Triumph in the Tropics? Surveying the thermal environment of the Queensland house 1905-1926

Daniel J. Ryan

The University of Sydney, Australia daniel.ryan@sydney.edu.au;

Abstract
While the desire for thermal control in our homes may today appear natural, its provision in the domestic sphere of early twentieth-century Australia was shaped by debates about regional development, household reform and racial acclimatisation. Contemporary publications by experts in tropical medicine highlight how thermal comfort research in Australia was intimately connected to the political objectives of white settlement in the tropical North. While outdoor work was seen to be safe for European men, the domestic thermal environment was considered a key impediment to the health and wellbeing of white Australian women. This paper critically examines three of the earliest surveys of the indoor thermal environment in Australia to establish how tropical medicine sought to understand domestic conditions of European settlers. It offers an insight into the early methods of thermal researchers and how the changing understanding of heat stress was politicised to promote reform of vernacular methods of construction.

Keywords: Environmental Possibilism, History of thermal comfort, Domestic thermal comfort, Tropical development, Settler Colonialism

1 Introduction

Thermal surveys of buildings are never simply about temperature or occupant satisfaction. Behind them lurk many assumptions about buildings and economic development, technology, nationalism and the agency of occupants. While today, vernacular buildings are commonly studied for their thermal performance, they are frequently justified as simply a means to validate traditional building techniques so that their principles may be applied to contemporary practice (Dili et al., 2010, Singh. et al., 2010, Cantin et al., 2010). Though many of these investigations can trace their origins back to the work of Otto Koenigsberger and his colleagues (Koenigsberger et al., 1974), traditional forms of construction have not always been held in such high regard.

Systematic study in Australia of the indoor thermal environment emerged in Queensland in 1913 with the recognition of the welfare of the servantless European housewife as a key obstacle to White settlement of Tropical Australia. While many of the commonly-accepted arguments against White Australian men working in the tropics had been successfully refuted, the welfare of women in the tropics became a source of national anxiety and the focus of expert scrutiny (Henningham 2011). Women were seen to be affected by tropical conditions more than men due to poor housing and the effects of being confined indoors without any possibility of domestic help (Anon., 1912, Anon., 1919). In many cases, the poor
construction of the house was highlighted, with corrugated iron held up as a symbol of all that was wrong with vernacular construction at the time (Anon., 1913d).

Although these early studies were premised on the improvement of women’s welfare, they ended up being promoted by experts like Sir Raphael Cilento, the director of the Australian Institute of Tropical Medicine in Townsville, as both a covert means to promote lifestyle reform in rural areas and to refute international claims by environmental determinists that the tropical climate was causing the long-term degeneration of Europeans. These studies occurred at a time where the discourse of tropical architecture in the British Empire was most concerned with sanitary and housing reform to improve the level of economic production in the Tropics by minimising worker’s illnesses (Chang and King, 2011 pp.295-296). Within much of the tropical world this entailed a metropolitan interest in the housing conditions of indigenous labourers. However, the promotion of sanitary and housing reform in Queensland provides a contrasting case study as there was little interest shown in the welfare of the Aboriginal population. The enforcement of the White Australia policy from 1901 saw the promotion of the tropical part of the state as a racial experiment in agricultural production by a White-only population. However the popular consensus among older experts still held that Europeans were out of place in the tropics as the climate impeded long term settlement (Anderson, 2002 pp85-86). Reformers therefore sought to examine the conditions in Northern Australia in which the average settler lived.

This paper examines three surveys conducted between 1913 and 1924 to show how the discourse on thermal comfort during this time produced a new subject, the servantless European housewife. It highlights how the studies sought to provide credible evidence of the effects of particular construction methods on internal temperatures and expanded in scope to survey the technology and layout of rural kitchens against the Australian Institute of Tropical Medicine’s hygienic ideal. The last study was published as one of the principle sections of Raphael Cilento’s government publication, ‘The White Man in the Tropics’ and was his main source of evidence that white men and women could live in the tropics and expect the same if not better health outcomes than those in more temperate lands (Cilento, 1925). Yet it also highlighted that many families lived in conditions that were far from ideal, serving as a precursor for Cilento and others to argue for housing reform in the state.

