnstone and Daintree Rivers, and in Cairns, for the acclimatisation and exchange of both indigenous and introduced species to and from the region.[48] In 1877 Hill attempted to directly assist that process. He visited Cairns to determine the site for a Botanic Garden there and wrote:

> I took with me a most valuable collection of tropical plants selected with great care and attention, and I think it may be said without exaggeration that it exceeded both in number and value, and probably usefulness, any collection that up to the present date

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[45] *Ibid.*, p. 1201
[46] W. Hill, 'Report on the Brisbane Botanic Gardens', *V&P*, 1868, p. 500; 'Report on the Brisbane Botanic Gardens', *V&P*, 1869, p. 584; 'Report on the Brisbane Botanic Gardens', *V&P*, 1870, p. 310; 'Brisbane Botanic Gardens. (Report from the Director)', 1880, p. 1292.
[47] Hill, 'Report on the Brisbane Botanic Gardens', 1875, p. 1198.
[48] *Ibid.*, p. 1199.

> has left any Botanical Garden at one time. These I have planted for the present in the Custom House Reserve, Cairns, under the charge of Mr. Sub-Collector Spence, to whom my thanks are due for the care and attention he has bestowed upon them.[49]

While there is no mention of Mr. Sub-Collector Spence's success or otherwise with his intimidating horticultural responsibility, two years later Hill was complaining that despite the large number of tropical plants he had raised at the Gardens and freely sent to those who had requested them, very few were tended with sufficient care to ensure beneficial results. Again he promoted his idea of

> entrusting to the willing superintendence of capable and respectable persons in the Northern districts ... a special collection of seeds and plants ... these persons would, I am assured, undertake the distribution of plants raised, up to a certain period, to those who applied for them for acclimatisation purposes only ... there are numerous agriculturalists who have applied to me for general information, and who have signified their wish to settle on the Johnstone and Daintree rivers; both places being specially suitable for the initiation of this mode of action.[50]

The orderliness of Hill's vision of 'capable and respectable persons' raising and distributing plants was set against the reality of a rapidly shifting, often rootless northern population during this period. The lure of the goldfields proved too strong for small settlements such as Cardwell, which in the 1870s lost many of its citizens to promising finds further north.[51] Those who attempted to stay were thwarted by the spread of disease, isolation, economic cycles of boom and bust, and by the unpredictable climate – major cyclones struck Cardwell and the surrounding coastline in 1867, 1870 and 1882, each time devastating buildings, crops, ships and roads. Aborigines strongly resisted the invasion of their lands throughout North Queensland, and conflict was particularly fierce in the 1870s. Hill himself referred to this in 1875 when he noted, in his evidence to the Select Committee on Forest Conservancy, that while there were good quantities of cedar on the northern rivers it remained hard to

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[49] W. Hill, 'Report on the Brisbane Botanic Gardens', *V&P,* 1877, vol. 3, p. 986.
[50] W. Hill, 'Report on the Brisbane Botanic Garden', *V&P,* 1879, vol. 2, p. 975.
[51] Jones, *Cardwell Shire Story*, p. 139.

get at the present time 'on account of the natives.'[52] And despite Hill's enthusiasm, rainforest selection had little appeal to most settlers due to the work involved in clearing the land.[53] It was against this backdrop that the first sugar plantation to be conceived on the soils of Far North Queensland, at Bellenden Plains near the Herbert River, failed to produce even a single harvest.[54]

However not only did the proper cultivation of tropical plants require order, it could also – in Hill's and others' view - promote it: the distribution of ornamental and shade trees to public institutions and establishments was intended, by beautifying the surroundings, to add a sense of permanency, on which a 'civilised' society could be based, in place of the often raw environment of early settlement.[55] In the words of Liberal politician, Henry Jordan: 'To till the ground is properly to possess it... '[56] When proposing his system of reserves or 'botanic gardens', to be included whenever a new township was surveyed, Hill declared that by leaving some 'noble forest trees' standing and by cultivating the ground, 'no great period would elapse before there would really be afforded the results for which such reserves must be intended – the means of recreation, instruction, and health of the people.'[57] Hill aimed, not to transform the landscape entirely, but to integrate the 'natural' and 'cultural' realms. The controversy which would occur in the early 1950s over the removal of the 'Cairns Fig Tree' showed that as living entities of great beauty, interest, and age, such 'noble forest trees' would become important to some citizens of North Queensland, and were regarded as both giving Cairns' surroundings a distinctive local character, and connecting the present landscape to that which existed prior to European settlement of the region.[58]

Underlying the belief of Hill and other government officers in the need for orderly social and environmental change, was an uncertainty about the degree to

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[52] 'Report from the Select Committee on Forest Conservancy', p. 1252.
[53] Birtles, 'A Survey of Land Use in the Atherton-Evelyn District,' p. 131.
[54] Jones, *Cardwell Shire Story*, p. 112.
[55] See Hill, 'Report on the Brisbane Botanic Gardens', 1873, p. 1322; and Hill, 'Brisbane Botanic Gardens. (Report from Director)', 1880, p. 1292.
[56] Henry Jordan quoted in W.H. Richmond, 'Government and Economic Development in Queensland', p. 26.
[57] W. Hill, 'Report on the Brisbane Botanic Gardens', *V&P,* 1874, vol. 2, p. 868.
[58] This is discussed in more detail in Chapter Six.

which governmental control and regulation should constrain or direct the process of settlement and the exploitation of the land's resources, particularly in its early stages and in places far distant from Brisbane. This mixture of conflict and convergence between public and private interests was highlighted in the debate over the conservation and management of forest resources in Queensland, which culminated in 1875 in the Select Committee Inquiry into Forest Conservancy, to which Walter Hill gave evidence.

In *Fashioning Australia's Forests*, John Dargavel argues that 'The transformation of the world system between the mid-1870s and World War One marked a new stage of capitalism; it was epitomised by the spread of railways and empires, and it added a new regime to the forests of remote Australia.'[59] In the second half of the nineteenth century Australia was drawn into a massive international trade in which timber-getting operations, often financed by foreign capital, exported large quantities of timber from Australia for use in Britain and Europe. Dargavel writes:

> Hard, durable timber, often in large sections, was essential for the world's new infrastructure; every kilometre of railway needed 3360 wooden sleepers. Wood was even used to pave the streets of London and Paris, at least in the 'better' quarters. If local forests were limited, as in Britain, sparse, as in much of Africa, or remote, as in much of India, then suitable timbers had to be shipped across the world, an enterprise that became more attractive as freight rates fell.[60]

While this international trade focused primarily on the forests of Western Australia, there were significant inter-colonial demands on Queensland's forests.[61] Furthermore, massive amounts of timber were required by the growing settlements throughout colony itself: timber was needed for construction of dwellings and fences, to line mines, and for building railways, bridges, and ports; bark was used for tanning; wood was required for fuel, and the list went on. In regions with minimal transport facilities, such as the Atherton Tablelands of North Queensland in the 1880s, the majority of

[59] John Dargavel, *Fashioning Australia's Forests*, Oxford University Press, Melbourne, 1995, p. 28.
[60] *Ibid.*, p. 29.
[61] These were examined by the Select Committee on Forest Conservancy in 1875, and are discussed further below.

timber was cut for local purposes.[62] The use of valuable cabinet-woods such as cedar and silky oak to meet general construction needs caused a great deal of consternation to men such as Walter Hill.

The first timber reserves were gazetted by the Queensland government in 1870. They were intended primarily for government supply purposes, and their tenure as reserves was revoked once logging had occurred.[63] In the same year, Hill began recommending the planting of forest nurseries in North Queensland to guard against scarcity of valuable timbers.[64] It was also in 1870 that correspondence was begun between L.A. Bernays, Vice President of the Acclimatisation Society of Queensland, and the Colonial Secretary, regarding the Society's views and concerns about forest conservancy in Queensland – primarily concerns about the impact of clearing on climate. The Acclimatisation Society originally requested funds to obtain information regarding the rate of clearing of timber in Queensland as part of the annual Agricultural Statistics. When the Society failed to receive the requested funds, they held a public meeting in May 1873 to discuss the problems of forest conservancy.[65]

The international basis of the trade in timber was also reflected in an international debate which occurred during the same period over forest conservation and management. According to Dunlap, by the 1870s only Canada amongst the settler societies, which also included New Zealand, Australia and the United States, was not discussing forest conservation.[66] The debate had been fuelled by the publication of George Perkins Marsh's *Man and Nature* in 1864, which was rapidly disseminated and by 1865 was being quoted in Australian newspapers in support of concerns regarding forest conservancy.[67] The ability of the British government to undertake centralised data-collections on the state of forests and uses of timber throughout the Empire – and its need to safeguard its own supplies of timber – gave it a broad view of the problem. In response to a questionnaire issued by the Secretary of State for the

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[62] Birtles, 'A Survey of Land Use', p. 125.
[63] Peter Holzworth, *A History of Forestry in Queensland*, Department of Primary Industries, Forestry Corporate Affairs, Queensland, 2000, p. 4.
[64] Hill, 'Report on Brisbane's Botanic Gardens', 1870, p. 310.
[65] 'Report on Forest Conservancy', pp. 1209 - 1219.
[66] Dunlap, *Nature and the English Diaspora*, p. 49.
[67] *Ibid.*, p. 89.

Colonies in 1874, Hill had been given the responsibility of collecting information on forests and the timber industry in Queensland. This work had left him 'in no doubt of the damage being caused and the poor state of Queensland's forests.'[68] The Queensland Parliament's Select Committee into Forest Conservancy of 1875 was a response both to a small number of vocal and influential Queenslanders who raised the issue of forest conservancy locally, and to the concerns of the British government which resulted from its own inquiries into the state of colonial timber supplies.

Evidence was presented to this Select Committee by, among others, Walter Hill, L.A. Bernays of the Acclimatisation Society, government officials from Crown Lands and Roads, and timber-getters and timber merchants. Both in his annual reports as colonial botanist, and in evidence he gave to the Committee, Walter Hill raised concerns about the impact of the current regime of timber-getting on the colony of Queensland. His concerns were based both on his own experience from his travels in Queensland and his widespread correspondence with settlers, and his views were influenced by the writings on forest conservancy of contemporaries such as Ferdinand von Mueller. While I have seen no direct evidence, I suspect that Hill would have also been sensitized to the problem by his early experience on the goldfields of Victoria, where, like many others, he went directly on arriving in Australia, and which are described by Dargavel as the site of 'the grossest assaults on the forests.'[69]

Many of Hill's concerns related to the lack of control exercised by the Queensland government over the cutting of timber, and the loss of expenditure this resulted in for the colony. In contrast to the lease conditions and fees applied to pastoral lessees of Crown Lands in Queensland, timber-cutters required nothing more than a license obtained by payment of a minimal fee, unrelated to the volume of timber taken. These licenses were poorly regulated and the fees often not paid.[70] As such, estimates of the number of timber-cutters at work in colonial Queensland were 'little more than conjecture and bore little resemblance to the number of licenses

[68] Peter Taylor, *Growing Up: Forestry in Queensland,* Allen & Unwin, Dept. of Primary Industries Forest Service, Brisbane, 1994, p. 49.
[69] Dargavel, *Fashioning Australia's Forests*, p. 60.
[70] Hill, 'Report on the Brisbane Botanic Garden', 1879, p. 971.

issued.'[71] Many timber-cutters worked for companies based in southern colonies, to which the wood, the employment associated with preparing it for market, and the profits of its sale, all went. Further, the unscrupulous practices of timber-getters often led to unnecessarily extensive, and sometimes irreversible, damage to forests and loss of species – many trees were felled and then left where they had fallen as it was not yet feasible to remove them from the forest; others were 'freshed', that is, rafted down river, an operation which sometimes led to massive losses. As Hill described it, 'reckless waste... has characterised the operations of the timber cutter, wherever he pursues his occupation; destruction of young growth by carelessness and fire preventing anything like a recuperative process being effected by nature.'[72] Hill recommended that the government should regulate the operations of timber-getters particularly in newly explored districts such as the rich rainforests of North Queensland.[73] He was concerned that lack of knowledge about the species of indigenous timbers growing in the rainforests would result in the destruction and waste of trees that could otherwise provide a valuable future resource. While many witnesses that appeared before the Committee regarded the northern rainforests as capable of providing a bountiful and almost endless supply of timber,[74] Hill urged the government to learn from the experiences of other regions before it was too late.[75]

All witnesses examined agreed in general terms that the unregulated depletion of forests posed a serious problem for the colony. On that basis, the Committee recommended the expansion of the existing system of timber reserves, greater governmental regulation of timber-getting in Queensland and the appointment of a Forest Conservancy Board, leading ultimately, perhaps, to a Department of Forestry. However, as Peter Taylor describes it:

> The report was adopted by the Legislative Assembly and after that the government did nothing. Indeed, the Premier, A. Macalister, was strongly committed to closer

[71] Taylor, *Growing Up,* p. 44.
[72] Hill, 'Report on the Brisbane Botanic Garden', 1879, p. 970.
[73] Birtles' 'A Survey of Land Use' tracks the wasteful and destructive practises of timber-getters in the Atherton-Evelyn District, which became a target after the lowland rainforests were largely cut out of cedar. Hill's concerns were far from baseless.
[74] 'Report on Forest Conservancy', p. 1224.
[75] W. Hill, 'Report on the Brisbane Botanic Garden', *V&P*, 1875, vol. 2, p. 1203.

> settlement and thus the clearing of land ... Politicians were also aware that the export of timber was a major contributor to state revenue. ... there were too many conflicting interests. The demand for land was simply far too strong ...[76]

Terry Birtles writes that 'The theory of limitless, untapped wealth – possibly an inheritance from the gold rushes – was applied to the mineral lodes, to the cedar stands and to the basaltic soils [of North Queensland].'[77] Despite the concern, and the consistency of evidence given in the course of the Select Committee into Forest Conservancy, regarding the depletion of forest lands in Queensland, the rainforests of North Queensland were seen by most as bountiful to the point that they required no governmental protection. By 1877 very little cedar remained in the Daintree and Mossman valleys. In 1878

> The *Port Douglas Times* reported that in the previous four years fifty-nine ships had taken away about 4 ¾ million super feet of cedar, and that was a conservative estimate of the total that had been taken from these two valleys. During that year a million feet of cedar was waiting shipment from the Mulgrave.[78]

In his 1879 report to the Queensland Parliament, Hill continued to raise the issue of forest conservation in Queensland, and he drew on a range of international sources to support his concerns. He presented the views of Captain J.C. Walker of the Madras Forest Department, who had recently toured the Kauri forests of New Zealand, and also quoted Sir Joseph Hooker, (whom Hill described as 'a most eminent authority on the subject') from his correspondence with one of the Commissioners appointed to consider the means of conserving the 'magnificent forests' of the Yosemite region of California.[79] In 1880, a despatch issued from Downing Street, from the Officer Administering the Government of Queensland to the Queensland Parliament noted that among colonial governments

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[76] Taylor, *Growing Up,* pp. 50 - 51.
[77] Birtles, 'A Survey of Land Use', p. 177.
[78] Taylor, *Growing Up,* p. 39.
[79] Hill, 'Report on the Brisbane Botanic Garden', 1879, p. 970.

> there is a general tendency to underestimate the importance of local action, in the expectation that an unlimited supply of timber will always be obtainable from other sources, whereas on reference to the digest of information respecting colonial timber it will be seen that out of the thirty-eight colonies referred to therein, there are only four in which timber is not diminishing, and in many cases rapidly diminishing, and without any steps being taken for replanting or preventing waste, I feel that it is only right that I should again press the subject upon consideration of your Government as one of great and growing importance, and in which in many cases the health and prosperity of the colonies is very deeply concerned.[80]

It was to take another Parliamentary report, and twenty years, until finally in 1900 a Forestry Branch, with an Inspector of Public Forests and two Forest Rangers, was created under the auspices of the Department of Primary Industries.[81] As Bernays reflected later, the findings of the Select Committee on Forest Conservancy had been at great variance from the beliefs and experiences of the general Queensland public:

> The bare idea of a scarcity of timber in Queensland, is often met with a smile of pity, or even a laugh of derision. One is asked to get upon any eminence, in any district, and to put to oneself the question – whether the sea of timber which meets the eye can ever run short.[82]

While Walter Hill argued differently, his visions of the bounty of the rainforest soils – visions which he put great effort into realizing – would equally encourage the destruction and loss of a large proportion of North Queensland's lowland rainforests by the late nineteenth century, and much of the rainforest of the tablelands by the early twentieth century, particularly under government policies of closer settlement.

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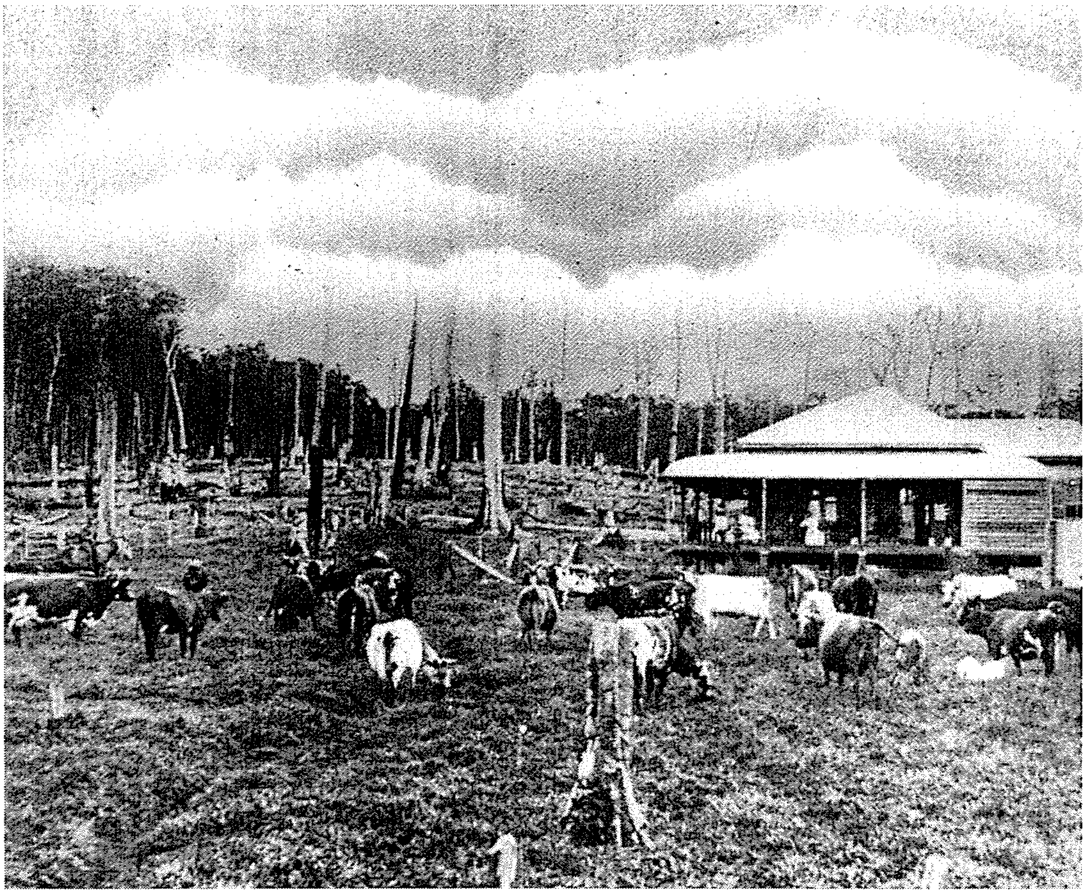
[80] 'Forest Conservancy, Despatch Respecting', *V&P*, 1880, vol. 2, p. 1311.
[81] Holzworth, *A History of Forestry in Queensland*, p. 6. This was an arrangement which, it would become increasingly obvious, left forestry officials under-resourced, politically hamstrung, and was therefore of limited utility.
[82] L.A. Bernays, quoted in P. Taylor, *Growing Up*, p. 48.



Atherton District, ca 1912.
Source: Courtesy John Oxley Library.

Ironically, Hill saw clearly that the practices of settlers were often equally as damaging as those of the timber-getters, if not more so. He wrote, in a report appended to the Select Committee Report:

> It would not, of course, be politic to enforce any rules or regulations as to the cutting or preservation of trees upon alienated land, although it would be greatly to the advantage both of the owner of the land and the interests of the colony, if some means were taken to impress upon the settlers the necessity and advantage of somewhat limiting their clearing operations; that, however laudable in some respects it might be to see every tree rooted out from their land, yet at no distant date they will much regret the wholesale burning and destruction of the very valuable timbers standing

> upon their land, and which, in many cases, have been needlessly destroyed and exterminated...[83]

Hill saw his role as an educator as a means to ensure that such needless destruction did not take place. One way in which Hill educated the public was through the displays he prepared for the International, Intercolonial and local Exhibitions.[84] While the International Exhibitions professed and promoted a broad range of ideals relating to progress, technology and modernity, their commercial basis was fundamental.[85] Hill was clear about his aim to attract investment into Queensland: the centrepiece of the displays he produced for the Exhibitions were the indigenous timbers of Queensland.[86] However, Hill was not simply promoting the region's exploitation – a process which he believed was already well underway. Rather, he was attempting to convince the public to place a higher value on Queensland's forests and the many diverse, useful and little-known species they contained, and to consider the possible benefits of more detailed investigation, selective logging and careful utilisation of timber than was currently being practised. Despite the efforts of Hill, Bernays and others, an unhappy combination of beliefs – that all suitable lands should be dedicated to the ongoing expansion of agriculture and settlement, and that timber supplies in North Queensland were almost limitless and so did not require careful management – continued to place forests, and foresters and conservationists, under pressure well into the twentieth century.[87]

The focus on economic botany, and the timber species of Queensland in particular, was to continue and deepen after Hill's retirement, through the work of

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[83] 'Report from the Select Committee on Forest Conservancy', p. 1281.
[84] During his term as colonial botanist, Walter Hill produced exhibits for International Exhibitions (for which he received awards) in London, 1862 and 1873, Paris, 1867 and 1878, Vienna, 1872, Philadelphia, 1876, and in New Zealand in 1865, as well as within Australia in Melbourne, 1866, and 1880, and New South Wales at the Intercolonial Exhibitions held yearly between 1870 – 1874, and the International Exhibition held there in 1879.
[85] See Paul Greenhalgh, *Ephemeral Vistas: The Expositions Universelles, Great Exhibitions and World's Fairs, 1851 – 1939*, Manchester University Press, Manchester, 1988.
[86] W. Hill, 'Report on the Brisbane Botanic Garden', *V&P,* 1874, vol. 2, p. 866.
[87] The problem was highlighted by the Director of Forests E.H.F. Swain, whose criticisms of forestry in North Queensland led to a highly-publicised Royal Commission into the subject in 1931, and to Swain's subsequent dismissal. For further details see L.T. Carron, *A History of Forestry in Australia*, Australian National University Press, NSW, 1985; Dargavel, *Fashioning Australia's Forests*; and Taylor, *Growing Up*.

Frederick Manson Bailey. In evidence given before the Select Committee into Forest Conservancy, eminent Queensland scientist, Dr. Bancroft, described Bailey as

> the only botanist here who is really acquainted with our *flora*; and to whom has been referred all difficult points for the last ten years. If there was any new plant it always came into his hands before any opinion was given; and he would work it up and find out the name, or something about it, and the information would all be supplied by Mr. Bailey.[88]

It was not surprising then that after Hill's retirement from his post as Colonial Botanist, Bailey was appointed to the position and reinvigorated it with an enthusiasm for taxonomic botany which eventually led him to publish the six-volume *Queensland Flora*, and even to vie with Mueller over authorship of a supplement to Bentham's *Flora Australiensis.*[89] While Hill's time had been primarily taken up with large scale exchanges of seeds, cuttings and plants, Bailey's main focus was on maintaining a steady flow of publications. He published his work in a range of forums: privately at his own expense, through the (often unreliable) Government Printer, and via the periodicals of scientific organisations such as the Linnaean Society of NSW and the Royal Societies of Queensland and Tasmania.[90] Bailey's great ambition was to systematise the diverse and extensive flora of Queensland. While the majority of his publications were concerned with taxonomic botany, he also offered general advice on horticulture and on the study of botany as a popular pastime, which he encouraged and championed in every way he could.

Bailey came from a family of botanists and nurserymen, and was trained in that work from a young age. As a child he moved from England to South Australia, where his father was appointed Government Botanist and Curator of the Botanic Gardens in 1839. Bailey later took part in establishing the Hackney Nursery, a family business in Adelaide and, on moving to Brisbane in 1861, opened an unsuccessful seed store and began to trade in botanical specimens with British and other foreign

[88] 'Report from the Select Committee on Forest Conservancy', p. 1246.
[89] Gail Clements, 'Colonial Science: F.M. Bailey and the Proposed Supplement to *Flora Australiensis*', *Historical Records of Australian Science*, vol. 12, no. 2, (Dec. 1998), pp. 149 - 162.
[90] For a bibliography of F.M. Bailey's published writings see *Proceedings of the Royal Society of Queensland*, vol. 28, (1916), pp. 7 - 10.

botanical museums and herbaria. Although he did not gain an official posting until 1875, Bailey collected botanical specimens around Brisbane from the time of his arrival, and undertook his first collecting trip to North Queensland in 1873 – during which he visited the rainforest areas around Rockingham Bay, Upper Herbert River and Seaview Range. As early as 1874 he funded the publication of a monograph on the *Queensland Ferns*, a topic for which he had a particular passion, shared at that time by other members of the Queensland public.[91] He returned to the north again in 1877, to explore Cairns and the ranges around the Barron River. It was probably during these two early expeditions that Bailey made contact with a number of local residents with whom he corresponded, and some of whom supplied him with specimens for many years to come.[92]

Bailey's first formal appointment was as Government Botanist on a board of enquiry into the causes of disease of livestock and plants in Queensland, and 'on this cause he travelled extensively in the State, especially in connection with plants reputed poisonous to livestock on the one hand and with grasses and native pasture herbages on the other.'[93] In 1880, Bailey was appointed Acting Curator of the Queensland Museum, and although he held the position for only two years, it was during this time that he began to establish the Queensland Herbarium. In 1881 he was appointed Colonial Botanist, a position which at first was part of the Department of Public Lands, but eventually fell under the auspices of the newly established Department of Agriculture. During his time as colonial botanist he not only continued to expand the Queensland Herbarium, mostly on the basis of specimens received from correspondents throughout the colony, but he also set up and maintained a Botanic Library and a Museum of Economic Botany.

One of Bailey's first tasks as colonial botanist was to construct exhibits of Queensland timber, first for the Colonial and Indian Exhibition held in London in

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[91] His work on algae and fungi, of which he was equally enthusiastic, never sold as well.
[92] Biographical details from C.T. White, 'F.M. Bailey: His Life and Work', *Proceedings of the Royal Society of Queensland*, vol. 61, no. 8, (1949), pp. 105 - 114; C.T. White, 'The Bailey Family and its place in the Botanical History of Australia', *Journal of the Royal Historical Society of Queensland*, vol. 3, (1945), pp. 362 - 368; and T. Harvey Johnston, 'Presidential Address', *Proceedings of the Royal Society of Queensland*, vol. 28, (1916), pp. 3 - 10.
[93] White, 'F.M. Bailey', p. 107.

1886, and then, in 1888, for the Centennial International Exhibition in Melbourne. For the latter, he collected, prepared and displayed almost 600 specimens of Queensland woods, which he described as 'probably the most extensive collection of woods ever exhibited from a single colony.'[94] He prepared each exhibit in duplicate, so that a copy might be kept within the colony to meet public inquiries there. The catalogue he published to accompany the exhibition was similarly intended as a general reference work for the Queensland public. Bailey suggested that at least 300 species of Queensland woods probably remained undescribed, and that the total range of timber in the colony might equal that found in India, and certainly exceeded any other colony in Australia. On this basis, he wrote,

> I would urge upon the Government the desirability of devoting some small vote towards the expense of carrying on the work of collecting and preparing as full a collection as possible of our indigenous woods... and also that experiments might be carried out to prove their adaptability for various kinds of work.[95]

Many of the unknown species of wood, Bailey argued, were to be found in the northern scrubs, an area still largely unexplored.

While Bailey expressed both scientific curiosity and aesthetic appreciation for the natural world, the fundamental force driving his work was a strong sense of the importance of the link between human and plant life. Bailey wrote:

> No other branch of natural history is so essential to man's existence. From plants man obtained his earliest food, material for his habitation, his utensils, as well as weapons and materia medica. And now in our advanced state of civilisation, if one looks into the matter, it will be seen that nearly all the necessaries of life are derived from the same source – the vegetable kingdom.[96]

It was the breadth of this connection between plants and people which Bailey attempted to highlight in the Museum of Economic Botany. The Museum primarily

[94] F.M. Bailey to Undersecretary for Agriculture, *V&P*, 1888, vol. 3, p. 779.
[95] F.M. Bailey to Undersecretary for Agriculture, *V&P*, 1889, vol. 4, p. 453.
[96] F.M. Bailey, 'Report of the Colonial Botanist', *V&P*, 1892, vol. 4, p. 617.

displayed the indigenous plants of Queensland which had been found useful for production of timber or edible fruits, oils and gums, grasses and cereals, medicinal products, fibres and dyes, and so on. The knowledge of which plants were edible, which provided useful fibres, and which had medicinal properties was often based on Aboriginal usage of plants, a topic on which Bailey always sought to gain information from his many correspondents.

The duplicate set of the timbers prepared for the Centennial Exhibition was also displayed in the Museum, and even 'the cabinets containing the book-blocks of indigenous woods are made of Queensland woods, and in themselves form a valuable exhibit, especially as several kinds have been used in the making of each cabinet.'[97] The displays were intended to assist members of the general public in identifying economically valuable species, and also provided the correct scientific names for such species. Bailey wrote with satisfaction that the Museum

> is not visited only by sightseers ... but principally by persons with an object in view... To many a one the visit means the obtaining or losing of a contract, for persons now are not satisfied with being put off with a local name as formerly; losses have made persons more mindful, therefore careful inquiries are constantly being made at my office upon these matters.[98]

Through the materials displayed at the Museum, Bailey hoped to encourage the further collection, investigation and cultivation of useful indigenous plants.

In 1889 Bailey took part in what he considered to be his most important collecting trip: the Bellenden Ker Expedition with Archibald Meston. Unlike the North-East Coast Expedition, the Bellenden Ker Expedition's primary goal was scientific, and its results 'added considerably to a knowledge of the flora of tropical Australia.'[99] Meston, Bailey, the Queensland Museum's zoological collector Mr. Broadbent, and a group of Pacific Islanders, left Cairns on June 14 1889, and ascended the Bellenden-Ker Range over the course of about a week. They followed

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[97] F.M. Bailey, 'Annual Report, Colonial Botanist', *V&P*, 1890, vol. 3, p. 750.
[98] F.M. Bailey, 'Report of the Colonial Botanist', *V&P*, 1894, vol. 3, p. 1500.
[99] C.T. White, 'F.M. Bailey', p. 109

Aboriginal paths some of the way, and at times utilised Aboriginal campsites for their own camping grounds.[100] At other times the group hacked their way, first through lawyer-vine and stinging-tree, and then, above 2,000 feet, through 'a thick wiry undergrowth which places track-cutting outside the pale of amusement.'[101] After ascending to the centre peak, Meston reported that 'Mr. Bailey thought we had collected all, or nearly all, of the plants flowering or fruiting at that time of year...' Bailey had better luck than the zoological collector, for 'the birds had left the cold, bleak summits and gone down into the warm gorges and ravines,'[102] and Broadbent returned with few specimens.

During their travels Meston made an effort to find out the Aboriginal names for the geographical features they encountered, and in his report 'respectfully suggest[ed] their adoption, not only for unnamed places, but to supersede many of the utterly meaningless names already conferred by surveyors and local residents.'[103] Bailey followed his advice and chose to use Aboriginal words for the specific names of a number of the new species which he described. However as Bailey did not know the words that referred to the plants themselves, he instead attached to them those geographical names published by Meston. He named one new species Melicope choooreechillum, from the Aboriginal name for Bartle Frere, and another Leptospermum wooroonooran, from the Aboriginal name for Bellenden-Ker.[104] Meston similarly spiced his own report with the scientific names of plants identified by Mr. Bailey – which included 'splendid masses of Bulbophyllum Baileyi with unusually large leaves.'[105] In his Annual Report for 1890, Bailey stated:

> My trip to the Bellenden-Ker Range brought a very large addition to the herbarium of specimens of indigenous plants. Up to the present I find that about sixty of the species are new to science; this of course is very satisfactory, and more than one could well

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[100] A. Meston, *Report by A. Meston on the government scientific expedition to the Bellenden-Ker Range (Wooroonooran), North Queensland.* Government Printer, Brisbane, 1889, p. 2.
[101] *Ibid.*, p. 3.
[102] *Ibid.*, p. 4.
[103] *Ibid.*, p. 2.
[104] F.M. Bailey, *A Synopsis of the Queensland Flora: Containing both phaenogamous and cryptogamous plants*, vol. 3, Government Printer, Brisbane, 1890, p. 27.
[105] Meston, 'Report by A. Meston', p. 2.

> have expected to have obtained considering the difficulty of preserving and carrying specimens in so rough a country.[106]

The species of plants Bailey collected were listed as an appendix to the main account of the expedition written by Meston, and Bailey continued to publish descriptions of new species from the region in various formats over the following years.

As important as his own collecting expeditions to North Queensland, were the correspondents he maintained there. In the 1880s F. M. Bailey received numerous specimens – particularly of orchids – from W.R. Kefford from the Johnstone River and from J.W.R. Stuart, a surveyor who collected as he worked in the vicinity of Herberton, as well as from many other occasional correspondents. Events and phenomena, such as new growth associated with ongoing heavy rains or outbreaks of pest species, could lead to Bailey being inundated with specimens to examine and where possible identify.[107]

In the 1890s, Bailey maintained a regular correspondence (often receiving a number of parcels of specimens each month) with Ebeneezer Cowley, overseer at the Kamerunga State Nursery near the Barron Falls, who collected prolifically, methodically, and with intense curiosity in the district around Cairns and north to the Daintree.[108] While Bailey sometimes had to complain of the damaged or incomplete state in which specimens reached him, it is clear from their correspondence that Cowley was – under Bailey's continual guidance – an attentive and persistent observer with some knowledge of botany. While Cowley was not a paid collector, Bailey certainly attempted to meet some of the expenses associated with his activities.[109] In mid November 1893 Bailey sent 500 labels by parcel post, in response to a request he received from Cowley by telegram.[110] The following year, when

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[106] F.M. Bailey, 'Annual Report, Colonial Botanist', 1890, p. 749.
[107] F.M. Bailey to Undersecretary for Agriculture, *V&P*, 1891, vol. 4, p. 638.
[108] Their correspondence, some of which is legible, is found in the Letterbooks of Frederick Manson Bailey, held on microfiche at the Queensland Herbarium Library (hereafter LFMB). Unfortunately, it seems that the more excited Bailey got, the more difficult – often impossible – it is to read his handwriting. The formulaic official correspondence is quite often legible, the more personal and passionate correspondence usually descends very quickly into illegibility.
[109] Bailey wrote, 'I have no employed collector ... ' LFMB, Book 2, Sheet 7, 22 March 1893, p. 354.
[110] *Ibid.*, p. 269.

asking that Cowley collect specimens of rainforest timber, Bailey wrote 'The expenses attending getting and forwarding these woods will have to be met out of the vote provided for obtaining and preparing Museum specimens.'[111] Less than a month later, a case arrived 'in splendid condition' and Bailey wrote 'I am pleased you have such a good opportunity for procuring the wood specimens.'[112]

Cowley also on occasions provided Bailey with what he believed to be the Aboriginal names for particular plants. 'Goorigen', Cowley told Bailey, was the name used by the Aborigines of the Barron River for a species of club-moss found in that district, and as yet undescribed by botanists. On December 6, Bailey wrote to Cowley that he would use the Aboriginal name as its specific name: 'I think you will agree with in thus keeping as many as possible of the native names.'[113] However, by December 20 Bailey had changed his mind, and decided to name the 'beautiful flowering Lycopodium' after Cowley's daughter, 'instead of attaching to it the Aboriginal name. It is a most lovely specimen and may claim the honour of having attached to it the young lady's name.'[114] It is recorded as *Lycopodium Clarae*, Bail., with the Aboriginal name added as a note in the description.[115] Six months later, when Ebeneezer Cowley left the colony on a collecting trip to New Guinea, Bailey suggested that Miss Cowley 'with the help of a kind friend' might continue to assist him while her father was away, and to encourage others in the neighbourhood to also collect; the use of her name was strategic as well as courteous.[116]

Bailey publicly recorded his gratitude to his many correspondents. In his annual report to the Undersecretary for Agriculture for 1891 – 92, he wrote:

> With regard to Botany, the work of collecting is principally being done by private individuals who being desirous of scientific knowledge of the plant life about them forward as opportunities occur, packets by post or otherwise, of numbered specimens

[111] LFMB, Book 2, Sheet 7, 23 February 1893, p. 325. Bailey was here referring to the Museum for Economic Botany, not the Queensland Museum.
[112] LFMB, Book 2, Sheet 7, 30 March 1893, p. 364.
[113] LFMB, Book 2, Sheet 6, December 6, 1892, p. 291.
[114] LFMB, Book 2, Sheet 6, December 20, 1892, p. 298.
[115] F.M. Bailey, *Comprehensive Catalogue of Queensland Plants*, Government Printer, Brisbane, 1909, p. 634.
[116] LFMB, Book 2, Sheet 7, May 15 1893, p. 414.

> of the indigenous plants for me to determine and return to them names to numbers. By this means new species are constantly coming to hand, as well as specimens of those previously but imperfectly known ...[117]

However Bailey's larger ambition to systematically study and document the flora of Queensland was, like Hill's, often frustrated by lack of government funding. Almost no financial support was offered for Bailey's own collecting work, and he had few resources with which to pay local collectors, though he did cover their shipping costs whenever he was able. As well as publicly praising his correspondents, Bailey also regularly recorded the professional difficulties caused him by having to rely on the often ad hoc work of unpaid amateur collectors for the majority of his new botanic materials:

> From a few the specimens thus received, and the notes by which they are accompanied, are quite sufficient for determination, or, if new, to allow of a full description being drawn up for publication. By far the greater number of correspondents, however, seem to think that it is quite sufficient to forward fruit picked up from under the trees, the only effect of which is to cause a waste of time in useless conjecture as to the plant from which they fell being an undescribed species or not. Specimens of this nature are being constantly received from Northern scrubs, where a large proportion of the trees are but little understood. Even the timbers of these localities which are in use are in many cases unknown scientifically, and one often finds glowing accounts of their value, as well as the excellency of the indigenous fruits, in the newspapers. It is time, therefore, that some careful, intelligent collecting was carried out. This would be required to be done at least twice during the year, so that both the flowers and the fruit would be available for examination. Large sums of money are voted annually for developing the mineral wealth of the Colony without a murmur, surely, then, some small vote might be afforded for making known the riches of the Colony's vegetation, which is of much more importance to man's well-being![118]

Bailey was to continue to be largely disappointed. In his later years he was given funds for an assistant botanist, a role filled first by his son John Frederick Bailey in

[117] F.M. Bailey, 'Report of the Colonial Botanist', *V&P*, 1892, vol. 4, pp. 616 – 617.
[118] *Ibid.*, p. 617.

1889, and then by his grandson C.T. White from 1905. As assistants, both White and J.F. Bailey were occasionally able to undertake collecting expeditions on Bailey's behalf. However, the large scale botanical investigation which Bailey had envisaged and argued for was not to take place in his lifetime.

Much of Bailey's role as colonial botanist can be seen as a disciplinary one: he laid down stringent guidelines on what and how to collect, necessary if the specimens sent to him were to be useful for making taxonomic determinations and for exchanges with other herbaria. He sent prospective collectors 'a printed slip with instructions in regard to collecting, drying and forwarding specimens of plants.'[119] He modelled his own taxonomic work closely on that of Bentham. Both in his *Queensland Flora* – much of which was taken directly from Bentham's earlier *Flora Australiensis* - and his proposed Supplement to the *Flora Australiensis*, Bailey gave strict priority to Bentham's descriptive language and classifications. Bailey was also concerned about the general public's botanical ignorance. Multiple vernacular names were often used for the same species while, at the same time, a single name would be repeatedly used in different places to refer to different species. Bailey provided an illustration of the confusion this caused:

> To show the ignorance which prevails with regard to even the trivial names of our timbers I may quote a paragraph or so from a pamphlet prepared by the Herberton Local Committee which was formed for collecting exhibits for the Centennial International Exhibition held in Melbourne in 1888. At page 10 of this literary gem the following occurs:
> 'Black Walnut (*Juglans nigra*) is described by Müller and others as a most ornamental timber, and of a purplish brown colour, and much prized for high class cabinet work.'
>
> The reason for this American tree being noticed amongst the timbers of the Herberton district is not very obvious. It may probably have happened thus: In the district there may be a timber known locally as 'Black Walnut' the compiler thinking that only one

[119] F.M. Bailey to collector in Mackay, LFMB, Book 2, no. 7, 8 January 1893.

> wood is known by the name consulted Baron Müller's work and copies the description there given of the American tree.[120]

Accordingly, Bailey saw it as his duty to strongly encourage the use of correct scientific nomenclature in public discussions of plants. He wrote:

> We have one system of public education, and what I am advocating is one system to be adopted in the labelling of plants in our private parks, gardens, &c., where it may be deemed advisable to label ... all I ask for is that where such are labelled throughout the Colony that the nomenclature should be under the immediate direction of the Government Botanist.[121]

By supplying 'correct' scientific names to specimens, Bailey aimed to create a stable botanical language, and to make knowledge of the physical properties of each plant as mobile as a botanical text, thus removing uncertainty from public discussions of plant species. Bailey's extensive work cataloguing, describing and exhibiting the timber species of Queensland was intended to assist toward this end. Bailey aimed in his work to create a clear and informed public discourse about the plant-life of Queensland, a discourse of which, as colonial botanist, he would be arbiter.

However Bailey's vision of the botanist's role in elucidating the order of nature, and so adding to the welfare of humankind, was not one held by all his fellow colonists.

