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The Leichhardt papers
Reflections on his life and legacy

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For the sake of science: Ludwig Leichhardt as botanist and ecologist

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Much of Ludwig Leichhardt's impressive scientific legacy has come to light in a fragmented form long after his death. His botanical achievements were undermined by the need to abandon his collection on the Port Essington expedition, and because his primary connections were in Paris not Britain where taxonomy of the Australian flora was being prepared. Leichhardt's diaries from 1842-1844 reveal a diligent and highly capable botanist who was tutored by the Aboriginal people as they guided his collecting tours. From these partnerships came the first comprehensive catalogue of plants from sub-tropical rainforest, complete with the plant names from a number of Aboriginal languages. Leichhardt was also concerned with ecological questions and expounded on the factors controlling the distribution of rainforest, the role of fire in the landscape and the intense climate fluctuations that shape the Australian landscape. He was a participant in the scientific ferment leading up to Darwin's explanation for the evolution of life. While his capabilities and experience qualified him to contribute to these discoveries there is no substantial evidence that he was following such questions. If he had survived to 'ruminate and digest that which I have seen and learnt' his contribution would probably have been directed towards understanding the geography of the Australian continent rather than to grand scientific theory.

❑ *Leichhardt, Ludwig (1813-1848); botany; Australian science.*

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When Henry Stuart Russell met a seemingly lost Ludwig Leichhardt in the forests of the Condamine River, he recalled a rather ridiculous chimney-pot hat and a bearded face 'bespattered with half a bushel of flowers, leaves and many vegetable specimens; the hat, too, was girt around by sundry creepers and climbers and here and there a beetle speared to the rim'. From the stranger's curious appearance it was apparent that this was an 'amiable inquirer into the general arcana of nature – a man of science' (Russell 1888: 360-361). While Russell's account of his would-be friend was tinged with derision, his final conclusion was entirely consistent with Leichhardt's own stated purpose. While his contemporaries Sir Thomas Mitchell and Captain Charles Sturt were able naturalists, they pursued such duties only as they coincided with their intent 'to spread the light of civilization over a portion of the globe yet unknown' (Cumpston, 1955: 74). Among the early Australian explorers, Leichhardt was from an entirely different mould, motivated almost entirely by a quest for rational understanding of the mysterious new world through which he travelled. In a letter to his brother-in-law he declared 'I have worked for the sake of science, and for nothing else; and I shall continue to do so even if no soul in the world pays any attention to me. I am fearful of losing God's blessing, should I give way to vanity and confound the driving ambition to be acclaimed and famous with the genuine, quiet and laborious striving after knowledge' (Leichhardt to Schmalfuss, 22 February 1848, Aurousseau, 1968: 993-994).

According to an idealised model of their operational method, scientists systematically gather data, subject that information to careful analysis, interpret their findings with deductive logic against prevailing understanding and ultimately communicate novel insights in scholarly journals. A scientist's status is elevated when their work challenges existing theory, or is most powerful when constructed into its own theory that is sufficiently robust for other scientists to become devoted to its critical dissection. Leichhardt's singular intention as a serious 'man of science' is unmistakable, but his manic schedule during six years in Australia never allowed for the quiet contemplation he needed to complete the formal scientific journey. His legacy as a scientist can only be assessed as fragments amongst the exhilarating story of his travelling life.[1]

Leichhardt's written scientific contributions from Australia consist of only four preliminary papers (Leichhardt, 1846; Leichhardt, 1847a; Leichhardt, 1855; Leichhardt, 1867-1868), with the remainder interspersed within the published journals of his expeditions (Bunce, 1979; Leichhardt, 1847b; Sprod, 1989; Webster, 1986), about 150 letters (Aurousseau, 1968), the diaries published for the first time here (Darragh and Fensham, 2013) and unpublished scientific notes from his time around Sydney and Newcastle during 1842 (Leichhardt, 1839-1842; 1842-1847). Amongst the impressions of the people and events of his travels, the diaries contain an orderly array of observations and inquiries from a young scientist intent on assimilating the strange geography of his adopted homeland.[2] Leichhardt's life coincided with an extraordinary period of scientific development, particularly in the field of natural science. By viewing his capacity and achievements in the context of those revolutionary times we are able to glimpse something of his potential contribution had his life not been cut short in the Australian interior.

SCIENTIFIC TRAINING

By the time Ludwig was a child in the 1820s, scientific textbooks were becoming widely available, and the educated masses were attending public lectures on the

latest discoveries and theories. Scientific journals were founded and their pages were filling with verbose scientific musings and convoluted debates attempting to find order in the revelations of nature. Societies and associations were founded to extend the domain of science beyond the elite, and into the realm of anyone with sufficient education. Even Australian newspapers had an unfamiliar tenor with significant scientific papers and discussion published on pages that are now filled with the trivia of sport and celebrity gossip. The discourse generated a great sense of awakening but was only encouraged if it emerged from careful observation subject to rational deduction. These were great times for science.

Ludwig's father, Christian, was a farmer on a small land-holding with little care for the new fashion of science. Fortunately the state-run education system in Prussia had recently been reformed by Wilhelm von Humboldt (the brother of the great geographer) and for the first time a broad syllabus was available to children regardless of their status. The young Ludwig made the most of the opportunity to transcend his mundane background and was a diligent student. His brother-in-law, Carl Schmalfuss, was a formative influence and the strength of Leichhardt's respect would be later displayed in his correspondence from Australia, a correspondence that included an important scientific legacy (Roderick, 1991).

After two and a half years studying languages and philosophy at the universities in Berlin and Göttingen, Leichhardt attended a lecture on natural science by Johann Blumenbach that would direct the remainder of his life, and he subsequently threw himself into the study of botany, natural history, physics and metaphysics. His scholarship began to exceed the stretched pockets of his family and after the death of a supportive aunt he was confronted with a pressing choice. Amidst great confusion, moments of depression and eventual resignation, he decided to forgo his passion and commenced training in economics and finance, fields that would lead him to a secure vocation where he could repay his debts and provide for his family (Roderick, 1991).