While ‘whiteness’ may today wield its power through its “unmarked, unnamed status”(Frankenburg, 1993 p.6), in Australia, as Alison Bashford has pointed out, it was explicitly studied, monitored and written about in the early decades of the twentieth century (Bashford, 2000). As both Anderson and Bashford have outlined, tropical medicine was instrumental in the governance of whiteness (Bashford, 2000, Anderson, 2002). Although previously white bodies were seen to be out of place and unfit for warm climates, by the early twentieth century, Australian experts in the new field of tropical medicine dismissed such a position, blaming disease not climate for all tropical ills (Anderson, 2002). Indeed the close connection between ideals of racial and medical purity were reflected in the many references made between the Immigration Restriction Act of 1901 (the ‘White Australia Policy’) and the Quarantine Act that followed it in 1908 (Bashford, 1998). Australian doctors were convinced that Europeans could survive in the tropics only by avoiding contact with disease. Increasingly they portrayed non-white labourers as disease carriers and argued for the preservation of white immunity through the deportation of Pacific Islanders and immigration restrictions on Chinese labourers (Anderson, 2002 p.111).
This attempt to keep Australia ‘pure’, justified on medical grounds, only exacerbated the 
decline in the availability of servants in the country. Along with the impact of the White 
Australia policy, Higman argues that the decline in migrants as a source of domestic labour 
was due to competition for servants between Britain and Australia along with increased 
rigour in the selection process for servants. The lack of servants, particularly in the tropics, 
was seen as one of the byproducts of the White Australia policy, and even despite continuing 
demand for them, into the 1920’s the government remained unmoved to repeal legislation to 
widens the labour force to include Chinese or Indian migrants (Douglas, 1977 p.91). Nor were 
Aboriginal women encouraged as a source of labour. The secretary of the Department of 
External Affairs, Atlee Hunt, considered their employment contrary to the ethos of the White 
Australia policy:

If, however, existing systems are to continue and be extended—if the natives are to be 
gradually drawn from their distant fastnesses and encouraged to work as servants of the 
whites—then are we not encouraging a state of things that it is one of the objects of the white 
Australia policy to prevent? (Hunt, 1915 p.50)

Therefore unlike the families of colonial officials in Singapore or Sri Lanka at this time, 
white women in Tropical Australia were unlikely to have assistance with housework.

2 First Investigations 1913

During the 1910’s a perception grew that white women suffered from the tropical climate 
more than men on account of the poor construction of dwellings, their confinement indoors 
and the long hours of labour they were expected to perform without assistance. The 
Commonwealth meteorologist, H.A. Hunt, painted a dramatic picture of typical conditions. 
“These unfortunate souls, cramped up in little iron boxes over a hot stove”, Hunt claimed, 
“are rarely healthy looking. They suffer from anaemia and lassitude….There is very little 
doubt that the anemic look is caused by the conditions in which they live and work” (Anon., 
1913a). Yet such pronouncements were not backed up by any scientific study.

Hunt and medical academics such as James Barrett and W.A. Osborne at the University of 
Melbourne were interested in the effect of humidity on the health of Europeans in the tropics. 
They were familiar with the work of J.S. Haldane, through their colleague Dr. Harvey Sutton 
who had worked under Haldane at Oxford (Osborne, 1909). A decade earlier, J.S. Haldane 
had proposed that the wet-bulb temperature was a better indicator of heat stress than air 
temperature alone. Haldane’s classic experiments on himself in mines and climate chambers 
had shown that high wet bulb temperatures had a bearing on productivity and he 
recommended an upper limit of 78°F or 25.5°C for people engaged in continuous hard work 
and 88°F or 31°C as the maximum safe temperature for people at rest (Haldane, 1905). He 
recognized that similar conditions to the tropics could be found in man-made environments as 
he noted that there were “many industrial occupations in which men or women have to work 
daily in very warm air”(Haldane, 1905 p.494). The tropics had come home to roost in 
England.