> To persons who have never given a thought to the importance of the assistance rendered by the botanist to the artisan, farmer, horticulturalist, or pastoralist, he is looked upon as a faddist and a dealer in long unmeaning names, and it is in this light that he is mostly placed before people by our newspapers. Practical men in the above branches, who may be termed the real backbone of the country, however, do not, I am glad to say, favour this idea. They know full well that in every phase of work where

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[120] F.M. Bailey to the Undersecretary for Agriculture, LFMB, 30 May 1892, Book 2, p. 72.
[121] Bailey, 'Report of the Colonial Botanist', 1892, p. 618.

> plants or plant products play a part, without the help of the botanist, very great and often inextricable confusion, and hence loss, occurs.[122]

Many commentators have identified profound anti-intellectualism as an ongoing characteristic of Queensland history and culture. Humphrey McQueen, in his influential article 'Queensland: A State of Mind', argued that this was founded primarily on two demographic factors: the overwhelming significance of regionalism in Queensland, exacerbated by the wide geographic area covered by the state; and the fundamental and continuing importance of primary industries to the Queensland economy.[123] This anti-intellectualism required that scientists such as Bailey should define and defend their work on the basis of its practical value. Queensland's colonial scientists not only worked in a society which did not value abstract thought or inquiry, but also in an economy which was often in crisis. During the depression of the 1890s, for instance, the budget for education in Queensland was reduced by 12.5%,[124] and in the same period Bailey's position as Colonial Botanist was abolished for four months, during which he continued to work without pay.[125] He wrote at this time to his longstanding correspondent Ebeneezer Cowley: 'I have faithfully done my work for the colony and been shamefully treated by the Government. No man in my position could expect that they would be turned out of office at a moment's notice without a pension.'[126] Bailey was re-instated, in large part because of the public support he received from his many correspondents; however his pay was cut from £350 to £200 per annum.[127] As an indication of the priority given to expansion of infrastructure – a priority made politically urgent by the tensions of regionalism in Queensland – between 1860 and 1915, at least 72% of gross public investment was dedicated to railways.[128] The government was interested not in names or knowledge, but in the more physical, visible and immediate ways in which the Queensland landscape could be opened up.

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[122] F.M. Bailey, 'Report of the Colonial Botanist', *V&P*, 1896, vol. 4, p. 458.
[123] Humphrey McQueen 'Queensland: A State of Mind', *Meanjin,* vol. 38, no. 1, (1979), pp. 41 - 51.
[124] M. Thomis, *A Place of Light and Learning: The University of Queensland's First Seventy-five Years*, University of Queensland Press, St. Lucia, 1985, p. 10.
[125] F.M. Bailey, 'Report of the Colonial Botanist', *V&P*, 1894, vol. 3, p. 1499.
[126] Bailey to Cowley, LFMB, Book 2, Sheet 5, n.d., 1893, p. 523.
[127] LFMB, Book 2, Sheet 5, January 6, 1894, p. 593.
[128] Thomis, *A Place of Light and Learning*, p. 8.

It was largely through work outside office hours that Bailey produced the *Queensland Flora*, which was the culmination of his many years of botanical endeavour. The *Flora* was published in seven volumes (six volumes and an index), between 1899 and 1905, and was based primarily on Bentham's *Flora Australiensis,* as well as the fragmentary taxonomic publications of Queensland species made by Ferdinand von Mueller, and Bailey's own lifetime's efforts. The work followed the arrangement and style of Bentham's *Flora Australiensis,* and reproduced Bentham's notes 'either entire or slightly altered to agree with our present knowledge.' The *Flora* contained explanations of the generic and specific names and, where known, vernacular names were also provided. Bailey wrote that 'a considerable amount of trouble has been taken in obtaining the correct aboriginal names, and in all instances where such are recorded the locality and authority for same are given.' He noted elsewhere that in many regions the Aboriginal names were of much utility for botanical collectors, who were often assisted by Aboriginal guides.[129] The work contained both indigenous and naturalised species, a point which Bailey believed was important. In a letter to the Department of Agriculture in Sydney (in this case with regard to the proposed supplement to the *Flora Australiensis*) Bailey wrote of the importance of including the many naturalised species now found in Queensland:

> I think it of as much importance that these introductions should be given, as the really indigenous ones, for many are so common that, except by the botanist, they are thought to be indigenous. You will remember the plate of "Queensland Wild Flowers" given with the Town and Country Journal of 1889, out of the six plants illustrated, three were introductions ...[130]

Bailey also listed any known economic properties and Aboriginal usage of the plants. He concluded, 'I have borne in mind throughout that the work is principally intended for Queenslanders, but, at the same time, I fully believe there will be a demand for copies beyond Australia ...'[131] His comment was prescient, as by the early twentieth century, the flora of Queensland had begun to attract the attention of botanists in

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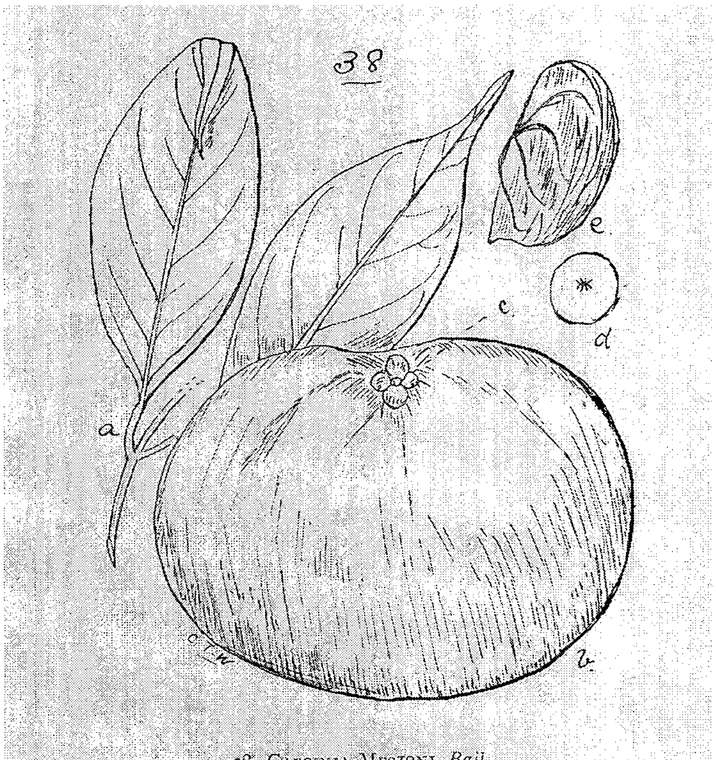
[129] Bailey, *Comprehensive Catalogue of Queensland Plants,* p. 9.

[130] Letter from F.M. Bailey to Mr. Turner, Department of Agriculture, Sydney, LFMB, 7 March 1893, Book 2, No. 7, p. 337.

[131] F.M. Bailey, 'Report of the Colonial Botanist', *V&P*, 1899, vol. 2, p. 603.

Europe and the United States. The Czech botanist Karel Domin who visited the state between 1909 and 1910 consulted with Bailey, and spent a month collecting in rainforest areas of North Queensland, starting from Cairns to Mt Bellenden Ker, Yarrabah, and in locations around the Atherton Tablelands. Domin, who returned to Prague to be appointed Professor of Botany of Karlovy University at the age of 34, was the first of a number of high-profile botanists from around the world who increasingly took an interest in the region during the twentieth century.[132]



38. GARCINIA MESTONI, *Bail.*
(a) Leaves, (b) fruit, (c) calyx, (d) the eight stigmatic lobes, (e) seed with its integument. All nat. size.

Garcinia Mestoni,
'Meston's Mangosteen',
collected by Archibald Meston on the Bellenden-Ker Expedition.
Drawn by C.T. White.
Source: F.M. Bailey, *Comprehensive Catalogue of Queensland Plants.*

As well as producing the formal *Queensland Flora*, Bailey, driven by his desire to assist members of the public interested in the study of botany, also published a number of more generally accessible works. The *Lithograms of the Ferns of Queensland* (1892) was prepared not for the 'scientific pteridologist. It is for that far more numerous class, lovers and cultivators of our indigenous ferns, who, while having a desire for their names, find a difficulty in determining them from published

[132] A.D. Chapman, 'Domin and Daneš in Java and Australia 1909 – 1910', in P.S. Short (ed.), *History of Systematic Botany in Australia: Proceedings of a symposium held at the University of Melbourne, 25 – 27 May 1988,* Australian Systematic Botany Society Inc., Melbourne, 1990, pp. 159 – 163.

descriptions, be such ever so plain and devoid of technicalities.'[133] *A Companion for the Queensland Student of Plant Life,* (1893, 1897) and *Botany Abridged* (1894) were both published as textbooks suitable for use in Queensland, and were, to Bailey's satisfaction, utilised in schools. The *Comprehensive Catalogue of Queensland Plants Both Indigenous and Naturalised* (1890, 1909) contained numerous figures drawn by Bailey's grandson and assistant C.T. White, as well as coloured plates of some rare and interesting species, and was composed for those with 'an eye for the beauties of Flora's Kingdom'.[134]

While Bailey had taken the opportunity to travel through the rainforest, and see it first hand on collecting expeditions, his primary contact with the 'Northern scrubs' came through the specimens of plants sent to him in Brisbane where he was based. A number of the plants he studied were described from specimens grown from seeds or cuttings in the Bowen Park Acclimatisation Gardens, rather than from observations in the field. The distance from Brisbane to the north, a large family of six children to support, and meagre government funding all limited his options for field research. In his official and personal writings, Bailey described the North Queensland rainforest as a rich and little-explored source of new species: of beautiful ferns, fungi and orchids, of valuable and unknown timber species, of shade and ornamental trees and fruits with potential for cultivation. Bailey's interest in the rainforests – that 'most interesting locality', as he wrote to Cowley[135] – was primarily economic, but economic not in the sense of being narrowly concerned with profits, but rather of being focused on human well-being.[136] His view of the value of the rainforests encompassed the wide range of human needs they could meet: he saw the diversity of the rainforest environment as corresponding to the diversity of human industry and interest. This was reflected in his continual attempts to draw attention to the range of uses of indigenous plants by both Aborigines and settlers. Through his

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[133] F. M. Bailey, *Lithograms of the Ferns of Queensland,* Queensland Department of Agriculture, Brisbane, 1892, p. 3.
[134] F.M. Bailey, *Comprehensive Catalogue of Queensland Plants*, p. 15.
[135] Letter to E. Cowley, LFMB, Book 2, Sheet 5, 14 November, 1894, 'Hoping to receive further specimens from your most interesting locality.' p. 861.
[136] See Donald Worster, *Nature's Economy: A History of Ecological Ideas,* (2nd ed.) Cambridge University Press, Cambridge, 1994, for an examination of the etymology of 'oeconomy', which traces its use through the sense of 'household management', 'political administration of all the resources of a community', 'divine dispensation', to 'nature's oeconomy', p. 37.

often brief and scattered notes on plant usage, included in the *Queensland Flora* and other writings, a picture emerges of the rainforest as a lived-in environment, a region which has for a long time met all the needs of its Aboriginal inhabitants. While, like Hill, Bailey was certainly interested in tropical horticulture, he had a fascination for the potential of the indigenous flora which far outshone that of his predecessor. It was a view which perhaps reflected his religious beliefs – in his own words he "Saw in all nature the work of an Almighty hand."[137] In this view, Bailey stood firmly in a long line of natural historians who viewed 'Nature [as] an order expressive of God's kindness toward his creatures, and especially toward man, for whom the creation primarily exists.'[138]

The accounts and reports of the colonial botanists were shaped above all by the distance between the north and the south – whether from the Barron River to Brisbane, or from Cardwell to Melbourne. Over the second half of the nineteenth century this distance was gradually bridged by postal steamers, telegraphs, and the expansion of settlement and infrastructure within North Queensland itself. However, opportunities for botanists to work in, and write from direct experience of, North Queensland continued to be limited. What knowledge colonial botanists held of the region was largely refracted through the work of their North Queensland-based collectors. While the collectors may have written about what they saw around them, on the whole they were not systematic or trained observers. They were confronted with a complex and challenging physical and social environment, and their work was shaped by the circumstances of early settlement. While the official correspondence and writings of the colonial botanists can be accessed to varying degrees, most of the letters written by their collectors have not been preserved. In examining what can be found of the correspondence between Mueller and Dallachy, Bailey and Cowley, essentially only half of a vibrant two-way conversation is being heard.

The Queensland colonial botanists were only precariously supported by the government. Their own official writings must, therefore, be read with the awareness

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137 C.T. White, 'F.M. Bailey', p. 114.
138 Worster, *Nature's Economy*, p. 44, see also Janet Browne, *The Secular Ark: Studies in the History of Biogeography*, Yale University Press, New Haven, 1983, p. 17.

that such writings occupied a place on a continually-moving spectrum between objective report and desperate plea. While Walter Hill held great hopes for the agricultural future of Queensland, and the tropical north in particular, and made tremendous efforts to realise those hopes, the sheer quantity of plants transported during his tenure from the Brisbane Botanic Garden to the northern ports did not translate quickly or simply into a landscape transformed to tropical agriculture. While acclimatisers such as Hill are now most often remembered for their introductions which flourished too well, and spread as uncontrollable and damaging weeds, an even more common result of their work, though one less evident now, was the failure of introduced plants to survive at all in a new environment.[139] Their many failures were one of the reasons why such massive quantities and such a wide range of species and varieties were exchanged and experimented with. Similarly Bailey's assertions of the importance and value of his work to the colony of Queensland were made in the face of government indifference and, sometimes, government hostility; in his later years, his annual reports became increasingly shorter and more formulaic, perhaps as he succumbed to the realisation that his work would not receive the understanding or support from the government which he felt it deserved.

The colonial botanists worked at the forefront of the processes of settlement, and attempted to both understand and to transform the lands which they encountered. As Dunlap writes:

> The settlers destroyed and re-created, appreciated the beauties of the land, and sought to bring it closer to their own ideal, and they did it on a grand scale... The settlers saw all this as the march of civilization, but that considerably overstates the orderliness of the process. It was a frantic rush.[140]

The orderliness required by the careful, methodical practices of botanical science was often lost in that rush. By the early twentieth century, the Department of Agriculture, in which Bailey remained until his death in 1915, increasingly employed a range of specialists. In 1900 the Department consulted experts in viticulture, fruit culture,

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[139] Dunlap, *Nature and the English Diaspora*, pp. 55, 57.
[140] *Ibid.*, p. 46.

coffee growing, tobacco, and other fields of agriculture. The days of the generalist – when Walter Hill could form a one-person Department of Agriculture based at the Brisbane Botanic Gardens – were gone.[141] The foundation of the University of Queensland in 1911 saw the beginnings of the institutionalisation of higher scientific education in Queensland.[142] The early twentieth century also saw the consolidation of support, under the new federal government, for scientific research through the Council of Scientific and Industrial Research, a research institution conceived in the midst of World War One, and established in 1920.[143] This increasing institutionalisation and specialisation of science, the shift of focus to experimental rather than descriptive botany, and the growing historical distance from early settlement of the region, combined to transform the ways in which the North Queensland rainforests would be approached and understood by scientists in the twentieth century.

However the most fundamental changes would not be institutional but conceptual. The work of the colonial botanists was based on the practices and worldview of taxonomy. As Dunlap writes: 'They saw the world around them as made up of separate parts – the various species – interacting on the apparently neutral backdrop of the land by processes that could be understood by observation.'[144] This view of nature fitted closely the early requirements of colonisation. However the sometimes destructive and unexpected consequences of these efforts to remake the natural world would, in the first half of the twentieth century, play an important role in the emergence of ecological science, and would lead to an investigation of the rainforests which went beyond simple observation and commonsense interpretation. Although taxonomy would remain important to this effort, it would lose its place as the primary framework for understanding the rainforests.

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[141] 'Annual Report of the Department of Agriculture, 1900', *Votes and Proceedings*, 1900, vol. 2, p. 727. This was a process which occurred not just within Queensland, but is identified by Dunlap as a widespread shift. According to Dunlap, increasing specialisation in the late nineteenth century was the result of the accumulation of information, and the development of new theories and research methods. Dunlap, *Nature and the English Diaspora*, p. 94

[142] Thomis, *A Place of Light and Learning.*

[143] B. Collis, *Fields of Discovery: Australia's CSIRO*, Allen & Unwin, Crows Nest, NSW, 2002.

[144] Dunlap, *Nature and the English Diaspora*, p. 87.

Chapter 4 'So Intricate a System'

The crystallization of ecology as an independent discipline in the first decades of the twentieth century, and its emergence into prominence as a result of the rising public concern for the state of the environment in the 1960s, were both reflected in changes to the scope and focus of scientific investigations into the rainforests of North Queensland.[1] While an ecological view of Australian rainforests had begun to emerge early in the twentieth century, systematic research into rainforest ecology began with the formation of the Rainforest Ecology Unit of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in 1958. Previously, when botanists and ecologists had distinguished between different 'types' of rainforest they had done so primarily on climatic grounds; ecologists Len Webb and Geoff Tracey developed a more nuanced method of classification of rainforest according to its structural features. From the work of Webb and Tracey emerged a vision of Australian rainforests as ecological systems of great complexity, composed of a multitude of diverse interrelated organisms, and shaped by processes that scientists only partially understood. However their research did more than just add to scientific knowledge of the rainforests. In *Australian tropical rainforests: science, values, meaning* Webb quoted Aldo Leopold's words on the ecologist as someone who

> lives alone in a world of wounds, and who must either harden his shell and make believe that the consequences of science are none of his business, or… who sees the marks of death in a community that believes itself well and does not want to be told otherwise.[2]

Webb felt that it was his moral responsibility as a scientist to speak publicly of the damage he saw around him. The experiences of working in the rainforest shaped

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[1] 'The crystallization of ecology' is the term used by Robert McIntosh for the emergence of ecology as a discipline and is the title of his first chapter. R.P. McIntosh, *The background of ecology: Concept and theory*, Cambridge University Press, Cambridge, 1985.
[2] Aldo Leopold quoted in L.J. Webb, 'Beyond the Forest', in L.J. Webb & J. Kikkawa (eds), *Australian tropical rainforests: science, values, meaning,* CSIRO, East Melbourne, Vic., c.1990, p. 117.

Len Webb and Geoff Tracey not only professionally, but also personally and politically. They in turn contributed significantly to the conservation movement in Queensland and throughout Australia.

While the work of the colonial botanists was linked primarily to concerns about the economic development of Queensland, the ecological examination of rainforest areas arose from the national structure of scientific research which had been put in place by the federal government following the First World War. There was, however, a clear connection between the colonial botanists and the pioneer rainforest ecologists in Queensland. Before he joined the CSIRO, Len Webb was employed by the Department of Agriculture, where he worked as an assistant in the Queensland Herbarium. Both Webb and Tracey had some contact with government botanist C.T. White, grandson of F.M. Bailey, who Webb recalls first sparked his interest in botanical science.[3] They were also assisted in their work by White's successor W.D. Francis, author of a leading botanical text on rainforest trees; as well as by the younger botanist Lindsay Smith, whose primary interest was in the taxonomy of rainforest species. Geoff Tracey stated that men such as C.T. White, Bill Francis and especially Lindsay Smith, did not help him to 'see' the rainforest, but rather showed him 'the science of taxonomic botany, the actual herbarium and what the role of a herbarium was and what all these dry specimens actually meant, and how it tied back to the taxonomic literature.'[4]

When Webb and Tracey began their research in North Queensland, the primary botanical guide to the rainforest continued to be Manson-Bailey's *Queensland Flora* (1899 – 1905) and *Comprehensive Catalogue of Queensland Plants* (1909). While taxonomic work had continued under White, Francis, and later government botanists, few inroads had been made into gaining a broader or more detailed understanding of the tropical rainforests of the far north during the first half of the twentieth century. When W.D. Francis published the first edition of *Australian Rain Forest Trees* in 1929, a text intended primarily as a practical field guide, he

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[3] Len Webb, personal communication, April 14, 2005, Brisbane.
[4] Interview with Geoff Tracey, interviewer Gregg Borschmann, recorded 9 & 21 May 1994, 'My Country – A Living History of the Australian Landscape', National Library of Australia, NLA TRC 2845/46: 2.1.2.

wrote that 'The species whose range is confined to the tropics have been excluded because of insufficient knowledge of their field characters.' However, he noted, many of the species found in the sub-tropics have a range which extends to the tropics, or are allied to species found in the tropics, so a familiarity with the sub-tropical rainforest trees 'is certainly helpful to persons studying the trees in the tropical rain forests of North Queensland.'[5] The second edition, published in 1951, included a greater number of 'those species of the tropics which are of economic value as timber trees', and drew on the Director of Forests, E.H.F. Swain's *The Timber and Forest Products of Queensland*, (1928), and on the work of Arnold Arboretum collector, S.J. Kajewski, who visited North Queensland in the early 1930s.[6]

In the introduction to *Australian Rain Forest Trees,* Francis wrote:

> To many observers the first sight of a rain forest of a tropical character is a memorable experience. The profound impression which it creates causes the mind to wonder how the dense and varied forms of plant life originated and are maintained. It is evident that there are very potent forces in the soil to maintain the luxuriant vegetation. The investigator is confronted by a wide field for study of the diverse forms and the forces which produce and maintain them.[7]

As Francis suggests, the diversity and sheer excess of life in the tropics had long evoked wonder in European observers, and had provided an important inspiration to 'proto-ecologists' working in the first half of the nineteenth century such as Alexander von Humboldt, Charles Darwin and Alfred Russell Wallace. Humboldt described his first encounter with tropical nature as an overwhelming experience:

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[5] W.D. Francis, *Australian Rain-Forest Trees, Including Notes on Some of the Tropical Rain Forests and Descriptions of Many Tropical Species,* 3rd ed., Dept. of National Development, Forestry and Timber Bureau, Australian Government Publishing Service, Canberra, 1970, p. viii.

[6] *Ibid.*, p. xi. E.H.F. Swain & Queensland Forest Service, *The Timbers and Forest Products of Queensland,* Government Printer, Brisbane, 1928. Peter Taylor points out that this volume, which was largely compiled by Swain's staff, 'is still a standard work'. Taylor, *Growing Up*, p. 65.

[7] Francis, *Australian Rain-Forest Trees*, p. xi.

> We rush around like the demented; in the first three days we were quite unable to classify anything; we pick up one object to throw it away for the next. Bonpland keeps telling me he will go mad if the wonders do not cease soon…[8]

Alfred Russell Wallace, like Humboldt, offered an account of the intense experience of encountering tropical rainforest, and argued that it was necessary to move past such powerful subjective responses in order to develop a systematic, scientific viewpoint. In *Tropical Nature*, Wallace wrote:

> To the student of nature the vegetation of the tropics will ever be of surpassing interest, whether for the variety of forms and structures which it presents, for the boundless energy with which the life of plants is therein manifested, or for the help which it gives us in our search after the laws which have determined the production of such infinitely varied organisms. When, for the first time, the traveller wanders in these primeval forests, he can scarcely fail to experience sensations of awe… There is a vastness, a solemnity, a gloom, a sense of solitude and human insignificance which for a time overwhelm him, and it is only when the novelty of these feelings have passed away that he is able to turn his attention to the separate constituents that combine to produce these emotions, and examine the varied and beautiful forms of life which, in inexhaustible profusion, are spread around him.[9]

Despite the initial disorientation Humboldt experienced, his writing on rainforest, as on other forms of vegetation, was 'marked by an effort to arrive at a holistic view of nature.'[10] Donald Worster outlines Humboldt's 'Essay on the Geography of Plants', published in 1807:

> the plants of the world must not only be considered in their taxonomic relations but also grouped in relation to the geographic conditions in which they live… Each major kind of community … was named after the species most responsible for its composite appearance. The effect of this procedure was to

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[8] Humboldt quoted in C. Kellner, *Alexander von Humboldt*, Oxford University Press, London, 1963, p. 34.
[9] A.R. Wallace, *Tropical Nature and Other Essays*, MacMillan & Co., London, 1878, pp. 67 – 68.
[10] Worster, *Nature's Economy*, p. 133.

> emphasize the visual patterns in vegetation, leading to a basically aesthetic approach to the "ensembles" of nature.[11]

However, Humboldt also asserted the importance of quantitative studies of plant communities, and suggested that such studies should examine both the number and range of species which make up the community, and consider associated statistics of temperature, altitude, rainfall and anything else which could be measured. He emphasized that 'the study of physiognomic divisions … was as much a mathematical and scientific as an aesthetic enterprise.'[12] Robert McIntosh suggests that

> "Humboldtian Science" involved accurate measurement of what could be measured, questioning of past theory, development or adoption of new tools to study natural phenomena, and applications, not in the laboratory but to a variety of phenomena in the field, all of which required a new approach.[13]

The work of Humboldt is widely regarded as having been central in shaping what would become the ecological 'point of view'.[14] While this was in part because of his breadth of focus, his intellectual curiosity and rigour, it was also a result of the example he offered of the adventurous life of the 'travelling naturalist'. Charles Darwin, who took Humboldt's *Personal Narrative of a journey to the equinoctial regions of the New Continent* with him on his voyage on the *Beagle*, later wrote of the volume: 'My whole course of life is due to having read and re-read [this work] as a youth.'[15] During the course of the voyage, Darwin described his first extended travel through rainforest in Brazil in a letter to a friend:

> Here I first saw a Tropical forest in all its sublime grandeur. – Nothing, but the reality can give any idea, how wonderful, how magnificent the scene is… I never experienced such intense delight. – I formerly admired Humboldt, I now almost adore

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[11] *Ibid.*
[12] *Ibid.,* pp. 134 - 135.
[13] McIntosh, *The Background of Ecology*, p. 26.
[14] McIntosh notes that 'Ecology in its early years was sometimes decried as not a science at all but merely a point of view', *Ibid.*, p. 1.
[15] Darwin quoted in *Ibid.,* p. 18; Worster, *Nature's Economy*, p. 132.

> him; he alone gives any notion, of the feelings which are raised in the mind on first entering the Tropics.[16]

During the first half of the nineteenth century, geographers following Humboldt became increasingly interested in what caused the variations in vegetation that they observed: Why did plants grow where they did? What factors limited their range? The term 'formation' began to be used to denote structurally comparable assemblages of plants found in similar climates, regardless of differences in their species composition.[17] This approach involved shifting the focus from identifying and locating individual species, to categorising 'plant societies', and 'discovering the laws they obeyed.'[18] It answered to that desire for universality which had led to the development of taxonomic botany: now, not only could individual species be placed in a universal taxonomic framework by which they could be compared and related to others around the world, but plant formations would also be considered on a comparative and global basis. Geographers were embracing a vision of plants as 'social' beings, which formed distinctive and integrated societies, about which questions of physical and historical causality could be asked.

From its earliest usage by Ernst Haeckel in 1866, 'ecology' was explicitly linked to the Darwinian notion of the 'struggle for existence.' The term 'œcology' did not come into common use until the 1890s when it first 'caught the fancy of botanists';[19] it took on its modern spelling at the International Botanical Conference of 1893, where it was defined as a sub-specialty of botany which had the distinction of using 'a dynamic perspective to study changes in plant communities.'[20] While there was some initial dispute about the meaning of the term, 'ecologists began to define ecology by doing it and by recognizing that they were doing it.'[21] Robert McIntosh describes this as the emergence of 'self-conscious ecology', a process which began in

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[16] Darwin to Henslow, quoted in Peter Raby, *Bright Paradise: Victorian Scientific Travellers,* Princeton University Press, Princeton, New Jersey, 1997, p. 19.
[17] Worster, *Nature's Economy,* p. 195.
[18] *Ibid.*
[19] McIntosh, *The Background of Ecology,* p. 29.
[20] Worster, *Nature's Economy,* p. 192; L. Robin, 'Ecology: a science of empire?' in Robin &Griffiths (eds), *Ecology and Empire*, p. 64.
[21] McIntosh, *The Background of Ecology*, p. 28.

the late nineteenth century, at a time when the influence of German botany and developments in plant physiology were of great importance.[22] Humboldt's work had been fundamentally integrative, based on a broad general knowledge of the content and technique not only of natural history, but also of the physical sciences. The development of ecology, while drawing inspiration from Humboldt, was part of a shift towards greater scientific specialisation. Although natural history would retain its broad popular appeal, it was no longer the realm within which pioneering scientific work would occur.[23] Thomas Dunlap writes that by the end of the nineteenth century 'Natural history was at its architectural peak and in its conceptual grave.'[24] It had lost its place of pre-eminence as an intellectual endeavour to experimental biology in the laboratory, and scientific ecology in the field.[25]

In 1870, Ernst Haeckel had elaborated on his first brief mention of the term:

> By ecology we mean the body of knowledge concerning the economy of nature – the investigation of the total relations of the animal both to its inorganic and to its organic environment; including above all, its friendly and inimical relations with those animals and plants with which it comes directly or indirectly into contact – in a word, ecology is the study of all those complex interrelations referred to by Darwin as the conditions of the struggle for existence.[26]

Early ecological workers were greatly influenced by Darwin's emphasis – following Humboldt – on the interrelations of organisms and populations, and by his attempt not just to describe what he saw but to understand how, by purely natural processes, it might have come to be. Darwin's theory of evolution rested on five primary assertions: First, that nature is a 'web of complex relations' in which no individual organism or species can live separately – that 'all survival on earth is socially determined'.[27] Second, that 'the economy of nature' can be considered, not just in terms of the relationships between particular organisms in their setting, but

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[22] *Ibid.*, pp. 36 - 37.
[23] Farber, *Finding Order in Nature*, p. 4.
[24] Dunlap, *Nature and the English Diaspora*, p. 71.
[25] *Ibid.*, p. 94.
[26] Haeckel quoted in McIntosh, *The Background of Ecology*, pp. 7 - 8.
[27] Worster, *Nature's Economy*, p. 156.

more abstractly, as 'a system of "places", or what later ecologists would call "niches."'[28] Third, that this system is not eternal or stable, because 'the amount of life is too great for the number of available places in the system.'[29] Fourth, that this incongruence between available 'places' and the organisms attempting to make use of them, leads to competition: the so-called law of the jungle.

Darwin's radical innovation was to suggest the mechanism of 'natural selection.' Although most ecologists agreed with Haeckel about 'the central relation of evolution and adaptation to ecology', Darwin's argument that natural selection provided the mechanism for evolution was much-disputed in the late nineteenth and early twentieth century.[30] McIntosh points out that 'natural selection was viewed by some with suspicion as a return to an earlier speculative botany.'[31] Evolution of species, Darwin argued, might take place through 'selection' of minute differences between competing organisms, which resulted from successful organisms' survival and reproduction over a very long period of time. Those species which were poorly adapted to their environment may be lost forever while others might emerge so changed as to form first varieties, and eventually entirely new species.[32] Finally, as well as interacting competitively, sometimes 'offspring may work out wholly new occupations for themselves, diverging from their parents and siblings and exploiting untapped resources and habitats.' Such divergence leads to increasingly complex relations within and between species and between organisms and their physical surroundings.[33] One important consequence of Darwinian theory was to make the relations of organisms to the environment a central concern of ecology – and Darwin and others emphasized that this included not only the physical environment, but also other organisms, or what became known as the 'biotic environment.'[34]

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[28] *Ibid.*, pp. 156 - 157. McIntosh points out that traditional natural history also had a concept of 'natural place', but one which represented the harmony of nature as a consequence of divine foresight. McIntosh, *The Background of Ecology,* p. 38.
[29] Worster, *Nature's Economy*, p. 158.
[30] An example is the prominent ecologist Clements who, in the 1930s held fundamentally Lamarckian views on evolution, and attempted (he believed successfully) to prove them experimentally. *Ibid.*, p. 259.
[31] McIntosh, *The Background of Ecology*, p. 38.
[32] Worster, *Nature's Economy,* p. 159
[33] *Ibid.*, pp. 161 - 162.
[34] McIntosh, *The Background of Ecology,* pp. 38 - 39.

Although Darwin was not the first to do so, he was perhaps more effective than any previous thinker in highlighting the dynamic, historical character of the natural world.[35] It was this sense of the importance of the processes of change, the notion that the form of living organisms offered an expression of their evolutionary history, which was to guide and dominate the direction of ecology for much of its future. Donald Worster sees a different kind of historical vision embedded in the Darwinian view of nature, one influenced both by the British experience of empire and by Darwin's reading of Thomas Malthus on the dynamics of population:

> So long as all species lived in fixed, permanent, eternally assigned stations, there was no reason for violent competition. But introduce natural forces that pushed creatures out of their settled places and sent them in search of new homes in far corners of the earth, and no end of conflict was possible. The English were experiencing this ecological phenomenon firsthand as they continued in the nineteenth century to migrate to new worlds.[36]

It is perhaps unsurprising that as ecologists attempted to describe the dynamics of 'vegetation formations', or 'plant communities', they commonly used analogies from human communities. Eugen Warming, who was inspired by his work in the tropics, highlighted the notion of succession as the process by which plant communities move through a series of transformations until they reach a state of stability – the climax community. Warming described the process of succession as occurring through the invasion of an area by opportunistic plants on the move, attempting to find their way through the defence put up against such invasion by the area's existing inhabitants.[37]

The notion of plant communities undergoing successional development until they reach a stable climax community was taken up as central to the study of ecology in the first half of the twentieth century by leading US ecologist Frederic Clements. Clements regarded plant communities as literally forming whole organisms, and

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[35] This aspect of Darwin's thought and its connection to geology, in particular to the work of Charles Lyell, is considered in more detail in the following chapter.
[36] Worster, *Nature's Economy*, p. 144.
[37] *Ibid*., p. 198 - 202.

compared their progression through developmental stages, which he termed ‘seres’, to the life process of an individual organism. Unlike the individual organism, though, Clements believed that, without external disturbance, the climax community had the potential to continue to perpetuate itself forever. He argued that the developmental process was a linear one; if disturbed, eventually nature would ‘find a way to get back on track.’ Clements’ work contrasted to the approach of Warming who, though similarly interested in processes of succession, maintained an emphasis ‘on the individual plant, and … was critical of higher-level units such as formations, or causes which could be applied to such entities.’[38] McIntosh points to the controversial nature of Clements’ theories and argues that ‘the persistence, intensity and inconclusiveness of much of the controversy suggests a philosophical as well as an empirical problem.’[39] This controversy derives from a tension between holistic notions of plant formations or communities as being ‘more than the sum of their parts’ (whether or not that view was taken to the extremes espoused by Clements), and the belief that progress in ecological science can be made only by application of reductive methods of experimentation and analysis.

While early ecologists such as Eugen Warming and his contemporary Andreas Schimper, who in 1898 coined the term ‘tropical rainforest,’[40] had been inspired by their encounters with the tropics, in the first half of the twentieth century ecologists turned away from the tropical rainforests and based most of their studies on the structurally and floristically less complex environments of the Arctic and the temperate zone of the northern hemisphere.[41] The emerging science of ecology received a new status in the public sphere in the United States in response to the Dust Bowl of the mid-1930s, when Clements and his colleague Paul Sears became involved in the inquiry into the causes of the disaster. The role of ecological science in unravelling the causes and interpreting the meaning of the Dust Bowl demonstrated what Paul Sears described as the ‘subversive’ nature of ecology. He argued that

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[38] McIntosh, *The Background of Ecology*, p. 43.
[39] *Ibid.*
[40] T.C. Whitmore, *An Introduction to Tropical Rainforests,* 2nd edition, Oxford University Press, 1998, p. 10.
[41] McIntosh, *The Background of Ecology*, pp. 37 - 38.

> the view of nature derived from ecological studies called into question some of the cultural and economic premises widely accepted by Western societies. Chief among these premises was that human civilizations, particularly of advanced technological cultures, were above or outside the limitations, or “laws”, of nature.[42]

Libby Robin suggests that in contrast to the situation in the United States, where the disaster of the Dust Bowl drew senior ecologists back from theoretical into applied work, ecology in Australia developed initially as an applied science, and has remained throughout its history closely linked to economic goals and utilitarian outcomes.[43] Robin distinguishes between ‘science for development’, which in Australia was primarily science applied to attain sought-after improvements in agriculture, and which was predominant at the time of federation; and ‘conservation science’ which emerged in both Australia and the United States as a result of encounters with environmental limits from the 1930s through till the 1950s. ‘Conservation science’ did not abandon the aim of developing the nation through scientific know-how, but rather ‘increasingly emphasized development in the long term, not instant results.’[44] Early work in ecological science in Australia drew on the institutional structures and expertise assembled for the purposes of ‘development’, and was directly, and necessarily, involved in examining the environmental impact of colonisation and the limits to the continuing expansion of settlement.

One of the first detailed ecological investigations in Australia was undertaken by a young Englishman, Francis Ratcliffe, who between 1929 and 1931 was employed by the Empire Marketing Board to work with Australia’s CSIR. Ratcliffe studied the populations of flying-fox which were believed to be decimating fruit orchards along the east coast of Australia. His work is described by John Calaby as ‘the first systematic [ecological] study of an Australian vertebrate’, though still one considered a ‘pest’.[45] Ratcliffe followed his flying foxes north up the Queensland coast and recorded his experiences, including observations of the Queensland

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[42] McIntosh, *The Background of Ecology*, p. 1.
[43] Robin, ‘Ecology: a science of empire?’, p. 73.
[44] *Ibid.*, p. 70.
[45] T. Griffiths, ‘Francis Ratcliffe and Changing Ecological Visions’, in Saunders et al. (eds), *Perspectives on Wildlife Research: Celebrating 50 years of CSIRO Wildlife and Ecology,* Surrey, Beatty & Sons, Chipping Norton, NSW, 2002, p. 135.

rainforests, in a popular account, *Flying Fox and Drifting Sands: The Adventures of a Biologist in Australia.* Ratcliffe wrote:

> … in the coastal belt of Queensland two contrasting types of vegetation are found side by side: the indigenous Australian "open" forest, and the rain-forest or "jungle". The distinction between them is sharp and definite, for they rarely intergrade. Seen from some high vantage-point the two formations stand out in the landscape as though they had been painted in different colours – the one sparse and pale, the other dark and close-grained… Not only is the jungle utterly unlike the open forest in appearance; botanically it is both quite different and much more complex. In a square mile of open forest it will often be impossible to find as many as half-a-dozen different species of trees. In a similar area of jungle there will probably be sixty. Moreover, quite a large proportion of this great variety of rain-forest species will bear fruit with some pretence of pulp and succulence. This, from the flying foxes' point of view, is important…[46]

Contrary to the view of fruit-growers, who felt themselves to be besieged by the 'foxes, Ratcliffe observed that flying fox populations were in the process of

> a natural and fairly rapid decline. Perhaps natural is hardly the correct word to use, for this decline has undoubtedly been caused by the spread of human settlement, which has mowed down the jungle and ring-barked the eucalyptus forest over thousands of square miles.[47]

After three years' study of flying fox communities, Ratcliffe concluded that the damage to orchards was not derived from the species' population as a whole, but was a result of the behaviour of a tiny segment of it. He suggested that to attempt to exterminate the flying fox, the solution sought by many fruit-growers, would be 'a waste of both time and money.'[48] Dunlap argues that although Ratcliffe viewed his finding as 'tinged with defeatism', it in fact 'had a radical core. It asked that people

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[46] F. Ratcliffe, *Flying Fox and Drifting Sands: The Adventures of a Biologist in Australia*, 2nd ed., Angus & Robertson, Sydney, 1951, pp. 6 – 7.
[47] *Ibid.*, p. 10.
[48] *Ibid.*

live with nature.'[49] The 'radical core' of Ratcliffe's conclusion contrasted starkly with results of research into another pest species in Australia – the prickly pear, which was dramatically and successfully controlled in the late 1920s through the introduction of the Argentinean moth (*Cactoblastus cactorum*). Botanist D.A. Herbert described this control as 'embarrassingly effective'[50] because it raised expectations that scientists should be able to find such simple solutions for all the ecological problems Australia faced. Ratcliffe returned to Australia in 1933 to report on soil erosion, which was at the time affecting a geographically comparable area of Australia to that decimated by the Dust Bowl during the same period in the United States.[51] Like Clements and Sears, Ratcliffe saw the problem as being caused by a fundamental mismatch between ecosystems and systems of land use:

> The essential features of white pastoral settlement – a stable home, a circumscribed area of land, and a flock or herd maintained on this land year-in and year-out – are a heritage of life in the reliable kindly climate of Europe. In the drought-risky semi-desert Australian inland they tend to make settlement self-destructive.[52]

In all these studies of flying fox, prickly pear and 'drifting sands', the techniques and insights of ecological science were utilised; and in all the CSIR (CSIRO from 1949) played a role of central importance. The CSIRO has been described by one commentator as 'the most monolithic research institute outside the Communist countries.'[53] Its predecessor, the CSIR, was established in 1926, and from the outset its aims were as much economic as scientific. It was a product of both wartime research and wartime nationalism, and reflected the continuing post-war need to 'encourage research and support the training of research workers at the national level for the purpose of enhancing technological change in Australian industry.'[54] The

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[49] Dunlap, *Nature and the English Diaspora*, p. 185.
[50] Herbert, 'A Story of Queensland's Scientific Achievement', p. 12.
[51] Robin, 'Ecology: a science of empire?', p. 70.
[52] Francis Ratcliffe, *Flying Fox and Drifting Sands*, p. 323.
[53] Derek de Solla Price, quoted in Jarlath Ronayne, 'Scientific Research, Science Policy, and Social Studies of Science and Technology in Australia', *Social Studies of Science*, vol. 8, no. 3, (Aug. 1978), p. 374.
[54] Schedvin, *Shaping Science and Industry*, p. x.

experience of the First World War had led, in Australia, to 'a growing appreciation … of the links between scientific research, economic strength, and national power,'[55] and this appreciation was heightened by the period of economic uncertainty which followed the war.[56] The founding of the CSIR was also, in part, an attempt by the Australian government to integrate the Australian economy more closely into the Empire. The Council was intended to act as a link to the Empire Marketing Board which was established in Britain, also in 1926, and which offered a fund to support industrial research within the Empire.[57] In contrast to the research undertaken in Britain, which was predominantly aimed at encouraging the manufacturing sector and relied on the work of physicists and chemists, the CSIR focused on the development of primary industries, and employed a high proportion of biologists and agricultural and soil scientists.[58] The CSIR drew on the pool of skilled scientific researchers available in Britain and then post-war Europe in the late 1940s, (a practice continued by CSIRO in the 1950s), and was instrumental in funding the postgraduate training of Australian research scientists in overseas universities.[59]

The CSIR, and later CSIRO, straddled (not always comfortably) the existing research programs of state government departments – most particularly departments of agriculture – and of the universities, which were also funded by, and the responsibility of, the states. C.B. Schedvin argues that the creation of the CSIR was in part a response to the inadequacies of research being undertaken by departments of agriculture in the face of the rising economic impact of pests, drought and disease.[60] By the late 1940s, the CSIRO Wildlife Survey Section was established under Francis Ratcliffe, with the aim of undertaking a national biological survey. However, the same concerns directed the work of the Survey Section as had determined earlier ecological research, and the more immediate problem of introduced pests such as rabbits took precedence over a consideration of indigenous species. Further, the project was

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[55] *Ibid.*, p. 12.
[56] *Ibid.*, p. 17.
[57] *Ibid.*, pp. 17 - 18.
[58] Robin, 'Ecology: a science of empire?', p. 67.
[59] Schedvin, *Shaping Science and Industry*, p. 23. The employment of Francis Ratcliffe to examine first control of flying fox populations, and then problems of soil erosion, was an example of the introduction of expertise from the Home country. See the discussion in Griffiths, 'Francis Ratcliffe and changing ecological visions', pp. 132 - 140. See also Collis, *Fields of Discovery*, p. xiii.
[60] Schedvin discusses the reasons for the formation of CSIR in *Shaping Science and Industry*, pp. 9 - 12.

sidelined by an international shift in ecology away from descriptive surveys pejoratively termed 'bucket science' and towards quantification, which was seen as being a more reputable form of 'hard science'. So although organisations such as the Australian Association for the Advancement of Science had been promoting the value of a detailed national survey of indigenous flora and fauna since the 1880s, 'no one had taken up the challenge while it was "frontier" science and, by the 1950s, it no longer had that status.'[61] Eight years after the establishment of the Survey Section, Ratcliffe 'remarked that his department had not been able to collect or collate even basic "data needed for appraisal of the present situation", or "information on the status and distribution of the more interesting species".'[62]

The Division of Plant Industry of the CSIRO, which in the 1950s would also establish an ecology section, was founded with the primary aim of assisting farmers to achieve greater productivity. To this end, it conducted investigations into pasture and crops, plant diseases, and crop protection – investigations in which it had to tread carefully to avoid upsetting the sensitivities of state departments of agriculture.[63] One of its longest running projects was the Australian Phytochemical Survey, which originated in response to the need during wartime to supplement the supply of essential drugs, vitamins and insect repellents, and focused on the search for sources of new drugs in Australian plant species. The Survey ran from 1946 to 1970, and during the course of its operation involved the collaboration of universities in Australia and the United States, as well as the American pharmaceutical company, Smith, Kline & French.[64] In 1944 Len Webb had been appointed as a field botanist with the CSIR, and at the Survey's outset he began establishing systems for collecting and testing promising plants. At the end of 1949 he was joined by Geoff Tracey, who was appointed as his technical assistant. While Webb was new to North Queensland, in which much of the collecting was based, Tracey had grown up in Cairns before studying at Gatton Agricultural College outside Brisbane. Tracey described the excitement he felt at the appointment:

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[61] Robin, 'Ecology: a science of empire?', p. 71.
[62] Letter, F. Ratcliffe to Australian Academy of Science, 1 May 1957, quoted in *Ibid.*, p. 71.
[63] Collis, *Field's of Discovery,* pp. 202 - 203.
[64] *Ibid.*, p. 217.