Such a compromise was averted through his friendship with John and William Nicholson, English brothers who had come to Göttingen for study. Over the next six years the Nicholson family would extend an extraordinary generosity, providing for Leichhardt's living expenses while he was the house-mate of William and thus allowing him to pursue his scientific study. The arrangement with the Nicholson family has been presented as evidence of Leichhardt's tendency to exploit the generosity of his acquaintances (Chisholm 1941: 73). In reality, the relationship was mutually beneficial as William's medical training was enriched by the long hours huddled over textbooks with an intelligent and enthusiastic friend. This was an intense and fruitful period of education and by the time Leichhardt left Germany he had a grounding in an astonishing breadth of disciplines including law, history, anthropology, demography, technological science, chemistry, botany, zoology, microbiology and comparative anatomy. Supplementing these were his previous scholastic endeavours in literature, theology, philosophy and mathematics, and languages including French, English, Hebrew, Latin, German, Greek, Sanskrit and Persian (Roderick, 1991).

After such an expansive classical training Leichhardt had absorbed all he could from the lecture room. Between 1837 and 1841, with William in tow, the enthusiastic young scholar embarked on a free-ranging jaunt around some of the finest academic institutions in Europe, attending courses with eminent scholars and immersing himself in the collections accumulating from voyages of exploration into the far corners of the globe (Roderick, 1991).

The first port was England where Leichhardt was able to express his gratitude to the Nicholson family, despite finding no affection for William's father whom he perceived as a narrow-minded bigot intent on tyrannising his adult children. England was full of other opportunities and a particularly influential meeting with Samuel Stutchbury of the Bristol Museum motivated an abiding obsession with geology (Darragh, 2013). In London he studied anatomical collections at the major museums, and on William's coat-tails was admitted to the most prestigious teaching hospitals, gaining first hand experience of patient care (Roderick, 1991).

We know that Leichhardt knew about the early accomplishments of Charles Darwin because his journal from 1847 includes a discussion about the merits of the great scientist's recent theories concerning the formation of coral reefs (Webster, 1986: 50, 56). In September 1837, when Leichhardt arrived in London, Darwin was about to retreat to the country for a period of convalescence. He was mentally and emotionally exhausted and suffering heart problems after a period of concentrated activity deciphering his collections from *The Beagle*. The patterns of variation among the South American fossils and the finches from the Galapagos Islands drew him to question the meaning of variation between closely related species, how species adapted to a changing environment and ultimately to the overarching problem of how one species might be transformed into another. This was probably the most important period in Darwin's working life where the essential structure behind his grand explanation of evolution was crystallized into coherent theory (Rachootin, 1985). If Darwin had been fit and able, Leichhardt may have sought a meeting, and he might have inspired the young German to consider the same questions that were his preoccupation.

Moving to Paris, Leichhardt attended lectures and demonstrations and honed his clinical skills in the modern hospitals. He took advanced classes in entomology, anthropology, chemistry and ornithology and deepened his interest in geology. At the *Jardin de Plantes* he was taught plant anatomy and classification by Adrien de Jussieu whose father had made considerable advances to the Linnaean system of classification by incorporating multiple characters rather than relying on the numbers of floral parts (Roderick, 1991). Botanical collecting trips with Jussieu were fundamental to the training that underpinned his achievements in Australia. From the palaeontologist Adolphe Brongniart he came to appreciate the fertile overlap between his favorite disciplines of geology and botany. Rocks captured an orderly botanical history in their fossils, and the fossils provided a code for the historical sequencing of rocks.

In the coal pits of St Etienne he surveyed the broad sequence of geological strata. Having become conversant with the recent revelations of the geologist Charles Lyell, he began to grasp the immense depths of time required to interpret the stratified deposits of ancient seas and lakes. 'A thousand years are as nothing, and old Moses, with his 600 years has lost all credit. For the geologists talk of 10-60-100 thousand years, and are striving to measure the course of time by the old, layered crust of the earth like the forester counting annual rings of an ancient oak' (Leichhardt to Schmalfuss, 11 July 1841, Aurousseau, 1968: 351). Examining the deluge of pumice that had buried Pompeii, he began to appreciate the immense power of volcanoes and their capacity to sculpt the Earth's surface. From the forests, mountains and meadows of Europe, Leichhardt filled cases with carefully collected insects, and perfected the art of preserving botanical specimens to represent the floral organs crucial to their classification.

TO AUSTRALIA

The next chapter of Leichhardt's life was inspired by the careers of Darwin and Humboldt who had formulated their discoveries and made their reputations through exploration. The idea of travelling to

Australia rather than Africa or North America, both of which were also considered, seems to have come about because William's brother Mark had established a sheep station in the recently settled Port Phillip district (Leichhardt to Christian Leichhardt, 21 October 1837, Aurousseau, 1968: 83; Leichhardt to Schmalfuss, 30 July 1841, Aurousseau, 1968: 364). The colony had been established for more than 50 years but only a handful of localities, mostly dotted around the coast, had been explored. There were rumours of an inland sea or a great undiscovered river and the scientific revelations of the vast empty space of the Australian interior become the object of his aspiration.

For an unknown scientist attempting to gain access to the people of influence in the fledgling colony it was crucial to obtain letters of recommendation. He returned empty handed after a meeting with botanist Sir William Hooker who considered that there were only negligible prospects of substantial discoveries in Australian botany, given the achievements of Robert Brown and others. An unsuccessful meeting with Alexander von Humboldt must have been especially disappointing. The great geographer was revered throughout the scientific community for his understanding of global patterns in climate, geology and botanical diversity. Humboldt's recommendation that Leichhardt would need to specialize within a single discipline if he were to make any real progress in science was especially confusing, given that he had modeled his cross-disciplinary training on the geographic synthesis that defined the career of his idol (Leichhardt to von Humboldt, 14 June 1841, Aurousseau, 1968: 332-333; Leichhardt to Schmalfus, 21 October 1847, Aurousseau, 1968: 963-964; Roderick, 1988: 147).

On the eve of his departure a young British scientist named Richard Owen provided a recommendation (Leichhardt to Owen, 10 July 1844, Aurousseau, 1968: 770) and it was this letter that secured Leichhardt attendance at a dinner with Surveyor-General, Sir Thomas Mitchell, soon after arriving in Sydney. Perhaps Mitchell and the other dignitaries were affronted by the overconfident foreigner who expressed his willingness to join a widely mooted expedition into the interior. Leichhardt was acutely sensitive to their reaction and left the function feeling alienated (Darragh and Fensham, 2013: 4). Whatever the nature of the exchanges, the tone was set for a contemptuous rivalry between Mitchell and Leichhardt that was occasionally veiled by platitudes but never resolved (see Clarke, 1858; Richter, 1898).