Yet if even tropical conditions could be found in industrial England, then how safe were 
working conditions in ordinary homes in Queensland? Haldane’s pronouncements on the 
upper limits of temperature for work greatly concerned Walter Osborne and James Barrett 
who feared that parts of the tropics might prove unsafe for work (Barrett, 1910). However 
they could not be sure which parts of the tropics were safe as no maps existed showing wet-
bulb isotherms for Australia (Barrett, 1910). Osborne and Barrett were searching for Australia’s thermal frontier.

The Commonwealth meteorologist H.A. Hunt responded to Osborne and Barrett’s pleas, producing a map with wet bulb isotherms in 1910 (Figure 1). It indicated that Australia’s tropical climate was safer than thought, with no parts of the country where the wet bulb temperature was in Haldane’s danger area of 88°F or 31°C (Dew, 1913). While Barrett was happy about this, like Hunt, he believed that the poor appearance of many tropical women had an environmental cause. He blamed this on the neglect of climatic ‘precautions’ in many residences in Queensland, lambasting the inappropriate adoption of Melbourne housing models which he believed explained why women rather than men suffered more in the tropics. Though doctors sought to preserve the biological heritage of Europeans in the tropics, to Barrett and others their cultural heritage was an impediment to mass settlement. “In the tropics”, Barrett lamented, “the white man clings tenaciously to his customs. His houses, his dress, his habits and even his food are to a great extent, constructed and arranged on the European model” (Barrett, 1910).

Of particular concern was the use of galvanised iron, a material that had been popularised, according to the historian Miles Lewis, in the late nineteenth century in rural Australia on account of its economy, weather-tightness and the purity of the water that could be obtained from it (Lewis, n.d.). However, Osborne and Barrett were less enthusiastic about the material.
Following on from mapping Australian wet-bulb isotherms, they urged the Commonwealth Meteorologist H.A. Hunt to “investigate the conditions under which women labor in the Northern Territory and Northern Queensland while performing their duties” (Anon., 1913b).

The design of the experiment was straightforward with wet-bulb thermometer readings to be taken twice a day, inside and outside houses in Darwin, Thursday Island and Townsville for a twelve month period. An article in *the Northern Miner* newspaper summarised the methodology and results:

The readings were taken twice daily in the open air and in the kitchen of a well-constructed house at Port Darwin. During the month of July the mean outside wet-bulb temperatures at 9 o’clock in the morning and at 3 o’clock in the afternoon were respectively 62.6 degrees and 68.8 degrees Fahrenheit. Inside the house, at the same hours, the thermometer registered 72.4 degrees and 90.2 degrees respectively (Anon., 1913b).

Hunt’s results were significant. Not only had he clearly demonstrated that houses were warmer inside compared to outside conditions but more importantly that kitchens were dangerously hot. At three o’clock the wet-bulb temperature in the kitchen was over 2°F (1.2°C) greater than Haldane’s recommended maximum safe temperature for people at rest. It didn’t matter that only three houses were tested. Experts now had the evidence to condemn tropical housing as dangerous to women’s health.

Although James Barrett presented his findings to politicians at the State Parliament house in late 1913, little appears to have been done about this (Anon., 1913c). For one settler it was clear from the findings that Europeans should not work in the tropics at all, while for Barrett, the problem was that few researchers sought practical solutions to their findings (Anon., 1914a, Barrett, 1914). Barrett and Hunt themselves argued that the Japanese house, with thin walls, open to the breeze was a much better solution for European housing in the tropics. However few people wanted to radically change their habits. As a contemporaneous article in Punch magazine noted: “not even an architect can force upon the public a style of house it does not want, and the Australian public has not hitherto wanted anything but the conventional and humdrum” (Anon., 1914b).