> Because I was a healthy young fellow and could put in a bit of work, I was the sort of bloke that Len was looking for who knew enough about what he was trying to do in terms of doing the tests on the plants, and was also strong enough and independent enough to be able to go bush, look after a vehicle and collect the bark and stuff, chop down trees, it was my job … And I never ever, from that day to this, felt the boss/worker relationship [with Webb]. It was always on an understanding that I was there helping him to do the job… I was absolutely thrilled to get it.[65]

At the time Tracey was appointed, the Survey was working from a list of priority species to collect which were based on the results of Webb's original testing program, and in which plants containing alkaloids were of particular interest. They also responded to requests for other types of plant compounds from chemists working in universities in Australia and overseas.[66] The decision of the Survey to focus its attention on alkaloids had been straightforward: alkaloids were simple to test for, (Tracey recalled that one chemist they worked with, Ern Richie from Sydney University, relied on the taste test – 'the worse it tasted, the better it was'!); [67] they were the source of many important drugs such as morphine, quinine and hyoscine; and the process of extracting them from plants was relatively easy.[68]

If an alkaloid was found in a particular species, then a systematic examination of other related species of its genera or family was undertaken. Tracey recalled, for instance, that a valuable alkaloid called reserpine was discovered in an Indian plant, *Rauwolfia*, which was part of a family of plants (Apocynaceae) which also occurred in Australia. An examination of Apocynaceae in Australia led to the discovery of reserpine in the root bark of an *Alstonia*. Tracey searched the collections of the Queensland Herbarium and discovered six other *Alstonias*, on which the next collecting trip was focused. He explained:

[65] Interview with Geoff Tracey, NLA TRC 2845/46: 1.1.10
[66] Interview with Geoff Tracey, NLA TRC 2845/46: 1.1.12
[67] Interview with Geoff Tracey, NLA TRC 2845/46: 1.2.6
[68] Collis, *Fields of Discovery*, p. 218.

> So we'd get a big long hit list, if you like, of things that were required, and then we'd say the best place to get the combination of these things is North Queensland, and we found that we were always coming back to North Queensland.[69]

Field trips, which involved driving north from Brisbane, would often take five or six weeks, during which time the men would sleep in swags by the side of the road or in forestry camps in the rainforest. The tropical rainforest was not an easy environment to work in – as well as the difficulties of finding plants and obtaining adequate specimens, and the discomfort of rain, leeches, and lawyer vine, Webb and Tracey's fieldwork occasionally brought them into contact with some of the more potent rainforest species. The 'poison walnut' tree found on the Atherton Tableland lived up to its name: Len Webb was 'laid low for days by nausea and swollen eyes and glands' after contact with its bark; Geoff Tracey was hospitalized for a week after its sap got into his eyes.[70] Webb recalls that although he presented the local doctor with his symptoms, no medical assistance was available because the active substances in the plant were as yet unknown to medical science.[71]

During their time with the Phytochemical Survey, Len Webb and Geoff Tracey received significant assistance from local people who lived and worked in the rainforests. When Webb first began working on the Survey he had sought information from Aboriginal people, who sometimes took him out and showed him traditional medicinal plants.[72] Much of the knowledge about medicinal plants was held by women, and in retrospect Webb reflected that he had been naïve in his interactions with them and would have had greater cooperation if he had been travelling with his wife. While the women gave him some assistance, Webb believed that their past experiences of sexual abuse at the hands of white men had made them reticent and nervous.[73] Webb and Tracey were also assisted in their search for particular species by the loggers and sawmillers, bushmen and foresters who worked, and often lived, in

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[69] Interview with Geoff Tracey, NLA TRC2845/46 1.1.12
[70] Collis, *Fields of Discovery*, p. 218.
[71] L. Webb, personal communication, April 14 2005, Brisbane.
[72] His findings were recorded in L.Webb, 'Some New Records of Medicinal Plants Used by the Aborigines of Tropical Queensland and New Guinea', *Proceedings of the Royal Society of Queensland,* vol. 71, (1959), pp. 103 - 110.
[73] Interview between Len Webb and Ian Fraser, Brisbane, December 1, 2001, tape held in Oral History Collection, James Cook University.

the forest. Tracey described the importance to their work of the loggers who would help them find the trees they were interested in:

> They were great blokes. We used to camp in their camps and talk with them about what we were doing, and we couldn't find them more helpful. The same with the sawmillers at the time… So we got to know quite a lot of the people in the timber mills and particularly the bush bosses from the mills, who were the ones that had to go out and get the logs… Those sorts of people, they knew the bush and they were very interested, particularly the ones we had something to do with.[74]

Research foresters working at Atherton were also helpful. They 'were interested in the sorts of combinations of trees which grew in certain parts of the forest' and at the time were setting up experimental plots in the rainforest: cleared plots to examine the process of regeneration after logging operations; and reference plots of intact rainforest to provide a comparison to the logged areas.[75] Tracey recalls his view of the North Queensland timber industry at that time:

> The Forestry Department just was there to actually supervise the logging operations, and logging was the thing you did because the trees are out there, and what people did with trees was cut them down, put them through sawmills and build houses out of them… At the time we were collecting phytochemical samples, the whole world was interested in collection of resources for the good of mankind, I mean this was what people did. So we had no qualms about interacting with the timber getters and the loggers, I mean this was the normal way of going about people's work.[76]

Tracey's early work as field botanist with the Survey was focused on addressing the practical problems of where to find the plants he required for testing, and how to obtain adequate specimens. However in the process of finding those plants, as he examined different areas of rainforest throughout Queensland, he began

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[74] Interview with Geoff Tracey, NLA TRC2845/46: 1.2.3 – 1.2.4
[75] Interview with Geoff Tracey, NLA TRC2845/46: 1.2.3
[76] Interview with Geoff Tracey, NLA TRC2845/46: 1.2.4

to grapple with broader questions about the patterns of plant distribution which he observed. He recalled that

> we were not only discovering where new chemical compounds were in relation to their distribution throughout the plant world in the area, we were actually finding that we knew very little about our own environment, the plant distributions patterns, which was a thing that started to fascinate me very early on. Because we had to go and locate certain types of trees, it was soon very obvious to even amateurs like myself that these trees were not scattered at random out there, they were found on particular types of environments, whether they were in swamps or in the edges of a dry country or in sands or in clay soils or whatever, you started to get this feel…[77]

In 1951 the Division of Plant Industry came under the stewardship of Otto Frankel, who was described by his colleague Lloyd Evans as 'a geneticist by training, plant breeder by occupation, cytologist by inclination and genetic conservationist by acclaim.'[78] Frankel widened the sphere of the Division's research considerably, and CSIRO scientists began to undertake work on plant biochemistry and physiology, genetics and cell biology.[79] An ecology section was established after lobbying from senior pasture researcher, Milton Moore, who had found himself 'changing from being an agrostologist interested in sown pastures to an ecologist interested in the effects of grazing on native grasslands.'[80] He soon attracted other researchers, and before long the ecology section included scientists working on alpine plant communities, spear grass vegetation in NSW, and the vegetation of the Riverina. Frankel made clear to Len Webb that in his view Webb's work on the Phytochemical Survey had moved out of the research stage and become a matter of simply collecting and testing plants for chemists, which was not a suitable investment in time for a CSIRO research scientist.[81] When he began to encourage Webb towards work in genetics, which was being undertaken in Canberra at that time, Webb asked – and was allowed – to join the ecology section and remain in Queensland. In 1959 he began the

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[77] Interview with Geoff Tracey, NLA TRC2845/46: 1.2.2
[78] Collis, *Fields of Discovery,* p. 206.
[79] *Ibid.*, p. 204.
[80] *Ibid.*, p. 214.
[81] Interview with Geoff Tracey, NLA TRC2845/46: 2.1.6

first official CSIRO research on the ecology of Australian rainforests. After a short period, Geoff Tracey was also moved across from the Phytochemical Survey to continue as his offsider.

While a small number of papers had been published on the classification of the vegetation of tropical Africa and tropical America during the 1940s in the US journal *Ecology* and the British *Journal of Ecology*, rainforests were an esoteric form of vegetation for many mid-century ecological scientists.[82] In 1952 Paul Richards' book, *The Tropical Rainforest* had been 'an eye-opener to most ecologists, since few had experience in the tropics.'[83] Robert McIntosh suggests that 'It was not until the mid-1960s that studies of tropical ecology became common and the tropics became the standard to which other regions were compared and in which ecological theories were generated and, where possible, tested.'[84]

Within the first year of the establishment of the Rainforest Ecology Unit Len Webb's article, 'A physiognomic classification of Australian rain forests', appeared in the *Journal of Ecology*, a publication of the British Ecological Society.[85] The choice by Webb of a British journal was a pragmatic one: only publication in an international journal would, at that time, guarantee a wide readership for his work. As Geoff Tracey put it, 'you could publish scientific articles in Australian literature, but no scientist worth his salt anywhere else in the world would ever read them.'[86] Webb's approach built on the methods of British ecologists such as A.G. Tansley and A.S. Watt, as well as the Canadian Dansereau, who, in mapping plant communities and studying the successional processes which occurred across such communities, had focused on structure as an important parameter for defining vegetation type. In his 1959 paper, Webb outlined a method of classification similarly based on vegetation structure which would identify the range of subformations of rainforest found in Australia. The

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[82] For instance J.S. Beard, 'Climax vegetation in tropical America', *Ecology*, vol. 25, (1944), pp. 127-58; and P.W. Richards, A.G. Tansley & A.S. Watt, 'The recording of structure, life form and flora of tropical forest communities as a basis for their classification, *Journal of Ecology*, vol. 28, (1940) , pp. 224 - 39.
[83] McIntosh, *The Background of Ecology,* p. 38.
[84] *Ibid.*
[85] L.J. Webb, 'A physiognomic classification of Australian rain forests', *Journal of Ecology*, vol. 47, no. 3, (Oct. 1959), pp. 551 - 570.
[86] Interview with Geoff Tracey, NLA 2845/46: 2.1.6 - 7

apparent clarity and simplicity of the process which Webb proposed in his 1959 paper is misleading. Tracey described the first experience of working within the rainforest as being like entering a 'green maze'; like many before him, he found it a complex and bewildering environment.[87] Before the work undertaken by Webb and Tracey, scientists had encountered 'the rainforest' in Australia as almost a monolithic entity, and neither popular nor scientific language had provided the tools to distinguish between what were in fact quite a diverse variety of ecosystems which came under the rubric of 'rainforest', 'jungle' or 'scrub'.

During the first half of the twentieth century, a number of scientists had attempted to offer ecological accounts of the rainforest vegetation of Queensland. Between 1909 and 1910 Karel Domin, a botanist from Czech University, Prague, had visited the state as he felt there was 'no other part of Australia which would be so interesting from the botanical standpoint', and during his visit he undertook fieldwork in North Queensland.[88] Domin sought to investigate the reasons for the distribution of various plant-associations within the region. He focused on the role played by the combination of soil-type and rainfall in determining the density and complexity of vegetation. Domin identified 'vine scrubs' as the form of association found, particularly in the coastal regions of North Queensland, on rich basaltic earth, or poorer soils where the rainfall was sufficient.[89] He described the vine scrub as a

> dense and thick forest association, with very little grass in the undergrowth, but with plenty of creepers (vines) and any amount of epiphytic plants on the trunks and branches of the trees. Orchids and ferns are the most numerous amongst them. There are many peculiarities in the vine-scrubs: the trees attain usually an enormous height, but their bark is regularly thin and their top not too dense. They are sometimes *cauliflor* (producing the flowers and fruit directly on the trunk or from old leafless branches), and they have on the base of the trunk dilated flanks.[90]

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[87] Interview with Geoff Tracey, NLA 2845/46: 2.1.4
[88] Karel Domin, 'Queensland's Plant Associations: (Some Problems of Queensland's Botanogeography)', *Proceedings of the Royal Society of Queensland*, vol. 23, (1910), p. 58. See also A.D. Chapman, 'Domin and Danes in Java and Australia, 1909 – 1910', in P.S. Short (ed.), *History of Systematic Botany in Australia: Proceedings of a symposium held at the University of Melbourne, 25 – 27 May 1988,* Australian Systematic Botany Society Inc., Melbourne, 1990, pp. 159 - 163.
[89] Domin, 'Queensland's Plant Associations', p. 59.
[90] *Ibid.*, pp. 60 - 61.

While Domin noted that there were ‘different types of vine-scrubs’, he described them in only the most general of terms on the basis of observations he had made during a limited period of field work. He did not have the opportunity or the resources available to offer a more qualified (let alone quantified) assessment.

The difficulties of formulating a detailed system of classification for the Queensland rainforests continued in the following decades. In the early 1930s E.C. Tommerup, while employed by the Queensland Forest Service, undertook research into the ecology of the forests of south-east Queensland. Tommerup noted that ‘the correlation of floristic distribution with environmental factors deserves increased attention from scientists’. However, he concluded that existing methods of vegetation classification which were intended to elucidate the relationship between species, climate and soil, while useful for the study of more open forest, were not applicable to the rainforests of Queensland.[91] By the late 1940s and early 1950s, attempts to classify rainforest vegetation within Australia had moved little further than to identify forests on a broad climatic basis, and note the presence of temperate, sub-tropical, tropical and monsoon rainforests, broadly along the lines established by Schimper at the turn of the century.[92] Webb’s 1959 publication, based on his and Tracey’s work in the Australian rainforests, suggested a way through the maze they had entered. Although the details of their structural schema would continue to be debated and scrutinised, Webb offered a new way of seeing those rainforests and, just as importantly, a new way of talking about them.[93]

The classification process outlined by Webb in 1959 began with a division made according to the predominant leaf size found in the forest. There were three possible categories: mesophyll, the larger leaf size typical of tropical rainforest; notophyll, found in sub-tropical areas or in the tropics on poorer soil; and microphyll, the smallest leaf, more common in temperate rainforest. Webb then made finer distinctions within these three groupings on the basis of a number of factors. He noted the presence and number of tree layers, and whether the canopy was closed, forming a

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[91] E.C. Tommerup, ‘Plant Ecological Studies in South-East Queensland’, *Proceedings of the Royal Society*, vol. 46, no. 10, (1934), p. 91.
[92] Webb, ‘A physiognomic classification of Australian rain forests’, p. 551.
[93] See also interview with Geoff Tracey, NLA TRC 2845/46: 2.1.7

dense layer which shaded and enclosed the species below, and stabilised the microclimate of the forest, or open and allowing sunlight and rainfall to directly reach the forest floor. He recorded whether the upper tree layers were dominated by a single, or by multiple species (which he referred to as simple or complex species dominance), and the presence and character of emergents, those occasional trees that break through the canopy to tower above it in the clear daylight. He noted whether emergents were deciduous, semi-evergreen (losing their leaves only as a response to conditions of drought), or evergreen.

Plank buttresses, a feature highly developed in tropical rainforest trees.

Webb observed other forms of vegetation which were common in the forest and which gave it much of its characteristic appearance: the vines (lianes) prominent in tropical rainforest in particular, which might be woody and thick as a man's arm or longer, thin, and wiry; the epiphytes which adorned the larger trees, and included numerous species of orchid, mosses, lichens and filmy ferns; the palms, such as *Licuala* or *Calamus*, which were so predominant in some swampy tropical areas as to form a transitional forest type which Webb referred to as 'Mesophyll Palm Forest'; tree ferns, found more commonly in sub-tropical and temperate rainforests; and the presence of plank buttresses on trees, an attribute most highly developed under 'hot humid conditions, where soil aeration is low', and which 'are popularly held to characterize tropical luxuriance.'[94] Webb also noted characteristics of leaves other than size, such as texture, whether leaves were simple or compound, the presence or absence of drip tips, serrated edges and so on.[95] Classification involved the systematic consideration of all these structural characteristics, and of the combinations in which they occurred. The result was a set of twelve distinguishable sub-formations of rainforest found in

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[94] Webb, 'A physiognomic classification of Australian rain forests', p. 559.
[95] *Ibid.*, p. 555.

Australia, and a further six types of transitional forest, containing a mix of rainforest and sclerophyll vegetation.[96] Each was identified by a three or four letter code, which conveyed information about its structural features and complexity.[97]

Here was a step-by-step method of classification which could be undertaken without reference to the precise species composition of the forest – the determination of which, in the species-rich rainforests, would require a high level of expertise and experience. While in the past, botanists with a scientific interest in the rainforests of the region had located, sampled and described its particular plant species, Webb looked beyond the individual species to the structural patterns which characterised the forest. He argued that in the more complex tropical rainforests, because so many species were present and because species composition varied even across quite small geographic areas, any attempt to identify which species were dominant (as recommended by Tansley as part of the process of structural classification) would be bound to be arbitrary to some degree, and would therefore not provide a sound basis for determination of forest types.[98] Webb also criticised existing classifications based on factors other than the vegetation features of the area – primarily those which distinguished forest types on the basis of latitude, as broadly indicative of climate, or of a single physical variable such as soil moisture (as Beard had done in his classification of tropical American vegetation). Webb suggested that to found the classification of a forest subformation, as he did, solely on the features of the vegetation 'avoids the presumption of simple cause and effect relations between plant communities and a relatively small number of independent habitat factors, and opens the way to quantitative studies of physical and biotic interrelations.'[99] This in part indicated the purpose of his classificatory system: over the coming twenty or so years he would follow his own advice, and continue not only to identify finer distinctions between forest types, but also to undertake quantitative studies of the relations of such

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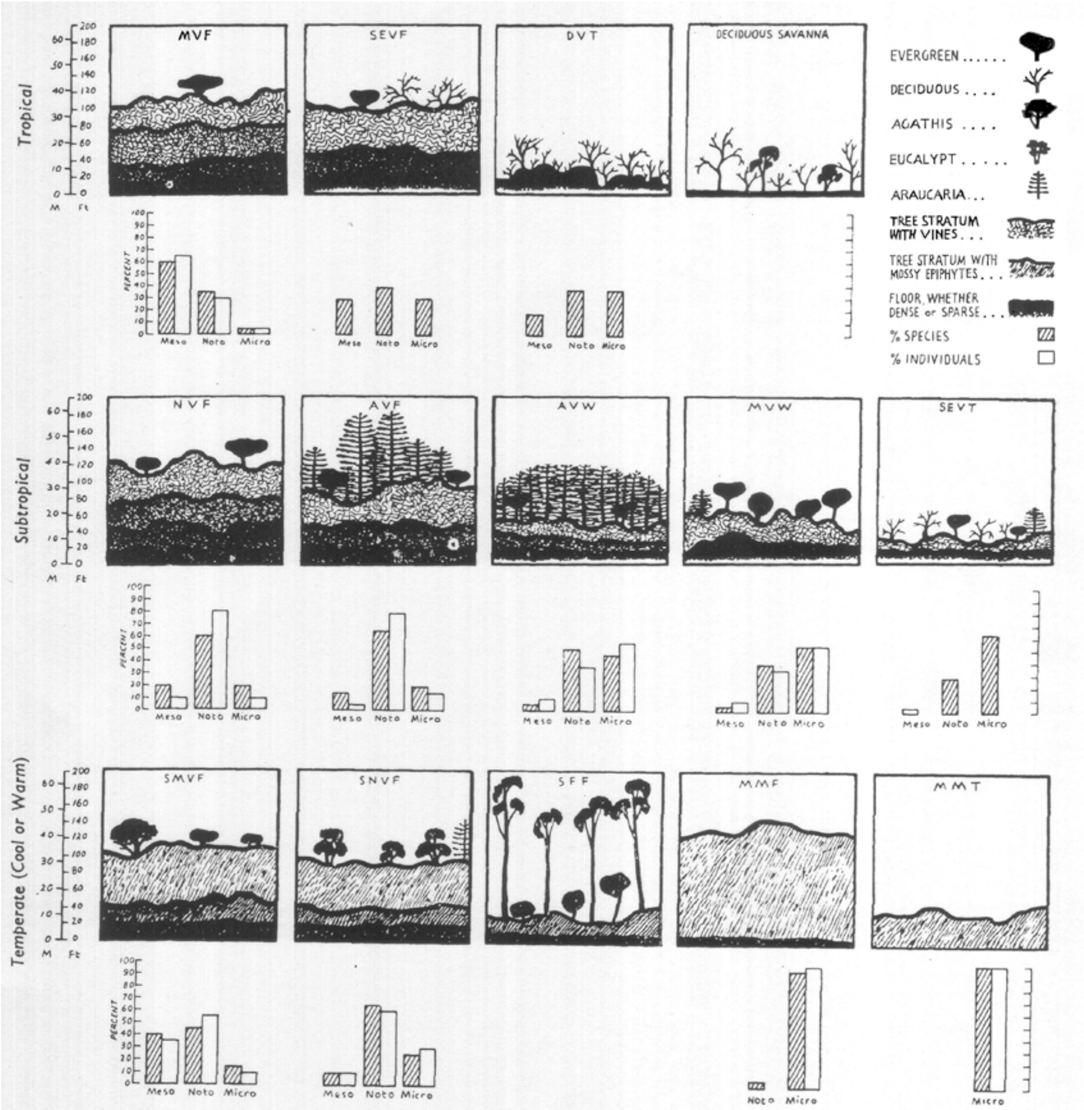
[96] This classification was further elaborated in L.J. Webb, 'Environmental Relationships of the Structural Types of Australian Rain Forest Vegetation', *Ecology*, vol. 49, no. 2, (Mar 1968), 269 - 311.
[97] See Webb, 'A physiognomic classification of Australian rain forests', p. 562 for a summary of the sub-formations and transitional forest types, and p. 567 for a listing of types with synonyms of names in popular usage in Australia, and in other methods of classification, such as Beard's in the United States.
[98] Species dominance was more appropriate when applied to temperate forests and simply not practical in categorising tropical rainforests. *Ibid.*, p. 554
[99] *Ibid.*

types to factors such as soil character and mineral availability, fire regimes, altitude and rainfall, and to examine how different types of forest regenerated after clearing.



Sketch of canopy silhouette from L.J. Webb, 'A physiognomic classification of Australian rain forests', 1958.

The top left formation, which later became known as Complex Mesophyll Vine Forest, (CMVF), represents the most dense and complex tropical rainforest, found generally on basaltic soils in areas of high rainfall.

Webb provided a key to his system, similar to a botanical key, which was designed to be used in the field and was intended to be relatively simple to follow, even for those without detailed botanical knowledge of the rainforest.[100] As his ongoing research revealed the dynamics of the various types of rainforests he identified and their relationship to the physical environment, Webb suggested that the key – or later incarnations of it based on further research – could be used to accurately predict the agricultural potential of forested areas. Frederick Manson Bailey had suggested that 'the plants speak the truth'; Webb found through the course of his fieldwork that their language was more complex than Bailey had anticipated, and that a history of misinterpretation by government departments and officials, and by farmers, had led to serious degradation of some areas that had previously been under rainforest.[101] Ultimately, Webb's classificatory system would provide a guide to the conservation of threatened habitats in North Queensland, and Len Webb, along with his colleague Geoff Tracey, would become one of the region's leading conservation advocates.

Webb argued that classification of rainforest should be based on 'mature, integrated and apparently stable forest, uncontaminated by other elements.' The article was illustrated with sketches of 'canopy silhouettes', which were simplified models designed to show change along a structural gradient of forest types ranging from the complex, multi-layered formation which would be found given an 'optimal' physical environment, through the increasing discontinuity and simplification of structure which occurred as the forest-formation moved onto impoverished soils or areas of lower rainfall. Webb's system of classification was based, though not unreservedly, on the notion of a climax community: a grouping of plants which had reached a state of structural stability through the process of succession. Certainly the range of structural formations he described were real phenomena, later found to be closely linked not only to rainfall and temperature, but also to soil types, fire regimes and mineral availability. Nonetheless the 'canopy silhouettes' highlighted a more general question, one which would be considered by Webb and Tracey in future publications and debated inconclusively over a long period by ecologists: do

[100] *Ibid.*, pp. 560 - 561
[101] Webb, 'Environmental Relationships of the Structural Types of Australian Rain Forest Vegetation', pp. 296 - 311.

classifications, such as that proposed by Len Webb, reflect actual and discontinuous ‘formations’ or do they simply provide a means of making distinctions within a gradient of often gradual[102] – but perhaps ongoing – structural and historical change? Does the language of classification refer to something ‘real’, or is it simply a construction, a tool which can be applied for particular human purposes? These questions may sound abstract, but as science and scientists entered the legal and political systems in debates over the conservation value of particular areas of rainforest, they were issues which would take on more than just a philosophical significance.[103]

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Optimal Complex Mesophyll Vine Forest.

Optimal habitat conditions in now rare residual lowland rainforest massifs in North Queensland. Showing high degree of diversity/complexity of life forms and structure accompanying high species diversity.

Source: L.J. Webb Ecological Images Collection, Griffith University.

An ongoing difficulty, according to one practising ecologist, is that, in part due to the complexity of its subject of study, ecological science is largely ‘conceptual rather than precisely quantifiable. It is rich in complexity, conjecture, and contention, and at best will provide general guiding principles rather than specific prescriptions for conservation practice.’[104] As Webb

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[102] Though as Webb and others have noted, Australian rainforests are noteworthy for the often sharp boundaries which occur between rainforest vegetation and sclerophyll vegetation, two very obviously distinctive types, within the rainforest itself graduated changes certainly occur. This is discussed in more detail in the following chapter.

[103] Webb discusses how these issues played out with reference to the inquiry into the logging of the rainforests of Terania Creek, at which he gave evidence. L. J. Webb, ‘After-dinner peroration’, pp. 95 - 99. For a recent discussion of these questions as they relate to the classification of species and implications for conservation management, see R. Schodde, ‘Populations, species or ?: taxonomy and the working units of conservation’, pp. 59 - 64, and D. Westcott, ‘Is what we see what we have got? Species concepts and modes of speciation in birds’, pp. 64 – 72, both in Saunders et al. (eds), *Perspectives on Wildlife Research*.

[104] A. Anderson, ‘Ecological Theory and Conservation Management’, in Saunders et al. (eds), *Perspectives on Wildlife Research,* p. 15.

noted, the very definition of rainforest remained elusive.[105] The notion of a climax community, most fully formulated in the work of Frederick Clements, had come under heavy fire from later ecologists.[106] It was also not clear to all observers whether distinctive levels, or storeys, of vegetation actually existed within the rainforest, or whether to talk of such structures was in fact merely a useful, but artificial, simplification of a complicated and irregular environment. At the same time that ecology became increasingly important in political decision-making and as a tool to manage the environment, ecologists were becoming increasingly divided about the nature and purpose of their own discipline.

Paul Sears described ecology as a 'subversive science', and the conservation stance of early ecologists working in Australia, such as Francis Ratcliffe and Alec Costin, supports that notion. Geoff Tracey's conservation concerns were initially based on pragmatic considerations; he recalled that his training at Gatton Agricultural College and experiences with relatives who lived on farms and cattle stations in North Queensland had made him particularly alert to the consequences of poor land use practices, such as clearing of rainforest from steep slopes, which had occurred in areas of the Atherton Tableland and elsewhere.[107] Len Webb was far from conservative even before he was further 'subverted' by his studies of ecology. In the anti-communist Menzies era of the early fifties, Webb had been targeted as a suspected communist as a result of activities he had undertaken as a university student a decade earlier. While he and Geoff Tracey had continued to be paid by CSIRO, they had been distanced from the institution, and Tracey was warned that his association with Webb would not stand him well in his future prospects within the organisation.[108] They were shifted out of the CSIRO Divisional Laboratory of Plant Industry in which they had worked, and into a room at the University of Queensland which was used to store equipment for the zoology department and also to kill animals for experimentation.

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[105] Webb, 'A physiognomic classification of Australian rain forests', p. 551. For a more recent discussion of these issues see David Bowman, *Australian Rainforests: Islands of green in a land of fire.* Cambridge University Press, Cambridge, New York, 2000.

[106] A.S. Watt (1947) in a paper on pattern and process showed that 'the climax is not fixed and that there are cycles in species dominance endogenously driven by the biology of the organisms.' This led to the debate over 'association' (Clements) versus 'continuum' (Watt following the earlier, 1926, work of Gleason.) Discussed by Brian Walker, 'The changing face of ecological and conservation theory', in Saunders et al. (eds) *Perspectives on Wildlife Research,* p. 9.

[107] Interview with Geoff Tracey, NLA TRC 2845/46: 2.1.10

[108] Interview with Geoff Tracey, NLA TRC 2845/46: 1.2.1

They were soon offered a more comfortable space in the University by the Professor of Botany, D.A. Herbert, and it was there they began work as the Rainforest Ecology Unit. After a few years a degree of rapprochement occurred – they were accommodated at the Long Pocket Laboratories of the CSIRO's Division for Animal Health by the Division chief, Harry Wharton, who had spent time working in Malaysia on malarial mosquito vectors, and was keen to have some 'rainforest ecologists' under his roof.[109] These early experiences were a preamble to an ongoing sense of tension Webb and Tracey felt between their increasing commitment to the conservation movement and their work as CSIRO scientists.

In late 1962, Len Webb was involved, with poet Judith Wright, in the formation of the Wildlife Preservation Society of Queensland, a group which would be vocal advocates of conservation at a time when the Bjelke-Petersen government was heavily focused on opening Queensland's resources up to foreign investors and encouraging the 'development' of the state by just about any means.[110] Judith Wright described Webb, who would become not only an important political ally but a close friend, as 'a vital and urgent man with a love for the magnificent forests he studied… [he] travelled to and fro, talking to people and making himself unpopular, but also being heard by those with foresight.' She recalled that Webb always returned to Brisbane from field trips 'imbued with the tragedy' of the destruction which was being wreaked as

> the rainforest continued to be felled and burned, and plants and animals unknown, or almost unknown, to science, and never to be replaced, went up in smoke. Progress was the cry, and progress we got, no matter how destructive and planless.[111]

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[109] Interview with Geoff Tracey, NLA TRC 2845/46: 1.2.2

[110] For a discussion of the Bjelke-Petersen era see R. Fitzgerald, *From 1915 to the Early 1980s: A History of Queensland,* University of Queensland Press, St. Lucia, Queensland, 1984. Part 2: '1957 to the Early 1980s: Conservative Monopoly'. The conservation movement is discussed in detail in Chapter Six. For the view of a contemporary conservationist, see J. Wright, *The Coral Battleground*, Thomas Nelson, West Melbourne, 1977.

[111] Wright, *The Coral Battleground*, pp. 3 - 4.

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Clear fall of rainforest drying out before burning and seeding with pasture grasses. Upper Johnstone River near Mt Hypipamee National Park,

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Clearing and grazing near the Daintree River, 1962.

Source: L.J. Webb Ecological Images Collection, Griffith University.

Tracey recollected that

> Len and I have always been activists and campaigners… We felt very proud to be able to use our science for looking after the environment and actually giving some scientific backup to the people who felt strongly enough to join these conservation movements. We had no compunction at all, since we were being paid as public
>
> servants, to actually fulfil this role of applying our scientific knowledge in the real world.[112]

So long as the Rainforest Ecology Unit continued to publish internationally recognised papers, the CSIRO continued to support their work. However Geoff Tracey recalled that they found themselves isolated within the institution, and were always concerned as to whether they would continue to receive funding.

The move to Long Pocket Laboratories turned out to be prescient in another sense as well. In return for Wharton's assistance in accommodating them, Geoff Tracey assisted Wharton by 'building a rainforest' in a gully near the laboratories with the application of treated effluent from the cattle store.[113] He used seedlings grown from seeds he had collected whilst out in the field, and planted them out, more opportunistically than systematically, on the basis of which species he had available. His success at growing that small area of rainforest – something not known to have been attempted in Australia previously – began to suggest the possibility not just of studying the processes of rainforest growth and the relationship of species in different formations, but of rehabilitating areas of rainforest that had been damaged or destroyed by clearing.[114] Tracey recalled that he 'used the confidence … [gained from the success of the Long Pocket rainforest] to actually write articles … There was a little publication called Plant a Tree, in which I gave as an example the types of combinations of trees that should be planted in different types of rainforest

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[112] Interview with Geoff Tracey, NLA TRC 2845/46: 3.1.1
[113] Interview with Geoff Tracey, NLA TRC 2845/46: 2.2.5
[114] Interview with Geoff Tracey, NLA TRC 2845/46: 2.2.6

environments, which would result in the building of a rainforest ecosystem…'[115] He recalled that the Department of Forestry expressed little interest in his work, as their main concern was with growing single-species plantations (primarily of radiata and hoop pine), and the notion that multiple species plantings could be viable was largely dismissed. Geoff Tracey continued to experiment with replanting rainforests in areas around Brisbane. Before long he experienced the frustration, which would eventually become all too familiar, of his rehabilitation work being disrupted by poor council planning when an area he had restored over a period of years was obliterated by having a road constructed through it.[116] When he returned to North Queensland in the early 1980s, to live on the Atherton Tablelands, Tracey built on his earlier experience by setting up extensive programs of rainforest rehabilitation, particularly around water-courses, and gaining the support and involvement of private landholders.

Len Webb published proficiently during his career as an ecologist with the CSIRO, from the first article of 1959 through to 1980 when he 'retired' to take a position at Griffith University. He wrote papers both on his own and co-authored with Geoff Tracey and others. While Tracey had a detailed, on-the-ground knowledge of the rainforests and of rainforest species which was vital to even the most technical papers they composed, Len Webb had the writing skills and university training which gave him authority and credibility as a 'scientist'.[117] Their publications examined the ecology of Australian rainforests from a number of angles, and included theoretical research papers published in international scientific journals, applied papers published in the *Australian Forestry Journal*, and popular writings, often advocating conservation, directed to a variety of audiences. Tracey states that he and Webb regarded it as an important part of their job as scientists to try to maintain connections with foresters and agriculturalists, and to attempt to communicate scientific findings in such a way that they might help to minimise the environmental damage caused by forestry operations and by farming in rainforest areas. As Australia was the only first world nation in which tropical rainforest was found, they also hoped that their work might be of assistance in guiding the environmental management of rainforest by

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[115] Interview with Geoff Tracey, NLA TRC 2845/46: 2.2.7
[116] Interview with Geoff Tracey, NLA TRC 2845/46: 2.2.9
[117] Tracey discusses these issues - his view of his and Webb's partnership, and his treatment by the CSIRO after Len Webb's retirement - in detail in his interview. NLA TRC 2845/46: 3.2.1 – 3.2.2

neighbouring nations in south-east Asia, which did not have the same resources to apply to ecological research as were available in Australia.

Geoff Tracey believed that, in many instances, the work undertaken by the CSIRO Rainforest Ecology Unit was at the forefront of ecological science globally, in both the problems addressed and the techniques applied. For instance, Webb and Tracey undertook research in the mid 1960s on alleopathy (the way in which plants kill other plants through secretions of antibiotics) and its role in maintaining diversity in rainforests, a field which Geoff Tracey described 30 years later as still being largely unexplored. Through the late 60s and early 70s, they worked with Professor Bill Williams, whom the CSIRO had 'imported' from England 'to be the go-between between the newly invented technology of computers and the CSIRO biological scientists, who were having the devil's own job in actually publishing their scientific work.'[118] Tracey believed that the use of computers was important in making the sort of work he and Len Webb were doing 'respectable' for scientific journals, which were biased towards the physical and chemical sciences. Webb recalls the collaboration as being an exciting and productive one. He recollected that before he began working with Williams he felt he had reached a dead-end in his understanding of the rainforests; the techniques and insight Williams offered allowed Webb to make significant breakthroughs in his own understanding.[119] On the basis of their work with Williams they published a series of papers entitled 'Numerical Analysis of Complex Rain-forest Communities,' in which they subjected the large quantities of data they had accumulated about various rainforest sites to computer-based analysis, a process which allowed them to uncover patterns within their data that had not been visible either on the ground during their fieldwork, or in their own unassisted analysis.

The authors stated, in the introduction to the first paper of the series, that

> The complexity of the ecological relationships between physical factors, natural biological communities, and the impact of man in tropical regions has handicapped basic research in scientific land use. Answers to these pressing problems

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[118] Interview with Geoff Tracey, NLA TRC 3.1.3
[119] Len Webb, personal communication with author, April 14 2005, Brisbane.

> can no longer be found by traditional methods, and require the rapid development of new theoretical principles to guide the classification of site productivity and stability under tropical conditions.

These 'new theoretical principles' would be based on the use of computer analysis of ecological data, a process which could handle (even in the 1960s!) much higher levels of numerical complexity than 'traditional methods'. The papers which followed were largely concerned with comparisons between different forms of analysis, different computational programs, and different modes of classification, with the aim of determining the most effective methods of addressing the pressing and practical problems of land management. They stated that:

> Any general theory of exploitation or conservation requires the prior solution of four problems, viz.: (i) categorization of forest systems … in order that general, rather than particular, statements may be made concerning the categories; (ii) establishment of a procedure whereby new sites can be allocated to existing categories, or quickly recognized as unallocatable within the existing system; (iii) establishment of the extent to which the categories reflect environmental factors, and the nature and relative importance of the factors concerned; and (iv) systematization of existing knowledge relating known environments and management systems to yield of agricultural crops.[120]

In other words, they aimed to use new computing technology and numerical analysis of data to relate characteristics (forest data, either structural or taxonomic), with treatments (management and improvement systems) and outcomes (such as agricultural yields). The authors also took the opportunity, on occasions, to consider the illumination such methods provided to longstanding ecological debates, including those over the continuity versus discontinuity of formations,[121] the significance of sample size in ecological research,[122] and the role of autogenic (developmental

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[120] L.J. Webb et al., 'Studies in the Numerical Analysis of Complex Rain-forest Communities: I. A comparison of methods applicable to site/specific data', *The Journal of Ecology*, vol. 55, no. 1, (Mar., 1967), p. 171.

[121] L.J. Webb, 'Studies in Numerical Analysis of Complex Rain-Forest Communities: V. A Comparison of the Properties of Floristic and Physiognomic-Structural Data', *The Journal of Ecology*, vol. 58, no. 1 (Mar., 1970), p. 205.