During his early months in Sydney, he was unsuccessful at securing a position as superintendent of the botanic gardens in Sydney. He may have been paid for a few lectures and some private tutoring in Sydney, but this was probably his only source of income for the entire period of his travels between February 1842 and June 1844 when he began to attract sponsors for his Port Essington expedition. From the £200 that had been generously provided by William Nicholson he lent his friend Murphy £50 and acquired several horses and dogs, as well as clothing and basic equipment for travel and scientific collecting. There was not much left[3] and his survival was dependent on the generous patronage of his hosts, including the Scott brothers in the Hunter Valley, Frances Rusden on the Horton River, the Archer brothers at Durundur, David McConnel at Cressbrook, Frederick Bracker at Rosenthal and Henry Russell at

Cecil Plains. These were well-educated men, mostly from wealthy families, who welcomed Leichhardt's intellectual stimulation amidst the company of the rough and ready working men they employed. David Archer described Leichhardt to his father as 'a most intelligent person and as he has a pleasing address and is not chary of his information, we find him a most agreeable inmate'[4]

One of his early interactions was with Reverend William Branwhite Clarke. Clarke had a Cambridge education with a special interest in geology and, after three years of intellectual isolation in Australia, was extremely eager to meet a scientist of Leichhardt's capacity. He wasted no time in hosting his new acquaintance on a tour of sites around Sydney selected especially to demonstrate his understanding of the regional geology.[5] It almost immediately became apparent that Clarke and Leichhardt did not see eye to eye. One of their first disagreements concerned the nature of the unexplored interior of the continent.[6] After only three months in the colony, Leichhardt had noted the predominance of the hot dry north-westerly winds and after integrating this observation with an advanced understanding of atmospheric circulation, he formulated the opinion that the heart of Australia was an arid desert (Leichhardt to Dove, 27 May 1842, Aurousseau 1968: 478-481; Darragh and Fensham, 2013: 7). This bold deduction may have been informed by the reports of others, such as Philip Parker King whose account of a voyage of circumnavigation included a map without any large rivers and an observation from the north-west coast that 'a change of wind from the South-East, which, from its heat, and from the listless sensations it caused, resembled the hot land-wind of Port Jackson: this seems to afford additional ground for the hypothesis that the interior of this immense island is occupied by vast sandy deserts' (20 February 1818, King, 1827).

Clarke was not dissuaded from a view that the atmospheric electricity he had measured by magnetic needle was transmitted by humidity originating from an interior water source. With some restraint, Leichhardt suggested that Clarke espoused his thoughts before he had them in order. While they could annoy and challenge one another, their debates never degenerated into personal animosity and a mutual respect and affection would grow over the coming years. For years after Leichhardt's death, Clarke worked to ensure that his friend's written legacy was published, and was a dedicated champion of a thorough search effort to unveil the fate or bones of his 'lamented friend' in the desert.[7]

LEICHHARDT'S BOTANY

Sydney in 1842 occupied only a narrow footprint fringing a short stretch of the harbour. The closest bush was on Surry Hills and this was probably where Leichhardt headed for his first chance to inspect the native flora in its natural setting. His excitement was palpable as he wrote 'I can't tell you with what excitement I leapt ashore, with what delight I greeted every botanical novelty or how new impressions came crowding in from all sides until I felt positively dizzy' (Leichhardt to Little, 25 March 1842, Aurousseau, 1968: 453). Almost every species he encountered during these early outings into the bush would have been foreign to his eyes if not to his understanding. His companion on these outings was Lieutenant Robert Lynd, a generous and abiding friend who it seemed had been 'providentially sent out here ahead of me when William [Nicholson] decided not to come' (Leichhardt to his mother, 27 June 1843, Aurousseau, 1968: 659). The younger man, however, set the pace on their energetic collecting trips and Lynd was duly humbled by the intensity of Leichhardt's botanical scholarship 'I want, like a schoolboy the

Masters' eye. I fear I shall never arrive at your precise, and painstaking method…' (Lynd to Leichhardt, 1 January 1843, Lynd, 1843).

The only available botanical texts of relevance to Australia included the first seven volumes of Robert Brown's (1810) *Prodromus florae Novae Hollandiae et insulae Van Diemen*, De Candolle's (1823-1873) *Prodromus systematis naturalis regni vegetabilis* and Endlicher's (1836-1841) *Genera Plantarum* (Leichhardt to Durando 6 January 1844, Aurousseau, 1968: 697; Leichhardt to King, 17 June 1846, Aurousseau, 1968: 876). Brown's work included many of the plants around Sydney but it needed updating and it was Leichardt and Lynd's intention to publish a new version of the flora in English.[8]

After Leichhardt left Sydney to travel from Newcastle to Moreton Bay, he more frequently encountered species that were undescribed. His training and the other general texts allowed him to associate unknown species with their more familiar relatives; an unknown aquatic herb in the mint family for example would become the 'broad-toothed water labiate'. The diaries are replete with similar examples complete with precise botanical descriptions that together with his collected specimens would allow him to complete more formal descriptions at a later date. Some of his field identifications are testament to outstanding botanical scholarship. He recognized *Burmannia*, a small orchid-like plant from an obscure tropical family in a swamp on his way to Pumicestone Passage in Moreton Bay, even though he had no opportunity to see these previously and his familiarity could only have come from memorizing the Latin description in Brown's Prodromus.

The timber-cutters in the Hunter Valley taught Leichhardt the importance of bark characters for recognizing separate forms amongst the *Eucalyptus* trees. The iron-bark, the stringy-bark, the smooth-bark, the box, and the bastard (representing parts of two bark types) became familiar at a glance. With more detailed observation he combined the bark characters with the shape and size of the leaves and fruit to distinguish the bewildering variety amongst the iconic genus that defines the Australian bush. Recognizing the trees became more than an end in itself, as Leichhardt realized their importance as a signature of the landscape revealing how much moisture was available and the character of the soil.

As he traveled further afield, his understanding of botany was advanced by Aboriginal people and he freely adopted their nomenclature. In the rainforest of Moreton Bay his botanical language was almost exclusively derived from the various dialects of his Aboriginal informants. When he was out with Charley he was learning Wakka and when he was with Nikke he was applying Kabi names to the trees. The Kabi word for the blue gum (*Eucalyptus tereticornis*) around Moreton Bay, *manborri*, became the working name for this species and recurs in the diaries of his later expeditions well beyond the region of its source (Sprod, 1989:135).