[122] L.J. Webb et al., 'Studies in the Numerical Analysis of Complex Rain-Forest Communities: II. The Problem of Species-Sampling', *The Journal of Ecology*, vol. 55, no. 2, (Jul., 1967),

processes inherent in organisms) and allogenic (environmental) factors in succession.[123]

The authors began by stating that previous work undertaken on temperate flora had shown that 'even in apparently simple situations a numerical analysis may disclose features of importance that can be overlooked in subjective assessment.'[124] Such newly available methods of analysis were seen, therefore, as having great potential to increase ecologists' understanding of the dramatically more complex environment of the tropical rainforest. And certainly the application of numerical analysis to Webb and Tracey's existing rainforest data provided some illuminating results: it revealed, for instance, that for the purposes of a floristic (species-based) classification, a relatively small number of species of 'big trees' (barely 25% of 'big tree' species, which was barely 8% of the total range of species considered) were sufficient to 'predict' the classification which had been arrived at based on an analysis of the full range of species present.[125] Another paper reported on a rare example of a quantitative study of plant succession. The data for the study were obtained over the course of seven years, and were based on the experimental clearing of a number of small plots of rainforest, and the observation of the successional processes which ensued. The authors concluded:

> In the form in which we have presented the results the problem may have appeared simple, but this was not our impression before the quantitative observations were made and the data analysed. Before this, qualitative observations on different patches of secondary growth had not revealed the change from temporal to spatial organization, nor the subtle effects of microsite factors. Moreover, without the analyses the detailed sequence of events which led to the establishment of two separate communities – the immature rain forest and the *Lantana* thicket – would have remained obscure, and the ecological problems involved would not have been explicit.[126]

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[123] W.T. Williams, G.N. Lance, L.J. Webb, J.G Tracey, and M.B. Dale, 'Studies in Numerical Analysis of Complex Rain-Forest Communities: III. The Analysis of Successional Data', *The Journal of Ecology*, vol. 57, no. 2, (Jul. 1969), p. 532.
[124]Webb et al., 'A comparison of methods', p. 172
[125] Webb et al., 'The Problem of Species-Sampling', pp. 529 - 531.
[126] Williams et al., 'The Analysis of Successional Data', p. 532.

In the following paper, which was concerned with the problems of effective sampling of forests to elucidate small-scale vegetation patterns, the authors again concluded:

> Those unfamiliar with these forests may perhaps feel that the ecological results are not especially striking or novel; but we must stress the special difficulties involved. Two of us had not only been familiar with the area over a considerable period of time, but had also been involved in the process of mapping the individual trees; yet, such is the density of the vegetation concerned, the importance of variation in slope, as distinct from variation in altitude, had not been appreciated, nor had the special position of what we have called site group B, as a pioneer area in the course of elimination, been grasped.[127]

Although the utility of numerical analysis to the study of rainforest ecology was clearly demonstrated in this series of papers, one of the most interesting problems which continually arose in the discussion of results was the role of human observation, experience and intuition in both the gathering and assessing of ecological data. Numerical analysis was a powerful tool, however sites still needed to be selected and data to be collected – and these were processes which, particularly in unfamiliar rainforest environments, posed practical problems and necessitated judgements to be made on the basis of both the past experience of the researchers and the purposes of the analysis. The papers also often involved the cross-checking of ‘ecological intuitions’ against ‘numerical analysis’ and back again in a complex (and sometimes admittedly circular) interplay of method, logic, and data.[128] The fifth paper, ‘A Comparison of the Properties of Floristic and Physiognomic-Structural Data’ most explicitly addressed the role of the observer. It was directed at the argument, on which Len Webb originally based his method of classifying rainforests according to structure, that the major difficulty with a floristic approach to classification is that it required highly trained and experienced observers, whereas ‘in those areas where

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[127] W.T. Williams, et al., ‘Studies in Numerical Analysis of Complex Rain-Forest Communities: IV. A Method for Elucidation of Small-Scale Forest Pattern’, *The Journal of Ecology*, vol. 57, no. 3, (Nov., 1969), p. 651.
[128] Webb, ‘A Comparison of the Properties of Floristic and Physiognomic-Structural Data’, p. 217, for an explicit discussion of this logical dilemma.

survey is most needed the flora is both at its richest and least known. In contrast,' the authors argued, 'relatively inexperienced observers can be trained to recognize and record physiognomic-structural features after only a short period of tuition.'[129]

The fifth paper reported the results of a study which compared the effectiveness and utility of the two classification methods through an examination of around 70 sites, some very different and others closely related. Geoff Tracey, appropriately playing the role of 'experienced observer', collected a spot list of canopy tree species; while a pre-selected list of structural features (based on Webb's existing classification system honed by computational analysis) was recorded by observers to whom the process – and in some cases the rainforest vegetation as a whole – was novel.[130] In the course of the study, which was intended to provide a comparison between two methods of classification, it became clear that also under examination was the variability of the observers' ways of seeing the rainforest. The authors reported that observers had difficulty attributing different structural features (such as lianes or plank buttresses) to the simple three-point scale which was designed for the collection of structural data. The observer had to decide whether a given feature was '1' absent or rare but inconspicuous, '2' occasional or rare but conspicuous or '3' common, either uniformly or in patches. The authors reported that this scale was

> insufficiently explicit for an observer not familiar with the whole range of variation… For example, an occasional plank buttress or a robust liane was, to an observer new to this type of vegetation, a conspicuous and striking object, and liable to receive a score of 3, whereas an ecologist familiar with the luxuriance of these life-forms in more favourable conditions would have been content with a score of 2 or even 1.[131]

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[129] *Ibid.*, p. 204.

[130] In the following paper, the authors concluded, on their recommendation for spot-lists of species to be undertaken, that 'it has been possible in the present work since one of us (J.G.T.) is sufficiently familiar with the trees of the Eastern Australian rain forests to undertake identification to species level virtually on sight. Experience at this level is very seldom available, and the collection of materials from a large plot for later identification is then an impossibly onerous task.' W.T. Williams, 'Studies in the Numerical Analysis of Complex Rain-Forest Communities: VI. Models for the Classification of Quantitative Data' *The Journal of Ecology*, vol. 61, no. 1, (Mar., 1973), pp. 67 - 68.

[131] Webb, 'A Comparison of the Properties of Floristic and Physiognomic-Structural Data,' p. 217.

Similarly the estimation of leaf-sizes, the basis of a primary division in Webb's original classification, proved difficult. The estimation was intended to be of canopy leaf-size, as that which showed the leaf in its optimum state of growth, however observers tended to be influenced in their estimations by the leaf-sizes of the understorey. Recognition of emergents, another important structural feature, again proved difficult. The structural data collected by the observers was inconsistent and hard to reconcile in a number of areas. Unlike the record of species which could take the form of 'presence or absence data', with specimens being referred to the herbarium for definitive identification when necessary, the recognition of structural features is complicated by the basic fact that they 'do not have a clear cut-off point so sharply defined that all observers will agree upon it.'[132]

Nonetheless, the authors concluded that the study had shown that both floristic and structural features can be equally useful at the 'forest-management level'. They went on to comment that:

> It is now clear to us that even an experienced worker cannot expect to produce a stable and communicable typology by intuitive inspection of so intricate a system. When our observers were collecting the basic data, the senior author independently recorded his own assessment of the position it would occupy on his own structural classification (Webb 1968); except in the extreme cases of the dry scrubs and thickets, the wet large-leaved tropical forests on good soils, and the wet sclerophyll forests, agreement with any of the four classifications reported here was poor.[133]

Through their work in numerical analysis of rainforest, Webb, Tracey and the scientists they collaborated with, aimed to make it possible to uncover in detail the relationship between different forms of vegetation, the physical environments in which they were found, and the processes which occurred after vegetation was disturbed or removed. This work drew on earlier notions of vegetation as an

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[132] *Ibid.*, p. 223. Of course this could also sometimes be the case for determination of species! But at least the type specimen of the herbarium offered formal grounds for floristic determination of which there was no structural equivalent.

[133] *Ibid.*, p. 220

environmental indicator,[134] and was based on a recognition of the importance, for human purposes, of knowledge of the dynamic structure of the forests. During the course of their fieldwork with the Rainforest Ecology Unit – from late 1940s to 1980 – Webb and Tracey had observed the continual opening up of rainforest lands for agriculture and forestry. Their work was intended to provide a framework within which these activities might take place in a more efficient and orderly manner.

However all the time that they were working on the rainforests, the rainforests were also working on them. The more extensive and detailed their observations and the more powerful the tools at their disposal, the greater their awareness of the complexity of the forests, and of the limitations of human knowledge and understanding. In his 'Introduction' to *Australian Tropical Rainforests: Science – Values – Meaning*, Len Webb quoted English tropical botanist, John Corner:

> I measured my insignificance against the quiet majesty of the trees. All botanists should be humble. From trampling weeds and cutting lawns they should go where they are lost in the immense structure of the forest. It is built in surpassing beauty without any of the necessities of human endeavour; no muscle or machine, no sense-organ or instrument, no thought or blue-print has hoisted it up. It has grown by plant-nature to a stature and complexity exceeding any presentiment that can be gathered from books, and it is one of the most baffling problems of biology.[135]

In a recent interview, Webb described his work within the rainforest as leading to a process of 'cathexis' – a process by which he invested an emotional significance into the forests themselves. He said 'Something rubbed off… I can't explain it… Something happened…'[136] During the course of his long friendship with Judith Wright, Webb shared with her the sense he had developed of the forest. In 1983 she sent him a poem, "Rainforest", which emerged from their discussions and expressed

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[134] The logical difficulties of establishing simple cause and effect between vegetation and physical environment are discussed, but were considered to not fundamentally negate the value which the use of vegetation as an environmental indicator has had over the years, *Ibid.,* pp. 203 - 204.
[135] Webb & Kikkawa (eds), *Australian Tropical Rainforests*, p. 1.
[136] Len Webb, interview with Ian Fraser, December 1, 2001, Brisbane.

their belief that 'the forest, like the world generally, could be properly understood only by those who had experienced and shared in its life.'[137] She wrote:

> We with our quick dividing eyes
> measure, distinguish, and are gone.
> The forest burns, the tree-frog dies,
> yet one is all and all are one.[138]

While Len Webb and Geoff Tracey may have begun their fieldwork in North Queensland with an acceptance of current practices of exploitation of rainforest areas, over time their experiences studying the ecology of the rainforests led them to doubt the course that European settlement of those areas was taking. And at the same time that their evaluations of the history of European settlement of the region began to shift, so too did their notions of the evolutionary history of the rainforests.

[137] V. Brady, *South of My Days: A Biography of Judith Wright*, Angus & Robertson, Sydney, 1998, p. 429.
[138] J. Wright, 'Rainforest', *Collected Poems 1942 – 1985,* Angus & Robertson, Sydney, 1994, p. 412, quoted in Brady, *South of My Days,* p. 429.

Chapter Five Re-writing Histories

During the second half of the twentieth century, there were two significant shifts in scientific understanding of the origins and history of Australian rainforests. Firstly, the notion that these rainforests were relatively recent introductions from nearby New Guinea or south-east Asia was overturned, and a new vision of rainforest as an ancient and truly Australian environment was outlined and promoted. Secondly, Aboriginal burning was postulated as having been an important factor in establishing and maintaining boundaries between sclerophyll and rainforest vegetation prior to European occupation of the rainforest lands. This re-writing of the history of the Australian rainforests was not only significant scientifically; it also resonated with potent questions regarding Australian nationhood and identity which would be more fully articulated as these scientific visions were adopted by the conservation movement during the 1980s. Above all, the new understandings of the past of the rainforest revealed it to be a dynamic historical environment, ever-changing in both extent and composition.

Scientific understanding of the evolutionary history of the Australian vegetation on the geological time scale has been shaped by two revolutions: the first, in biological thought, was ushered in by Darwin and Wallace in the mid-nineteenth century; the second, in geological thought, was introduced by Wegener at the beginning of the twentieth century, and then gradually confirmed by force of evidence. Both of these revolutions highlighted the ubiquity of change in the natural world: not only are species mutable and historical entities, but the continental landmasses, which give shape to the world such species inhabit, have also changed dramatically over geological time. In the words of botanist J.M.B. Smith:

> Vegetation is vibrant with change – with short term fluctuations, medium-term successions and longer-term evolutionary changes; its constituent taxa are ever able to migrate wherever conditions in some way change to allow it. This dynamism needs to be superimposed over the palaeogeographical picture of slowly sliding continents, upthrusting and downwearing mountains, the rise and fall of land and sea,

> and the changing picture of world climates. The resultant pattern of kaleidoscopic complexity is simplified in appearance only by the paucity of the fossil data…[1]

In 1860, J.D. Hooker first outlined the evidence regarding the distribution and affinities of the Australian vegetation in the introduction to his *Flora Tasmaniæ*. He took on this considerable task because he believed that it was not possible to understand the flora of a single region without considering its relationship both to those regions surrounding it and – more particularly – to similar species and formations found elsewhere in the world. Hooker's work was based not only on his peerless access to botanical resources from his base at Kew Gardens, but was compiled after a four-year voyage with the *Erebus* and *Terror* which, between 1839 and 1843, had taken him through the southern waters of Antarctica, New Zealand, and Tasmania.

Botanical specimens had been reaching European collections from Australian shores since the voyages of the eighteenth century, and at an increasing rate since the spread of settlement and inland exploration of Australia during the nineteenth century. Antipodean plants had aroused great curiosity amongst European botanists. By the mid-nineteenth century, according to Hooker, the flora of Australia was

> justly regarded as the most remarkable that is known, owing to the number of peculiar forms of vegetation which that continent presents. So numerous indeed are the peculiarities of this Flora, that it has been considered as differing fundamentally, or in almost all its attributes, from those of other lands; and speculations have been entertained that its origin is either referable to another period of the world's history from that in which the existing plants of other continents have been produced, or to a separate creative effort from that which contemporaneously peopled the rest of the globe with its existing vegetation; whilst others again have supposed that the climate

[1] J.M.B Smith, 'An introduction to the history of the Australasian vegetation', in J.M.B. Smith (ed.), *A History of Australasian Vegetation*, McGraw-Hill Book Company, Sydney, 1982, p. 27.

> or some other attribute of Australia has exerted an influence on its vegetation, differing both in kind and degree from that of other climates.[2]

In much recent ecological literature, Hooker is represented as having argued that rainforest was an 'alien' floral element within Australia, a newly-arrived invader from the north which he contrasted to the 'autochthonous' and more ancient eucalypt-dominated vegetation. In 1981 Len Webb and Geoff Tracey described Hooker's assessment of Australian rainforest flora as having its origin in 'late invading elements from the "Indo-Malayan" region', and elsewhere in the same year the depiction was simply 'alien and invasive'.[3] While such terms do carry some of the general sense of Hooker's argument they also bear a strong political resonance. Conservationists utilised such resonance to the full when they contrasted Hooker's view with new scientific understandings of the origins of rainforest, in the fight for the preservation of those forests in the 1980s.[4] However, it is more accurate to state that Hooker was concerned to provide evidence demonstrating the connectedness of a range of Australian flora with that found on other continents.

Hooker was well acquainted with the ideas of Charles Darwin, a close personal friend with whom he maintained an extended correspondence since their first meeting in 1843. According to Janet Browne, Hooker was 'the naturalist to whom Darwin most frequently turned for advice and criticism.'[5] In 1858 Hooker had encouraged Darwin to publish a short piece on the evolution of species by natural selection in the *Journal of the Linnean Society*, which appeared alongside an article by Alfred Russell Wallace exploring similar themes.[6] It is not surprising, then, that in

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[2] J.D. Hooker, *The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror, In the Years 1839 – 1843, Under the Command of Captain Sir James Clark Ross, KT., R.N., F.R.S. & L.S., etc.* Part III. *Flora Tasmaniæ*, Vol. I. Dicotyledones, Lovell Reeve, London, 1860, p. xxvii.

[3] L.J. Webb & J.G. Tracey, 'Australian rainforests, patterns and process', in A. Keast et al., *Ecological Biogeography in Australia*, W. Junk, Den Haag, 1981; L.J. Webb & J.G. Tracey, 'The rainforests of northern Australia' in R.H. Groves (ed.), *Australian vegetation*, Cambridge University Press, Cambridge, 1981, p. 67.

[4] This is discussed in detail in Chapter Six.

[5] Browne, *The Secular Ark*, p. 131.

[6] Charles Darwin, 'On the tendency of species to form varieties, and on the perpetuation of varieties and species by natural means of selection,' *Journal of the Linnean Society of London (Zoology)* vol. 3 (1858), pp. 45 - 62. It was Darwin's reading of Wallace's article, on which Wallace had sought his opinion, which provoked him at last to publicly present his own theory. For further details see J.L. Brooks, *Just before the origin: Alfred Russell Wallace's Theory of Evolution,* Columbia University Press, New York, 1984.

Hooker's discussion of the origin and relationships of the flora of Australia in the *Flora Tasmaniæ*, which was published shortly after, he incorporated and responded to the ideas of Darwin and Wallace. He suggested that

> The Natural History of Australia seemed … to be especially suited to test such a theory, on account of the comparative uniformity of its physical features being accompanied with a great variety in its Flora; of the differences in the vegetation of its several parts; and of the peculiarity both of its Fauna and Flora, as compared with those of other countries.[7]

Like Wallace and Darwin, Hooker had been influenced by Lyell's unveiling of the great expanse of geological time and his exposition of the radical, inexorable, world-wide geological changes which had occurred over that time.[8] In his *Principles of Geology*, published in 1830, Lyell had attempted to overturn the catastrophist explanations which were the dominant means of making sense of the history of the earth and its land forms, (explanations which link back to the Biblical notion of the deluge),[9] and instead argued that the physical world had changed, and continued to do so, gradually over almost unimaginable lengths of time, in response to timeless and predictable physical processes – a doctrine of uniformitarianism.[10] Consequently, Lyell had

> brought to the study of animal and plant geography a deep sense of history – an appreciation of development over time, which was mirrored in the arrangement of today's organisms. He studied processes and thought about the dynamics of floras and faunas in conjunction with the continuing flow of geological change.[11]

Following Lyell, Hooker argued that there were 'two classes of agents, both of which may be reasonably supposed to have had a powerful effect in determining the

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[7] Hooker, *Flora Tasmaniae*, pp. ii – iii.
[8] *Ibid.*, p. xvii. On Lyell, see Browne, *The Secular Ark*, pp. 102 - 107.
[9] In the first chapter, 'Descent from Ararat', Browne describes how the early concerns of geology and biogeography arose directly from prior attempts to investigate in detail the biblical account of the deluge.
[10] J.H. Brown & A.C. Gibson, *Biogeography*, C.V. Mosby Company, St. Louis, 1983, p. 9.
[11] Browne, *The Secular Ark*, p. 103.

distribution of plants; these are changes of climates, and changes in the relative positions and elevations of land.'[12] These are the two factors with which scientists interested in explaining the distribution of species were to continue to grapple from Hooker's time until the present day. Given the immense time scales involved, and the paucity of – and difficulty of interpreting – geological and fossil evidence,[13] as well as the incomplete state of knowledge regarding the existing Australian flora, Hooker concluded that

> The problem of distribution is an infinitely complicated one … the mutations of the surface of our planet, which replace continents by oceans, and plains by mountains, may be insignificant measures of time when compared with the duration of some existing genera and perhaps species of plants, for some of these appear to have outlived the slow submersion of continents.[14]

Hooker's counter-intuitive vision of forms of plant life actually outlasting massive geological changes was a precursor to what later investigators would suggest with regard to the antiquity of elements in the Australian – including Australian rainforest – flora.

Hooker tackled the problem of the origin and affinities of the flora by compiling and statistically analysing lists of the natural orders of plants found in Australia, comparing those which occurred only in Australia with those which also occurred in other countries, and in each case noting where they were found. This method of 'botanical arithmetic' was devised by Alexander von Humboldt, and was particularly dominant in botanical studies during the first half of the nineteenth century.[15] As Queensland botanist D.A. Herbert later described the approach:

> Through a consideration of the types which are common or closely related, and their geographical distribution in the countries concerned, conclusions are

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[12] Hooker, *Flora Tasmaniæ,* p. xvi.
[13] *Ibid.*, pp. xix - xxii, c-cii.
[14] *Ibid.*, p. xxii.
[15] Browne, *The Secular Ark*, p. 59.

> reached as to the migration of antecedent floras whose mixing and sifting have culminated in the present plant populations.[16]

Hooker concluded that the families found in Australia were almost all also found elsewhere, though to varying degrees. He identified Indian floral elements in the north-west, Polynesian and Malayan in the north-east, New Zealand and Antarctic in the south-east, and South African in the south-west. Although Australia contains little alpine country, Hooker found that mountainous areas were home to New Zealand, Andean, Fuegian and European genera and species. As J.M.B Smith points out,

> Clearly land masses not in contact are likely to have different floras, and the more mutually remote they are, the more different may their floras be expected to be. Interest is immediately aroused when this is found not to be so. Some plant groups are found to occupy ranges which are separated by awesome dispersal barriers … There are two types of explanation for such patterns: to assume past earth movements which broke a former land connection between the now disjunct populations, or to account for the distributions in terms of dispersal of seeds over the very long distances indicated by present geography…[17]

In order to explain his findings, Hooker argued that there must have been former land connections between the southern temperate land masses.

Overall, Hooker concluded that

> the peculiarities of the [Australian] Flora, great though they be, are found to be more apparent than real, and to be due to a multitude of specialities affecting the species, and to a certain extent the genera, but not extending to the more important characteristics of the vegetation, which is not fundamentally different from that of other parts of the globe.[18]

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[16] D.A. Herbert, 'Presidential Address: The Relationships of the Queensland Flora', *Proceedings of the Royal Society of Queensland,* vol. 44, p. 2.
[17] Smith, 'An introduction to the history of the Australasian vegetation', p. 15.
[18] Hooker, *Flora Tasmaniæ* , p. xxvii.

He wrote, aptly, of his viewing the vegetation of Australia in a 'double light' – as simultaneously having characteristics peculiar to it, and taking its place in 'the existing Flora of the globe.'[19]

It is noteworthy that Hooker's conclusions, based as they were on available specimens and existing taxonomic work, were not made by means of an aesthetic assessment of the appearance of vegetation – such as led Dalrymple to describe the North Queensland rainforests as being 'Indian'.[20] They were, however, based on the expectation that natural classifications, derived from observable features of plants, offered an indication of closeness of relationship which could ultimately be traced back to a common origin.[21] The exact mechanisms of that relationship, and the implications of an attempt to express it through a system of classification, had yet to be fully explored.[22]

Hooker noted that the number of species in tropical Australia appeared to be 'extremely small', and stated that although 'many discoveries may yet be anticipated', the work up to that date of collectors such as Cunningham, Mueller, McGillivray and others led him to 'doubt whether future explorers will raise the known number of 2,200 tropical flowering species to much above 3,000.'[23] He also noted the curious fact that, although families, genera, and species from India, south-east Asia and the Pacific had found their way to Australian shores, there had been very little reciprocal migration of more peculiarly Australian forms, although genera such as *Acacia*, *Eucalyptus* and *Casuarina* 'flourish when planted in the Peninsula of India.'[24] He added that while the presence of 'Indian' species in tropical Australia 'could be

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[19] *Ibid.*, p. xxvii.
[20] Dalrymple, *Narrative and Reports*, p. 30.
[21] Hooker, *Flora Tasmaniæ,* p. iv, xii.
[22] David L. Hull, *Science as a Process: an evolutionary account of the social and conceptual development of science*, University of Chicago Press, Chicago, 1988, p. 102.
[23] Hooker, *Flora Tasmaniæ,* p. xl. None of the explorers listed had collected extensively in North Queensland rainforest areas – Mueller at this stage had not yet settled Dallachy into his role in Cardwell. A century later, botanist Nancy T. Burbidge, in 'The Phytogeography of the Australian Region', a work which closely followed Hooker's approach, wrote of the North-East Queensland region: 'Unfortunately there is no detailed account of the flora of the area and this analysis has had to be based on scattered records in taxonomic and more general botanical papers…' Nancy T. Burbidge, 'The Phytogeography of the Australian Region', *Australian Journal of Botany*, vol. 8, (1959), p. 134
[24] Hooker, *Flora Tasmaniæ,* p. l.

accounted for by trans-oceanic migration … this theory offers no explanation of the total absence of Australian species and typical genera in the tropical parts of India.'[25]

Despite Hooker's assertions that the tropical regions of Australia were relatively well-examined, at the time of publication of his 'Introductory Essay' the North Queensland rainforests had barely been penetrated by botanical collectors or botanists. Nonetheless, Hooker's outline of the origins of the Australian flora, and the tropical flora in particular, was subsequently regarded by most botanists as a largely useful and accurate account of the affinities of particular floral regions in Australia, and was not overturned until late in the twentieth century. However while such general approval was granted, a number of naturalists, in attempting to grapple with the taxonomic evidence at hand, offered slightly different interpretations to those given by Hooker. In doing so they can be seen as tentatively 'bridging the gap' between the earlier views espoused by Hooker, and later theories about the ancient, indigenous nature of Australian rainforests.

For instance, in an article on 'The Origin of Australia', presented to the Queensland Royal Society in 1907, geologist and past President of the Society, Sydney B.J. Skertchly began by stating that

> We are indebted to Sir J.D. Hooker for the first comprehensive view of the flora of Australia, and the long years that have passed since the masterly essay "On the Flora of Australia" was published in 1859, have not materially altered the views therein set forth.[26]

Skertchly noted the marked differences between the 'Australian' or temperate flora, found in present times at its most diverse in the south-west of the continent; and the 'Asiatic' or 'tropical' flora found in the north-east. He noted the statistical difference in species dispersal, suggesting that only 14% of the species listed in Bailey's *Queensland Flora* also occurred in Western Australia. Moreover, he stated that

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[25] *Ibid.*
[26] Sydney B..J. Skertchly, 'The Origin of Australia', *Proceedings of the Royal Society of Queensland,* vol. 21, (1908), p. 66.

> mere numerical statements convey but an inadequate conception of the difference between the so-called Extra-tropical and the Tropical floras. It is the general facies that is most striking, and I can best illustrate it by a personal reference. I came to Queensland after spending years in the primeval forests of the Far East, and my first introduction to the Australian forests was in the scrub of North Queensland. To me it was a revelation and somewhat of a disappointment. I knew, so far as the books and specimens can teach, what the peculiarities of the Australian flora were, but this Atherton scrub, this wild tangle of the Barron Gorge, was not Australian at all. It was pure Asiatic "utan rimabau" – the deep forest – I had left in Borneo. The same tall trees with broad shade-giving leaves, the same climbing "rotan" (*Calamus*), and even the insects, gaudy *Ornithopteras* and royal purple *Eupleas*, met me on every hand. It all looked familiar. Some years afterwards, when I had grown accustomed to this flora, I entered W. Australia for the first time, landing at Albany from S. Africa. What a revelation it was! At last I saw Australia-Vera: at last I was in a new and strange land…[27]

However, despite giving such emphatic statement of the true 'Australian-ness' of the flora adapted to arid and semi-arid conditions, and the 'Asiatic' or 'Oriental' nature of that found in the tropical regions, Skertchly went on to note that 'The Oriental flora is more Asiatic in general aspect than in number of species actually common to Australia and Asia', which, on his count, were 620 flowering plants and 200 species of ferns co-occurring between the two.[28]

Skertchly argued against the widespread view that the Australian flora and fauna were 'ancient'. He suggested, on the basis of both current distribution of plants and animals, and fossil and geological evidence, that in fact they had evolved in relatively recent times in response to changes in climate and sea levels.[29] He painted a vision of the very different 'Australia' that would have been found by a 'Cretaceous

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[27] *Ibid*., pp. 67 - 68.
[28] *Ibid*., p. 68.
[29] This is in contrast to the views of Hooker, who argued that the peculiarities of the Australian flora led to the conclusion that it was 'a very ancient one'. Hooker, *Flora Tasmaniæ,* p. cii. Skertchly in part was opposing the notion that evolutionary processes are by necessity gradual, and believed that the fossil record suggested that at some times, and under some conditions such as changes in climate, the process of speciation was much more rapid and diverse than Hooker suggested. Skertchly, 'The Origin of Australia', p. 81.

Cook', during which time, 'there was no Australian continent at all, but instead, an Archipelago consisting of two main islands, one in the west, the other in the north and east, with a number of smaller islands in between.'[30] The influence of the shallow sea found then in what are now desert areas of inland Australia, which he called the 'Opal Sea' and compared with the Arafaura of present, would have been to moderate the climate to 'temperate to warm-temperate, equable, and the land bathed with plentiful rains.'[31]

Skertchly suggested that there had been a much greater level of uniformity in the Tertiary flora than is presently evident, and that allied forms had been found across a wide range of latitudes and climates.[32] This was, he suggested, a flora in which '*the characteristic plants of Australia are but feebly represented.'*[33] Skertchly argued that 'the old universal flora had all the makings of the new flora in it – both the Orientalis and the Vera types – but when the Opal Sea became dry, only certain plants had adaptability enough to battle with the increasing heat and decreasing moisture. The rest died.'[34] He continued:

> But there was a great difference between Australia-Orientalis and Australia-Vera. The former, owing to its mountainous and coastal character suffered less in climate – it has continued to receive fairly, and in parts quite, abundant rain and so a portion of the old flora has been preserved, in spite of its inferior adaptability. This is the Tropical Flora which I prefer to call Oriental. It is as has been said, essentially Asiatic in facies, but the bulk is not specifically identical with the Asiatic flora – it is merely the tropical part of the Universal flora. This portion of our present flora, then, I look upon as a true survival.[35]

Skertchly identified the 'tropical flora' of the north-east of Australia as a relic of a flora much more widespread during the Tertiary, and perhaps established in the Cretaceous era. He went on to acknowledge the more recent incursion of some

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[30] *Ibid.*, p. 57.
[31] *Ibid.*, p. 58.
[32] This idea of a uniform flora at an earlier period of life's history stretches back to the work of Brongniart and de Candolle in the early nineteenth century, and was widely debated during the mid-nineteenth century. It is discussed by Browne, *The Secular Ark*, pp. 94 - 102.
[33] Skertchly, 'The Origin of Australia', pp. 69 - 70.
[34] *Ibid.*, p. 77.
[35] *Ibid.*

'Asiatic' species as a result of the geographical proximity between northern Australia and New Guinea, but his overall conclusions, based on the taxonomic, fossil and geological evidence, belied his more simple and immediate response to the physiognomic similarity between the rainforests of Borneo and those of North Queensland. The tropical flora was not a recent invader, identical with the 'utan rimabau' he had met with in Borneo, but was rather a 'true survival' of the massive climatic and geological changes which had taken place on the Australian continent over tens of millions of years.

It is noteworthy, and clearly illustrated by Skertchly's description of his own reaction to the North Queensland and Western Australian flora, that during the colonial era of the nineteenth and early twentieth century, many British or European-born botanists and explorers came to Australia with prior experience of India, or of various parts of South-East Asia.[36] As such, the rainforest of the north-eastern coast was in fact a more familiar – if still exotic – form of vegetation than that classed as 'Australian'. The 'Australian' trees, so well-adapted to arid conditions, with their sparse, hard, narrow, vertically-hanging leaves, their peeling bark and dull colouring, appeared alien and strange. This is in stark contrast to the views of those Australian-born scientists of the later twentieth century, who had largely grown up not only surrounded by the 'Australian' flora and with little experience of or exposure to rainforest environments, but also at a time in which a pastoral landscape dominated by gum-trees was a central national image – a landscape represented as truly and sentimentally 'Australian'.[37] The re-positioning of rainforest (which had always been considered to have aesthetically 'Asian' overtones) as an 'Australian' flora, and one perhaps even prior in evolutionary terms to the sclerophyll vegetation, thus presents a complex mix of both scientific discovery, based on advances in geology, palaeoecology and botany, and an attempt to expand the historical and aesthetic imaginations – and allegiances – of Australians.

Karel Domin followed Hooker in suggesting that the flora of Australia was composed of three main elements 'represented in a very unequal degree in the flora of

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[36] Including Skertchly, Dalrymple and Dallachy.
[37] Dunlap, *Nature and the English Diaspora*, pp. 100 - 102.

the different States': the 'true *Australian*' element, the 'so-called *Antarctic* element (named so by *Hooker*)' and the '*Malayan* (including the Papuan)' element.[38] He observed that

> The forest flora consists of true Australian types; the scrub [rainforest] flora for the greatest part of Malayan and Papuan types. The historic evolution of these elements has been *quite diverse*, and we find always that they never come into a friendly contact. They are of quite different character, and on localities where the conditions are not so decidedly in the favour of one of them, there results a *strong struggle* between them.

Domin stated that 'The wet tropical part of Queensland has altogether a true Malayan-Papuan flora, which shows that there was formerly a land or island connection and an easy way for propagation of this equatorial flora southwards.' He also suggested that

> it would not be correct to regard Queensland's tropical flora only as a new comer and a recent branch of the regions mentioned above. All we know seems to testify that: –
>
> 1. The tropical "Malayan" flora of Queensland is only a small remainder of a flora spread formerly over large areas, which are now mostly sunken into the sea. Accordingly
> 2. The flora does not consist only of the original Malayan types. These made only a base, but it has been transformed in the great number of genera and species, which are known only from the Australian Tropics (endemic in Australia). It seems that the separation took place at a very early epoch, so that the ancestors of the present tropical flora in Australia developed themselves quite independent of the Malayan flora, and originated a large number of new forms.[39]

Like Skertchly, Domin asserted the antiquity and floristic distinctiveness of the so-called 'Malayan' flora, found in the rainforest areas of north-east Queensland – though he attributed this distinctiveness to a long period of isolation from the original,

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[38] Domin, 'Queensland's Plant Associations', p. 71.
[39] *Ibid.*, p. 72.

Malayan 'parent stock'. Although Domin, unlike Skertchly, was not a geologist, he also highlighted the significance of geological processes in the shaping and distribution of the flora.

Botanist D.A. Herbert considered the evolutionary history of the Queensland rainforests in his Presidential Address to the Queensland Royal Society, delivered in 1932 on the topic of 'The Relationships of the Queensland Flora'. Herbert began by outlining Hooker's argument, and the methods of statistical analysis on which it was based, stating that

> An important point brought out by Hooker's analysis was that the families of Australia were almost all also found elsewhere, and though various families reach different degrees of development, many of the largest families here are the largest in the world as a whole.

However Herbert was critical of too strong a reliance being placed on the statistical method:

> Any study of the relationships of a flora, as a whole, cannot be simply statistical … Before we can examine the external relationships of a flora we must deal with its internal relationships – the opportunities for migration and establishment, the factors governing local distribution of its associations, and the past geological history which has so largely determined what raw material should be available for environmental factors to shape into the present flora. [40]

While accepting that the fossil evidence was scant and difficult to interpret accurately, Herbert suggested that recently discovered leaf impressions found in rocks purportedly dated to the middle Jurassic pointed to the 'ancient nature of angiosperm inhabitation of the continent.' Further, he added that fossil evidence indicated that

> The eucalyptus and various types now characteristic of both open forest and rain forest were well developed in the early Tertiary. Though the rain forest types are

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[40] Herbert, 'The Relationships of the Queensland Flora', p. 3.

> not necessarily tropical, they do indicate warmer conditions than obtain in those localities of the present day.

In consequence of this, Herbert stated that

> We must commence an enquiry of the relationships of the present flora, therefore, by recognizing that the continent has been inhabited by a diversity of both rain and open forest types since, at least, the early Tertiary, and that their geographical range has, in the past, been profoundly modified by climatic and geological change. In other words, the sifting effect of environment has been operating for a long time, and the mixing of types of various origins, and the elimination of others, has culminated in our present flora.[41]

Herbert went on to consider what might be meant by the 'Malaysian flora', and highlighted the distinction between genera of flowering plants found in the eastern and western regions of Malaysia, and the 'unstable insular area' in which the two types meet and mix, between Wallace's line on the west, and Weber's line on the east.[42] Wallace's line, which runs between Bali and Lombok, and Borneo and Celebes, was identified by A.R. Wallace in 1860 and 'separates two markedly different mammal faunas, solely placental in south-east Asia and predominantly marsupial in Australasia.'[43] Other attempts to define the boundaries between the Oriental and Australasian biotas (of which Weber's line is one) reflect the fact that 'different taxa have managed to penetrate different distances from their continent of origin into the islands of the East Indies.'[44] Herbert suggested that these two lines do not represent 'true biogeographic boundaries', but rather 'approximately define the limits of the two centres of origin and distribution, Sunda Land on the west, and New Guinea in the east.'[45] Herbert argued that the large numbers of endemic genera found in Queensland indicate the 'ancient character' of the palaeotropic element in Australia:

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[41] *Ibid.*, pp. 10 - 11.
[42] *Ibid.*, p. 12.
[43] Smith, 'An introduction to the history of Australasian vegetation', p. 12.
[44] Brown & Gibson, *Biogeography*, p. 234.
[45] Herbert, 'The Relationships of the Queensland Flora', p. 12.

> Eastern Malaysia and Western Malaysia differ considerably from one another, but North Queensland shows a further differentiation from New Guinea, North Australia from North Queensland, and South Queensland from North Queensland. The differences are sufficiently accounted for by the long continued sorting of types by climate without reference to the relative ages of the palaeotropic element in the different areas under consideration … the Australian palaeotropic element is restricted in range by climate and not by age.[46]

In a paper written almost twenty years later, 'Present Day Distribution and the Geological Past', Herbert addressed some of the same issues, and stated some of his conclusions more forcefully. Again he discussed Hooker, this time typifying Hooker's presentation of the origins of Australian flora a little more sharply, as being an account

> of immigrants pouring in from various directions and pushing out the truly Australian plants, and of a very restricted export from Australia … the whole "set-up" being rather similar to the human settlement of this Continent. When these so-called invasion elements are subtracted from the flora, we are left with those that are more or less peculiar; they are the autochthonous element and no-one can take them away from us.[47]

After outlining the characteristics of this 'autochthonous element', Herbert used the example of Queensland 'dry scrubs' derived from rain forest types, to show how under pressure of climate, some survivors of a dying flora may provide the base for a new association. He further suggested that it is possible that the 'Australian' vegetation found in sub-humid, semi-arid and desert (C, D and E) climates could, in fact, have been derived from a previous mesic vegetation (that is, vegetation adapted to moist conditions). He concluded that it seemed reasonable 'to regard the rain forest types, [and] the beech forests as equally Australian [as sclerophylls]. They are very

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[46] *Ibid.*, pp. 14 - 15.
[47] D.A. Herbert, 'Present Day Distribution and the Geological Past' *Victorian Naturalist*, April 1950, pp. 228 - 229.

old members of the flora.' [48] Herbert suggested that both the fossil record and the occurrence of residual rainforest types in places now far distant from the extant forests – such as the palms of the MacDonnell Ranges of Central Australia – provide strong evidence that such rainforest vegetation was previously much more extensive than at present.[49] To explain this change in distribution, Herbert adapted the notion of a land-bridge, so enthusiastically utilised by Hooker, and instead suggested that a 'climatic bridge' must, at some time past, have linked areas of the continent which now experience such radically distinct climates, and carry such radically different flora.

The debate surrounding the history of vegetation in Australia has invoked clear (sometimes explicit) metaphorical resonances with concerns about the human history of the continent. In discussions of the origins of the Australian rainforests, broader questions of race, identity and belonging have been raised. Rainforest was regarded an 'invader', and its presence was the result of its success in the struggle for survival against the autochthonous vegetation. Whether this explanation of the rainforests' origin was regarded as scientifically tenable or not, the story itself was seen clearly as a parallel to the European invasion of the continent and the historical processes of colonisation. However, the suggested Asian lineage of Australia's rainforests highlighted Australia's proximity to south-east Asia, and connected this invasion narrative with concerns over the security of Northern Australia, and long-held fears amongst many white Australians of a possible future re-invasion of 'their' lands. A closer examination of Herbert's account suggests that the debate about rainforests' origins could also carry a more complicated and nuanced message. Herbert argued against the notion that the separation of the Oriental and Australasian biotas represented a true biogeographic boundary, and highlighted the fluidity, interpenetration and interrelationship which existed between these supposedly separate 'elements'. As such, Herbert implied that any essentialist understanding of biogeographic identity, any exclusive focus on separation and competition as fundamental to the history of the region, was necessarily false. Further, Herbert suggested that even if the rainforest had originated from outside Australia, given the passing of time, it could eventually be legitimately considered to be 'Australian'.

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[48] *Ibid.*, p. 230.
[49] *Ibid.*

Hooker, Skertchly, Domin, Herbert, and others who discussed the origin and distribution of Australian vegetation prior to the late 1960s were attempting to grapple with an often scant and confusing array of evidence. Each responded to the problem of where the various floral elements of Australia had originated from and why they were now found where they were. Answers made reference to changes in climate and landform over geological time, to the rise and fall of mountain ranges and sea levels. Their examination of the rainforest flora of Australia showed that, although it did not appear distinctively 'Australian', in taxonomic terms much of it was not simply identical to that found to the north in Malaysia, or nearby in New Guinea. However the closeness of Northern Australia to south-east Asia and New Guinea – which had been connected by a land-bridge to north-eastern Australia during the Pleistocene glaciation – and the fact that recent floral arrivals were found on northern shores, further complicated the issue. Explanations were based on an analysis of the patterns of distribution observed in both present and fossil flora, and on a belief in 'the steady state of the earth's crust, its continents and archipelagos in supposedly fixed position.'[50] An important focus was placed on the processes by which plants might have arrived in Australia from elsewhere. Immigration was generally regarded as having occurred by two routes: an older route, following the Lesser Sundas to the north-west of Australia, and a more recent, late Tertiary or early Quaternary path, via New Guinea to the north. The latter provided the connection which 'had led to the ingress of rainforest taxa down the east coast, along with the Indo-Malayan elements of the flora.'[51] In the words of CSIRO ecologist Richard Schodde:

> Australia was still seen as something of a biotic vacuum, a bottomless cup waiting to be filled with everything that Eurasia could pour into it. The idea that Australia might have also had a vertebrate fauna, as well as a flora, as old as any in the world and had contributed colonists from its shores to Eurasia in reverse was barely considered.[52]

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[50] R. Schodde, 'Origins, Radiations and Sifting in the Australasian Biota – Changing Concepts from New Data and Old', (Nancy T. Burbidge Memorial Lecture, 1989), *Australian Systematic Botany Society Newsletter*, vol. 60, September 1989, http://www.anbg.gov.au/asbs/newsletter/burbidge-1989.html, p. 3.
[51] *Ibid*., p. 4.
[52] *Ibid*.

A final and comprehensive summary of this dominant viewpoint was offered by Nancy T. Burbidge, a century after Hooker's original statement, in a paper described as 'the apotheosis of a conventional interpretation that had continued from the time of J.D. Hooker.'[53] Burbidge restated the tripartite distinction in the Australian flora between the old, autochthonous, sclerophyll element – the 'Australian' – and the more recently arrived Antarctic and Indo-Malayan elements, which were best typified by the cool temperate forests of Tasmania and the tropical lowland forests of north-east Queensland, respectively.[54] She stated that north-east Queensland had provided one of the most important 'portals' to the Australian region, and that its present flora contained 'elements which have either failed to penetrate further or have not yet had time to disseminate.'[55] With regard to the theory of continental drift, Burbidge wrote

> The long-standing floristic relationship between Australia and Malaysia, a relationship which from geological evidence apparently extends back as far as the Cretaceous at least, coupled with affinities among both fossil and modern plants with the flora of South America but not with southern Africa, militates against unqualified acceptance of any of the hypotheses, such as that of continental drift, which have been proposed to explain biological affinities between the major land masses. Plant distribution patterns are facts which can be demonstrated and at this stage of our knowledge further critical analysis is more important than the correlation between available facts and proposed explanations.[56]

In the decade after Burbidge wrote, the rapid acceptance of the idea of continental drift revolutionised scientific understanding of the history of the earth and of life; and necessitated a radical rethinking of the origins and history of the Australian flora.

The notion that the continents may, in the past, have been somewhere other than their present locations, and in different relationship to each other, was first

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[53] *Ibid*., p. 1.
[54] Burbidge, 'The Phytogeography of the Australian Region', p. 201.
[55] *Ibid*., p. 203.
[56] *Ibid*., p. 77.

seriously proposed in the late nineteenth century. In 1885, Austrian geologist Eduard Suess observed that many of the rocks in India, southern Africa and Madagascar contained very similar plant fossils (*Glossopteris*), and so, he postulated, may have once been part of the same landmass.[57] He termed this ancient supercontinent 'Gondwana'. The idea of drifting continents was given its most detailed early enunciation by Alfred L. Wegener, who first outlined his theory of geological change in 1910, and whose major work, *The Origin of Continents and Oceans*, was translated into English in 1924. Wegener developed his ideas after 'observing on a world map the congruence of opposing coastlines across the Atlantic.'[58] While his original formulation was based on scant evidence, he ultimately synthesized the findings from a number of disciplines to support his theory: not only geology and geophysics, but also palaeoclimatology, palaeontology and biogeography. Wegener suggested that the major landmasses of the earth had once been united in a single supercontinent which he named Pangea. He argued that Pangea began to break up in the Mesozoic, and that the mid-oceanic ridge indicated where Europe and North America had once been joined. Wegener suggested that zones subject to active vulcanism, earthquakes and mountain-building were exhibiting the ongoing processes of movement of the crustal plates.[59] Although Wegener was able to amass circumstantial evidence in support of his theory, there was no way to demonstrate its validity conclusively to his many doubting critics, and there were no known geological processes which could explain the radical continental movements he proposed.

During the 1940s and 50s, more evidence began to mount in favour of Wegener's theory. Developments in the understanding of marine geology led to the discovery of the phenomena of seafloor spreading, which showed that the oceanic crusts were not static or fixed, but were involved in dynamic physical processes. Most conclusively, new techniques in measuring paleomagnetism enabled scientists to determine the orientation of landmasses at the time particular rocks were formed, as rocks containing iron and titanium oxide become magnetized as they solidify and cool, and so can act as fossilised 'compasses'. Paleomagnetic studies in the mid-1950s provided strong evidence that, as Wegener had suggested, Europe and North America

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[57] David Johnson, *The Geology of Australia*, Cambridge University Press, Cambridge, 2004, p. 252.
[58] Brown & Gibson, *Biogeography*, p. 130
[59] *Ibid.*

had once been joined and had later drifted apart. On the basis of this new evidence, an updated model of continental drift was proposed, which 'used the growth, movement and destruction of crustal plates to account for major tectonic events of the world (plate tectonics).'[60] An account of continental drift was presented by Herman Hess at Princeton University in the early 1960s, and was first published for a general readership in 1962. The predictions made by Hess, on the foundation of Wegener's original model, were tested and continued to hold, and through the mid 1960s further evidence mounted which corroborated the theory. Plate tectonics and continental drift were rapidly accepted by earth scientists, and by the early 1970s stood as geological orthodoxies.[61]

The acceptance of the idea of continental drift resulted in a re-appraisal of the way scientists – not only geologists, but also zoologists, botanists, biogeographers, and others – talk and think about the past.

> Simply defined, the theory of continental drift states that continents and portions of continents are or have been separate crustal entities that have rafted across the surface of the globe on the weak upper mantle. Thus the lithosphere is not composed of fixed ocean basins and continents, as was once supposed, but instead is a changing landscape in which once distant lands are now in juxtaposition and others once attached are now distantly removed.[62]

As geologist David Johnson states:

> It is important to realise that while we say something happened in Canada or South Africa, that is just because that is where the rocks lie today. In the Archaean these fragments were not assembled as they are today. The crust of the Earth has been moving since it first formed. The atlases and geography we know today are only true for now. In the past the landmasses were totally different shapes.[63]

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[60] *Ibid.*, p. 135
[61] *Ibid.*, p. 136. However, it took botanists – many of whom responded to these developments with 'outright rejection' – a little longer to accept the new theories than it did geologists. J.M.B. Smith, 'An introduction to the history of Australasian vegetation', p. 2.
[62] Brown & Gibson, *Biogeography*, p. 127.
[63] Johnson, *The Geology of Australia*, p. 73.

For instance, as part of Gondwanaland 'Queensland', which presently lies betwen 12˚ and 28˚ S latitude, 'was located near the north pole in the Proterozoic (1 billion years ago), at the equator in the Silurian, and at 40˚ S latitude in the Mesozoic.'[64] Writing in the late 1980s, ecologist Richard Schodde reflected on the lack of resonance between the way biogeographers in the 1980s were talking about biological history, and the significance of this changed vision of the Australian continent.

> Pick up any modern text and you will see bird geographers and reptile geographers talking about Antarctic dispersal routes into Australia via Gondwana and Indo-Malayan dispersal routes in via Indonesia. Even current phytogeographic treatises talk about Australia receiving its first stocks of angiosperms by north-west land bridges from Laurasia in the Cretaceous. The point I want to make here, and I can't stress it enough, is that whatever biotic elements Australia received before its break from Antarctica in the early Tertiary it inherited from Gondwana. If angiosperms did come into the region from the north in the Cretaceous, they came to Gondwana, and perhaps even the Australian-sector of Gondwana; but not to Australia as such. This point needs absorbing in Australian biogeographic thinking.[65]

To the extent that ecologists, bio-geographers and other scientists utilise historical narratives, the theory of continental drift raises some significant historiographical questions: How is it possible to write an historical account which reflects not only the flow of time, but also the movement of the ground on which events were played out? What does such a history mean when its reference to place is set adrift? And at what point is it no longer a history of 'Australia'? The difficulty of separation of ecological history from Australian history seems to have been more than a question of geological and terminological accuracy. The rich layers of meaning biogeography had derived from its metaphorical resonance with Australia's human past seemed to have been abruptly sundered.

The acceptance of Australia's past as part of Gondwana necessitated a re-thinking of the prominence previously given, in most theories of vegetation history

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[64] Brown & Gibson, *Biogeography*, p. 143.
[65] Schodde, 'Origins, Radiations and Sifting of the Australasian Biota', p. 5.

from Hooker onwards, to the importance of immigration of species in explaining the composition of the Australian flora. While the details of the movement of continental plates continued to be argued over, by the early 1980s there was sufficient evidence to allow a number of conclusions to be fairly confidently drawn. As part of Gondwana, Australia shared a history, and therefore biotic affinity, with its fellow travellers; from about 500 million years ago until around 180 million years ago these were (what would become) South America, Africa, India, Madagascar, New Zealand and Antarctica. Gondwana was separated from the ancestral Eurasian continent, (which was part of Laurasia), by the Tethys Sea, 'a barrier that seems to have been much wider and more effective than the island-dotted Indonesian seas today.'[66] When the supercontinent began to fragment, Australia retained the longest contact with Antarctica and the two were not finally separated until around 38 million years ago, when a deep marine strait formed between Antarctica and Tasmania, and Australia began its own northwards drift. This movement carried the continent, and its biota, through several climatic zones. At the same time as Australia shifted latitude, the global climate made the transition from 'greenhouse' to 'icehouse', and by around 15 million years ago the climate in Australia had become dramatically drier.[67] Vegetation which was adapted to moister, more equable conditions retreated, and by the mid-Miocene was largely restricted to sections of the Eastern Highlands where altitude and proximity to the sea ensured higher levels of rainfall, and younger volcanic soils supported growth.[68] The movement of Australia northward also resulted in the mid-Miocene collision of the Australian Plate with the Pacific, Philippine and Sunda Plates which led, among other things, to the formation of the mountain ranges of New Guinea. These ranges are believed to have acted as an important refuge for Gondwanan plants and animals whose habitat was restricted due to a changing climate.

This newly-contoured continental history has not disproved the notion that migration of species via long distance dispersal may have, at various times in the past,

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[66] *Ibid.*, p. 4.
[67] Robert J. Morley, *Origin and Evolution of Tropical Rain Forests*, John Wiley & Sons, Chichester, c. 2000, p. 224; Johnson, *The Geology of Australia*, p. 151.
[68] Paul Adam, *Australian Rainforests*, Clarendon Press, Oxford, 1992, p. 148.

been an important factor in shaping Australia's biota.[69] It has also not fully accounted for all distribution patterns observed in the Australian vegetation.[70] However the acceptance of continental drift did significantly change the range of possible interpretations of both present and fossil distribution patterns. The earliest flora of Australia was of Gondwanan origin. Gondwana was the site of development of a vascular flora, including some of the first flowering plants,[71] and was also home to humid forests, comprised at least in part of species similar to some found today in the temperate rainforests of Tasmania (in particular, species of *Nothofagus*) and on the mountain ranges of New Guinea. While Australia's northward drift brought it into contact with the Indonesian plate from around 45 million years ago, and has certainly allowed immigration of plants and animals in more recent times, Australia was not a 'biotic vacuum' waiting to be filled.

In the 1959 paper with which he had begun his ecological career, Len Webb had described the tropical rainforests of Australia as 'a predominantly Indo-Malaysian flora' and used the contrast between it and 'the autochthonous flora characterized by sclerophylls' as a basic division within his classificatory system.[72] Twenty years later, around the time of his retirement from CSIRO (which by no means signalled the end of his active career as an ecologist), Webb wrote, in a chapter he co-authored with Geoff Tracey,

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[69] Especially as early tectonic reconstructions seemed to indicate invasion would have been possible from Indo-Malayan flora from 15 million years ago, and from Antarctica prior to 45 million years ago; and more recent research has identified a number of microcontinental fragments which lay between Laurasia and northern Gondwana and may have allowed 'island hopping' migration to have occurred between Australia and south-east Asia since the Jurassic. *Ibid.*, p. 149.

[70] J.M.B. Smith argues that the usefulness of plate tectonics in accounting for previously intractable problems in plant geography had led to 'a danger that the fashionable paradigm would be applied to every situation, whether relevant or not… no single explanation – land bridges, plate tectonics, or long-distance dispersal – can of itself account for all or even most distribution problems, and … all the continental floras have mixed origins and migration histories.' Smith, 'An introduction to the history of Australasian vegetation', pp. 16 - 17.

[71] 'The origin of angiosperms is a topic which has long excited interest and speculation.' Adam suggests that claims that Australia was the site of the original development of angiosperms is not supported by evidence. Adam, *Australian Rainforests*, pp. 157 - 160. The major work on this topic around the time the theory of continental drift became accepted was A. Takhtajan, *Flowering Plants: origin and dispersal*, Oliver & Boyd, Edinburgh, 1969. His work was influential in shaping Len Webb's interpretation of the presence of primitive angiosperms in the Australian rainforests.

[72] Webb, 'A Physiognomic Classification of Australian Rain Forests', pp. 551 - 552.

> The rainforest habitats preserve a remarkable wealth of endemic and, in some areas, primitive biota, as well as exhibiting strong affinities at the generic level with surrounding countries that were continuous with the Australian land mass in Gondwanic time. Although the processes of evolution and community development responsible for the patterns of Australian rainforests are being unravelled only now, evidence already forthcoming indicates a need for revision of traditional concepts in Australian phytogeography that previously regarded the floristic elements of the northern rainforests as alien and invasive. [73]

While acceptance of the theory of continental drift was vital, this revision was also based on a large amount of work undertaken across a range of disciplines over a period of decades. In the article in which they undertook to re-examine the origins of Australian rainforest communities, Webb and Tracey pointed to 'three recent events' which had provided the opportunity for a new consideration and understanding of that question. Firstly, the intensive ecological surveys of rainforests which had been undertaken in Eastern Australia during the 1960s and 70s, and the use of 'modern numerical and analytical techniques enabling the processing of large data sets to give a comprehensive floristic typology and habitat correlations.'[74] Secondly, the palynological studies which 'furnish an exceptional chronicle of tropical vegetation during the last 80,000 to 100,000 years of the late Quaternary period.'[75] And finally, the 'new and now firmly established evidence for continental drift and an ancient Gondwanaland flora.'[76] As Geoff Tracey put it, 'when this theory of plate tectonics was actually acceptable, the whole thing fell into place…'[77]

During field work, particularly that undertaken for the Phytochemical Survey, Len Webb and Geoff Tracey had observed distribution patterns which simply did not accord with the accepted notion of rainforest species as recent arrivals and therefore unrelated to the truly 'Australian' flora. As they searched for a particular alkaloid in a genus, related species would be found across a range of environments: in wetter rainforests, dry eucalyptus woodlands, and bottle tree scrubs. On the other hand, there

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[73] Webb & Tracey, 'The rainforests of northern Australia', p. 67.
[74] L.J. Webb & J.G. Tracey, 'Australian rainforests: patterns and change', in A. Keast (ed.), *Ecological Biogeography of Australia*, vol. 1, W. Junk, The Hague, 1981, p. 607.
[75] *Ibid.*, p. 608.
[76] *Ibid.*
[77] Interview with Geoff Tracey, NLA TRC 2845/46: 3.1.10

were a number of genera and species – including some endemic angiosperms with primitive morphological traits – which 'didn't ever leave the wet rainforest.'[78] As they continued to collect data and subject it to a range of methods of analysis, their findings continued to support their sense that what they were examining were not scattered invasive elements, but rather an 'archipelago of refugia', the distribution and composition of which reflected processes of climatic and edaphic sifting over – in some cases – many millennia.[79] The work of other scientists across a range of disciplines was also beginning to shed light on these issues. The pioneering palaeobotanical and palynological studies undertaken by Isabel Cookson in the 1950s had uncovered evidence that, in the early Tertiary, at least the southern half of Australia had supported a predominantly mesic flora. The climate had been humid, and many plants ranged further to the south and to the west than they do at present.[80] In the 1970s Peter Kershaw continued such studies, and extended the research into the northern part of the continent. Kershaw's findings were largely consistent both with Cookson's work and with Webb and Tracey's conviction that wet rainforests had previously been much more extensive, and had become restricted to their present position by unfavourable climatic change. Webb and Tracey had concluded, like D.A. Herbert before them, that the rainforests were restricted by climate and not by age. A range of evidence strongly suggested that, although the rainforests did contain some newer arrivals, they were in fact largely relict populations of a previously-dominant form of vegetation.[81]

Webb and Tracey decided to publish their conclusions in the new edition of a European volume, *Ecological Biogeography of Australia*, which was to be released in 1981. The 1959 edition, *Biogeography and Ecology in Australia*, had been 640 pages long, and had barely mentioned Australian rainforests. [82] The new edition offered a clear indication of the extent to which knowledge of the Australian environment had

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[78] NLA TRC 2845/46: 3.1.9. As Adam points out, 'Referring to living taxa as primitive does not necessarily imply that they are ancestral, but rather that they possess a larger number of primitive traits than other taxa.' Adam, *Australian Rainforests*, p. 158.
[79] Webb & Tracey, 'Australian rainforests: patterns and change', p. 609.
[80] R.L. Crocker, 'Past climatic fluctuations and their influence upon Australian vegetation', in Keast (ed.) *Biogeography and Ecology of Australia*, p. 284.
[81] For a more recent and detailed overview of Australia's rainforest past, see Morley, *Origin and Evolution of Tropical Rain Forests*, pp. 225 - 235.
[82] A. Keast, R.L. Crocker, C.S. Christian (eds.), *Biogeography and Ecology in Australia*, W. Junk, The Hague, 1959.

increased between the 1960s and 1980s: it was over 2500 pages long, and comprised three volumes. Len Webb was invited to contribute a chapter, and he and Geoff Tracey thought it an ideal place to muster the evidence, and outline their interpretation of the origins and evolutionary history of Australian rainforests.

In 'Australian rainforests: patterns and change', Webb and Tracey attempted to apply their ecological understanding of the ways in which rainforest environments respond to disturbance in the observable short-term to the palynological evidence provided by Kershaw's analysis of pollen cores from the Atherton Tablelands, and the new model of geological history provided by the theory of continental drift. They distinguished between two forms of change which have occurred in all vegetation communities. The first were progressive successional processes in which change is initiated by disturbance, but rainforest communities return to a predictable 'terminal community', similar in structure and species composition to the community which existed prior to the disturbance. The second encompassed longer-term changes through which communities evolve unpredictably, and which involve adaptation, migration, extinction and speciation. Webb and Tracey recognised that the distinction between the two types of change is not always clear, and that the 'extent and duration of disturbance … the ecological stability [of the original community]; and the area and location of the disturbed community in relation to other communities' all determine the new patterns of community development which result from change.[83]

Webb and Tracey divided the rainforests of Australia into 3 floristic regions: the cool forests of the south-east (A), the warm and moist forests of the north-east (B), and the warm, drier forests of the north and sub-coastal regions (C).[84] Their floristic region B corresponds with the wet tropical rainforest region of north-east Queensland. They argued that floristic regions A and C do not represent 'transitions' or 'attenuations' of the tropical rainforest along a gradient of decreasingly favourable temperature or rainfall, as has sometimes been suggested, but rather the three regions

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[83] Webb & Tracey, 'Australian rainforests: patterns and change', p. 628.
[84] *Ibid.*, p. 637.

> approximate 'core areas' somewhere near where ancient widespread floras from Gondwanaland crystallized under different climatic-edaphic-topographic conditions, accompanied by the interplay of seed and pollen dispersal systems. Ecological differentiation and geographical isolation would have favored independent lines of evolution. [85]

They further divided each of these regions into overlapping 'phytosociological or vegetation provinces', characterised by a range of indicator species, and closely correlated to particular climatic regimes.[86] They interpreted the distribution of some genera and species across provinces as implying 'a long and complex history of climatic-edaphic-topographic sifting often accompanied by fire.'[87] On the other hand, the occurrence of many species as endemics in particular floristic regions was regarded as demonstrating 'a long history of segregation to permit species differentiation.'[88] They concluded that

> biogeographical subdivision often comes to rest on the distribution of relict and narrowly endemic species at a level that corresponds to refuge areas and areas of minor isolation. The subdivision also reveals groups of relatively small and widely separated patches of rainforest with strikingly similar botanical composition. Vegetation classification therefore raises problems of origin and adaptation and of community dynamics on different time scales in habitats of different size and distribution. [89]

Webb and Tracey identified a range of types and probable locations of refugia which would have sheltered wet rainforest communities during periods of climatic stress, particularly from the impact of increased fires associated with drier conditions – these included the summits and gullies on the upper slopes of cloudy wet mountains, very wet lowlands, deep moist gorges of coastal lowlands, and the fringing areas alongside permanently flowing rivers.[90] Webb and Tracey argued that such sites have

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[85] *Ibid.*, p. 638.
[86] *Ibid.*, pp. 642 - 645.
[87] *Ibid.*, p. 649.
[88] *Ibid.*, p. 651.
[89] *Ibid.*, p. 654.
[90] *Ibid.*, pp. 654 - 661.

acted as nuclei for the subsequent re-expansion of rainforest areas which, as the work of Peter Kershaw on the Atherton Tablelands demonstrated, has occurred repeatedly when an unfavourable climate has shifted to one more suited to support the growth of rainforest vegetation.[91] Webb and Tracey suggested that in tropical north-eastern Australia such refugia had allowed 'narrow endemics including primitive angiosperms … to survive in a kind of Noah's Ark situation…'[92] They noted that

> despite the greater concentration of primitive genera and species in south-east Asia, there is a far greater concentration of primitive families in Australasia. This suggests that the refugia now centered in this region are of great antiquity, extending to the Cretaceous or earlier when many primitive angiosperms originated … and Gondwanaland was still entire.[93]

While the extent and nature of endemism provided one plank to their argument, they also undertook, like Hooker, an analysis of the distribution throughout the world of non-endemic rainforest genera[94] found in Australia, and concluded that the floristic affinities of such genera

> with other tropical countries are consistent with derivation from a Gondwanaland flora for which the land mass that is now Australia also provided a substrate. It seems no longer valid to label taxa also found in India and Indomalesia as 'invasive elements'. It also seems unnecessary to accentuate the role of long-distance seed dispersal throughout this part of the southern hemisphere, although dispersal over moderate distances may have occurred.[95]

Finally, Webb and Tracey concluded that 'the traditional concept that two invasive floristic elements – one from south-east Asia to the north, and the other from Antarctica to the south – form the core of Australian rainforest vegetation is no longer tenable.'[96] They characterised the contemporary patterns of Australian rainforest

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[91] *Ibid.*, p. 663.
[92] *Ibid.*, p. 661.
[93] *Ibid.*
[94] They concentrated their analysis on genera as knowledge of species distribution for the region continued to be inadequate, and many species remained unnamed and some undescribed. *Ibid.*, p. 668.
[95] *Ibid.*, p. 669.
[96] *Ibid.*, p. 672.

vegetation as a series of 'chequered layers', of which the base is the 'floristic matrix inherited jointly with other countries from Gondwanic times.' Upon this base has been overlain 'a shadowy mosaic woven from the phylogenetic development of communities in prehistorical and geological times,' which remain as fragmentary relicts across a number of locations, such as in the 'ever-moist summits and gorges of the north-east'. The upper, and most recent layer they identified as

> the product of natural disturbances (and most recently white man) in historical times. It is often starkly variegated, ranging from low herbaceous pioneers to advanced secondary growth and broken-canopied forests disrupted by cyclones, as the result of ontogenetic development and recent succession.[97]

Webb and Tracey presented the rainforests as a complex, ancient, and ever-changing Australian environment in which current distribution in space could be investigated to reveal 'antiquity and innovation in time.'[98] The mixing of historical and spatial imagery in their depiction of the patterns of rainforest vegetation is striking: it reveals their understanding that, in the context of geological, evolutionary and historical change, it is the rainforests themselves which offer a thread of continuity.

Not only was the long evolutionary history of the rainforests subject to reassessment in the second half of the twentieth century; new work in the fields of archaeology, palaeoecology and anthropology began to suggest a new vision of the continent's human past as well. The predominant European view of Aborigines before this time had characterised them as fundamentally a-historical: an 'unchanging people in an unchanging environment.' [99] Or, as anthropologist Norman Tindale wrote in 1958, many

> saw the Australian continent as existing in a zoological and botanical equilibrium in which climate, and not man, was sole and final arbiter. It was possible thus even as late as thirty years ago to dismiss the Australian aboriginal as an

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[97] *Ibid.*, p. 676.
[98] *Ibid.*
[99] For an outline, and important critique, of this view see D.J. Mulvaney, *The Prehistory of Australia*, Penguin Books, 2nd edition, Melbourne, 1975.

> ecological agent. As a "newcomer" in ineffectually small numbers (under 300,000) he had merely scratched a few holes, had destroyed a few plots of forest land with effects which could be dismissed as insignificant. [100]

This viewpoint had provided an important philosophical underpinning to the colonial venture, and was regarded as legitimating and justifying European settlement. However, it was a view which began to shift from the early 1960s, and by the late 1970s was coming under fire from a range of angles. The growing recognition by archaeologists of the length of Aboriginal occupation of the continent, and the increasing attention given by palaeoecologists to the study and dating of the fossilised pollen and charcoal records, led to a dramatic reassessment of the role Aborigines had played in shaping the Australian environment. Archaeologists, palaeoecologists, and anthropologists began to express the view that, far from being an untouched wilderness prior to European occupation, the Australian landscape and its biota bore the deep and recognisable imprints of human action over vast spans of time. As J.M.B. Smith wrote in 1982:

> The explanation of any region's vegetation history is incomplete without serious consideration of the role of man… It may be from arrogance that people assume that major man-induced vegetation change is a result only of the activities of modern industrial or agricultural people. It is from ignorance that earlier hunter-gatherer or simple agricultural human populations may be incorrectly assumed to have lived in "harmony" with their biological environments … the vegetation of probably all regions of the world has been influenced by long periods of human impact, so that what is often considered natural is usually far from it. [101]

This suggestion that the 'natural' environment was in fact the product of longstanding 'cultural' practices was at the core of the revision. The blurring of the boundaries between 'nature' and 'culture' seemed to offer support to Aboriginal claims for land rights, and to require a new way of seeing and understanding the

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[100] Norman Tindale, 'Ecology of Primitive Aboriginal Man in Australia' in Keast, Crocker & Christian (eds), *Biogeography and Ecology in Australia,* p. 43.
[101] J.M.B. Smith, 'An introduction to the history of the Australasian vegetation', p. 2.

Australian landscape. It also provided an important impetus to the development of the field of environmental history within Australia.

The dating by archaeologists of human remains, by use of radiocarbon techniques developed in the 1940s, was of great significance in this changing understanding of the Australia's past. Until the early 1960s, archaeologists had been reluctant to accept that Aborigines were other than recent arrivals, "newcomers" in Tindale's term, who had been present in Australia for no more than around 8700 years.[102] However, in 1962 evidence uncovered by John Mulvaney pushed back the length of Aboriginal occupancy of Australia to 10,000 years, and before long further finds extended that to a period of 20,000 years. By the late 1970s, archaeological research had demonstrated conclusively that Aboriginal people had inhabited the Australian continent for at least 40, 000 years, and there were some suggestions that their presence could be traced as far back as 120, 000 years ago, although these much earlier dates are disputed. [103]

While the exact timing of settlement across different areas of the continent is unclear, Hiatt and Jones argue that evidence 'demonstrates that occupation had occurred throughout every major ecological zone of the continent' by about 25, 000 years ago.[104] However the dating for North Queensland rainforest areas is more recent. The high levels of rainfall and extensive use of plant products in material culture mean that remains have tended to be poorly preserved in the tropical rainforest environment. While existing archaeological evidence shows Aborigines have inhabited this area for at least 5000 years, it is likely that their occupancy has been much longer.[105]

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[102] R. Jones, 'The Fifth Continent: problems concerning the human colonization of Australia', *Annual Review of Anthropology*, no. 8, (1979), p. 445.
[103] Bowman, *Australian Rainforests*, p. 240.
[104] L.R. Hiatt & R. Jones, 'Aboriginal conceptions of the workings of nature', in Home (ed.), *Australian Science in the Making*, p. 2.
[105] N. Horsfall & J. Hall, 'People and the Rainforest: an Archaeological Perspective' in Webb & Kikkawa (eds), *Australian Tropical Rainforests*, p. 38. R. Cosgrove, 'Origin and development of Australian Aboriginal tropical rainforest culture: a reconsideration', *Antiquity*, vol. 70, pp. 900 - 912. Linguist R.M.W. Dixon recorded Aboriginal stories which seem to describe events such as active vulcanism and changing sea levels which occurred over 10,000 years ago. R.M.W. Dixon (comp. & ed.), *Words of our Country: Stories, Place Names and Vocabulary in Yidny, the Aboriginal Language of the Cairns-Yarrabah Region*, University of Queensland Press, St Lucia, 1996, pp. 1 - 2.

Research into 'fire history', undertaken by archaeologists, anthropologists and palaeoecologists with increasing vigour from the late 1960s onwards, has largely been grounded in two distinct temporal perspectives. The first perspective has considered the role of fire in shaping flora and fauna on the geological time scale, and examined the ecological and evolutionary impact of 'the arrival in Australia of a new ignition source: *Homo sapiens*'. A number of researchers have posited the possibility that this arrival 'triggered the evolutionary diversification of non-rainforest vegetation'[106]; or as Stephen Pyne more poetically termed it, 'The eucalypt revolution that swept through Holocene Australia may have been an artefact of Aboriginal burning.'[107] The second perspective has examined evidence of the impact of more recent Aboriginal burning practices, which continue to be maintained in some parts of Australia, and their role, alongside changing climate and other ecological factors, in controlling the past and current distribution of rainforest, and in particular in maintaining distinct boundaries between rainforest and sclerophyll vegetation.[108]

Arguments about Aboriginal burning draw on a number of scientific disciplines. Historical records have also been important, and historians and others have suggested they show that 'at the time of European colonisation during the nineteenth century, Aboriginal people burnt landscapes for a great variety of purposes including clearance of thick vegetation to facilitate travel, signalling, controlling insects and vermin, hunting and waging war.'[109] As explorer, Thomas Mitchell, famously observed in 1848:

> Fire, grass, kangaroos, and human inhabitants, seem all dependent on each other for existence in Australia; for any one of these being wanting, the others could no longer continue. Fire is necessary to burn the grass, and form those open forests, in which we find the large forest-kangaroo… But for this simple process, the Australian

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[106] Bowman, *Australian Rainforests*, p. 218.
[107] Stephen Pyne, 'Firestick History', *The Journal of American History*, vol. 76, no. 4, (Mar 1990) p. 1133.
[108] Bowman, *Australian Rainforests*, p. 218.
[109] *Ibid.*, p. 222

> woods had probably contained as thick a jungle as those of New Zealand or America…[110]

The study of and debate around Aboriginal use of fire has been wide-ranging within Australia and there is an extensive existing literature on the topic. I will focus on the changes in scientific understanding of, and attention to, the role of fire in determining the extent of rainforest in North Queensland. Debate has been sparked primarily by two puzzling phenomena: first, the existence of clearings of various sizes within the rainforest, apparently unrelated to changes in soil or other ecological factors; and second, the existence of sometimes stark boundaries between rainforest and sclerophyll vegetation, an ecological pattern which is regarded as unique to Australia.

During his visit from 1909 to 1910, Karel Domin had observed that 'secondary' eucalyptus forests had replaced rainforests in southern Queensland as a result of Aboriginal use of fire. Domin further suggested that regular bush fire, 'which kills all scrub plants springing up on the border of the forest', was responsible for maintaining the generally strict boundaries which exist between the two types.[111] W.D. Francis, in *Australian Rain Forest Trees*, regarded sensitivity to fire as an important ecological feature of Australian rainforest vegetation – just as tolerance of, and even reliance on, fire is an outstanding ecological feature of Australian sclerophyll vegetation. He wrote,

> In most if not all cases the rain-forest constituents are killed by even slight contact with or proximity to the fires which periodically sweep through many of the Eucalyptus and open forests of Australia.[112]

Francis noted that European settlers soon discovered that rainforest trees, unlike eucalyptus, were killed when felled and burnt. He suggested that this

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[110] Sir T. L. Mitchell, *Journal of an expedition into the interior of Australia, in search of a route from Sydney to the Gulf of Carpentaria*, Greenwood Press, New York, 1969, (1st pub. Longmans, London, 1848), pp. 412 – 413.
[111] Domin, 'Queensland's Plant Associations', pp. 65 - 66. Herbert followed this view in his 'The upland savannahs of the Bunya Mountains, South Queensland.' *Proceedings of the Royal Society of Queensland*, vol. 49, (1937), pp. 145 - 149.
[112] Francis, *Australian Rain Forest Trees*, p. 10.

characteristic of rainforest enabled what had initially seemed dauntingly dense vegetation to actually be cleared more easily than the eucalyptus and open forests, which exhibited a remarkable ability to sucker and regrow following burning.

Anthropologist Norman Tindale followed Mitchell and offered a clear formulation of the idea that Aborigines had used fire to radically alter their environment. In 1959, in the first edition of *Biogeography and Ecology in Australia*, Tindale wrote:

> Man, setting fire to large areas of his territory … probably has had a significant hand in the moulding of the present configuration of parts of Australia. Indeed, much of the grassland of Australia could have been brought into being as a result of his exploitation. Some of the post climax rain forests may have been destroyed in favour of invading sclerophyll, as the effects of his firestick were added to the effects of changing climate in Early Recent time…[113]

Tindale based his argument, in part, on his experiences whilst working on the Atherton Tableland. He wrote that:

> In the rainforests of the Atherton Plateau there are often to be met … enclaves of grassland as well as curious patches of wet sclerophyll forest. According to the views of local negrito aborigines, as expressed to me in 1938, such areas arise from their occasionally successful practice of setting fire to rain-forest patches during the dry spells which periodically occur and cause the usually wet forest floor to become a giant tinder box. Since the burning of the rain forest is regarded as a useful hunting expedient, fires are likely to have been lit by many past generations of men, and the cumulative effects of the practice on the forest cover may have been very great. Perhaps it is correct to assume that man has had such a profound effect on the distribution of forest and grassland that true primaeval forest may be far less common in Australia than is generally realized, as indeed it is relatively rare in all lands where man has intruded for lengthy periods of time. [114]

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[113] Tindale, 'Ecology of Primitive Aboriginal Man in Australia', p. 42.
[114] *Ibid.*, p. 43.

In 1968, Len Webb published a major paper in the journal *Ecology* in which he attempted to identify the habitat factors, such as soil nutrient status, temperature and rainfall, which limited the distribution of the various types of rainforest he had outlined in his earlier classificatory work.[115] He concluded that 'wildfire' played an important role in favouring 'the regeneration of eucalypts and other sclerophylls after the destruction of the mostly fire-sensitive rain forest species', and could over-ride the controlling influence of other habitat factors in determining what vegetation would be found on a particular site.[116] Webb described wildfire as 'a potent ecological factor'. He suggested that the occurrence of such fire explained the divergence between actual distribution of vegetation types and the distribution which would be inferred from the environmental characteristics of sites, in locations 'without any evidence of human interference.'[117] Webb noted that

> conflagration-type fires have devastated millions of acres of forest vegetation in intermittent "blow-up" years in southeastern Australia and Tasmania since settlement by Europeans … Early records indicate that prior to European settlement, bush fires were also widespread, although possibly less severe and more frequent, and that these fires resulted from the activities of the Aborigines and from occasional lightning strikes.[118]

In north-eastern Australia, however, fires rarely penetrate undisturbed rainforest, though they do occur along its edges where vegetation is more exposed. Fire-sensitive rainforest species survive not only in 'fireproof topographical niches', such as rocky outcrops and wind-protected gullies, but also in 'fireproof vegetation niches', where rich soils and high rainfall favour the establishment of extensive complex vine forests.[119] Webb concluded, on this basis, that 'the occurrence of rain forest species on eutrophic soils does not reflect a narrow physiological tolerance for a high nutrient status, but rather implies fire sensitivity', as the rainforest vegetation found on lower fertility soils tends to be both more vulnerable to fire, and slower to

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[115] L.J. Webb, 'Environmental Relationships of the Structural Types of Australian Rain Forest Vegetation', *Ecology*, vol. 49, no. 2, (Mar., 1968), pp. 296 - 311.
[116] *Ibid.*, p. 296.
[117] *Ibid.*, p. 304.
[118] *Ibid.*, pp. 305 - 306.
[119] *Ibid.*, p. 306.

regenerate after burning.[120] Webb regarded an understanding of the role of fire as vital to comprehending the ecology of all Australian forests:

> It is thus helpful to regard the Australian forest flora as composed of species ranging from extremely fire-sensitive to fire-tolerant, which have been sifted by fire as an evolutionary factor to produce two major classes of vegetation: one whose existence depends on protection from fire, the other which is able to survive or regenerate in differing degrees after burning. This qualitative difference is reflected in the remarkably sharp boundaries of fire-sensitive raingreen forests in the tropics and subtropics, which is related to the exclusion of fire, virtually on an all-or-nothing basis. In the rain forest areas the eucalypt forests are always poised nearby, ready to compete for the same sites.[121]

Tindale regarded 'man' as an intruder in the natural world, and placed human action at the centre of his account of environmental change. Len Webb did not draw such explicit distinctions, and suggested that fire, whether natural or not, played a central role in the ecology of the rainforest. While he did not disregard human action, he saw 'wildfire', not Aboriginal burning, as being the important factor, and represented the vegetation itself as having significant, human-like agency.

While these early discussions of the role of fire in shaping the distribution of rainforest were primarily based on direct observation and botanical and ecological analysis, in the 1970s Peter Kershaw began a palynological study which shed light on the patterns of both burning and vegetation change over a much larger historical scale. Palynology, or the analysis of fossilised pollen, has been used to describe the changing nature of past vegetation communities since the first decades of the twentieth century.[122] Microscopic pollen, which is washed into lakes, rivers or swamps, is sometimes preserved in sediment, and may accumulate there for many thousands of years. The fossilised remains of that pollen can be sampled, and identified to at least the family level and sometimes to the genus. The changing quantities and types of pollen found reflect (though not in a direct or simple way)

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[120] *Ibid.*, p. 307.
[121] *Ibid.*
[122] I. Colin Prentice, 'Records of vegetation in time and space: the principles of pollen analysis', in B Huntley & T. Webb (eds), *Vegetation History*, Kluwer Academic Publishers, Dordrecht, 1988, p. 19.

changes in the ecosystem over time. The quantity and regularity of the appearance of charcoal in the fossil record indicate the varying frequency and intensity of fires.

Kershaw produced a series of papers analysing the fossilised pollen found in samples taken from a number of sites on the Atherton Tablelands, including Lake Euramoo, Bromfield Swamp, and a 60m core sample taken from Lynch's Crater. The core is thought to contain sediments deposited over the course of almost 200, 000 years, and thus spans the dramatic climatic and environmental changes of two glacial-interglacial cycles. For younger samples, accurate dates were obtained using radiocarbon-dating. For those core sections which were outside the range of radiocarbon dating, a more complicated process of correlation of evidence was undertaken to obtain approximate dates.[123] Pollen assemblages were related to extant vegetation types, and therefore to a proxy regional climate, and these climatic estimates were matched to temperature records interpreted from a marine core, the chronology of which was then used to estimate the age of the pollen assemblage. In a sometimes circular method of reasoning, changes in vegetation were likewise explained by changes in climate.[124] As Bowman suggests, 'Such long chains of reasoning are vulnerable to serious error given the difficulties in matching pollen assemblies to specific vegetation types to regional climate estimates.'[125] Bowman notes a similar difficulty with respect to the charcoal record: it is impossible to tell whether increased burning has led to a transition of vegetation type from fire-sensitive to fire-tolerant, or whether a transition of vegetation type has led to a greater frequency of fires.[126]

On the basis of evidence provided by this pollen record, Kershaw argued that each of the interglacial intervals had been characterised by complex notophyll/mesophyll vine forest, comprised almost entirely of angiosperms.[127] During the drier glacial intervals the area supported araucarian microphyll/mesophyll vine forest, which included both gymnosperm and angiosperm species characteristic of

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[123] A.P. Kershaw, 'Australasia', in Huntley & Webb (eds), *Vegetation History*, p. 269.
[124] *Ibid.*, p. 270.
[125] Bowman, *Australian Rainforests*, pp. 240 - 241.
[126] *Ibid.*, p. 236.
[127] Though each formation seems to have involved a distinctly different mixture of dominant taxa. Morley, *Origin and Evolution of Tropical Rain Forests*, p. 235.

rainforest. However Kershaw's analysis suggested that between 38,000 and 26,000 BP the dominant vegetation changed from rainforest with a strong *Araucaria* component to a vegetation entirely dominated by *Eucalyptus*, and the transition was accompanied by a dramatic increase in microscopic charcoal.[128] This was the first time that more than 'a few grains of pollen attributable to *Eucalyptus*' had been found in the core sample. Kershaw argued that the change could not have been due to climate alone, as the rainforest type that had been present was (by analogy with its contemporary representatives) capable of withstanding low annual precipitation on the volcanic-derived basaltic soils of the Tablelands. There had been no such elimination of araucarian forest at the height of the previous glacial period. The date at which this change of vegetation and fire regime took place coincided with the earliest archaeological dates for the presence of humans on the continent, and so Kershaw concluded that human action was the sole distinguishing factor which could explain the transformation.[129] Not only was there a change in the extent of rainforest at this time but, Kershaw argues, one taxon, *Dacrydium*, became extinct, 'while other components of these drier forests which are palynologically less visible, may have suffered the same fate.'[130] Kershaw concluded that Aboriginal burning was the cause of the decline of rainforest in the late Pleistocene.

In his 1976 discussion of the evidence, Kershaw stated this conclusion fairly cautiously, noting that

> The direct replacement of Low Microphyll Vine forest by sclerophyll vegetation could also have occurred through the effects of fire. It is difficult though to imagine that natural fires, created by lightning strikes, should suddenly become critical after having had little influence on the vegetation for at least 15,000 years, without some kind of concomitant climatic change, but fires made by man would be a different proposition.[131]

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[128] Kershaw, 'Australasia', p. 272.
[129] Kershaw, 'Australasia', p. 272. His argument was also followed by G. Singh, 'Environmental upheaval: The vegetation of Australasia during the Quaternary', in Smith (ed.), *A history of Australasian vegetation*, p. 107.
[130] Kershaw, 'Australasia', p. 272.
[131] A.P. Kershaw, 'A Late Pleistocene and Holocene Pollen Diagram from Lynch's Crater, North-Eastern Queensland, Australia', *New Phytologist*, vol. 77, (1976), p. 490.