There are at least 2,600 Leichhardt plant specimens lodged in Australian herbaria (almost exclusively Melbourne and Sydney) and more were received by European herbaria (Leichhardt to Durando, 12 July 1844, Aurousseau, 1968: 777). Of particular interest is the carefully catalogued collection, mostly from the rainforests of the Blackall Range, commissioned by Adolphe Brongniart, Leichhardt's teacher in Paris. He made the collections with the assistance of his Aboriginal guides who helped him fell trees in order to prepare the wood samples and pressed specimens of leaves and flowers. The smattering of rainforest trees collected by Robert Brown along the coast and the incidental collections of Allan Cunningham and Charles Frazer were rudimentary

compared to Leichhardt's comprehensive collection from south-east Queensland.

Rainforests are characterized by a great variety of canopy trees and intimate knowledge of their botany requires years of concerted observation. The early timber-cutters needed a rapid means of identifying the rainforest trees in order to avoid the substantial effort of chopping down a species with worthless timber. A long swipe of the trunk with a knife or an axe reveals a 'blaze' exposing the characters of grain structure, colour, scent and sap that can greatly assist in identification. The catalogue of the rainforest collection in the diaries includes detailed descriptions of wood features and Leichhardt's appreciation of these cryptic features predates the refinement of the technique by foresters. The catalogue of 143 trees diligently chronicled in the various languages of his informants is partly revealed within the diaries but until the specimens in Europe[9] are properly catalogued, the identity of Leichhardt's rainforest trees and their Aboriginal names remain a mystery. This is a substantial omission from the records of Australian science because it represents the first systematic collection of rainforest plants and its recognition will greatly enhance Leichhardt's under-valued contribution.

Leichhardt's record of rainforest locations includes many that have been obliterated over the intervening years. On the banks of Enoggera Creek, he visited the Three-Mile Scrub, an important camp for the Aborigines known to them as Buyuba (Petrie, 1904: 141).[10] The Scrub (one of the early terms for rainforest) was long ago displaced by houses and sportsfields in what is now the Brisbane suburb of Newmarket. After vanquishing the forest, future confusion was avoided by renaming the Three-Mile Scrub Road (Gordon and Gotch, 1920) as Ashgrove Avenue. Leichhardt visited the scrub (Fig. 1) in July 1843 when the trees were not flowering and made a short list of species. His records from Buyuba and the Eagle Farm Scrub (Darragh and Fensham, 2013: 246-249) provide some of the only records of the tree species that grew in the rainforests along the Brisbane River valley. The diaries also provide lists of plants on the Liverpool Plain (Darragh and Fensham, 2013: 175-184) where cultivated crops have almost completely supplanted the native grassland.

The pinnacle of Leichhardt's exploratory achievement was his first major expedition traversing the interior of the north-eastern quarter of the continent from the Darling Downs to Port Essington. The botanical specimens from this monumental journey had been carefully pressed, wrapped in green-hide and securely packed in saddle-bags (see Fensham *et al*., 2006). By Leichhardt's reckoning the collection numbered 4000 to 5000 plant specimens (Leichhardt to Durando, 20 May 1846, Aurousseau, 1968: 870), and he records that 'The length of time 14 ½ months enabled me to render the collection very perfect, as I remained long enough within the two Floras (the Eastern Interior and the Gulf of Carpentaria including 'Arnheim' land) to see the flower, the fruit and seed of almost every one'. (Leichhardt to Durando, 20 May 1846, Aurousseau, 1968: 869).

At the Roper River disaster struck when three horses, including Black Jack, the expedition's strongest pack-animal, were carried away in the current and drowned. There was no choice but to discard any luggage that was not absolutely essential, including most of the precious plant collection. Leichhardt was devastated, 'This disastrous event staggered me, and for a moment I turned almost giddy; but there was no help …. The fruit of many a day's work was consigned to the fire; and tears were in my eyes when I saw one of the most interesting results of my expedition vanish into smoke.'

FIG 1.

Left: Section of 'Map of the environs of Brisbane Town situate in the County of Stanley by Henry Wade, Surveyor, 1844 (MT.12, Department of Environment and Resource Management, Qld 2012) showing the location of Three-Mile Scrub (Buyuba) within an oxbow of Enoggera Creek immediately downstream of the Great Northern Road (now Enoggera Road);

Lower image: Fishing and boating parties at Enoggera Creek, Brisbane, in vicinity of Three-Mile Scrub, c. 1900. The almost extinct rainforests typical of the lower Brisbane Valley are visible on the far bank. Image: John Oxley Library, State Library of Queensland, Neg 69613.

A massive contribution to Australian science was reduced to ash. The specimens were a vital record of Leichhardt's scientific achievement, and he would have understood the cost of the sacrifice for his professional reputation. Despite his anguish at the Roper River, Leichhardt retained the far bulkier animal specimens of John Gilbert who had lost his life to an Aboriginal spear on the Nassau River. The specimens preserved to this day under Gilbert's name are a testament to Leichhardt's selfless act.

Leichhardt was eager to make up for the disastrous loss of plant specimens from the first trip and envisaged that his second expedition would be a 'famous one for botany' (Leichhardt to Durando, 20 May 1846, Aurousseau, 1968: 870). This was his first attempt to cross the continent from east to west, and it was marred by abysmal weather, debilitating illness, mutinous discontent amongst his subordinates, not to mention his own eccentric leadership. The incessant rain meant that it was impossible to keep anything dry and pack animals frequently had to wade through flooded streams. Under the appalling conditions the extensive collections he made with 'his botanical collector', Daniel Bunce, were 'very much injured' (Leichhardt to Bunce, November 1847, Aurousseau, 1968: 974). A selection of specimens survived but they represent only a limited region and are of modest significance compared to the collection that was abandoned.

Some surviving Leichhardt plant specimens have scarcely been seen since, including the *Burmannia* he recorded from Pumicestone Passage and the Queensland galium (*Galium terra-reginae*) collected near Rosewood where its natural habitat has been severely fragmented by urban development, coal mines and farms (Thompson, 2009). His specimen of *Commersonia leichhardtii* from the Expedition Range was the only record of this species for more than 150 years and it was only rediscovered after careful analysis of his route (Guymer, 2005).

The records in Leichhardt's journal challenge the botanical orthodoxy about the origins of some plants in Australia. Some species such as the common couch grass (*Cynodon dactylon*), of cricket pitch fame, are sometimes regarded as native. In the diaries he makes careful observations of the situations where couch grass was growing and was convinced that it had arrived with the European settlers (Darragh and Fensham, 2013: 39, 93, 404, 451). Leichhardt's collections of swamp foxtail grass (*Pennisetum alopecuroides*) and prickly mimosa (*Acacia farnesiana*) indicate that some of these 'exotic' species were already integrated into the flora at the time of settlement despite having evolved on distant continents.