In 1983, Kershaw presented the results of further investigations which focused on the pollen record spanning from 8500 BP to 4500 BP. New samples had been exposed by peat-mining operations on the site, and Kershaw correlated these to the core sample already examined. Although the focus of the paper was on a much more recent timeframe, Kershaw was nonetheless much more direct in his discussion of 'the influence of Aboriginal man', writing:

> There has been increasing awareness in Australia of the degree to which aboriginal man may have modified the plant landscape with his conscious use of fire and other practices related to his food-gathering activities… Some of the evidence for the impact of man has been derived from Lynch's Crater. A massive increase in charcoal concentrations around 38 000 BP has been interpreted as the result of aboriginal burning, which brought about a change in regional vegetation from moist araucarian rainforest to sclerophyll vegetation… Burning pressure was maintained, and it is reasonable to consider that the fire regimes responsible for charcoal deposition in the early Holocene were those imposed by Aborigines.[132]

The argument that Aboriginal burning played a significant role in shaping the vegetational history of Australia has not gone unchallenged. David Horton has been the strongest critic both of Kershaw's findings, and those of a similar palynological study undertaken by Singh, based at Lake George in Southern Queensland. One of Horton's central criticisms seems to be well illustrated by the last passage quoted from Kershaw. Horton suggested that:

> There is a real danger that the hypothesis (of 'fire-stick farming') has become a kind of self fulfilling prophecy. Biological and archaeological data are not being treated as a test of the hypothesis, but rather the data are being interpreted with the assumption that fire-stick farming is a reality. Interpretations made on this basis are then, in a process of circular argument, seen as providing further evidence for the hypothesis.[133]

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[132] A.P. Kershaw, 'A Holocene Pollen Diagram from Lynch's Crater, North-Eastern Queensland, Australia', *New Phytologist*, vol. 94, (1983), p. 678.
[133] D.R. Horton, 'The Burning Question: Aborigines, Fire and Australian Ecosystems', *Mankind*, vol. 13, no. 3, p. 248.

Horton pointed to inconsistencies in the correlations between climate, charcoal and vegetation in the Lynch's Crater record, and suggested that at best, the pollen and charcoal record analysed by Kershaw provided 'equivocal evidence.'[134] He noted also that, although Kershaw suggested that Aboriginal burning had led to the substantial reduction in rainforest areas, Aboriginal presence in the region had continued, and rainforest had re-established at the site on which his arguments were based. Horton also raised questions about the dating of other sites at which Aboriginal burning has been postulated as an explanation of vegetation change, particularly of Lake George, in which the transition is suggested as beginning 120,000 years ago, well before there is clear archaeological evidence of human presence. He argued that the claims being drawn from the evidence went far beyond what was justified:

> The pollen data show complex vegetation-fire relationships in which man plays no perceptible role. In effect … vegetation and fire regimes form a complex feedback system. What we see reflected in the pollen record is climatic change resulting in vegetation change resulting in fire regime change which in turn causes vegetation change. There is no one to one correspondence between climatic and vegetation change because fire adds a complex oscillation to the system. Suggesting man as the cause of fire is starting from the wrong end of this chain of cause and effect and imposing a simple explanation where a complex one is required.[135]

Horton suggested that the 'fire-stick farming' model equates Aboriginal use of fire with farming practices which are based on continual 'interference' with ecological systems. In contrast, he believed hunter/gatherers are 'observers', and as such they rely 'on detailed knowledge of climate and native plants and animals in order to extract energy from the system. The system can remain stable because the observations are in effect designed to detect and harvest surplus.'[136] Horton suggested that this knowledge has included an understanding of the long-term effects of fire. Rather than using fire to dramatically modify the environment, Horton believed that

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[134] *Ibid.*, p. 247.
[135] *Ibid.*, p. 241.
[136] *Ibid.*, p. 248.

Aborigines lit fires 'deliberately to clear the bush if lightning or an accident had not intervened in time'[137] so as to maintain, and make use of, a 'natural potential fire regime.'[138] Horton concluded that 'had Aborigines never reached Australia, the distribution and adaptations of the plants and animals of the country would have been almost identical to those which the first European explorers found around two hundred years ago.'[139]

David Bowman later caricatured Horton's position as suggesting that Aborigines were simply 'part of the ecological furniture' (as opposed to 'furniture re-arrangers', as per Rhys Jones, or 'furniture burners', as per Tim Flannery).[140] Kershaw's own response, in a chapter published during the Australian Bicentenary in 1988, a year during which debates around the indigenous history of Australia were at fever-pitch, was revealing. He first stated that 'The fact that these fire-sensitive communities are still present suggests that the replacement process was initiated relatively recently and this is consistent with *both the fossil evidence and the belief* that people have played a major role.'[141] And he concluded that Horton's views had no substance, 'and similar sentiments would be rejected anywhere in the colonised world.'[142]

The debate over the long-term impact of Aboriginal use of fire has been multifaceted and highly politicised, and conclusions have often been based on inference from slender evidence.[143] As David Bowman points out, the issue is 'not only important for the development of a comprehensive understanding of the dynamics and evolution of the Australian biota, but is central to the formulation of appropriate strategies for the conservation of the nation's biodiversity.'[144] It also has

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[137] *Ibid.*
[138] *Ibid.*, p. 249.
[139] *Ibid.*
[140] D.M.J.S. Bowman, 'The impact of Aboriginal landscape burning on the Australian biota', *New Phytologist,* 1998, vol. 140, p. 386.
[141] Kershaw, 'Australasia', p. 293, my italics.
[142] *Ibid.*, p. 294.
[143] An at times inflammatory perspective on the complex politics of current discussions regarding past Aboriginal land use in the context of present decisions regarding land management is presented by David Horton in *The Pure State of Nature: Sacred cows, destructive myths and the environment,* Allen & Unwin, St Leonards NSW, 2000. On the role of inference see Bowman, *Australian Rainforests,* p. 219.
[144] Bowman, 'The Impact of Aboriginal landscape burning', p. 385.

deeper symbolic resonances and dissonances with the way in which the Australian landscape and its history have been understood by its non-indigenous inhabitants. On the one hand, the suggestion that Aboriginal burning practices have had a significant impact on the ecology of Australia undermines the common notion that Australia was a 'wilderness' prior to European occupation and that, lacking agriculture, Aboriginal people had made no significant mark on their lands – a view which underpinned both the notion of Australia as *terra nullius*, and the arguments of some in the environmental movement for protection of particular 'untouched' natural areas. The terming of Aboriginal burning practices as 'fire-stick farming' was a clear attempt to communicate the conclusion that Aboriginal people purposefully managed the land and its productivity in a way which was practically – and perhaps morally – analogous to European agricultural techniques.[145] Jones and others attempted to challenge the view that Aboriginal society was primitive, a judgement long-formed by a European-derived culture which linked historical 'progress' to particular modes of social, technological and economic organisation (largely those modes which mirrored the history and development of Europe).

On the other hand, suggestions that the arrival of Aboriginal people in Australia had resulted in the extinction of megafauna, and the contraction of fire-sensitive rainforest in favour of fire-tolerant sclerophyll tarnished the conceptions of some white Australians of Aboriginal people as having lived 'in balance' with nature, (a conception which David Horton attempted to re-instate). The work of Tim Flannery in particular, on the ecological impact of Aborigines on Australia, has been used in some instances to justify current environmental practices based on a very different economic and social system, and undertaken with very different technologies and legal structures. Bowman notes that 'vague, speculative palaeoecological arguments can be used for mischievous political purposes in the intense ongoing debates about the conservation and development of Australia's natural resources.'[146]

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[145] R. Jones, 'Fire-stick farming', *Australian Natural History*, vol. 16, (1969), pp. 224 - 228.
[146] Bowman, 'The impact of Aboriginal landscape burning' p. 404

According to J.M.B. Smith, 'With any fossils there are three difficulties: finding them, dating then, and identifying them.'[147] The interpretation of the pollen record in particular involves a number of practical and theoretical difficulties, and any conclusions drawn from it can at best be no more than persuasive. R.T. Lange writes, encouragingly, that 'Reconstructions of palaeovegetation are derived from evidence by speculation, a process not to be confused with mere conjecture where the role of evidence is neglected.'[148] Smith concurs that:

> Interpretation of fossil pollen assemblages is fraught with difficulty. Different types of plants produce pollen in different quantities, dispersed in different ways and to different distances. Many taxa will not be represented by pollen at all, though present in the vegetation. Some pollen types under some conditions may deteriorate to unrecognisability while others in the sample remain identifiable, further distorting the picture.[149]

Any attempt to not only reconstruct the past distribution and composition of vegetation, but also past human actions from such a record, is necessarily tentative. Kershaw presented his conclusions as a possible interpretation of the available evidence. The process by which he reached those conclusions involved puzzling through as many of the difficulties as possible by, for instance, examining the pollen dispersal characteristics of the taxa he was considering in present plant communities and applying those findings to the fossil record under consideration. However, regardless of the scientific merits of his arguments, the question of the impact of Aboriginal burning was one which resonated strongly with political and historical concerns, particularly during the 1980s. This was a period in which the politics of the Aboriginal past in Australia was receiving increasing attention and public debate. At the same time, rainforest was becoming a highly-valued environment, and was the focus of a vocal conservation movement in Australia as in other parts of the world. The notion that Aboriginal burning had in fact limited the area of rainforest in favour of other vegetation types was, in such a charged debate, politically ambiguous. From

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[147] Smith, 'An introduction to the history of the Australasian vegetation', p. 9.
[148] R.T. Lange, 'Australian Tertiary Vegetation: evidence and interpretation', in Smith (ed.) *A History of the Australasian Vegetation,* p. 45.
[149] Smith, 'An introduction to the history of the Australasian vegetation', p. 11.

the long-cold remnants of old charcoal, Kershaw and other palynological researchers sparked new fires of controversy, which have continued unabated in subsequent decades.

The discussion of the process of reconstruction of past landscapes through the examination of fossil remains suggests similarities between the processes of palaeoecological and historical research. Histories of ecosystems and of human communities are tentatively established through reference to scattered, incomplete and sometimes inconclusive sources. In both cases some voices are not heard: some taxa remain invisible in the pollen record, although present in the vegetation community; the lives of individuals and the stories of communities likewise sometimes go unrecorded. Although historians and palaeoecologists may attempt to fill in the 'missing pieces' through inference and contextualisation of evidence, their interpretations will remain open to criticism. However the two disciplines do not only grapple with similar problems of incomplete evidence and difficulty of interpretation, their subject-matter meets explicitly in the question of Aboriginal burning.

In 2000, researchers at James Cook University collaborated with Bamanga Bubu Ngadimunku, an organisation representing a large number of Kuku-Yalanji people in the Mossman district, to produce a paper entitled 'Rainforests, Agriculture and Aboriginal Fire-Regimes in Wet Tropical Queensland, Australia'.[150] The authors criticised the hypothesis that 'Aboriginal fire-regimes in the coastal wet tropics… have been responsible for significant rainforest decline in the past,'[151] and utilised a range of sources to complicate scientists' interpretations of the historical contexts within which Aboriginal burning has taken place, to highlight the continuity of Aboriginal cultural practices, and the continuing presence of Aboriginal communities in the region. Historical records and aerial photographs were examined to assess the extent and direction of change in rainforest areas from European settlement of the region to the present, and Kuku-Yalanji people contributed oral data to the construction of the environmental history. The authors argued that re-expansion of

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[150] R. Hill, P. Griggs, and Bamanga Bubu Ngadimunku Incorporated, 'Rainforests, Agriculture and Aboriginal Fire-Regimes in Wet Tropical Queensland, Australia', *Australian Geographical Studies,* vol. 38, no. 2, (July 2000), pp. 138 – 157.
[151] *Ibid*., p. 138.

rainforest, which was evident from the mid-1960s to 1990, must be assessed against the dramatic losses of both rainforest and open forest which occurred during early European settlement. The authors suggest that Kuku-Yalanji people adapted their fire-use practices to these new circumstances. As open forest patches in the Mossman valley were either permanently occupied or cleared by the settlers, the Kuku-Yalanji sought to regain access to important open forest resources by firing small areas of rainforest.[152] Until 1970, two important areas of open forest were kept clear by annual burning, however around this time a fire suppression regime came into force, and missionaries reported that burning was prohibited on penalty of heavy fines. The authors noted that

> Kuku-Yalanji people are considering applying corrective burns to some areas of formerly open forest that have become rainforest. However, the desire for more open forest does not reflect an overall preference for open forest over rainforest vegetation – it arises because of the extensive loss locally of open forest since European occupation.[153]

The question of whether rainforest should be regarded as 'invader' or 'survivor' remains open, and answers are shaped by cultural and historical, as well as scientific, perspectives.

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[152] *Ibid.*, p. 154.
[153] *Ibid.*, p. 153.

Chapter 6 A Living Museum?

Conservationists have offered a range of arguments in support of the preservation of rainforest areas in North Queensland, and in particular have highlighted the environment's aesthetic, recreational and ecological values. One idea has emerged repeatedly: the rainforest as a 'living museum', a notion which has carried a shifting array of meanings. At times it has been intended as explicitly historical – areas of rainforest should be preserved because they reveal the character of the region as it was encountered at the moment of first European settlement, and thus provide contemporary observers with a moral as well as historical lesson in the courage and tenacity of their 'pioneer forefathers'. It has also been linked to the long history of Aboriginal occupation of the rainforest; conservationists have at times placed Aboriginal culture behind the museum's glass, and some have implied that there was little relationship between this past and the needs and wishes of contemporary Aboriginal communities. It has further been suggested that the rainforest provides a showcase of living fossils. North Queensland's rainforests are home to a number of 'primitive' families of plants, and are regarded as a relictual representative of a form of vegetation once much more widespread on the Australian continent, which originated on the Gondwanan supercontinent. The rainforest itself has been seen as in some sense anachronistic: a pristine, Edenic natural world threatened, but as yet unspoiled, by the destructive processes of colonisation and development. And museums are not only sites of display, but also of scientific inquiry; alongside the notion of the 'living museum' has been the rainforest as 'outdoor laboratory' – an area dedicated to the pursuit of scientific education and research. These diverse visions of rainforest have drawn on a complex and changing mixture of scientific and historical viewpoints, and their formulation has been influenced both by local concerns and by the currents of national and international opinion.

The initial impetus for preservation of natural areas of Queensland was drawn directly from the national parks tradition of the United States. Robert Collins, Member of the Legislative Assembly of Queensland, visited Yellowstone National Park in 1896, and was inspired by what he saw. When he returned to Queensland, his lobbying of Parliament led in 1906 to 'An Act to provide for the Reservation, Management and Protection of State Forests and National Parks'.[1] The Forestry Service was given responsibility for the administration and management of reserved areas in Queensland, and retained that responsibility until 1975, when an independent National Parks service was created. A number of rainforest areas were reserved in the early twentieth century, including popular recreational locations such as Lamington National Park, and places renowned for their beauty such as Witches Falls on Tambourine Mountain near Brisbane. Witches Falls was the first reservation made under the legislation, and was chosen because of its

> picturesque ruggedness, the presence of waterfalls and vast quantities of palms and tree-ferns, and the desirableness, in view of the rapid denudation of the mountain of timber, of providing protection for the native flora and fauna. [2]

According to Rod Ritchie, rainforests had been 'the favoured natural aesthetic for most of the 19th-century.'[3] Appreciation of the beauty of rainforest, and particularly of the romantic pairing of forest with water, was reflected in the popularity with tourists and day-trippers of destinations such as Lake Eacham, Lake Barrine, the Barron Falls, and Millaa Millaa in North Queensland in the late nineteenth and early twentieth centuries.[4] Rod Ritchie notes, however, that at this time

> it often was just the lone palms and fern-trees that became signifiers for the luxuriant vegetation, symbolic representatives of the forests that were being rapidly cleared … their presence alone was sufficient to instil places with a 'tropical character'.[5]

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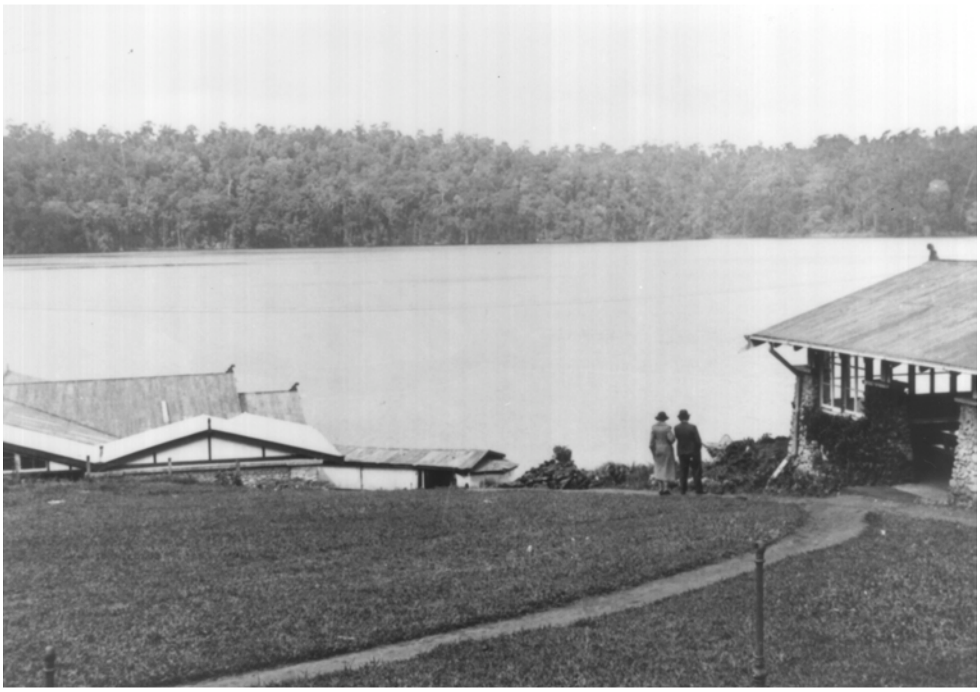
[1] L.T. Carron, *A History of Forestry in Australia*, Australian National University Press, NSW, 1985 p. 98.
[2] *Ibid.*, p. 121.
[3] R. Ritchie, *Seeing the rainforests in 19th century Australia*, Rainforest Publishing, NSW, 1989, p. 9.
[4] *Ibid.*, p. 149.
[5] *Ibid.*, p. 152.

Picnickers at Yungaburra, ca 1912.

Source: Courtesy John Oxley Library.



Lake Eacham, Atherton Tablelands, 1935.

In 1921 Mt Bellenden Ker, regarded since the nineteenth century as both a location of great interest to naturalists and a scenic attraction, was the first National Park to be declared in North Queensland.

National parks were also a focus for those wishing to protect native fauna and flora, and to provide opportunities for recreation outside the urban settings in which the majority of the population lived. The National Parks Association of Queensland was founded in 1930 with the State Governor, Sir John Goodwin, as patron, and has continued its active promotion of Queensland's parks ever since.[6] John Dargavel describes the expression of the national parks ideal within Australia as 'markedly muscular'; walking clubs were influential in the formation of National Parks Associations in a number of states.[7] In its first decade, the National Parks Association of Queensland achieved not only a four-fold increase in the area of National Parks reserved in the state, but also the construction of 170 km of walking tracks through the Parks, to allow public access and enjoyment.[8]

Although the majority of areas offered protection were in the south-east and relatively accessible to the Brisbane public, an organised voice for conservation also emerged in the North in the early decades of the twentieth century. In 1932, an editorial of the *North Queensland Naturalist* summed up the progress that the North Queensland Naturalists' Club (NQNC) had made since its founding earlier that year:

> The club is increasing in membership and in importance. Already in the Cairns district, it is making itself felt as a force. We think that the force is one for the good of the district… Unfortunately there are those who think otherwise, too. They resent the new body's activities as being calculated to disturb preconceptions or established ideas… We reach the conclusion that the resentment is dictated by constitutional weakness in unprogressive minds which reveals itself as a fear of

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[6] Colin Michael Hall, *Wasteland to World Heritage: Preserving Australia's Wilderness,* Melbourne University Press, Melbourne, 1992, pp. 112 - 113.
[7] Dargavel, *Fashioning Australia's Forests*, p. 75.
[8] National Parks Association of Queensland, 'Our History', http://www.npaq.org.au/aboutus.html#our%20beginnings, (accessed 30 May, 2005).

> anything that was not done aforetime. There are other critics, of course, who offer an honest difference of opinion and who seek to support it by the agitation fostered against a simple request that the natural flora of the Far North should be regarded as a heritage to be protected. A Naturalists Club would certainly have no right to exist if it made no spirited protest against the perpetuation of past errors in this regard. The obliterating of a district's natural vegetation, and fauna, is not a weakness so much as a wickedness.[9]

The tone of moral crusade adopted by the NQNC was a response to the sense its members had of their concerns going strongly against the grain of the society in which they lived. Both the tone, and the sense of embattlement on which it was based, can be found in the writings of Northern conservationists throughout the twentieth century.

From its establishment in 1932, the NQNC attempted to raise the awareness of Cairns residents of the uniqueness and value of the local rainforest and reef environments through its promotion of better understanding of the natural history of the region. The NQNC addressed conservation issues ranging from the dangers posed by introduced plants such as lantana, to the damaging impact of unregulated tourist visits to the reef and islands. They discussed the problems of soil erosion and wildfire on the ranges around Cairns,[10] opposed the dynamiting of fish,[11] and the hunting of native wildlife.[12] It is noteworthy too that, like many North Queensland-based conservationists to follow, NQNC founder Hugo Flecker moved to Cairns from 'down south' (Melbourne). The excitement of his first encounter with the tropical environment, combined with his interest in natural history and his scientific training, led Flecker to become a passionate advocate for the preservation of the 'natural wonders' of the region.[13]

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[9] 'Editorial', *The North Queensland Naturalist*, vol. 1, no. 2, (Nov. 1932), pp. 3.
[10] *The North Queensland Naturalist*, vol. 9, no. 64, (Dec 1940).
[11] *The North Queensland Naturalist*, vol. 2, no. 1, (Oct. 1933).
[12] *The North Queensland Naturalist*, vol. 5, no. 51, (Sept. 1937).
[13] Clarkson notes that while Flecker's ongoing health problems and the favourable climate offered by the North were significant reasons behind his move there, his friendship with an x-ray technician who had moved to Melbourne from North Queensland, and with whom he used to discuss 'the largely unexplored wonders which abounded in tropical Queensland' was also a significant factor. John Clarkson, 'Hugo Flecker and the North Queensland Naturalists' Club' in Short (ed.), *History of Systematic Botany in* Australia, p. 171.

Flecker had been involved in natural history organisations all his life: as a child in South Australia he was a member of the Boy's Field Club, at university, where he studied medicine, he joined the Naturalists' Club of New South Wales and the Sydney University Students' Science Club. On returning to Australia after serving in the First World War, he became a member of the Field Naturalists' Club of Victoria. When he arrived in Cairns, Flecker looked for a similar organisation and found that none existed. He arranged a public meeting, chaired by the Mayor of Cairns, to discuss the formation of such a club and was promptly elected its foundation president.[14]

Despite the enthusiasm of Club members, Flecker was dismayed by the lack of interest shown in natural history by a large proportion of the population of Cairns. He wrote, in 1937, that most residents of the North

> are quite content to remove every vestige of natural vegetation to make way for a garden, perhaps of crotons and acalyphas, precisely similar to that of almost every other householder and public body. The wonderful treasures [of the region's flora and fauna] then to most people are not at all appreciated.[15]

Flecker did not regard the Club as merely providing a service for members, but sought to also encourage those who had grown up in Cairns to learn to see the natural world through new eyes. This was the aim of the 'Wild Nature Shows', at which the natural wonders of the North (mostly stuffed) were put on display. As reported after the first Show, held in August 1933:

> The general public showed keen interest in this venture and attended well. One object of our Club is to educate the public and local organisations to appreciate the beauty of our local flora and fauna, and as 98 per cent. of our exhibits were purely

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[14] *Ibid*., p. 172
[15] H. Flecker, 'North Queensland – A Naturalists' Paradise', *The Queensland Naturalist*, February 1937, p. 20.

native to North Queensland we feel that the Wild Nature show accomplished much in this direction.[16]

Flecker also wrote a 'Current Nature Topics' column, which was published in the Cairns weekly newspaper from 1935 until his death in 1957. The column discussed the natural history of the region, offered updates on the activities of the NQNC, details on visiting eminent naturalists and scientists, and reports on the progress of collections for a North Queensland Herbarium.[17]

Under Flecker's guidance the Club's publication, the *North Queensland Naturalist*, developed into a quarterly publication which contained information of interest to professional biologists. From 1933 to 1948 Flecker supplemented the journal with a 'census of North Queensland plants', compiled initially from existing taxonomic work. With the encouragement of Queensland Government Botanist C.T. White, Flecker and other members began to collect more ardently, and 'quite a number of new taxa were described and new combinations made in the journal'.[18] Club members continued to send specimens to the Queensland Herbarium for identification and classification; however a duplicate collection was also maintained and, with the assistance of the identifications made by the government botanist, a local herbarium was begun. As Flecker's work became better known, botanists from throughout Australia sent him specimens for the North Queensland Herbarium.[19] When the Herbarium was donated to the CSIRO at Atherton in 1971, it contained over 10,000 specimens. Around two dozen were type specimens, from which the original description of the taxa was made.[20] The NQNC contributed significantly to the botanical knowledge of a largely unexplored flora; and in doing so, it laid the groundwork for the development of local scientific research institutions, and for the efforts of conservationists in later years.

From its inception, the Club was not shy to petition local authorities on issues of concern. The first controversy entered into by the NQNC was over 'the planting out

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[16] *The North Queensland Naturalist*, vol. 2, no. 1, (October, 1933), p. 1.
[17] Clarkson, 'Hugo Flecker and the North Queensland Naturalists' Club', p. 173.
[18] *Ibid.*, p. 172.
[19] *Ibid.*, p. 174.
[20] *Ibid.*, pp. 173 - 174.

of exotic shrubs and trees in the jungles and on the ranges about Cairns'. The NQNC was supported in its protest by the Queensland Naturalists' Club (Brisbane), but strongly opposed by some locals, particularly horticulturalists and commercial nurseries.[21] As well as protesting the planting of exotic species in 'the jungle', the NQNC also promoted the planting of local species as ornamental trees in the streets of Cairns,[22] and agitated for the establishment of a Botanic Garden.[23] Another dispute began in 1949 when the local council decided to remove 'The Cairns Fig Tree', a large native fig (*Ficus infectoia*) of unknown age which grew in the busiest section of the city. Flecker wrote an article detailing both the natural and particular history of the tree, including the range of mishaps which had damaged it over the years, the birds and epiphytes which occupied it, and the regular seasonal changes it underwent. Flecker presented the tree as providing a connection with the pre-European past of Cairns, and as being valuable not only for its beauty and novelty, but for the historical anchorage and sense of authenticity it offered to the city. He stated: 'Is it any wonder then, that this oldest inhabitant of Cairns should be revered by most of its residents and considered an important feature not possessed by other cities?'[24] In 1951 Flecker applied to UNESCO to have the tree listed as a national archaeological treasure.[25] When the council finally removed the tree in 1953, he lamented that it would never be forgotten by any who had seen it: 'they might forget the existence of Cairns – they might forget where it is – but they will never forget the tree.'[26] In a poem published in the *North Queensland Naturalist* 'On the Death Of A Tree' (I will spare the reader its full reproduction!), the Cairns Fig Tree was represented as having existed not only prior to European settlement, but also prior to Aboriginal presence in the region.[27] The tree was important both because it was deeply imbedded in the history of the region, its 'oldest resident', and because it stood separate from it, an archaeological treasure, representative of a world now lost. The NQNC's viewpoint unintentionally echoed a longer history of association between nature and culture: in Yidiny, the language of

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[21] 'Bougainvillea Controversy', *The North Queensland Naturalist*, vol. 1, no. 4, (Jan. 1933), p. 8.
[22] Flecker, 'North Queensland – A Naturalist's Paradise', p. 21.
[23] 'Flecker Botanic Gardens' was established by the Cairns City Council in 1971. Clarkson, p. 172.
[24] H. Flecker, 'The Cairns Fig Tree,' *The North Queensland Naturalist*, vol 17, no. 92, (Sept. 1949), pp. 1 - 3.
[25] Flecker to Jean Devanny, 20 September, 1951, quoted in Ian Frazer, 'Conservationism and Farming in North Queensland, 1861 – 1970', MA Thesis, James Cook University, 2003.
[26] *The Cairns Post*, 29 July, 1953.
[27] *The North Queensland Naturalist*, vol. 22, no. 106, (Oct. 1, 1953), p. 1.

the Aboriginal people who belong to the country around Cairns, the site on which Cairns was built was named *Gimuy*, after another variety of native fig tree (*Ficus albipila*).[28]

The North Queensland Naturalists' Club saw natural history as a means of better appreciating the flora and fauna of North Queensland, and a means that was accessible to anyone willing to spend the time, regardless of age or education.[29] The conservation concerns of members were based on their direct observation of environmental change, which led them to focus on the protection of noteworthy or emblematic elements of the flora and fauna. The arguments they offered in favour of conservation appealed strongly to regional pride, and human sentiment and values. The notion of 'heritage' underlying the NQNC's work was a complex one: it suggested the valuing of local over introduced species and landscapes, for aesthetic and parochial as well as scientific reasons; it promoted a sense of the worth of the environment beyond economic values; and it presented natural history as morally preferable to other ways of relating to the flora and fauna of North Queensland.[30] Absent was any consideration of the significance of such 'heritage' to the Aboriginal inhabitants of North Queensland. The *Naturalist* sometimes included ethnographic notes, transcriptions of Aboriginal legends, or discussions of artefacts uncovered by 'locals', but largely placed Aboriginal presence and culture within the realm of natural history.[31] The notion of 'natural heritage' would be central to later conservation battles over the rainforests of North Queensland, and would continue to meet with local opposition.

The Royal Society of Queensland has, since its foundation in the late nineteenth century, provided an important forum for scientifically-based arguments

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[28] Dixon, *Words of Our Country*, p. 1.
[29] For instance, Flecker initiated an annual 'natural history essay competition' for local children, which aimed to encourage the clear recording of careful and direct field observations. *The North Queensland Naturalist*, no. 114, (Feb. 1956), p. 7.
[30] On the changing of use of the term 'heritage' in Australia see T. Bonyhady, 'The Stuff of Heritage', in T. Bonyhady & T. Griffiths (eds), *Prehistory to Politics: John Mulvaney, The Humanities and the Public Intellectual*, Melbourne University Press, Carlton South, Vic., 1996, pp. 144 - 162.
[31] For instance, 'Further Notes on the Ooyurka of North Queensland', *The North Queensland Naturalist*, vol. 18, no. 94, (June 1950); 'Legend of the Big Rock', *The North Queensland Naturalist*, vol. 20, no. 99, (Dec. 1951); 'A Legend of Durren Dae (Dream Time)' and 'Rock Paintings of the Konkandji People', *The North Queensland Naturalist*, vol. 20, no. 101, (June 1952).

for conservation.[32] These arguments have largely been presented in the Society's Annual Presidential Addresses, which allowed greater expression of personal and political views than regular articles.[33] Part of the value of the Society has been that its membership included not only amateur naturalists and research scientists, but also government officials and other prominent citizens, and its Presidents have been drawn from all of these groups. As Len Webb stated in 1963: 'I can think of no better body in Queensland than this Society for the job of spreading the lessons of conservation in quarters where it is most needed.'[34]

In the late nineteenth and early twentieth century, the view put forward in Presidential Addresses was that conservation was the wise and careful use and development of resources. Speakers emphasised the rich potential of Queensland's natural environment, and the importance of science and technology as means to its full and efficient development.[35] The Second World War led to greater attention being given to the need to develop and populate the North. Professor H.C. Richards, in his Presidential Address of 1939, noted that 'Things have changed very decidedly, and we need to use to the very best advantage all our resources – material, research, and human.'[36] The way in which to do this was, he suggested, through the further funding of scientific research organisations such as CSIR. Professor D.H.K. Lee agreed that 'the northern parts of Australia have been sadly neglected', and that 'science must be an integral part of the national organization for progress.'[37] While H.A. Longman, in his Presidential Address of 1940, also believed that 'Science is the greatest inciter of

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[32] Paul Stevens, 'Plants, forests and wealth: vegetation conservation in Queensland, 1870 – 1900', in B.J. Dalton (ed.), *Peripheral Visions: Essays on Australian Regional and Local History*, James Cook University, Townsville, 1991, p. 167.

[33] In recent years these have included R.H. Greenwood, 'Pressure on Land and Resources in Queensland', *Proceedings of the Royal Society of Queensland*, vol. 80, (1968), pp. v - xiv; G.W. Saunders, 'Variety and Diversity', *Proceedings of the Royal Society of Queensland*, vol. 86, (1975), pp. v - xiv; H.J. Lavery, 'Conservation and Change', *Proceedings of the Royal Society of Queensland*, vol. 90, (1979), pp. 1 - 12; B. Rigsby, 'Aboriginal People, Land Rights and Wilderness on Cape York Peninsula', *Proceedings of the Royal Society of Queensland*, vol. 92, (1981), pp. 1 - 10; P.S. Sattler, 'Nature Conservation in Queensland: Planning the Matrix', *Proceedings of the Royal Society of Queensland*, vol. 97, (1986), pp. 1 - 21.

[34] L.J. Webb, 'Concepts of National Parks and Nature Reserves', *Proceedings of the Royal Society of Queensland*, vol. 75, no. 10, (1963), p. 81.

[35] For instance, see Sir Leslie Wilson, 'Queensland Assets', *Proceedings of the Royal Society of Queensland*, vol. 48, (1936), p. 96.

[36] Professor H.C. Richards, 'Some Scientific Investigations Affecting Queensland', *Proceedings of the Royal Society of Queensland*, vol. 51, no. 1, (1939), p. 1.

[37] D.H.K. Lee, 'Terra Australis Rediviva', *Proceedings of the Royal Society of Queensland*, vol. 55, no. 1, (1943), pp. 2, 4.

hope that we know', he was less sanguine about some of the side-effects of 'progress', (or at least 'progress' unguided by scientific knowledge):

> We have deliberately destroyed countless areas of magnificent jungles or rain forests which, with their associated fauna, represent an intensive development during thousands of years. We have denuded mountains of their natural vegetation and turned fertile slopes into barren wastes. We have cleared innumerable acres of forests in order to make (as I have heard it quaintly put) two blades of grass grow where one tree grew before. The problem of soil erosion is now being studied intensively and in the future we shall doubtless avoid some of the mistakes made in the past.[38]

He also noted that it was not only nature that required protection from these processes of change:

> In the extension of what we call civilisation man has rarely considered the rights of lower races… although Governments have been, on the whole, sympathetic, it has been found almost impossible to conserve Stone Age Man in association with Europeans. At times we have done more in providing sanctuaries for our wild birds than for our wild people, and their survival as a race is doubtful.[39]

Longman added, however, that 'there are significant credits as well as debits… Where once a few thousand Australian aborigines eked out a parlous existence, we have built up a standard of living which is the envy of the old world.'[40]

In 1959, Professor of Botany, D.A. Herbert, presented a public lecture to celebrate Queensland's centenary.[41] Herbert argued that 'progress over the century has been made possible by increasing application of scientific principles.'[42] After outlining the role science played in forestry, agriculture, management of pests, health and hygiene, Herbert concluded:

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[38] H.A. Longman, 'Homo Sapiens: Turbulentus', *Proceedings of the Royal Society of Queensland*, vol. 52, no. 1, (1940), p. 4.
[39] *Ibid.*, p. 3.
[40] *Ibid.*, pp. 4 - 5.
[41] Delivered in the City Hall, Brisbane, 12th May, 1959. Herbert, 'A Story of Queensland's Scientific Achievement'.
[42] *Ibid.*, p. 2.

> Where the pioneers found a difficult environment – difficult because it was so different from that of their home land – their successors with the resources of modern science have increasingly changed it and are continuing to change it. They have the upper hand.[43]

However Herbert argued that the preservation of nature was necessary to balance the environmental transformations caused by such progress:

> This would perhaps lead us to the conclusion that the goal of those who built Queensland and are working towards its future is to change the face of nature. Forests of hoop pine are to replace our rain forests, the wildflower country of the coast is to be converted to pastures, farms and forests of exotic pines, the pastures are to be replaced, poor soils made fertile, rivers dammed, dry country irrigated, and in fact the whole country ultimately transformed until little of its original character remains. … but far seeing citizens over fifty years ago saw the urgent need of reserving areas of the State as National Parks, wherein the native plants and animals would be strictly preserved in their natural condition for all time… [44]

Herbert regarded such preservation of nature as a freezing of historical time; the creation of a living museum which would not only be enjoyed for its own sake, but also for the sense it provided of the scope of the historical process from which it had been protected. He suggested that visitors to Queensland's National Parks 'can pass in a short space of time from Queensland as she is today into the wild untouched surroundings that faced our early pioneers.'[45]

From the early 1960s there was a shift in the meaning of 'conservation' as discussed by the Royal Society. The notion of wise use of resources, and the desire for the preservation of flora and fauna as an 'island in the stream of development'[46] remained significant. However a range of scientific justifications for conservation based on ecological arguments re-directed the politics and practice of conservation in

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[43] *Ibid.*, p. 14.
[44] *Ibid.*, pp. 14 – 15.
[45] *Ibid.*, p. 15.
[46] Dunlap, *Nature and the English Diaspora*, p. 290.

Queensland. During the 1960s and 1970s, the Royal Society of Queensland held symposia which brought together experts to discuss National Parks and conservation, to consider conservation issues affecting Cape York Peninsula and Stradbroke Island, and to support a proposed National Park in the Border Ranges of New South Wales, which would complement Queensland's adjacent Lamington National Park. Speakers highlighted the inadequacies of current scientific knowledge, and pressed for careful surveying of fauna and flora to allow reservation of representative ecosystems, and for scientific reserves to be declared so an experimental approach might be taken to the study of such ecosystems. As there were direct connections between the debates which occurred within the Society and those which took place in scientific organisations at a national and international level, I will first consider these national and international currents and then examine how they affected discussions at the state level.

National scientific bodies such as the Australian and New Zealand Association for the Advancement of Science (ANZAAS) and the Australian Academy of Science have long played a significant role promoting conservation, and providing resources to concerned scientists.[47] Following the lead of the Australasian Association for the Advancement of Science in the nineteenth century, from the 1930s onwards ANZAAS championed the idea of a national biological survey, expressed concern at the inconsistency of legislation protecting fauna and flora in each of the states, and argued the urgent need to protect the habitat of Australia's wildlife.[48] In 1958 the Australian Academy of Science established a National Parks Committee to 'study and report on the situation in respect to National Parks, Wildlife and Archaeological Reserves and Primitive Areas within the Commonwealth.'[49] Despite the terming of such parks 'national', not only were they entirely the responsibility of the states, but they were differently defined and subject to varying forms of management and use in different parts of Australia. The Academy consulted with the Commonwealth Attorney General on the legal and administrative aspects of the issue. Lack of resources, and the difficulty of reconciling the divergent approaches taken by each

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[47] L. Robin, 'Nature Conservation as a National Concern: The Role of the Australian Academy of Science', *Historical Records of Australian Science*, vol. 10, no. 1, (June 1994), p. 1.
[48] *Ibid.*, p. 2.
[49] *Ibid.*, p. 4.

state, made the report's compilation a slow and complex undertaking.[50] In legal and practical terms, even after federation, a 'national' conservation strategy was long held as an aspiration rather than a fact. Under the Australian Constitution, the states retained legislative responsibility for everything not designated a power of the Commonwealth, and this has included most matters relating to the environment.[51] This division of power did not go unnoticed by Australian scientists, who regularly undertook legal, rather than scientific, research to promote their conservation concerns.

Robert Boardman suggests that the contemporary history of international conservation began in 1948, with the formal establishment of the International Union for the Protection of Nature (later the International Union for the Conservation of Nature and Natural Resources, or IUCN).[52] Endangered species were the first focus of the organisation's activities. In 1949 the IUPN, in collaboration with the United Nations Educational, Scientific and Cultural Organisation (UNESCO), produced the first of a continuing series of 'Red Data Books', which contained lists of threatened and endangered species.[53] However it soon became clear that not only was little known about many endangered species, but it was difficult to compel action on any other than the most notable – generally large, appealing mammals and attractive birds. The major threat to species was loss of habitat and so, from the late 1950s, the organisation increasingly focused its efforts on promoting the reservation and protection of ecosystems in National Parks or other equivalent reserves worldwide.[54]

Boardman argues that from the foundation of the IUPN, 'the conviction grew that international conservation of nature was inherently a science-based enterprise.'[55] Central to the organisation's early history was a tension between the scientific and public faces of conservation. Boardman suggests that those who saw getting the science right as fundamental to the promotion of conservation aims and outcomes

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[50] *Ibid.*, pp. 5 - 7.
[51] For a detailed discussion see Colin Michael Hall, *Wasteland to World Heritage: Preserving Australia's Wilderness*, Melbourne University Press, Melbourne, 1992, pp. 162 - 165.
[52] Robert Boardman, *International Organization and the Conservation of Nature*, Macmillan Press, London, 1981, p. 25.
[53] *Ibid.*, pp. 51 - 52.
[54] *Ibid.*, p. 49.
[55] *Ibid.*, p. 47.

tended to err on the side of greater caution and concern for scientific professionalism. In contrast, those aiming to make conservation a popular issue were eager to use the media and create a rapid public response to incite political action. This was a conflict which would also be significant in the history of conservation organisations in Australia – in particular, in the early years of the Australian Conservation Foundation (ACF).[56]

In 1964 the International Union of Biological Science initiated the International Biological Programme (IBP), a large-scale project which incorporated a range of approaches to problems within the biological sciences and included a section on the Conservation of Terrestrial Ecosystems (CT). The CT's goal was to survey plant communities and to investigate the adequacy of their representation in reserves throughout the world. The outcomes of the CT's work were limited by financial constraints, the short lifespan of the programme, the difficulties of achieving agreement on the classification system to be adopted,[57] and of finding the balance between obtaining results general enough to be comparable and detailed enough to actually be meaningful.[58]

In Australia the CT's work, headed by Professor Ray Specht of the University of Queensland, was supported by the Australian Academy of Science. The aim of the Australian survey was to 'show how a national system of reserves could be created to conserve the maximum possible number of species.'[59] Lists of endangered plant species were provided by each state herbarium, and a number of biological scientists and professionals were involved in the Programme. The Queensland survey included Len Webb; Stan Blake and Lindsay Smith of the Queensland Herbarium; Syd Curtis and Peter Stanton of the National Parks branch of the Forestry Commission; Betsy Jackes, botanist at James Cook University; and University of Queensland zoologist

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[56] This was a substantial reason for the 'takeover' of what had been a conservative, establishment ACF by a younger and more radical group in 1973. For further details, see B. Broadbent, *Inside the Greening: 25 Years of the Australian Conservation Foundation*, Insite Press, Elwood Vic., 1999.
[57] The Australian Committee of the CT chose not to use the classificatory system recommended by the IBP, which it saw as being unsuited to the Australian situation. Specht et al., *Conservation of Major Plant Communities in Australia and Papua New Guinea*, CSIRO, Melbourne, 1974, pp. 4 - 5.
[58] For a detailed discussion, see E.B. Worthington (ed.), *The Evolution of IBP*, Cambridge University Press, Cambridge, 1975, pp. 80 - 86.
[59] Linden Gillbank, 'The Life Sciences: Collection to Conservation', in Roy Macleod (ed.), *The Commonwealth of Science*, Oxford University Press, 1988, p. 116.

Jiro Kikkawa, as well as a number of others.[60] The survey provided a 'scientific basis for conservation at a level that [had] never been previously possible.'[61] As almost half the plant alliances identified by the survey were found not to be protected, urgent calls were made for a system of ecological reserves to be established.[62] In particular, the authors noted that

> For some plant formations most alliances are not represented at all, and this surely calls for urgent examination by the Governments concerned, particularly in cases of special responsibility where alliances of great biological interest and complexity, such as the tropical closed-forests of Queensland, are restricted to one State.[63]

E.M. Nicholson, the head of the CT, recalls that when the Programme began, many scientists were wary both of the grand international approach and of the inclusion of conservation within the IBP's aims. He notes that as the directions to be taken by the Programme were being discussed in 1962,

> inclusion of conservation in the programme did little to overcome the distaste for it felt by many biologists at that time. Few were attracted by its pretensions as a leading form of applied ecology... The idea of harnessing conservation to the fulfilment of ecological research, and conversely of underpinning ecological research through a worldwide network of scientific reserves to be used as outdoor laboratories was keenly held by [the organisers], but its effective backing among both conservationists and ecologists was minimal...[64]

As Boardman notes, 'the intellectual basis of conservation… was being slowly put together piecemeal at a time when the urgency of the threat facing the world's wildlife seemed to many to be approaching crisis proportions.'[65] In 1975, after the

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[60] The full list of those involved, and of the results of the survey, is found in Specht et al. (eds), *Conservation of Major Plant Communities,* pp. 644 - 646.
[61] *Ibid.*, p. 629.
[62] Dargavel, *Fashioning Australia's Forests*, p. 155.
[63] Specht et al. (eds), *Conservation of Major Plant Communities,* p. 631.
[64] Worthington (ed.), *The Evolution of IBP*, p. 12.
[65] Boardman, *International Organization and the Conservation of Nature*, pp. 49 - 50.

conclusion of the IBP, Nicholson recorded his hope that 'If world conservation grows steadily more scientific, and if the biological and earth sciences grow steadily more conservation-minded, the work of CT will not have been in vain.'[66]

Both within Australia and internationally, the 1960s and 1970s saw ecological science thrust to the centre of public debates on 'the environment'. Thomas Dunlap notes that

> Scientists became familiar with ecology through professional learning and practice, the public through the apparatus of public education that had been developing since natural history had been a popular recreation. The public learned that biological systems were intricately interconnected and that the growing human population and industrial development threatened many species. What gave these concerns point was the more troubling knowledge that humans were personally involved. It was one thing to know that pollution and population were destroying natural beauty, another to find that human ingenuity threatened humans, even oneself and one's family.[67]

The publication of Rachel Carson's *Silent Spring* in 1962 added an important impetus to an already growing public concern, although the response of many scientists to Carson's work, during the controversy which followed, was not supportive.[68] Locally, a number of scientists contributed to Jock Marshall's *The Great Extermination: a Guide to Anglo-Australian Cupidity, Wickedness and Waste* (1966), a stark condemnation of the history of European settlers' interactions with the Australian biota. Len Webb's chapter, 'The Rape of the Forests', argued that Australians should develop 'ecological literacy': they should be aware of the signs and implications of ecological damage, and have a greater understanding of its causes.[69] In an account which mixed scientific explanation, historical narrative, and political rhetoric, Webb argued that current damage to Australia's forests did not simply result from the need, greed and ignorance of individuals, but also from the

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[66] Worthington (ed.), *The Evolution of IBP*, p. 86.
[67] Dunlap, *Nature and the English Diaspora*, pp. 264 - 265.
[68] *Ibid.*, p. 265. Len Webb recalls the galvanizing effect the book had on him and others involved in the conservation movement in Queensland, (L.J. Webb, personal communication, 14 - 15 April 2005, Brisbane).
[69] L.J. Webb, 'The Rape of the Forests', in Marshall (ed.) *The Great Extermination*, pp. 157 - 158.

economic and legal systems which regulate individual action. He suggested this has been evident in the conflict between land development and forestry, and highlighted the fundamental ecological principle that

> the land is a unity… Forests, soils and water form an inseparable trinity, and each keeps the other in health. Hence good and permanent agriculture depends on good and permanent forestry, and vice versa… Conservation is positive in outlook and technique and is inseparable from the continued productivity of the land.[70]

In the introduction to *The Last of Lands* (1969) Webb wrote: 'not another acre to be alienated, not another native habitat to be gutted, until we take stock.'[71]

As Dunlap notes, by the late 1960s, 'the sense of crisis and the recognition that ecological problems cut across disciplinary boundaries were breaking down walls between fields and between scientists and the public.'[72] In 1970 UNESCO launched its long-term interdisciplinary and intergovernmental programme 'Man and the Biosphere', which would, among other things, work for the development of a 'Co-ordinated World-Wide Network of Protected Areas', including 'biosphere reserves': representative areas of all important ecosystems within a nation's boundaries.[73] Environmental degradation – from the extinction of species, to deforestation, from overpopulation to the threat of nuclear war – was widely regarded as a potentially irreversible process occurring on a global scale. The use of the term 'global' is more than just suggestive: the first images of the earth seen from space, a beautiful and lonely globe encompassed by what suddenly seemed a very vulnerable 'biosphere', were pivotal to the emerging environmental movement.[74] This sense of crisis led to the blossoming of local, national and international organisations concerned with environmental issues. John Dargavel argues that these organisations were characterised by the involvement of the 'new middle class', a group which was

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[70] *Ibid*., p. 197, 202.
[71] L.J. Webb, D, Whitelock, & J. Le Gray Brereton (eds), *The Last of Lands,* Jacaranda Press, Queensland, 1969, p. xi.
[72] Dunlap, *Nature and the English Diaspora*, p. 287.
[73] Hall, *Wasteland to Wilderness,* p. 183.
[74] T. Griffiths, 'The nature of culture and the culture of nature', pp. 73 - 74. It is an image commonly used to represent both the finitude and the unity of planet earth. See, for instance, Stan Croner, Commissioner on Education, IUCN & UNEP, *An Introduction to the World Conservation Strategy*, IUCN, Gland, Switzerland, c1984. It is both discussed and represented visually on p. 4.

typically urban, well-educated, and removed from direct involvement in primary or secondary production, and which 'wanted to know more about and sought more say in public affairs.'[75] Dargavel suggests that:

> In 1950 there were probably less than 50 conservation societies [in Australia]; by 1970 there were over 200; and by the 1980s a directory listed 800 organisations covering all sorts of areas, interests and activities, but thought there were 300 to 400 more, many of which were probably local and transient.[76]

Amongst the organisations which emerged in the initial expansion of the 1960s were those such as the Queensland Wildlife Preservation Society (1962), founded by Judith Wright, supported by Len Webb as an early Vice-President; the Australian Conservation Foundation (1964), conceived by CSIRO ecologist, Francis Ratcliffe, and of which Len Webb was also a founding member; the Littoral Society of Queensland (1967); and the Queensland Conservation Council (1969). These bodies directed public attention to threats to the Queensland environment – primarily to the Great Barrier Reef, Cooloola, Fraser Island, and to the wet tropical rainforests of North Queensland – which came thick and fast under the development-oriented Bjelke-Petersen government.

From the mid-1960s in Queensland, focus shifted from reservations of National Parks made on the basis of the scenic values of an area, to reservation of 'representative' samples of ecosystems.[77] Len Webb supported this new approach, and argued that it enabled the scientific research which must underpin any sound conservation policy:

> One of the first steps is to preserve and maintain, as part of the nation's natural heritage, reference areas or representative habitats … to enable comparisons to be made between primitive or relatively undisturbed communities and the modifications introduced by varying degrees of human interference. Only then can we understand what the so-called balance of nature means. To do this we need more than

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[75] Dargavel, *Fashioning Australia's Forests*, pp. 137 - 138.
[76] *Ibid.*, pp. 142 - 143, statistics from ACF's *The green pages: directory of non-governmental environmental groups in Australia*, ACF, Melbourne, 1982.
[77] Carron, *A History of Forestry in Australia*, p. 122.

> National Parks as at present conceived and administered. We need more than political thinking which does not see beyond tourism and the superficial appearances of vegetation.[78]

In 1963, the Royal Society of Queensland held a symposium to discuss national parks and the conservation of living space for flora and fauna. Webb noted that the symposium was timely for a number of reasons: because it coincided with work undertaken by the IBP, and with the Australian Academy of Science's efforts to ascertain 'which biogeographic regions in Australia should be reserved as reference areas for biological studies', and also with the establishment in Queensland of a Ministry of Conservation.[79] Stan Blake, botanist at the Queensland Herbarium, wrote:

> Queensland has built up a fine system of National Parks, but many types of country are still not represented, and the total area is distressingly small – only about one fifth of one percent of the area of the State. Although these are so small, there are all too many attempts being made to interfere with them.[80]

A number of arguments were raised to support the need for better protection of native flora and fauna. These included their direct and indirect economic values – as sources of food, furs and skins; in limiting pest species and preventing damage to crops; and for blood sports and as tourist attractions.[81] Greater emphasis was placed on the scientific rationale for conservation, based on the unique characteristics of Australian biota and the lack of scientific knowledge of many of Queensland's ecosystems. As University of Queensland entomologist, Elizabeth Marks, stated (revealing her own inclinations in the process):

> Identification of a species is just a beginning; we still have to study its life history, distribution, behaviour, ecology, morphology, physiology, and genetics. This will take generations of scientists to accomplish, yet the tapeworm and the termite

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[78] Webb, 'Concepts of National Parks and Nature Reserves', p. 82.
[79] *Ibid.*, p. 81.
[80] E.N. Marks, 'National Parks and Sanctuaries and the Conservation of Living Space for Native Flora and Fauna', *Proceedings of the Royal Society of Queensland,* vol. 75, no. 10, p. 73.
[81] *Ibid.*, p. 74.

> may have as much to tell us in their own way as the bower bird and the bandicoot… We do not know sufficient about any species to say it cannot be saved or it is not worth saving, though undoubtedly some are worthy of very special efforts and some will disappear despite our efforts.[82]

Marks noted that to conserve a viable population of a species it is necessary to conserve its living space; however the extent and range of habitat required for many species remained unknown. While the Queensland Forestry Act determined that National Parks should be areas of 1,000 acres or more, that figure was not based on scientific research.[83] Marks argued that, in the face of such lack of knowledge, it was necessary to err on the side of generosity rather than economy.[84]

However, Charles Roff, Fauna Officer for the Queensland Department of Primary Industries, struck a sober note:

> I think we must agree that the ideal of re-establishment of primitive conditions in developed areas is not much more than a dream, desirable though it might appear from the historical and sentimental standpoints. Most of us would like to see more of the magnificent rain forests and eucalyptus forests that once covered many parts of the Great Dividing Range and coastal plains; or the many waterfowl that excited the awe of early colonists in Central and North Queensland; or the wildflowers of the Gold Coast wallum now gone; but few would be willing to do so at the cost of destroying the cities, homes, holiday resorts, industries and farms that make up this State.[85]

Roff pointed both to the immensity of loss, and to the personal enmeshment of all Queenslanders on a daily basis with the causes of that loss.

In 1966 Len Webb published an article in the *Proceedings of the Royal Society of Queensland* on 'The Identification and Conservation of Habitat-Types in the Wet

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[82] *Ibid.*, p. 75.
[83] J.K. Jarrot, 'Queensland National Parks and Scenic Areas', *Proceedings of the Royal Society of Queensland*, vol. 75, no. 10, (1963), p. 79.
[84] Marks, 'Conservation of Living Space for Native Flora and Fauna', p. 76.
[85] C. Roff, 'Fauna Sanctuaries', *Proceedings of the Royal Society of Queensland*, vol. 75, no. 10, (1963), p. 83.

Tropical Lowlands of North Queensland'. While 'The Rape of the Forests', published in the same year, had been explicitly political and intended to rouse the general public to action, this article was of a muted tenor. Webb had originally sent a more forthright version to the Society, only to be

> gently but firmly told that the Constitution of the Royal Society did not provide for advocacy and value judgements in a scientific paper, and would I mind leaving the unscientific bits out. Which I did.[86]

Webb argued that North Queensland contained 'a unique flora and fauna which have yet to be systematically studied', and the remaining fragments of which were facing imminent destruction. The article was the outcome of a survey of rainforest in North Queensland undertaken by Len Webb and Geoff Tracey in 1963. Tracey recalled that they 'had recognised the tremendous impact of settlement on the last remaining stands of lowland rainforests, so [in preparing the article] we concentrated specifically on the lowlands.'[87]

Webb began with a discussion of the historical processes which had shaped the region; and he wrote with the knowledge and passion of one who had seen those processes of clearing and development continuing in the present day. In the 1960s, improvements in the mechanics of clearing and soil-drainage, and in the use of fertilisers, had sharply increased pressure for clearance of lower-fertility land which still supported rainforest and other ecosystems.[88] Cattle-fattening had recently begun – between 9,000 and 20,000 acres of rainforest had been removed to establish the US-owned King Ranch on the lowlands near Tully[89] – and the expansion of banana-growing was also anticipated. Webb wrote:

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[86] Webb, 'After-dinner peroration', p. 96.
[87] Interview with Geoff Tracey, NLA TRC 2845/46: 2.2.13
[88] L.J. Webb, 'The Identification and Conservation of Habitat-Types in the Wet Tropical Lowlands of North Queensland', *Proceedings of the Royal Society of Queensland*, vol. 78, no. 6, (1966), p. 68.
[89] Webb, 'The Rape of the Forests', p. 191. Webb notes that the lower estimate is the Company's.

> This development threatens to destroy all that remains of the native vegetation and its associated wildlife on the narrow coastal lowland strip on moderate slopes and flats which are reasonably well drained or which can be drained.[90]

Of the 457,872 acres of National Parks and Scenic Areas in the Townsville-Cooktown region, most were on rugged mountain slopes on granitic and metamorphic rocks and low-fertility soils. Other than the outer limits of existing highland parks, there were no National Parks in the mainland coastal tropical belt below an altitude of 1,000 feet.[91]

Webb recommended a series of reservations of lowland tropical ecosystems between Thornton Peak and the Cardwell Range. He argued that such areas have an 'intrinsic interest to future generations of Australians who want to see how the country appeared to their pioneer forebears, and who will undoubtedly visit North Queensland in ever increasing numbers.' He suggested that they would provide important 'outdoor teaching and research laboratories' as recommended by the IBP, and were also a source of economic plants such as drug plants, of the kind sought and found by the Phytochemical Survey. Finally, Webb stated that:

> the rain forests of North Queensland constitute the habitat of many interesting and often strikingly beautiful animals – birds, mammals, lower vertebrates, insects and other invertebrates – which occur nowhere else in Australia, which can live in no other habitat, and whose local and then complete extinction is threatened as their habitat is encroached upon and destroyed.[92]

Webb based his recommendations on the structural classification of rainforest he had developed in 1959 and on the principle that, because of the high proportion of narrowly endemic species, representatives of the whole range of habitat-types encompassed in his classification should be protected. He recommended twenty sites for reservation, most as National Parks, while a few smaller areas were included on

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[90] Webb, 'Habitat-Types in Wet Tropical North Queensland', p. 59.
[91] *Ibid.*, p. 60. However there were two Scenic Areas (of less than 1,000 acres each) and a number of smaller Scenic Reserves.
[92] *Ibid.*, pp. 60 – 62.

the basis of their value to science or as additions to existing reserves. Although duplication of habitat-types was minimal, some areas were important because they demonstrated the conjunction of a number of different habitats, and others included buffer zones of a different habitat-type around a core protected area.[93]

Webb argued it was not possible to prioritise his recommendations on the basis of the value of each ecosystem, but only on the imminence of their destruction.[94] He provided a detailed description, and a scientific and practical rationale, for each reserve. Many sites were on land which had an 'indifferent potential' for grazing or agriculture.[95] However Webb argued that as so much land had already been cleared, those with productive potential should also be preserved for their 'intrinsic value and biogeographical interest.'[96] The recommendations were given the support of the Australian Conservation Foundation.[97] National Parks officer Peter Stanton was sympathetic, and when he was later given responsibility for the location and dedication of National Parks in Queensland he made good use of Webb's proposals.[98]

From the late 1960s to the early 1970s there was a transition in the approaches, aims and demographic of those who would come to be regarded as 'environmentalists'. In *Defending the Little Desert*, Libby Robin argues that, despite alliances which cut across this divide,

> the shift from 'conservation' to 'environmentalism' is striking… Environmentalism changed the world-views of some and alienated others, but none denied that 'something had happened.'[99]

In part that 'something' is what Robin describes as 'the rise of ecological consciousness' which is 'necessarily a multifaceted concept. It includes "ecological" in both its scientific and philosophical guises, and "consciousness" in the individual,

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[93] *Ibid.*, p. 69.
[94] *Ibid.*
[95] *Ibid.*
[96] *Ibid.*, p. 76.
[97] Broadbent, *Inside the Greening*, pp. 17, 35.
[98] Interview with Geoff Tracey, NLA TRC 2845/46: 2.2.13
[99] Libby Robin, *Defending the Little Desert: The Rise of Ecological Consciousness in Australia*, Melbourne University Press, Carlton, Victoria, 1998, p. 5.

collective and political senses.'[100] This led, as discussed earlier, to a shift from the wise-use traditions of conservation founded in forestry and agricultural and soil sciences, to calls for the preservation of nature – and the transformation of human society – based on popular understandings of the concepts of ecological science. The language of 'wise use' began to be regarded by some environmentalists as the language not of conservation, but of exploitation.[101]

When Len Webb explored these issues in *Environmental Boomerang* (1973) he went beyond the conception of conservation as 'wise use' and suggested that 'conservation has taken on a broader, ecological meaning: the maintenance and management of entire natural processes.'[102] He defined conservation as 'applied ecology',[103] although he also acknowledged that scientific management alone 'will not be enough'. Webb explicitly argued for the need to 'integrate ecological and social attitudes',[104] and aimed to build an ethical framework on the basis of ecological principles. He outlined a number of 'practical rules of ecology to be applied to environmental management'.[105] While some of Webb's rules drew on the traditional perspective of wise-use conservation, Webb's view was characterised by a focus on management of whole systems, not objects, and of change over time being a fundamental aspect of such systems. He also saw ecological principles as applicable to human societies. Under the heading of 'Maintain and cultivate diversity' he wrote:

> be diverse in bodies and minds, maintain the family, marry the stranger, tolerate the eccentric, don't censor, encourage private choice, keep communities small so they can be diverse too.

And under 'Accept change': 'Do not reverence stable, known, familiar values. Do not cherish dogmas, and do not have ideas of absolute Right and Wrong.'[106] However, as *Environmental Boomerang* makes clear, Webb by no means adopted a relativism which eschewed values altogether, but rather sought a foundation on which

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[100] *Ibid.*, p. 4.
[101] *Ibid.*, p. 145
[102] L.J. Webb, *Environmental Boomerang*, Jacaranda Press, Queensland, 1973, p. 4.
[103] *Ibid.*, p. 118.
[104] *Ibid.*, p. 112.
[105] *Ibid.*, pp. 119 - 120.
[106] *Ibid.*, p. 119.

an alternative system of ethics, more appropriate to the development of an environmentally sustainable society, could be constructed. The statement is evocative of its time, and of Webb's perspective as someone trying to undermine a particular set of 'stable, known, familiar values', which he saw as being unnecessarily destructive of the environment.

While *Environmental Boomerang* presented the human and natural worlds as practically and metaphorically interconnected, a more radical approach was the emergence in Australia of 'wilderness' as both a category of land and a quality of experience to be fought for by environmentalists.[107] The notion of 'wilderness' has a long history in the United States; however it gained political momentum in Australia only in the 1970s.[108] John Dargavel notes that 'wilderness was a more exacting claim than those made for natural heritage or national parks, yet it was one whose mix of spiritual, recreational and ecological aspects eluded any final definition.'[109] Although its definition is elusive, at its core is a vision of a primeval natural world unaltered by human technology. Colin Michael Hall describes wilderness as 'land which is remote from, and undisturbed by, the influences and presence of settled people'.[110]

Proponents of wilderness invoke concepts drawn from popular ecology, such as diversity, integrity, and the absence of human 'disturbance' of ecological systems. However the importance of wilderness has, paradoxically, been primarily seen as a consequence of its experiential qualities. Wilderness was and is an urban vision; in a highly urbanised society the existence of wilderness, whether visited or not, is regarded as offering a sense of perspective to the human mind and restoration to the human spirit.[111] The historical implications, ethical dimensions, and practical consequences of that vision have been questioned, particularly by Aboriginal

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[107] Robin notes that one aspect of the shift from 'conservation' to 'environmentalism' was a transition from an approach based on networking and diplomatic use of personal contacts to a view of environmental disputes as battles to be fought and won. Robin, *Defending the Little Desert*, p. 152. For a good example of this see the title (and tone) of the Third National Wilderness Conference, 1983 – J.G. Mosley & J. Messer (eds), *Fighting for Wilderness,* Fontana/ACF, Sydney, 1984.
[108] Hall, *Wasteland to World Heritage*, pp. 7 - 8. For a detailed examination of the development of the concept in the United States see Roderick Nash, *Wilderness and the American Mind*, Yale University Press, New Haven, 1967.
[109] Dargavel, *Fashioning Australia's Forests*, p. 180.
[110] Hall, *Wasteland to World Heritage*, p. 4.
[111] Robin, *Defending the Little Desert,* p. 151.

activists.[112] Hall notes that while the 'experiential' and 'ecological' criteria for wilderness have often been confused, they are 'substantially different'.[113] The ecological view of wilderness, according to Hall, is based on a philosophy of biocentrism – a belief that ecosystems have an intrinsic right to exist – whereas the experiential view is fundamentally anthropocentric. As Godfrey-Smith writes: 'From a genuinely ecocentric point of view the question 'What is the *use* of wilderness?' would be as absurd as the question 'What is the *use* of happiness?''[114] Such a view has been seen by some as an extreme divergence from the traditions of conservation.[115]

In 1975, the ACF called for the creation of a 'nation-wide system of wilderness reserves,'[116] and in 1977 organised the first of a series of national wilderness conferences, held at the Academy of Science, and attended by representatives of governmental and non-governmental organisations.[117] The conference was inspired by the wilderness tradition of the United States and modelled on the National Wilderness Conferences which had been organised by the Sierra Club since 1949.[118] Sir Otto Frankel, of the CSIRO's Division of Plant Industry, was asked to address the conference on 'The Value of Wilderness to Science'. Frankel highlighted three important 'scientific values' of natural areas: Firstly, they were a source of genetic resources for future generations; secondly, they provided an important base for ecological research and biological monitoring; and finally, they offered a location for environmental base-line stations, to 'provide an early warning system for significant environmental problems.'[119] For wilderness areas to be useful for scientific investigations, Frankel argued they must meet a number of requirements.

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[112] For instance, when the World Wilderness Congress was held in Cairns in 1980, the North Queensland Land Council held an alternative conference directly across the road, which it named the 'Development without Destruction Conference.' http://www.cafnec.org.au/history/Wet_Tropics_History.html (accessed 21/01/2004)
[113] Hall, *Wasteland to World Heritage*, pp. 19 - 20.
[114] W. Godfrey-Smith, 'The value of Wilderness', *Environmental Ethics*, vol. 1, Winter, (1979), p. 319, quoted in Hall, p. 51.
[115] R.G. Downes, 'Conservation in relation to land and its use', in Webb, Whitelock & Le Gray Brereton (eds), *The Last of Lands*, p. 14.
[116] Dargavel, *Fashioning Australia's Forests*, p. 181.
[117] G. Mosley (ed.), *Australia's Wilderness: Conservation Progress and Plans. Proceedings of the First National Wilderness Conference, Australian Academy of Science, Canberra, 21 – 23 October, 1977.* Australian Conservation Foundation, Hawthorn, Victoria, 1978.
[118] Sir Mark Oliphant, 'Opening Remarks', *Australia's Wilderness*, p. 11.
[119] Sir Otto Frankel, 'The Value of Wilderness to Science', in *Australia's Wilderness*, pp. 101 - 102.

They must have long-term security of tenure to match the time-frame of ecological research; they must preserve the widest possible range of representative ecosystems (not a necessary consequence of a focus on wilderness qualities); and they should be of sufficient size and diversity to allow the processes of evolution and adaptation to environmental change to continue.[120]

Despite the title of his presentation, Frankel was critical of the notion of wilderness and its value for science. He argued that the imposition of strict wilderness criteria, though perhaps useful in the short term, could lead to insecurity of tenure in the longer term. Frankel highlighted the problems posed by the rapid, global destruction of rainforests:

> It is increasingly recognized that a large proportion of the now existing species of plants and animals will be extinct or seriously threatened by the end of the century. Especially exposed are the species of the tropical rain forests in Latin America and Asia, many of which are rapidly being deprived of their habitats through large-scale destruction of the forests… one third of the 150,000 tropical plant species may become extinct, although we know so little about many of these species that it is not possible to arrive at meaningful projections or realistic conservation policies.[121]

In contrast to the views of many present, Frankel argued that controlled utilization and conservation of rainforest were not necessarily mutually exclusive:

> I cannot see that a localized infringement or disturbance such as a limited number of access roads, mining operations with a strictly localized impact, or water storages in man-made lakes, would drastically infringe the genetic potential of the biotic system *as a whole, provided the total area is large indeed*… a moderate and controlled utilization, for example in a rain forest ecosystem, seems preferable to its total loss which may be inevitable if the former is rejected. If appropriately managed such a system of reserves might succeed in salvaging species and communities which otherwise would become endangered or extinct… inflexible restrictions are less likely to remain unchallenged than a regime which can accommodate compromise.[122]

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[120] *Ibid.*, pp. 101 - 103.
[121] *Ibid.*, p. 102.
[122] *Ibid.*, p. 104.

In the discussion which followed, most of which was (not surprisingly) critical of his rejection of the scientific value of the concept of wilderness, Frankel defended his position, particularly with reference to areas facing pressure of resource scarcity such as the rainforests of south-east Asia. He stated:

> …all the social and individual advantages of wilderness, I'm most willing to subscribe to. My task has been to talk about the value of wilderness to science. You others have been, and will be talking about the other values. Now, I think as a scientist I have been very clear thinking, which I have tried to be, and stick to my onions.[123]

Frankel drew a clear and strict distinction between scientific reasoning and political rhetoric. The notion of wilderness would be central to the campaign to 'save the Daintree' in the early 1980s, and the historical and scientific limitations of the concept would be further tested in the heat of that battle.

The political climate for conservation began to shift when, from 1970, politicians throughout the world 'discovered' environmental concerns.[124] In Australia, the Whitlam Labour government came to power in 1972 in the midst of national controversy over the flooding of Lake Pedder. Hall argues that 'the need to construct environmental policy on a national basis was one of the critical points to emerge from this period.' He suggests that the disputes over Lake Pedder, and over the Bjelke-Petersen government's support for drilling for oil on the Great Barrier Reef and sand-mining on Fraser Island 'were seen as national issues rather than as state concerns; they helped to develop a concept of a natural heritage that was to be preserved for all Australians.'[125] The Whitlam government, though unable to prevent the flooding of Lake Pedder, moved to create a stronger legislative and administrative basis for Commonwealth involvement in conservation issues. In 1973 the government set up the Committee of Inquiry into the National Estate and announced the establishment of

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[123] Discussion of 'The Value of Wilderness to Science', G. Moseley (ed.), *Australia's Wilderness,* p. 108.
[124] Robin, *Defending the Little Desert*, p. 137.
[125] Hall, *Wasteland to World Heritage*, p. 150. For further details on the Great Barrier Reef and Fraser Island disputes see pp. 139 – 145.

the long-awaited Australian Biological Resources Study; in 1974 it made Australia signatory to the World Heritage Convention and enacted the *Environmental Protection (Impact of Proposals) Act*, which was followed by the *National Parks and Wildlife Act* 1975. These initiatives demonstrated the federal government's commitment to environmental issues, and gave the Commonwealth greater capacity to protect the environment against the development aspirations of the States.

The Whitlam government was also willing to bring into the fold conservationists who had at times been outspoken critics of government policy. The Committee of Inquiry into the National Estate included a number of prominent conservation activists as members and appointed consultants, including Len Webb, who prepared the chapter on 'The Natural Environment'; Judith Wright, who had played a critical role in the campaign to prevent drilling for oil on the Great Barrier Reef; and Milo Dunphy, who also served on the committees of the ACF, National Parks Association of NSW and Nature Conservation Council of NSW, and was known as a vigorous campaigner.[126] The Committee received more than 650 submissions from a range of individuals and organisations, held public discussions in all major capital cities and a number of regional cities and towns, and travelled widely throughout Australia before preparing its Report.

The Committee linked concern for conservation with a renewed sense of Australian nationalism.[127] The Report stated that the concept of National Estate

> is a powerful crystallisation of an emergent but hitherto almost unfocused idea. This idea … has been taking shape at an increasing rate precisely because it has been aroused by the realisation that much which is of national, and even international, value in the man-made and natural spheres is coming under very strong threats and

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[126] For further details on J. Wright see Veronica Brady, *South of My Days: A Biography of Judith Wright*, Angus & Robertson, Pymble, NSW, 1998. For further details on M. Dunphy see Peter Meredith, *Myles and Milo*, Allen & Unwin, St Leonards, NSW, 1999.

[127] This was a significant change. Only 5 years earlier Francis Ratcliffe, then secretary of ACF, had written that patriotism and development were seen as synonymous in Australia, and conservation therefore was 'not part of nationhood'. Francis Ratcliffe, 'Conservation and Australia', ACF, Canberra, 1968, reprinted from *Australian Quarterly*, March, 1968.

> pressures from damaging or potentially damaging human action. The National Estate is a limited and valuable possession and much has already been lost.[128]

The Report also linked the National Estate with projects such as the Biological Survey and UNESCO's Man and the Biosphere programme. It stated:

> The rationale for conservation of natural areas will be greatly increased when these are seen, as ecologists already see them, not just as 'real estate' of recreational and cultural value, but as essential areas with a protective function for all those enterprises on which human comfort and security depend, as well as sources of immensely valuable scientific knowledge.[129]

While the National Estate was based on and reinforced 'a new national set of values', it was to be seen and measured against the standards of World Heritage, and some sites, including Australia's remaining tropical rainforests, 'would seem to be immediately placeable in the context of World Heritage.'[130]

The chapter of the Report examining 'The Natural Environment' began by describing the radical cyclical changes of climate which have shaped the Australian continent over millennia, and which were echoed in shorter-term cycles that influenced the circumstances of human life. Although human societies have expended great effort to protect themselves from climatic extremes and science has offered a means of understanding them, such cycles were ultimately, the authors stated, beyond the realms of human control: 'It may take only a tiny change on the natural scale to bring catastrophe to countless humans.'[131] The Report presented human societies as not only profoundly interconnected with the natural world, but also, despite technological and scientific achievements, profoundly at its mercy.

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[128] Committee of Inquiry into the National Estate & Robert Marsden Hope, *Report of the National Estate: report of the Committee of Inquiry into the National Estate*, Australian Government Publishing Service, Canberra, 1974, p. 20.
[129] *Ibid.*, p. 27.
[130] *Ibid.*, p. 30. The *Convention for the Protection of the World's Cultural and Natural Heritage* had been adopted by UNESCO in 1972.
[131] *Ibid.*, p. 44.

The authors urged that land use be planned and undertaken on the basis of scientific knowledge and ecological principles, and that all management should recognise the dynamics of natural systems. The Report highlighted the continually changing character of the natural world, and gave as an example the rainforest of the Atherton Tableland which

> had very probably occupied the same area for about 7,000 years. But the distribution of species within it had changed a great deal during that period and it is unlikely that a complete description of the contents of a single hectare of such forest would remain correct for a couple of decades.[132]

The authors noted that rainforests 'are now so scarce in Australia, and their continued existence so threatened, that they merit special treatment in this report.'[133] The lack of scientific understanding of the rainforests was highlighted, as was the threat that ongoing and haphazard development posed to many species. The authors stated that the drastic changes occurring within a few decades in the northern tropics 'represent a loss of world heritage of genetic resources, and indeed a loss of biological perspective for the evolution of man himself.'[134] The *Australian Heritage Commission Act* was enacted in 1975, following the publication of the Report of the Committee of Inquiry, and brought into existence the Heritage Commission and the Register of the National Estate.[135] In 1980, a large number of rainforest areas in North Queensland were placed on the Register. Tim Bonyhady notes that 'National Estate' and 'heritage' are key conservation tools because they

> …have been the most significant terms capable of embracing all aspects of the natural and the cultural environment but also because of their direct appeal to national identity. The clear implication in each is that the public interest in environmental protection should take precedence over established private rights, or for that matter competing public interests.[136]

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[132] *Ibid.*
[133] *Ibid.*, p. 55.
[134] *Ibid.*, p. 55.
[135] Dunlap, *Nature and the English Diaspora*, p. 295.
[136] Bonyhady, 'The Stuff of Heritage', p. 145.

The Committee's notion of 'heritage' was shaped with reference to the *Convention for the Protection of the World's Cultural and Natural Heritage*, which had been adopted by UNESCO in 1972. In 1974 Australia became the twenty-second country to ratify the Convention. As a signatory, the federal government committed itself to 'assist in the identification, protection, conservation and preservation of World Heritage Properties' and to refrain from any action which might directly or indirectly damage such properties.[137] The World Heritage Convention was intended 'to enable nations to cooperate in the protection of cultural and natural sites of outstanding value to humanity'.[138] The majority of World Heritage listings have been of cultural, rather than natural, sites.[139] However the notion of 'heritage' outlined in the Convention embraces a concern with the preservation both of objects constructed by humans and intimately linked with human history, and of 'natural monuments' which allow a vision of the depths of time and reflect the results of continuing processes of geological and evolutionary change. In practise, the criteria of 'cultural' and 'natural' heritage are largely kept separate; and a primary aim of World Heritage listing of natural areas is to preserve such areas from the impact of human actions, which would diminish their 'naturalness'.[140]

The IUCN was involved in the early drafting of the Convention, and has continued to act as an advisor on the selection and protection of natural heritage sites. Sites nominated for World Heritage listing must meet one of a number of criteria, including:

24 (i) be outstanding examples representing the *major stages of the earth's evolutionary history*; or

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[137] Hall, *Wasteland to World Heritage*, p. 167.
[138] *Ibid.*
[139] In 1992, only 23% of sites on the World Heritage List were 'natural' sites, and 35% of all sites were located in Europe. Jim Thorsell, 'From Strength to Strength: World Heritage in its 20th Year', in Jim Thorsell (comp.), *World Heritage Twenty Years Later*, IUCN, Gland, Switzerland, 1992, p. 22.
[140] For a further discussion of the difficult relationship between 'natural' and 'cultural' heritage in an Australian context see T. Griffiths, 'History and Natural History: Conservation movements in conflict?' in D.J. Mulvaney (ed.), *The Humanities and the Australian Environment*, Australian Academy of the Humanities, Canberra, 1991, pp. 87 – 109.

> (ii) be outstanding examples representing *significant ongoing geological processes, biological evolution and man's interaction with his natural environment*… or
>
> (iii) contain *superlative natural phenomena, formations or features*, for instance, outstanding examples of the most important ecosystems, areas of exceptional natural beauty or exceptional combinations of natural and cultural elements; or
>
> (iv) contain *the most important and significant natural habitats where threatened species of animals or plants of outstanding universal value* from the point of view of science or conservation still survive.[141]

Sites must also meet conditions of integrity, and demonstrate fully the interdependence and diversity of natural systems and processes. The scientific assessment of the quality of a 'natural' site is central to the determination of whether an area meets the criteria for World Heritage listing.

Dargavel notes that the processes for listing of world and national heritage were similar: 'sites or "properties" of various sorts were nominated, placed on an interim register, assessed by experts against detailed criteria, and if found worthy finally listed.'[142] Listing of an area as National Estate had only persuasive value in government agencies' decision-making processes.[143] In contrast, once the *World Heritage Properties Conservation Act* was passed in 1983, the Commonwealth had a legislative basis to protect World Heritage areas.[144] The immediate effect of this legislation was to enable the Commonwealth to override the Tasmanian state government and prevent the damming of the Franklin River. This conservation victory provided the backdrop to the dispute over the Douglas Shire Council's plan to construct a road through the Cape Tribulation National Park, North Queensland.

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[141] World Heritage Committee, *Operational Guidelines for the Implementation of the World Heritage Convention*, WHC/2 Revised, UNESCO, Paris, 1984, pp. 8 - 9, quoted in Hall, *Wasteland to World Heritage*, p. 169.

[142] Dargavel, *Fashioning Australia's Forests*, pp. 141 - 142.

[143] *Ibid.*, p. 179 - 180.

[144] Hall, *Wasteland to World Heritage*, pp. 201 - 207.

Public concern over the fate of the world's rainforests intensified from the early 1980s.[145] Ian Watson suggests that, at this time, the rainforest 'crisis' became the new bearer of 'doomsday ecology' which in the late 1960s had focused on the problems of pollution and over-population.[146] Philip Stott expresses a similar cynicism:

> …along with the giant panda and the whale, the 'tropical rain forest', Schimper's 1898 invention, has become an icon for all 'Green' movements, for environmentalists, for Deep Ecologists, and for New Age folk throughout Europe and North America. They are regarded as the ultimate organismic entity, 'the lungs of the world'… To the older European myths have been added a whole gamut of so-called 'scientific' myths to help to ensure that 'tropical rain forests' are seen as essential to us all, wherever we live and whatever we do.[147]

In his analysis of the Terania Creek dispute, Watson suggests that the struggle over rainforests in Australia was in part a class conflict. Environmentalists came primarily from a well-educated urban middle class, and held romantic notions about the natural world; their opponents were drawn from a regional community with little economic security and limited education, who based their livelihood and identity on logging, and understood the rainforests on a physical and economic basis. Philip Stott argues that, internationally, the 'myth' of the tropical rainforest has provided a neo-colonial tool to constrain the development of the poorer nations of the South.[148] Both object to the vision of rainforest as the ultimate wilderness – a timeless 'virgin' ecosystem not to be violated by human action or industry. This vision, which Frankel argued against in 1977, divorces the forest, sometimes by force of law, from the needs and experiences of those who live and work within it. For some residents of North Queensland, this would be the effect of World Heritage listing of the Wet Tropics.

In *Tropical Forests, International Jungle*, Marie-Claude Smouts examines how concern for tropical deforestation was transmitted from a small group of experts

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145 Marie-Claude Smouts, *Tropical Forests, International Jungle: The Underside of Global Ecopolitics*, (Trans. Cynthia Schoch), Palgrave Macmillan, New York, 2003, p. 3.
146 Watson, *Fighting Over the Forests*, p. 107.
147 Stott, 'Jungles of the Mind', p. 44.
148 *Ibid.*

to a wider public forum in the 1970s, and became a focus of intensive campaigning by environmentalists in the 1980s.[149] Smouts argues that UN and other international organisations played an important role in 'canalizing' this process.[150] One of the first alarming estimates of the rate of deforestation, which put it at between 11 and 15 million hectares per year, was published by the United Nations Food and Agriculture Organisation in 1976.[151] By the early 1980s this figure had been loosely translated by Greenpeace into the image of 'a football field every two seconds'. While Smouts suggests the actual rate of deforestation has been difficult to estimate, there was evidence of 'a clear trend of tropical forest degradation. The extent of it was debateable but not the reality.'[152] In 1979 the US Department of State hosted an international conference on tropical forests, which was closely followed in 1980 by an expert meeting organised by the United Nations Environment Program (UNEP). The serious threats to tropical forests were highlighted in the World Conservation Strategy, which was announced by the IUCN and UNEP in 1980.[153] The Strategy listed the need for co-operative programs for conserving tropical forests as a 'Priority International Action'.[154] This view was supported by the Ecological Society of Australia in 1980,[155] and the International Botanical Congress in 1981.[156] In 1982, ACF director Geoff Moseley attended the World Wildlife Fund and IUCN's launch of their 'International Tropical Forests Campaign'.[157]

Rainforest had also been a focus at the Second World Wilderness Congress, held in Cairns in 1980. The conference was incongruously opened by Queensland Premier Joh Bjelke-Petersen, a politician renowned for his adherence to a philosophy

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149 Smouts, *Tropical Forest, International Jungle,* pp. 26 - 54.
150 *Ibid.*, p. 27.
151 Adrian Sommer, 'Attempt at an assessment of the world's tropical forests', *Unasylva*, vol. 28, (1976), pp. 5 - 25.
152 Smouts, *Tropical Forest, International Jungle,* p. 29.
153 Croner et al., *An Introduction to the World Conservation Strategy*, p. 11.
154 Barry Cohen, Dept. of Arts Heritage and Environment, & Working Group on Rainforest Conservation, *Rainforest Conservation in Australia: A Report to the Hon. Barry Cohen M.P., Minister for Arts Heritage and Environment,* Australia, 1985, p. 6.
155 M. Dale et al., 'Resolution by the Ecological Society of Australia on Australian Rainforest Conservation', *Bulletin of the Ecological Society of Australia Incorporated*, vol. 10, no. 3, (Sept. 1980), pp. 6 - 7.
156 *Proceedings of the XIII International Botanical Congress*, Sydney, August 1981, Australian Academy of Science, Canberra [1983] [Resolution 5].
157 http://www.cafnec.org.au/history/Wet_Tropics_History.html, p. 4.

which placed development above all else. However, in fitting with the occasion he declared his commitment to create a new National Park at Cape Tribulation, stating:

> The area provides a living museum of plants and animal species in what is one of the few remaining examples of undisturbed coastal rainforests in the world … [it is a] breathtaking example of Nature's work.[158]

In 1981, a range of conservation organisations based in the Cairns region, including local Wildlife Preservation Societies, the Cape Tribulation Community Council, and the NQNC, came together to form the Cairns and Far North Environment Centre (CAFNEC). Later that year they held a blockade to protest the logging of virgin rainforest on the Mt Windsor Tableland, west of the Daintree. The action did not draw much coverage from the metropolitan or national media; however it was a significant change of tactics from the polite lobbying and letter-writing of earlier times. In collaboration with the ACF and the Queensland Conservation Council, CAFNEC promoted the concept of a large protected area north of the Daintree River: a 'Greater Daintree National Park'.[159] CAFNEC founders Rosemary Hill and Mike Graham highlighted the aesthetic and recreational values offered by the region and also, drawing on the work of Webb and Tracey, its scientific significance:

> Refugia, areas where rainforest has existed continuously for some 200 million years, have been identified in this region. Primitive plant families, amongst the first flowering plants to evolve on earth, have surviving representatives. Botanists regard the area as a living museum.[160]

In August 1983, a paragraph in the works program issued with the Douglas Shire Council's rates notice alerted residents to the impending bulldozing of a road through the Cape Tribulation National Park. By December 1983 the 'Daintree Road' had received national media attention, caused dilemmas for the Federal Government

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[158] Opening speech to the World Wilderness Congress, 13 June 1980, quoted in Phillip Toyne, *The Reluctant Nation*: *Environment, Law and Politics in Australia.* ABC Books, Sydney, 1994, p. 65.
[159] R. Hill & M. Graham, 'Greater Daintree National Park' in Moseley & Messer (eds), *Fighting For Wilderness*, pp. 7 - 23.
[160] *Ibid.*, p. 9. Their interpretation of Webb and Tracey's thesis is somewhat loose.

and, as the predicted national conservation issue for 1984, become a focus of activities for a diverse array of individuals and organisations. Although the campaign against the road was begun by local environmentalists, it was joined by a range of groups including the IUCN, the Australian Conservation Foundation, the Wilderness Society, the Wildlife Preservation Society of Queensland, the Rainforest Conservation Society, the Rainforest Information Centre, and the Nomadic Action Group. Prominent British naturalists David Bellamy and David Attenborough also offered support. On an Australian tour in late August 1984, Attenborough stated that the short period he had spent in the Daintree region was one of the 'magical experiences' of his life: 'This region contains an immense treasure of unique plants and animals. I am amazed that anyone would want to damage or diminish it in any way.'[161] While local conservationists still fought logging, clearing and re-zoning of lands in other northern rainforests, it was the Daintree that captured the nation's imagination.