Perhaps because Hooker had refused to extend his patronage, Leichhardt had no inclination to send his botanical collections to the British Herbarium, and Kew Gardens would only ever receive a handful of his specimens, forwarded much later by the colonial botanist Ferdinand von Mueller. Mueller tended to only dispatch Leichhardt specimens if they were species he had missed during his own travels through northern Australia as a member of the Gregory Expedition of 1855-56. Because the botanists at Kew such as John Bentham described most of the Australian flora, Leichhardt's botanical discoveries would never gain the credit they deserved (Barker and Barker 1990). Most of Leichhardt's specimens remained in Australia or were sent to Paris where he hoped they might advance the career of his friend Gaetando Durando (Leichhardt to Schmalfuss, 22 February 1848, Aurousseau, 1968: 994).

ETHNOBOTANY

Unlike Humboldt, who romanticized the place of indigenous people in nature, Leichhardt had a more direct experience. Through the Archers at Durundur he met Aboriginal people who would be his companions over an eight month period. While his attitude to Aboriginal people could be patronising, he had developed an abiding empathy and trust and he became a respectful student in their company. 'I would remain in this region for a year and request to live as much as possible with the Blacks, who observe nature itself or who receive their astonishingly exact knowledge from their parents' (Darragh and Fensham, 2013: 331). After his initial instruction into the plant resources in the bush around Durundur, his journals, diaries and letters are replete with references to Aboriginal plant use, including those from the Alligator Rivers region which expand on more detailed records since compiled with Aboriginal people whose ancestors also instructed Leichhardt (Russell-Smith et al., 1997).

The success of the Port Essington expedition was largely a result of Leichhardt's capacity to utilise the resources of the bush when their limited supplies became expended (McLaren, 1996:163-164). Plant gums exuding from the trunks of trees were collected by Aboriginal people as medicine and favoured food.[11] Leichhardt's record provides insights into the diversity of species providing edible gums and also confirms that in some areas they were a critical source of carbohydrate rather than just an incidental luxury. Amongst the items left behind in an Aboriginal camp on the Isaacs River in central Queensland was 'a small water–tight basket containing acacia–gum' (24 February 1845, in Leichhardt, 1847b:162-163). This carefully stored item may have come from *Acacia bidwillii* as there are frequent references to the edible gum of this species in the journal (9 December 1844, 3 April 1845, 16 April 1845 and 29 October 1845, Leichhardt, 1847b:66, 201, 292 and 459). The tropical genus *Terminalia* provided particularly fine-tasting gums and were important as a regular food item. It seems that all of the four species that Leichhardt encountered yielded edible gums and they were readily eaten by both the members of the expedition and their Aboriginal hosts.[12] In the western Gulf of Carpentaria, Leichhardt records that the tracks of the natives were 'everywhere in the scrub, with frequent marks [on the *Terminalia* trees] where they had collected gum' (22 August 1845, Leichhardt, 1847b:374). There is ethnographic evidence (Clarke, 1986) to suggest that these 'frequent marks' were deliberate scars imposed by Aboriginal gatherers to promote the exudate. Leichhardt even recorded edible gum from white-wood (*Atalaya hemigaluca*) one of the most widespread trees in inland Australia (19 August 1845, Leichhardt, 1847b: 370). With such a freely available resource, Leichhardt avidly attempted to improve the palatability of the gum-balls for his European palate. He thought that roasting was the traditional technique,[13] while his own concoctions involved dissolving gum balls in boiling water, adding them to a gelatine soup and garnishing them with salt. This incident typifies Leichhardt's open-minded approach to supplementing expedition provisions with wild produce. Regardless of his lack of enthusiasm for the taste of the tree gums, he was sufficiently astute to appreciate their nutritional value and their effect on digestion, describing them as 'a good lenient purgative' (22 August 1845, Leichhardt, 1847b: 374).

Aboriginal people who lived in the rainforest used yams (e.g. *Dioscorea* and *Alocasia*) and tree seeds for a staple supply of carbohydrate. Leichhardt's record of his Aboriginal guides using the seeds of black-bean (*Castanospermum australe*) confirms our existing understanding of this species

as an important resource (Maiden, 1889). In south-east Queensland Leichhardt had been told about a 'bread-vine' that was valued as a food item (Darragh and Fensham, 2013: 313, 333). His description of a large vine festooned with clusters of violet flowers and a specimen (MEL2092006) from Nurrum Nurrum confirms the identity of *Birrwi* as *Callerya megasperma*, popularly known as native wisteria (Fig. 2). This seems to be the only record of this plant as a traditional resource and indicates not only the potential for other unique records buried within the diaries, but also the certainty that much Indigenous plant knowledge has been lost without trace.

Some of Leichhardt's references to Aboriginal plant use are mysterious, such as the 'native *Malva*' from the Liverpool Plains that the 'aborigines eat in their thousands' (Darragh and Fensham, 2013:224). The only likely candidate based on current distributions is *Hibiscus trionum*, but this species is not recorded as edible in the existing literature and its dry, bristly mature fruits would seem to have little potential as a food item. However, when the epicalyx of emerging fruits is peeled away the young heart has a refreshing taste reminiscent of a garden pea. Closer scrutiny of the diaries will generate further understanding of Aboriginal plant resources.

FIG 2. *Birrwi* (*Callerya megasperma*) was a valued source of carbohydrate amongst the Aborigines of the Blackall Range.

Aboriginal plant foods can be misidentified and biographer Colin Roderick assumed that Leichhardt's description and drawing of *jindilli* (Darragh and Fensham, 2013: 318) was the first European record of the macadamia nut, and interpreted the location as Mt Bauple, the source of its other common name, the 'bauple nut' (Roderick, 1988: 207, 210). *Jindilli* was actually collected from the 'Bunya Bunya Brush' near Commissioners Flat (26° 51' S, 152° 49'), and the written description confirms that it cannot be *Macadamia*. Instead his description is consistent with *Endiandra pubens*, a common small tree known as Queensland walnut. *Jindilli* resurfaces later in the diary in relation to a lillypilly fruit (probably *Syzygium hodgkinsoniae*) suggesting the Aboriginal name may have been a generic term for a soft fleshy fruit (Darragh and Fensham, 2013: 375). A Leichhardt collection of *Macadamia ternifolia* held in Melbourne from the Bunya Brush is the first record of the genus but this species has poisonous fruit. In the Kabi dialect of the Aboriginal informant Nicki it was known as *Dullabi*. Nowhere in Leichhardt's record does he describe the edible *M. integrifolia* despite spending time collecting plants within its habitat in the upper Stanley River. This is a curious omission given his collaboration with Aboriginal people who presumably relished such a nutritious and delicious item of food.