Conservationists declared their opposition to the road on two main grounds. First, it cut through a national park that contained the last remaining extensive lowland tropical rainforest in Australia, and threatened many endemic species regarded as being of great scientific importance. The area was listed on the register of the National Estate, and considered by the IUCN to be of World Heritage quality.[162] Second, it was argued that the road's construction in an area of extremely high rainfall would lead to siltation and run-off that would damage the fringing reefs of the Great Barrier Reef Marine Park which, in a rare conjunction of two of the most complex and diverse ecosystems in the world, were found just off-shore. Conservationists focused on the area's aesthetic and wilderness qualities and used photography to highlight the beauty of the rainforest – from the grandeur of thickly-vegetated mountains dropping down to pristine beach, to the minute exquisiteness of rainforest fungi or ferns.[163] One visitor from the United States wrote to the *Cairns Post*:

> The [rainforest] perfectly corresponds with the "wilderness in the back of the mind" – that place of serenity that keeps us sane in an insane world. It embodies all

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[161] *Sydney Morning Herald*, 'The living Attenborough', August 27, 1984.
[162] IUCN Commission on National Parks & Protected Areas, *The World's Greatest Natural Sites of World Heritage Quality,* IUCN, Gland, Switzerland, 1982, p. 53.
[163] See, for example, Gregg Borschmann, *Greater Daintree: World Heritage Tropical Rainforest at Risk*, Australian Conservation Foundation, Hawthorn, Vic., 1984.

> the virtues that human societies strive for, but never attain, in that every member of it, by merely following its own nature, thereby contributes to the health of the whole system.

The road, the writer argued, would be constructed at the cost of 'cutting our link with the wilderness in the back of the mind.'[164]

Petitions and letters of protest proved ineffective. Local conservationists formed the Douglas Shire Wilderness Action Group (DSWAG), and began their blockade of the construction site on 30 November 1983, when the bulldozers crossed the Daintree River. They hoped to allow the Commonwealth government time to intervene, as it had done earlier in the year for the Franklin River. Although the Daintree had not yet been nominated as a World Heritage site, conservationists argued that, as the area possessed World Heritage values, the Commonwealth had an obligation to protect it.[165] The confrontation between protestors and bulldozers took place in two stages: the first blockade lasted from 30 November until 15 December 1983, when the onset of the wet season halted construction. During the wet season, local and interstate conservationists worked tirelessly on publicity, fundraising and lobbying. On 6 August 1984 the bulldozers returned. This time they were met with national protests and heightened media interest. Three weeks later the blockaders conceded defeat, and the direct action phase of the campaign ended.

The Daintree blockade was not just a physical confrontation, but also a philosophical one. It was the head-on meeting of two very different views of the nature and value of North Queensland. One upheld a pioneering ethos: the construction of the road was an inevitable element in the development and progress of the North. Local commentators made much of the hypocrisy of 'southern' protestors denying basic infrastructure to a remote community: 'They all have their roads and conveniences in the south, but what about the real Australians still trying to pioneer

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[164] *Cairns Post*, Tuesday August 7, 1984.
[165] Toyne, *The Reluctant Nation*, pp. 70 - 71. Hall, *Wasteland to World Heritage*, pp. 204 - 205. Others were more equivocal about the legal position of the Commonwealth government, for instance M. Barker, 'Daintree: A complex legal environment', *Rainforest Seminar Papers*, CRES Working Paper 1985/21, CRES, ANU, pp. 1 - 7.

Peter Stanton, National Parks and Wildlife Officer responsible for Cape Tribulation National Park, was caught between the bulldozers and the blockaders, December 1983. Stanton was ordered by the Director of the Queensland National Parks Service to ensure the road went through. He describes this as the blackest day of his life, and recalls that watching the bulldozers begin work was 'like being forced to watch an execution'. (Interview with Peter Stanton, NLA TRC-3077, pp. 115 - 116.)

Source: Photograph from the Papers of Antony Toohey, MS 1053, National Library of Australia, Manuscripts Collection.

the Far North? Don't they rate good roads and communications?'[166] The other view saw the Daintree River as the place where the line should be drawn, and beyond which the rainforest should be left undisturbed. Rainforest was a wilderness of intrinsic and universal value, not a local resource. In the words of the DSWAG:

> This is 1984, not 1884. Our pioneering days are done. The end of the road belongs at Cape Tribulation. There are places on this earth so ancient and precious, that we still know so little about, that are not ours to despoil.[167]

However, the conservationists' position was complicated by the fact that members of local Aboriginal communities supported the road's construction.[168] Duncan Missionary, a resident of Mossman Gorge who described himself as a Kuku Yalanji elder, told the *Cairns Post* that the route selected by the Douglas Shire Council was one traditionally used by Aboriginal people in the area: 'Our people always chose the easiest path to follow or hunt from and I must say the council was right in their selection of a road path.' Missionary denied claims by the Northern Land Council that the road infringed on sacred sites, stating rather that the areas described by the Land Council chairman were 'merely areas of land with tribal names.' Missionary believed the road would allow easier communications between the residents of Wujal Wujal (Bloomfield River Mission) and Mossman, the two townships into which his people had been split up during European colonisation of the region.

> At the moment if a family in Mossman wants to make contact with a relative in Bloomfield, they have to come to Cairns, up to Cooktown and then through to the Bloomfield River Mission.

Further, Missionary criticised the actions of conservationists who had been allowed entrance to the Bloomfield River Mission by his people, but who he felt were

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[166] 'Coast Road Favoured since 1935', *Cairns Post*, August 8, 1984.
[167] Douglas Shire Wilderness Action Group, *The Trials of Tribulation*, DSWAG, Port Douglas, [c.1984]. Held in the JCU NQ Collection and the NLA, Antony Toohey Manuscripts Collection.
[168] C. Anderson, 'Aborigines and Conservationism: The Daintree-Bloomfield Road', *Australian Journal of Social Issues*, vol. 24, no. 3, (Aug. 1989), pp. 214 - 227.

now abusing the area – swimming and washing in water that was required for drinking, and upsetting people with their 'lack of modesty'.[169] Christopher Anderson, an anthropologist who worked at Wujal Wujal, suggests that

> There was no serious attempt [by conservationists] to discuss matters with the relevant local Aboriginal parties, either with or without anthropologists acting to overcome some of the cultural and linguistic difficulties. Nor was there an attempt to discover something of the relevant local political factors which in the end played a determining role in whether site locations or any other Aboriginal issues would affect the fate of the road … as long as Aborigines are viewed as natural conservationists and not as political actors within complex systems involving both Aboriginal and European factors, this relationship will remain for the white conservationists one with ideological phantoms and not with real people.[170]

Not only was there a lack of meaningful consultation with Aboriginal communities, but conservationists cited the need to protect and preserve the area's Aboriginal heritage as support for their arguments against the road, and later for World Heritage listing of the area.[171] Although conservationists recognised the long and continuing Aboriginal occupancy of the region, World Heritage listing was opposed by some Aboriginal communities, who saw it as further undermining their self-determination.[172]

Despite the complicated currents of local opinion, the future of the region's rainforests, if not of the road, would be decided elsewhere. As the first blockade took place at Cape Tribulation in December 1983, a workshop was held at Griffith University which brought together experts to discuss the 'past, present and future of Australia's rainforests.'[173] The workshop, which aimed to increase the awareness of the significance of rainforest amongst the general community and to formulate

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[169] 'Tribal elder says road route not sacred land', *Cairns Post*, August 11, 1983.
[170] Anderson, 'Aborigines and Conservationism', p. 226. One member of the blockade who I spoke to supported Anderson's assessment of the lack of consultation and understanding between blockaders and the community at Wujal Wujal. Judy Salmon, personal communication, Canberra, January 2004.
[171] *Rainforest Conservation in Australia*, pp. 92 - 93.
[172] Toyne, *The Reluctant Nation*, p. 84.
[173] Australian Heritage Commission, *The Rainforest Legacy: Australian National Rainforests Study*, volume 1 – The nature, distribution and status of rainforest types, Australian Government Publishing Service, Canberra, 1987, p. iii.

recommendations for its conservation, was organised with the support of Len Webb, and Dr Aila Keto of the Rainforest Conservation Society.[174] Speakers highlighted the problems posed to conservation by the current limitations of scientific knowledge.[175] Len Webb suggested that not only was it impossible to be sure of the extent of rainforest which had been cleared during European settlement, but that the area of rainforest remaining in North Queensland was also presently unknown.[176]

In January 1984 a national meeting of all major conservation groups, held in Brisbane, resolved to pursue World Heritage Listing for the wet tropical rainforests of North Queensland. There were differences in strategy between different groups: some believed the emphasis of the campaign should be on direct action, others argued for increased and more careful lobbying; some believed the World Heritage proposal should focus on the Greater Daintree, others saw it as vital that it should take in a larger area of North Queensland. Aila Keto argued strongly for the latter view, and held firmly to her belief that scientific evidence, not physical obstruction, was the best means to a conservation victory.[177] She was able to follow through on those beliefs when the Rainforest Conservation Society obtained funding from the Australian Heritage Commission to prepare a report assessing the World Heritage potential of the North Queensland Wet Tropics.

In February 1984, a two-day conference on rainforest conservation was held in Cairns on the initiative of the federal Minister for Arts, Heritage and the Environment, Barry Cohen. Despite the precedent of the Franklin, the Minister made it clear the Commonwealth Government would not to intervene to prevent the construction of the Daintree road against the wishes of the Queensland Premier.[178] However an outcome of the conference was the formation of a 'Working Group on Rainforest Conservation' which brought together environmentalists, members of the timber industry, the Australian Workers Union, foresters, representatives of National Parks

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[174] *The Rainforest Legacy*, vol. 1, p. vii.

[175] H.A. Nix, 'An environmental analysis of Australian rainforests', p. 2; T. Whiffin & B. Hyland, 'Current status of taxonomic knowledge of the Australian rainforest flora' p. 93; in *The Rainforest Legacy*, vol. 2.

[176] L.J. Webb, 'Conservation status of the rainforest of north Queensland', in *The Rainforest Legacy*, vol. 1, pp. 154 – 157.

[177] http://www.cafnec.org.au/history/Wet_Tropics_History.html, pp. 5 - 6.

[178] Toyne, *The Reluctant Nation*, pp. 70 - 72.

and Wildlife and others, (though there were no Aboriginal representatives involved), to discuss the future of rainforests in Australia and develop policy options for the Commonwealth Government. Aila Keto was included in the Working Group as a representative of the Rainforest Conservation Society.

In June 1984, before the Working Group's Report was completed, the Rainforest Conservation Society's report, *Tropical Rainforests of North Queensland: Their Conservation Significance*, was submitted to the Australian Heritage Commission.[179] The RCS's assessment of the region was based on the framework of scientific knowledge which had been evolving since the first botanical collectors visited the coast in the late eighteenth century; it drew on taxonomic botany and zoology, geology, biogeography, ecology, and palaeoecology. The report highlighted the structural and floristic diversity of the rainforests, and the presence of primitive angiosperm families which the authors argued were found there in their highest concentration on earth. They stated:

> The rainforests of the Area are recognized internationally as holding important and unique clues to the problem of the origin, evolution and migration of the flowering plants. It is a matter of fact that virtually any modern review of this subject makes reference to these rainforests.[180]

The report also argued that the rainforests contained evidence of four major stages of the earth's evolutionary history:

> the 'Age of the Angiosperms'; the evolution of Australia's unique sclerophyll vegetation during 35 million years of isolated, northward drift of the continent…; the unparalleled mixing of two continental floras and faunas that occurred when the Australian plate collided with the Asian plate; and one of the most extreme effects of the Pleistocene glacial periods on the world's tropical rainforests.[181]

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[179] Rainforest Conservation Society of Queensland, *Tropical Rainforests of North Queensland: Their Conservation Significance,* Australian Government Publishing Service, Canberra, 1986.
[180] *Ibid.*, pp. 1 - 2.
[181] *Ibid.*, p. 2.

The wet tropics region provided the only habitat for many rare and restricted species of plants and animals, some of which had survived more or less unchanged since Australia was part of Gondwana.[182] It also sheltered the ancestors (or their near relatives) of the banksias, grevilleas, dryandras and other taxa, 'that today are such an important part of our typically Australian sclerophyll vegetation.'[183] In a chapter entitled 'Description and Inventory of the Natural Features', the authors also highlighted the Aboriginal history of the region, drawing for support on the work of archaeologists, anthropologists, linguists, and palaeoecologists.[184] They suggested that the region between Cooktown and Cardwell

> contains the only recognized Australian Aboriginal rainforest culture and is therefore a significant component of the cultural record of aboriginal society which has the
>
> longest continuous history in the world… the major centres of survival of the aboriginal rainforest culture are found at the Bloomfield and Lockhart Rivers… with less intact elements south of the Daintree River at Murray Upper.[185]

The report concluded that the wet tropics of north-east Queensland contained examples of the major stages of the earth's evolutionary history; examples of significant ongoing biological evolution; areas of exceptional natural beauty; and significant habitats where threatened species of plants and animals of great scientific value still survive.[186] The Wet Tropics therefore

> are of outstanding conservation significance and more than adequately fulfil all the criteria defined by the World Heritage Committee for inclusion in the 'World Heritage List'.[187]

The report was refereed by four overseas experts and at least ten Australian scientists from CSIRO, the Australian National Parks and Wildlife Service and the

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[182] *Ibid.*, p. 44.
[183] *Ibid.*, p. 47.
[184] *Ibid.*, p. 39.
[185] *Ibid.*, p. 3, 41.
[186] *Ibid.*, pp. 77 - 79.
[187] *Ibid.*, p. 3.

Bureau of Flora and Fauna, and received strong support. On this basis the Australian Heritage Commission recommended 'that the Commonwealth Government take immediate steps to nominate the region for entry in the World Heritage List.'[188] Although the Cape Tribulation to Bloomfield road was declared open on 7 October 1984, the dispute over the road had created a momentum of concern and action which, particularly with this assessment to build on, did not end with the blockade. However, despite the Australian Heritage Commission's recommendation, the Federal Government remained unwilling to move against the Queensland Government, which strongly protested the proposal.

While the report of the RCS presented a vision of the region based solely on its scientific values, the Working Group on Rainforest Conservation's Report, *Rainforest Conservation in Australia*, completed in September 1985, represented the diverse and sometimes conflicting views of its members. It sought compromise, but where compromise was not possible allowed opposing opinions to be recorded.[189] The Report stated that

> of one central matter the Working Group is fully convinced. Australia's rainforest is a most important part of the national heritage and must be conserved and managed in ways which ensure the various values are preserved for future generations.[190]

Disagreements were based on varying interpretations of 'heritage' and 'conservation.' The Working Group 'had regard' (the wording suggesting something less than unanimous acceptance) for the definition of conservation adopted in the World Conservation Strategy, which described it as

> the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive,

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188 *Rainforest Conservation in Australia*, p. 14.
189 Letter from K.E. Thompson, Chairman of Working Group, to Hon. Barry Cohen MP, 18 September 1985, included as foreword in *Rainforest Conservation in Australia*.
190 *Rainforest Conservation in Australia*, p. 4.

> embracing preservation, maintenance, sustainable utilisation, restoration, and enhancement of the natural environment.[191]

Queensland Government representatives strongly argued that rainforest areas could be managed so as to meet this definition with continued, carefully-controlled logging, and without recourse to World Heritage listing.[192] In contrast, representatives of voluntary conservation organisations believed that, even with the ongoing reductions in cut, logging of the North Queensland rainforests was not sustainable, and they were concerned at the limited representation of rainforest ecosystems in National Parks. They argued that, given conclusive evidence of the area's World Heritage values, the Commonwealth should take action despite the Queensland Government's opposition, and nominate the region for World Heritage listing.[193]

While the economic, social and scientific values associated with rainforest were the focus of the Working Group, the public campaign for World Heritage listing strongly emphasised the beauty of the region. One consequence of priority being given to such beauty is that its appreciation requires a viewing place – whether a natural clearing such as a beach, river or lake, or a topographic prominence such as a mountain. An oft-noted characteristic of travel within extensive areas of rainforest is the difficulty of finding anything like a traditional 'view'. In 1985 ACF employed two project officers to work solely on the Wet Tropics campaign, and produced a beautifully-photographed book *Greater Daintree – World Heritage Tropical Rainforests at Risk*.[194] In 'Dreaming up a Rainforest', George Seddon recalls the time he spent with a photographer who was working in the Daintree region for the CSIRO, and reflects on the difficulty of photographing the rainforest:

> There was always something in else in the way of everything he wanted to photograph. He could never get a long view and there was never enough light, so he was generally reduced to photographing detail, such as cauliflorous trunks, or knotted lianes, or epiphytic ferns.[195]

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[191] *Ibid.*, pp. 2 - 3.
[192] *Ibid.,* pp. 10 - 12.
[193] *Ibid.*, pp. 8 - 10.
[194] G. Borschmann, *Greater Daintree – World Heritage Tropical Rainforests at Risk*, ACF, c1984.
[195] *Ibid.*

Children's author Jeannie Baker worked painstakingly on a picture-book about the Daintree entitled *Where the Rainforest Meets the Sea*, which was first published to great acclaim in 1987.[196] Through collages made from living materials collected from the forest, Baker attempted to communicate her sense of the 'beauty and luminous calm of that distinctive and threatened environment, and thus to urge its conservation.'[197] While Baker's story follows the present-day journey of a small white boy into the rainforest, her images clearly present it as an ancient landscape: she includes ghostly figures of dinosaurs and Aboriginal inhabitants. George Seddon discusses the picture which forms the centre-piece of Baker's book. While most of the collages present the rainforest as observed from natural viewing points such as the beach or creek, in this image the viewer is placed in the midst of the forest itself. Seddon notes that while her portrayal is accurate in the sense that genera of plants shown in the rainforest can be identified and the structure of the forest is realistically represented, the picture is somewhat misleading. He argues that 'the only way that anyone could enjoy such a panorama would be to clear a strip with a bulldozer, and then observe from the cleared strip.'[198] In April 1987 the ACF further raised the profile of the campaign with the release of an edition of *Habitat* containing

> the first photographs of a rare possum, the White Lemuroid, a spectacular looking animal … found in only two high altitude locations … earmarked for logging by the Queensland Forestry Department. The photos were extensively reprinted by the
>
> media and the community's response to the news of the imminent threat to this furry white creature was very strong.[199]

In September 1985, the ALP State Council had called on the Commonwealth to make the nomination, in accordance with the recommendations of the Australian

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[196] Jeannie Baker, *Where the Rainforest Meets the Sea*, Walker Books, London, 1987. It was winner of the Friends of the Earth Earthworm Award and the Australian Children's Picture Book of the Year Honour Book.
[197] George Seddon, 'Dreaming up a rainforest', in *Landprints,* p. 94.
[198] *Ibid.*
[199] *Ibid.*, pp. 76 - 77.

‘I pretend it is

a hundred million years ago’.

Source: J. Baker, *Where the Forest Meets the Sea*.

Heritage Commission, by December 31st 1985.[200] In July 1986 a National Rainforest Strategy Meeting held in Townsville resolved that individual conservation groups would make no proposals for National Parks in the region in isolation, even as an interim measure, but would stand firm on the need for nomination of the whole Wet Tropics. On World Environment Day, June 5 1987, Prime Minister Bob Hawke announced that his government would nominate the Wet Tropics for World Heritage listing. This announcement, a month before a federal election, reflected the degree of public support for the nomination throughout Australia which was the result of the intensive and unified campaign maintained by conservation groups between 1985 and 1987.[201] Phillip Toyne believes that Dr Aila Keto and the Rainforest Conservation Society

> contributed most in achieving the successful outcome. They showed that the rare combination of formidable and detailed scientific knowledge, enormous persistence and shrewd political judgement is unstoppable. So respected was Aila Keto that the Commonwealth asked her to prepare the justification documents for the nomination and included her on a number of its delegations to the World Heritage Committee.[202]

Peter Stanton also saw the World Heritage listing as the result of Keto's efforts, and admired her capacity as a scientist to 'handle enormous amounts of data, analyse it, perceive flaws in it, criticise, [and] take on forestry departments and hydro-electricity commissions on their own data'.[203]

I will not examine in detail the political wrangling which surrounded the Commonwealth's nomination of the Wet Tropics for World Heritage Listing. Its highlights included the assault on Environment Minister Graham Richardson by timber workers in Ravenshoe; High Court challenges to the listing by the Queensland government; and a Queensland delegation attending World Heritage Committee

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[200] Toyne, *The Reluctant Nation*, p. 74.
[201] At the Joint Daintree Strategy Meeting in June 1984 it had been believed that the Commonwealth government was not willing to publicly commit to nomination until after the next Federal election. 'Joint Daintree Strategy Meeting Minutes, 23 & 24 June 1984', ACF Papers, Head Office, MS 9429, Box 350, held in Manuscripts Collection, National Library of Australia.
[202] *Ibid.*, p. 87.
[203] Interview with Peter Stanton, NLA TRC-3077, p. 126, 147.

meetings to oppose the Australian government's nomination.[204] The 'Statement of Objection by the Queensland Government' argued that there had been inadequate consultation, inadequate scientific and technical data to support the nomination, inadequate regard to existing rainforest management arrangements, that the nomination would cause social and economic dislocation, and was an abuse of the Constitutional powers of the Commonwealth government.[205] The 'Statement of Objection' argued that the nomination made no distinction between areas of higher and lesser conservation value, as it 'indiscriminately mixes together virgin and logged areas … while at the same time excluding areas on grounds which appear to be related not to conservation values but to considerations of ownership.'[206]

The Queensland Government regarded the scientific basis of the Rainforest Conservation Society's Report to the Australian Heritage Commission as flawed in a number of respects:

> Whilst the Report highlights the general conservation values of the proposed area, it does not provide scientifically rigorous locational data for individual species, habitat types, and vegetation groups which could provide a sound basis for professional planning and management of the Area.[207]

Of course, scientists such as Len Webb had long been stating that, due to the complexity of the rainforest environment and the limited resources committed to its study, such data was simply not yet available; they regarded this as an important reason why the area should be preserved.

Some conservationists were concerned that the Queensland government's objection might be successful. Peter Stanton recalls that at the time he believed that

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[204] A detailed discussion of events is give by Toyne, *Ibid.,* pp. 77 - 83.
[205] Legislative Assembly of Queensland, *Statement of Objection by the Queensland Government Concerning the proposal by the Commonwealth Government for world heritage listing of the wet tropical rainforests of Queensland*, [Queensland Government Printer, Brisbane?], 1987., p. 1.
[206] *Ibid.*, p. 6.
[207] *Statement of Objection,* p. 6.

> a large part of the area had been so damaged by logging that I really didn't see that it was likely to be listed as world heritage… If an area had been logged once, twice or three times, I really didn't, in my understanding of world heritage, consider that it was worthy of world heritage status… Fortunately, Aila had more vision and understanding than I did and proceeded… It would have been very difficult to create a world heritage area which excluded those [damaged areas]. It would not have been acceptable and those areas still retain values which we at the present know are recoverable.[208]

The World Conservation Strategy suggested that the role of development was to provide for the essential needs of individuals and societies; to generate economic wealth; and to provide economic capacity which helps society to practise resource conservation, which in turn enables sustainable development. The Queensland government suggested that World Heritage listing would prevent such sustainable development in the region, and was therefore inconsistent with the World Conservation Strategy.[209] While the Queensland government's use of the World Conservation Strategy was not consistent with that Strategy's emphasis on the high level of priority which should be given to conservation of rainforest, it did point to a significant difference between the essentially traditional 'wise-use' conservation of the Strategy, and the stronger notion of 'preservation' implied by World Heritage listing. The implications of this were further elaborated in a report into the socio-economic impact of listing prepared for the Forest Industries Campaign Association Ltd., Melbourne. The Report's author, James Cook University economist Percy Harris, argued that the notion of 'outstanding universal value' was problematic because it obscured the real balance of costs and benefits flowing from the proposed World Heritage listing:

> While the benefits from Listing are widely spread in terms of location and time (all Australia and even the world, and extending to future generations), the costs are heavily concentrated in both location and time, occurring mainly in small

[208] Interview with Peter Stanton, NLA TRC-3077, p. 126.
[209] *Ibid.*, p. 11.

> communities on the Atherton Tableland, and as soon as the logging of the rainforests cease.[210]

Harris's survey of the affected communities revealed a population with limited education, often no formal qualifications and little employment experience outside the timber industry, who earned below average incomes. Such communities, Harris argued, had little of the flexibility which would be required to successfully adapt to the changes World Heritage listing would bring. Harris opposed the notion of 'natural heritage' with an alternative view:

> The Commonwealth Government, when the nation is approaching the bicentenary of settlement, has as much an obligation to preserve the social heritage of our pioneers, who explored, opened up, and settled the North, as it has to preserve the natural integrity of the rainforests. Many will claim that the first obligation is of greater and of paramount importance.[211]

Harris' notion that the timber industry should be protected because of its heritage values fitted uncomfortably with the arguments of those who had observed the industry of many years and believed that it was already undergoing an unavoidable process of decline. Peter Stanton, who was trained as a forester and had within the Forestry Department, stated that he

> would have given the timber industry in the mid-1980s another five years before it ran out of timber and probably a natural attrition would have closed most of it down… At the time I think all of us who knew much about logging operations in the wet tropics, including some of those in forestry, felt that there was not much point sacrificing the last few virgin areas for the sake of a dying industry.[212]

Despite the Queensland government's objections, the Commonwealth Government pushed on with the nomination. On January 19 1988 commercial forestry operations were made illegal in the Wet Tropics under the *World Heritage Properties*

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[210] P. Harris, 'An analysis of the socio-economic impact of the World Heritage Listing of the rainforests of North Queensland', A Report prepared for the Forest Industries Campaign Association Ltd, Melbourne, 1987.
[211] Harris, p. ix.
[212] Interview with Peter Stanton, NLA TRC-3077, p. 126.

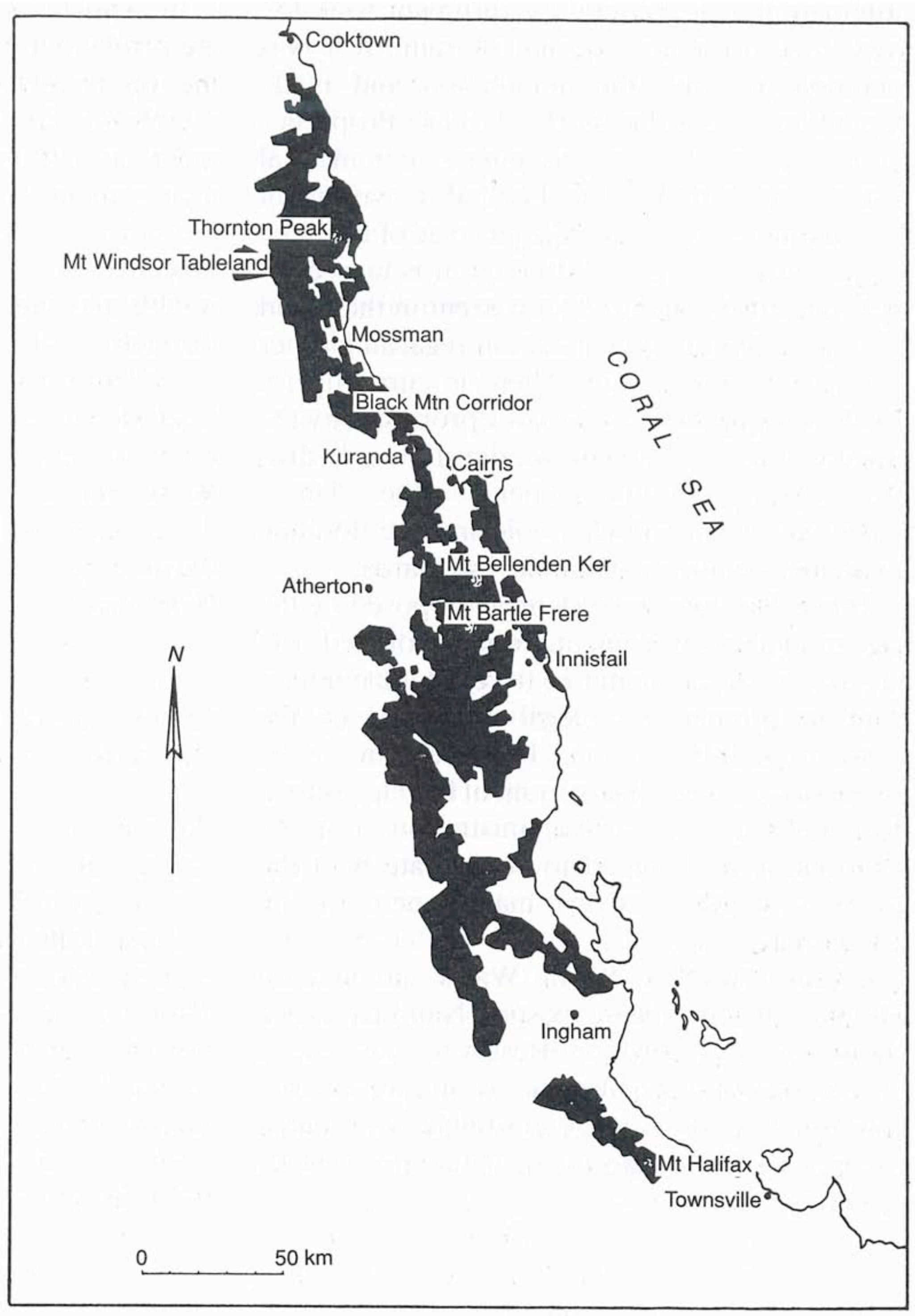

Figure 3 The wet tropics of north-east Queensland World Heritage area.

Source: P. Adams, *Australian Rainforests*, p. 247.

Conservation Act. On December 7 1988 the nomination was accepted and the Wet Tropics listed as a World Heritage area.

World Heritage listing of the Wet Tropics was based not on an assessment of the local area's conservation needs, which raised difficult political, economic and social questions, but of its 'outstanding universal values', which could be most legitimately spoken of in the language of science. Listing formally protected the area as 'a living museum', a place in some sense more symbolic than real, a space where human history no longer happened. The history of European settlement of the region, and the attempts to impose an economy and modes of agriculture and industry derived from elsewhere, had certainly devastated the rainforests. Peter Stanton, who began his career as a cadet with the Forestry Department in the early 1960s, recalls:

> Unless you can actually experience what it was you have no idea what you've lost. The virgin forest that I saw in areas which are now virtually vine thickets were incomparably more beautiful and better than what we see now. There are very few areas left in the wet tropics of forest of the magnificence of a large part of what I saw, in areas that are now accessible from Cairns… We have begun to accept the degraded and rundown as the norm. We do accept it as the norm, without ever realising the magnificence of the early forests.[213]

The work of scientists such as Len Webb and Geoff Tracey had shown that the loss of species and ecosystems which fuelled this environmental transformation was also a loss of the living substance of continuing evolutionary processes, the cutting of a thread which connected the distant past with the present. Conservationists saw World Heritage listing as a way of protecting the 'natural history' of the rainforests from the rapacious historical trajectory of the region's human inhabitants.

However there is a danger in an appeal to values based primarily on a scientific viewpoint: such an appeal has the tendency to take on an aura of

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[213] Interview with Peter Stanton, NLA TRC-3077, p. 92.

universality which, as it is translated into the political sphere, obscures the diversity of interests, beliefs, knowledge and experiences which exist both within and beyond science. The physical intimacy of living and working within the rainforest had led some settlers to an understanding of that environment which did not translate simply or comprehensively into the language of science. Both Geoff Tracey and Len Webb recalled the great depth of knowledge and feeling for the rainforest held by some men in the logging camps they encountered during their early fieldwork in the 1940s and 50s. The thousands of generations of Aboriginal people whose traditional lands were near or within the rainforests had maintained not only an intricate knowledge of the history of particular places, of the seasonal cycles of plant and animal life, and the useful products which can be extracted from the forest, but also a deep spiritual identification with, and obligation to, the rainforest.[214] Finding a place within the framework of World Heritage not only for the experiences and knowledge of Aboriginal people, but also for their legal and moral rights as traditional owners of the land, has been an ongoing challenge.[215] A clear recognition of the rainforest as a fundamentally historical environment is a vital part of any just response by non-Aboriginal people to the damage and dislocation which colonisation has inflicted on Aboriginal communities. Facing that challenge has also begun to extend and deepen scientific understandings of the rainforests of North Queensland.

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[214] For a discussion see Timothy Bottoms, *Djabugay Country: An Aboriginal History of Tropical North Queensland,* Allen & Unwin, St Leonards, NSW, 1999; and Dixon, (comp. & ed.) *Words of Our Country*.

[215] In 1996 a review began to address these issues. The report was published by the Review Steering Committee, Wet Tropics Management Authority, Queensland, *Which Way Our Cultural Survival – The Review of Aboriginal Involvement in the Management of the Wet Tropics World Heritage Area*, Cairns, Qld, 1998. The full implementation of the recommendations of the review is still continuing. Wet Tropics Management Authority, http://www.wettropics.gov.au/rah/rah_partnerships.html, (accessed June 2005).

Conclusion

As an expression of the complexity and diversity of plant and animal life which reaches its zenith under tropical conditions, rainforest has long challenged and enticed scientific inquiry. On entering the rainforests, scientists have looked for patterns and for means of explaining those patterns. They have sought to order the seeming chaos of the forest, and have attempted to uncover its history and functioning. Scientific investigations of the tropical rainforests of North Queensland have been motivated by a desire for knowledge, by an awareness of the environment's potential economic value, and a concern for its conservation. However an important aspect of the biological sciences has also been to explore, sometimes directly and at other times more metaphorically, the relationship between humans and the natural world. Scientists have done this not only through examining the consequences of human actions, but also by suggesting an ethical framework to guide such action based on scientific insights and, in a deeper sense, by offering a perspective on human existence drawn from an intimate engagement with the non-human world.

Central to late eighteenth and nineteenth-century taxonomic investigations into the North Queensland rainforests was the notion that it was possible for a botanist, at least in principle, to attain a full, accurate and comprehensive account of all the diverse species that make up the rainforest, and to place them in clear relationship both to one another and to the vegetable productions of the world as a whole. This was the aim of the taxonomic process: the careful and meticulous collecting of specimens; the ordering, examining, comparing, describing, sketching, and naming of species; the publication of Flora; and the formation of herbaria. Botanists such as Frederick Manson Bailey believed that to truly value the rainforest it was necessary to truly know it, and such knowledge must be based on the ability to identify and name each plant according to a taxonomic system of classification. Individual botanical specimens acted as representative objects: they are unique, and were seen and described in their own right; but also took their place as elements within a larger classificatory system as the means by which other specimens might also be described and named. The discipline of taxonomic botany set up a clear distinction between the knowing human subject and the natural world as the object of knowledge. The colonial botanists regarded such orderly knowledge of the natural world as vital to the well-being of both individuals and societies.

A more explicit way in which science has explored the ethics and meaning of human existence has been through providing an explanation of the patterns found in the natural world in the form of an historical account in which human intentions are not placed at centre stage. Ecologists have been led to doubt the vision of historical progress which provided momentum to the colonial endeavour, and which saw transformation of the natural environment as the necessary basis for the increasing social and economic development of human societies. In line with this view, the eighteenth- and nineteenth-century explorers of North Queensland had interpreted its vegetation as a sign that the land was destined for settlement. The ecological vision of history has at times taken an opposite approach and presented humans as outsiders – ‘disturbers’ of the natural processes of otherwise intact ecosystems. Because of the physically closed character of tropical rainforest, logging or clearing of the forest creates an immediate, dramatic and visible impact. While I have not undertaken a comparative study, I would expect that this would have lent greater prominence to the sense of human as ‘disturber’ in discussions of rainforest history than might be found in ecological accounts focused on more open forest or grassland communities. Conversely, this physical characteristic of rainforest has also led to the history of its human occupation prior to European invasion being clearly and lastingly written on the landscape to a greater degree than perhaps it would be in more open areas: paths, trails and clearings within the forest provided entry-points for European invaders, and were a subject of discussion and curiosity amongst early settlers and later scientists.

In the period under consideration in this thesis, ecological research into the rainforests of North Queensland drew on a range of techniques and technologies to grapple with the task of gaining a systematic understanding of the structure and dynamics of rainforest ecosystems. Lack of resources and the difficulty of undertaking fieldwork in remote and isolated areas have long been recognised as limiting the extent of scientific knowledge of the rainforests. However, as ecologists accumulated and analysed data, they increasingly found that the complexity of the rainforest environment itself was the greatest obstacle to attaining comprehensive understanding. While the taxonomic endeavour was based on, and contributed to, a sense that complete knowledge of the rainforests was possible, ecological research increasingly ran up against the bounds of human comprehension. Such research highlighted the diversity of human perceptions of the rainforest and the enormous range of factors to be taken into account in any classificatory or explanatory model. While in taxonomic botany, the distinction between knowing human subject and the specimen as representative object was clear, ecologists could make no such definite boundary: they were concerned not with objects, but with relationships. Their attempts to understand the ecology of the rainforests necessarily led them to make human societies and human actions a subject of their inquiries. While the historical accounts provided by ecologists presented human presence in the rainforest as in some sense problematic, the research process itself led ecologists such as Len Webb and Geoff Tracey to develop a sense of awe and respect for the rainforests which was based on an awareness of the limitations of their own understanding.

History has been a central concern of ecology, and ecological views have enriched and complicated historical accounts of the rainforest. The narratives of biogeography, while connected to and drawing on ecological insights, look beyond such accounts, and have mapped environmental change on a timescale that entirely displaces human presence. Not only does the chronology of the evolution and dispersal of rainforest species overwhelm the human sense of time, but the acceptance of continental drift has undermined the stability of place which had previously given shape to human understandings of the distant past. Although observers have often regarded rainforest as in some sense timeless, biogeographers and palaeoecologists have shown that it has in fact been a continuously changing, fundamentally dynamic environment. One response of scientists to this displacement of human perceptions and preoccupations has been to question the validity of anthropocentric systems of values. Humans clearly have the capacity to destroy the rainforest – an environment which they can neither fully understand nor control, which is intricate beyond anything which human endeavour could create, and which is the product of ecological interactions and evolutionary processes on a time-scale which dwarfs all human history. From these assumptions, scientists such as Len Webb have argued that human actions cannot be reckoned in terms of human interests alone, and that whatever the imagined or actual gain, the loss caused by the continuing destruction of the rainforests is both irreversible and morally unjustifiable.

Scientists' responses to rainforest have been shaped both by the relatively distinctive range of methods and aims on which scientific investigations have been based, and by the characteristics of the forest itself. As well as providing an intriguing array of scientific puzzles, the rainforest has at times been metaphorically linked to larger questions of historical process and social dynamics. The lushness of rainforest vegetation has been seen in a symbolic as well as an actual sense as representative of the fertility and bounty of the natural world. The history of the rainforest has been written in terms both of invasion and of survival. The dynamics of its ecological systems have suggested that qualities of interrelationship, creativity, and diversity are central to the health of a community. The ways in which scientists have responded to the metaphorical aspects of their inquiry has varied according to their personal inclinations and experiences, and the historical circumstances in which they have worked. My research has suggested that for many scientists, the intimate process of their research led them beyond a curiosity which might be satisfied by intellectual understanding, to a sense of wonder which demands not knowledge of an object, but transformation of the relationship between the human and natural realms.

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Specific articles that have been directly useful to this thesis are listed with the journal articles above.

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