LEICHHARDT AS ECOLOGIST

Natural history was very much in vogue in the 19th century and the specimens of otherwise forgotten clergymen, school teachers and police magistrates still adorn the shelves of museums and herbaria. The early record of flora and fauna would have been far less complete if Australia had been colonized amidst the mayhem of the early 20th century. If catalogued collections and a far-reaching knowledge of the natural world were Leichhardt's only legacy he would have been amongst good company, though not in the league of the eminent scientists of his era. Leichhardt was compelled well beyond the realm of the elementary collector because his fanatical curiosity was directed towards the history of the natural world and how it functioned. 'Ecology' as a scientific discipline was not yet born but his writings reveal that this was the subject of his abiding interest. If Leichhardt had lived a longer life he would have been one of its forefathers.

All the explorers had their individual styles. Sturt had a delightful self-deprecatory turn of phrase reflecting his deep God-fearing humility; Mitchell's bombastic prose reflects a military commander complete with a sense of his own importance; Stuart was too taciturn to express himself beyond the most cursory notes; while Gregory's brief but accurate journal reflects his extraordinary competence and the ruthless efficiency of his expeditions. Leichhardt was a wanderer and his journeys allowed plenty of time for careful observation, collection and contemplation. The final destination was never an end in itself but the closing chapter on his latest mission for science. Contemporary ecologists, attempting to reconstruct and understand Australian environmental history, hanker desperately for detail in the early records. In this respect, of all the early explorers, it is Leichhardt who gives the greatest satisfaction.

Leichhardt knew that his legacy as a scientist would be undermined if he succumbed to the temptation of exaggerating natural phenomena. 'The traveler who just tells the truth' he wrote to his brother-in-law on 22 February 1848, 'earns the thanks of scholars' (Leichhardt to Schmalfuss, 22 February 1848, Aurousseau, 1968: 992). *The Journal of an Overland Expedition in Australia from Moreton Bay to Port Essington* (Leichhardt, 1847b) describing his famous journey from

the Darling Downs to Port Essington was not only the first European record of the hinterland of north-eastern Australia but it is delivered with all the detail, accuracy and objectivity of a scientist.[14] It should be regarded as a monumental record of Australian natural heritage.

Not only was Leichhardt the first European to traverse the interior of the north-eastern quarter of the continent, but he also provided detailed maps. These maps include descriptions of the vegetation that can mostly be aligned to precise locations. These records have been used to compare the structure of vegetation after 100 years of pastoralism and more intensive agriculture (Fensham, 2008). The analysis challenges the widely held belief that open grasslands have converted to scrub with the abandonment of Aboriginal burning (Gammage, 2011). Many of the impenetrable scrubs and treeless plains that Leichhardt recorded still retain their character today, although the vegetation mosaic in southern and central Queensland have been obliterated by late 20th century clearing.

'Lectures on the geology, botany, natural history, and capabilities of the country between Moreton Bay and Port Essington' (Leichhardt, 1847a) appears in the *Tasmanian Journal of Natural Sciences* and is Leichhardt's interpretation of his findings from the Port Essington expedition for a scientific audience. This obscure paper develops insights from the cross-fertilization between climatology, geology, geomorphology, soil science and botany to deliver a coherent understanding of the landscape patterns of north-eastern Australia. It is a remarkable achievement, prescient of the land system surveys that provided the first comprehensive description of the Australian continent more than 100 years after his death (Christian and Stewart, 1953).

There is a section in the 'Lectures' where Leichhardt interprets his observations on shell deposits, stream profiles and the intrusion of tidal waters into stands of tea-trees (*Melaleuca* spp.) as evidence of much wetter conditions in the recent past. He proceeds to presage the *El Niño*/*La Niña*-Southern Oscillation that determines the climate cycles that we have recently come to understand as fundamental determinants of the Australian climate. 'We are, therefore compelled to look for the cause in some until now unknown change of the atmosphere, which may be periodical, and allow us to hope that the continents will be again favoured with a series of more rainy seasons.' After an extended systematic record we now know that the Australian climate is characterized by extremes – droughts, floods and cyclones are peppered throughout its history. But the early colonists had come from Europe where clearly defined seasons marked out the passage of years with monotonous predictability and Leichhardt's precise insights are particularly impressive because they come without any established expectation of the Australian climate. Recent studies interpreting the signature of past climates in the growth rings of coral, desert-dust deposits, and Aboriginal remains, vindicate his insight and suggest that after 200 years the full force of a variable climate is yet to be revealed (Fanning, 1999; Lough, 2011; McGowan *et al*., 2008).

Leichhardt's consideration of island-like pockets of rainforest amidst the vast eucalypt forest exemplifies the ecological orientation of his thoughts. For contemporary ecologists this question is central to understanding the forces that shape Australian vegetation and has fuelled much research (Bowman, 2000). At Mt Royal in the Hunter Valley, Leichhardt observed that rainforest was advantaged by moisture, noting that it occurred on the slopes facing the rain-bearing winds from the south-east (Leichhardt, 1867-1868:45).

Around Moreton Bay he systematically observed that the 'scrub' boundaries were associated with porous rocks and speculated that these rocks could absorb more water than coarse-grained rocks supporting eucalypt forest (Darragh and Fensham, 2013: 347). Subsequent research, pursued with the luxury of broad regional surveys and manipulative experiments, supports Leichhardt's contention as it is true that the scrubs have a propensity for fertile soils. The partial explanation was accurate but overlooked the crucial role of fire. Leichhardt had not yet developed his observations to notice that the *Eucalyptus* forest is flammable and needs fire to regenerate, while the rainforest is both fire-retardant and fire-sensitive (Bowman, 2000).

Our failure to comprehend the power of Aboriginal fire management to shape vegetation continues to confound our understanding of the continent and how it can be sustainably managed (Bowman, 1998). What we do know from Leichhardt's observations of burning across northern Australia (Fensham, 1997) and other more recent records (Russell-Smith *et al*. 1997, Haynes 1985) is that the country was burnt frequently whenever there was available grass fuel. In the north reliable monsoonal rain regenerates grass every year and burning seems to have followed an almost annual cycle. In the Gulf of Carpentaria, Leichhardt recorded systematic patch burning along water-courses and around lagoons that encouraged game onto the fresh growth of grass. His notes from south-east Queensland confirm regular burning by Aboriginal people and he inherited their view that the health of the landscape was intimately dependent on regular burning. The legacy of regular Aboriginal burning is evident in Leichhardt's careful observations of the vegetation. In the diaries he specifies that blady grass (*Imperata cylindrica*) is the second most abundant grass species in south-east Queensland after kangaroo grass (*Themeda triandra*)(Darragh and Fensham, 2013: 402). Blady grass colonises burnt-out rainforest, and in Australia it is often assumed to indicate excessive and destructive burning. This 'fire weed' was well-entrenched as a major component of the eucalypt forest at the time of European contact. A discussion of the motivations for burning and its effects are commenced in a number of places throughout his writings and he recognized that the practices of Aborigines involved skilful and systematic management (Leichhardt to Lynd, 24 November 1843, Aurousseau, 1968: 680; Leichhardt to Schmalfuss, 2 February 1844, Aurousseau, 1968: 719; Leichhardt, 1847b: 354; Darragh and Fensham, 2013: 367). Had he the luxury to write with contemplation, perhaps he could have shared first-hand insights into how Indigenous people used the wind, or predicted changes in the weather, or how they were able to read the seasonal condition of fuels in order to control the impacts of their fire-stick.

LEICHHARDT'S WOULD-BE LEGACY

The disappearance of Leichhardt amongst the spinifex dunes and salt scalds of the Australian interior remains an enduring mystery. But what of his fate as a scientist? Did he have the capacity to develop the myriad observations he had carefully catalogued and bind them together into a lasting scientific legacy? The successful expedition to Port Essington was not enough to satisfy his wanderlust, and with only a pause of six months he was proceeding on a wildly ambitious continental crossing. After learning of the failure of the first attempt, his friend W. B. Clarke issued a note of relief and a message of warning. 'This interruption of your scheme is I hope providential. How do you know what was before you to the

westward? Better to be back in the Downs than be down on your luck in the desert' (Clarke to Leichhardt, 7 August 1847, Moyal, 2003: 214). The caricature of Leichhardt presented in *Voss*[15] suggests a madman who pitted his senseless pride against an unforgiving landscape. Alternatively Leichhardt may have been addicted to the exhilaration and glory that came with grand exploration. While there are some of these elements in Leichhardt, a full appreciation of his character and achievements indicates that his passion for science was, as always, his most important motivation. There are indications in his letters that his physical health and mental determination for arduous travel were faltering and that he was frustrated by the postponement of his final journey and the chance to properly assimilate his observations (Leichhardt to Schmalfuss, 22 February 1848, Aurousseau, 1968: 995; Leichhardt to Macarthur, Aurousseau , 1968: 1000-1001; Leichhardt to Archer, Aurousseau, 1968: 1005). Even during his early years in Australia the voice of the frustrated scientist rings loud and clear:

> It follows that the mind is never so deeply, nor so universally occupied on these travels, than when you properly focus on your work in peaceful study in your room, and that impulses and passions and images of fantasy hold their own against sound judgement far longer in the bush and can only be overcome when they are matched (Darragh and Fensham, 2013: 455).

Not only were his intentions explicit, but Leichhardt's legacy of written papers and specimens is sufficient to convince us that, given the chance, he would bind his prodigious knowledge of the Australian landscape 'into exact science' (Leichhardt to Macarthur, 1 August 1846, Aurousseau, 1968: 889).

Over the course of Leichhardt's time in Australia a scientific revolution was maturing in the mind of the greatest scientist of the era. Charles Darwin was about to unlock the most important biological puzzle of them all, the 'mystery of mysteries' (Darwin, 1979: 46) that would explain the diversity of life. The beautifully simple but deeply profound theory of natural selection was borne from a precise realm of experience channeled by brilliant deduction and a wonderfully fertile imagination. That suite of circumstances was becoming increasingly likely to arise amidst the milieu of emerging scientists and opportunity during the middle of the 19th century. It was no grand coincidence that Darwin and Alfred Wallace converged on the mechanism of evolution almost at the same moment in history. Without detracting from their brilliance, an explanation for the myriad forms of life seemed to be an inevitable conclusion demanded by rationalist philosophy and rapidly accumulating scientific understanding. The new breed of scientist could no longer find satisfaction manipulating evidence from the world around them in order to justify the version of events they had inherited from the bible. These were exceptional times, presenting outstanding opportunity within the very realm of science which consumed Leichhardt.

Leichhardt's Christian faith did not disconnect him from the new breed of enlightened thinkers. He felt a divine expectation to engage in rational discourse and he was contemptuous of the missionaries at Moreton Bay who resorted to scripture to interpret what was beyond their immediate comprehension (Darragh and Fensham, 3013: 385). He would later declare that 'in all our reasonings on nature we should not start with the *a priori* doctrines of the bible but return to it with our *a posteriori* knowledge' (Leichhardt to Hull, 21 November 1847,

Aurousseau, 1968: 974). With the rejection of divine events such as global floods and instantaneous creation, the radiation of life could only be explained by incremental change over greatly expanded time frames. Charles Lyell had laid out a radical new chronology in his *Principles of Geology* and Leichhardt demonstrated his familiarity by attributing the Australian rocks to their place in the emerging framework (Leichhardt to Nicholson, 26 March 1844, Aurousseau, 1968: 740-743; Leichhardt, 1847a).

Darwin and Wallace generated identical insights from the patterns of species on archipelagos of islands – the greater the barrier to dispersal, the fewer species in common and the more distantly they would be related. Leichhardt never gained an island perspective of the Australian continent by travelling to New Zealand or Indo-Malaya. Instead he was absorbed with the patterns that occurred within Australia itself. His intentions for his last fatal passage across the country were 'to discover the nature of the interior of Australia, the extent of Sturt's desert, the character of the West and North-west coast of Australia, and the gradual change in plant and animal life from one coast to the other' (Leichhardt to Schmalfuss, 6 December 1846, Aurousseau, 1968: 929). He had already begun to address these questions in his journeys from the south to the north (Leichhardt, 1847b: 219-220). If he had succeeded in the Swan River mission he would have been confronted at the end of his travels by the remarkable explosion of diversity within the south-western corner of Australia – one of the botanical hotspots of the globe. Amidst the forests and shrubland of the south-west, his imagination may have focused on the history and processes that could spawn such radiant variety. Perhaps he might have pondered the importance of the isolation and begun to imagine the mechanisms that beget diversity.

Such wild speculation should probably be curtailed. While Leichhardt's perspective and experience partially converge with the revolutionary biologists of the era, and despite his excellent training, acute and creative intelligence, geographic insight and appreciation of deep time, there is no evidence to indicate that he was focused on the great question of evolution. In fact a letter to William Hull, written not long before his death, reveals the extent to which the mechanism behind the diversity of life was muddled in his mind and serves to reflect the general state of confusion that prevailed on the eve of the grand revelations from Darwin and Wallace (Leichhardt to Hull, 21 November 1847, Aurousseau, 1968: 972-974).

Like Darwin, Leichhardt was an authentic 'man of science', but the questions that gripped his imagination were not directed towards the development of grand theory. Leichhardt's science was embedded in a place, and that place was the Australian continent. He had come to consider the interior of the continent his natural homeland and he had no intention of returning to Europe.[16] 'My passion for the study of my environment here, and my ambition to solve the riddles of this continent, are boundless and beyond control' (Leichhardt to Schmalfuss, 20 October 1847, Aurousseau, 1968: 955). His contribution to a geographical understanding of Australia would have been especially important because he occupied the profound watershed between the hunter-gather society of the Aboriginal people and the Old World colonists who would transform the continent with agriculture and industry. While Leichhardt's 'dizzy excitement' generated an immense catalogue of careful observation, we should also imagine that this extraordinarily capable scientist would have produced profound revelations into the nature of Australia had he the time to

'ruminate and digest' his observations into 'exact science'.[17]

When Charles Darwin boarded *The Beagle* and left Australia for the first and last time his parting impressions left little doubt about his opinion. 'The general bright green colour of the brushwood and other plants, viewed from a distance, seemed to promise fertility. A single walk, however, was enough to dispel such an illusion; and he who thinks with me will never wish to walk again in so uninviting a country' (7 February 1836, Darwin, 1913: 700). Australia, the object of Darwin's derision, was the subject of Leichhardt's delight and dedication. Leichhardt was not only a great scientist, through his training, the intensity of his inquiry, his yearning to experiment, the creative brilliance of his deduction, his vast intelligent memory and his capacity to synthesise, but a great scientist who belonged to Australia.

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❑ ENDNOTES

1. There are numerous sources on Leichhardt's life and travels. Colin Roderick's (1988) scholarly biography ia a comprehensive audit of Ludwig Leichhardt. Roderick read and summarised the full sequence of Leichhardt's diaries, including those published here. The three volumes of letters translated and edited by Marcel Aurousseau (1968), include exceptionally well researched supplementary material including an almost exhaustive bibliography of Leichhardt material. Dan Sprod's (1989) superbly presented scholarly tribute to Leichhardt is largely concerned with the events surrounding his disastrous second expedition. Webster (1980) is another exhaustive biographer who presents an outstanding body of research. Webster (1986) has also contributed original diaries from Port Essington and the voyage returning to Sydney.
2. 'It's quite likely that I shall stay in this colony for good….' (Leichhardt to Gaetando Durando, 12 July 1844, in Aurousseau 1968: 778).
3. A letter from Lynd dated 25 January 1844 indicated Leichhardt had only £30 and the debt from Murphy had not been paid.
4. The description appears in a letter from David Archer to his father William Archer (father), 7 Jan 1844, Durundur. Archer family papers State Library of Queensland, OM69-07.
5. In a letter to Thomas Ridge Hacket, Clarke claims that they visited Waimalee (Prospect Hill), near Parramatta, where he convinced Leichhardt that it was feasible to find fossils in igneous rocks (diorite). See Clarke to Thomas Ridge Hacket, 1 December 1869 (Moyal, 2003).
6. The argument is further articulated in a letter (27 May 1842) to the eminent meteorologist Professor H.W. Dove at the University of Berlin (in Aurousseau, 1968: 478).
7. Clarke was directly responsible for ensuring the publication of two of Leichhardt's three formal publications. On his search for Leichhardt see Clarke (1858).
8. See Leichhardt to William Nicholson, 17 July 1842 (in Aurousseau 1968: 507). Leichhardt even wrote to Sir William Hooker seeking his support for the project (Leichhardt to William Little, 12 November 1842, in Aurousseau, 1968: 591).
9. Leichhardt sent most of his specimens to Paris where they would be received by his good friend Durando who might have the opportunity to 'distinguish himself should my collection prove to be one of value' (Leichhardt to Carl Schmalfuss, 22 February 1848, in Aurousseau, 1968: 994). Some of the plant material from south-east Queensland was sent to Germany and England. In a letter to his agent he specifies: 'I addressed you a letter under the 12th July 44, announcing you the sending of 8 boxes by the Ganges. Of these boxes 5 were addressed to the Museum of the Garden of Plants in Paris, one to the botanical garden of Schoenberg, Berlin University and 2 to my friend Dr Will. A. Nicholson 2 Eldon Square Newcastle-upon-Tyne.' (Leichhardt to Mr Pamplin, 15 July 1844, in Aurousseau, 1968: 779-780) although see also Darragh and Fensham (2013: 457).
10. According to Petrie (1904: 316), Buyuba was the straight stretch of Enoggera Creek near the Newmarket saleyards, which were situated on the northern corner of Enoggera and Newmarket Roads.
11. There are references to Aboriginal people using gum as a food item from other areas (Latz, 1995; Wightman *et al*., 1991; Clarke, 1986).
12. These were identified in relation to a reference in the Port Essington Journal (27 May 1845, in Leichhardt, 1847b: 272) as *Terminalia canescens, T. platyphylla, T. platyptera* and *T. subacroptera* (see Fensham, 2006). See also Leichhardt's (1847b: 335, 354, 355, 359) entries of 19 July, 2 August, 3 August, 6 August 1845.
13. Edible gums were roasted in South Australia (Clarke, 1986; Bailey 1914).
14. It should be noted that that there are other abridged versions containing information from the expedition that is not presented in the full version (Leichhardt 1846; Leichhardt 1847a).
15. The main character in Patrick White's (1960) classic novel is based on Leichhardt.
16. In a letter to Sir Thomas Mitchell he suggests 'we meet in the interior, which I consider home, as I have no other one' (Leichhardt to Sir Thomas Mitchell, 24 July 1844, in Aurousseau, 1968: 780), and in a letter to Durando 'It is quite likely that I shall stay in this colony for good – —I may even leave my bones to lie whitening on the plains far inland'. (Leichhardt to Gaetano Durando, 12 July 1844, in Aurousseau, 1968: 778)
17. This is reinforced in a letter written before the Port Essington expedition where he eagerly anticipates the time 'when I shall gladly sit down, not to start again, but to ruminate and digest that which I have seen and learnt' (Leichhardt to Walker Scott, 10 May 1844, in Aurousseau, 1968:748).