### 3 Matching Climate with Construction Methods

It was only with the formation of the Queensland Country Women’s Association (QCWA) in 1922 that there was renewed interest in the rural housing conditions of European women. The association acted as a lobby group looking to improve the welfare of rural women and initially was an active promoter of research on domestic living conditions. There was a whole session devoted to “The Housing Problem” at their inaugural conference in Brisbane in July 1922. Among the speakers was the land surveyor Walter Wynne Williams who lectured about housing conditions in Tropical North Australia (MacFarlane, 1922, Anon., 1922b).

Williams sought to undertake a thermal survey of housing in Northern Queensland (Williams, 1922a). The objective was not simply to record the temperature of the houses but to be able “to illustrate to the public the considerable differences there must be between some of these houses” (Williams, 1922a). He was interested in finding out the effect that building construction had on the thermal range in houses in summertime in tropical Queensland. Williams had been spurred on to pursue the study after his lecture to the QCWA who
endorsed his proposal with a resolution to help him obtain the necessary equipment to carry out the study (Anon., 1922a, Williams, 1922a).

He suggested a survey of a range of buildings of different materials in both the town of Cloncurry and in ‘distance stations’ – large farmholdings in the interior where houses were made of stone and pisé construction. Cloncurry is located in the arid interior of North West Queensland and noted for its extreme climate. However it was not the external climate but the high temperatures of houses and the variation within buildings that most concerned Walter Wynne Williams. In the homesteads in the hinterland around Cloncurry such as at Devoncourt Station, Williams noted that there were marked variations in temperature between the ground floor of the house and the external upper floor balcony: “The reading in the lower part of the house was 95 degrees and under the naked iron the shaded, verandah upstairs the reading was 110 degrees”(Williams, 1922b p.1). Other homesteads he’d visited such as at Lake Nash registered temperatures of 117°F (47.2°C) on the verandah.

Although limiting the survey to recording just twelve buildings over a week in summer, Williams considered this adequate to obtain sufficient data that could “disclose some very startling comparisons”(Williams, 1922a p.1). Part of Williams’ argument for the necessity of the survey was to make a case against the use of galvanised steel construction. Though he acknowledged that poorly designed ventilation was a greater problem than the steel itself, this did not stop him from laying most blame on the effects of specific construction materials rather than particular design strategies. Like Hunt ten years earlier, his mind was made up, the vernacular needed reform and only temperature measurements would mobilise change.

For Williams, the construction and ventilation of the verandah, the default solution for European housing in the tropics, had not been considered enough. As most verandahs he encountered were of galvanised iron and without a ceiling, temperatures were “10 to 15 degrees above the shade air temperature”(Williams, 1922b p.1). Williams took issue with the standard forms of roof ventilators and ceiling vents which he considered a ‘farce’. His statements challenge the then-prevalent view that verandahs and ventilators were sufficient to provide relief in a hot climate. Instead, he cited a “weird looking little residence” built by a tinsmith as the only house in Cloncurry that stayed cool in summer. It challenged the popular thinking about building in the tropics as it was made of galvanised iron and had no verandah on its western façade. Its secret, according to Williams, was the system of ventilation.

Though Williams could see the limitations of accepted construction methods, he felt that “without some scientific data it is impossible to lay a case before the public or before any Society”(Williams, 1922b p.3). Williams did not believe that he could make any credible statements to either the public or learned societies, without recourse to temperature measurements. He aimed to “be able to produce some undisputed data illustrating the danger of our unventilated iron shacks for the public to think about”(Williams, 1922b p.4).
For that he sought the Chief Quarantine Officer General, J.S.C. Elkington’s expertise and equipment. Elkington viewed Williams proposal as an opportunity to provide assistance to the new director of the Australian Institute of Tropical Medicine, Raphael Cilento and requested Cilento to review the proposal with him (Elkington, 1922b). Three months later, having commenced his new position in Townsville, Cilento followed up with Wynne Williams, asking about his ideas on housing in the tropics (Cilento, 1922). Wynne Williams’ letters to Cilento are important as they reveal the faith placed in science by both professionals and landowners to make life bearable in a climate many thought was unnatural for Europeans. They also highlight how the thermal conditions of the domestic interior, and more specifically the ‘plight of the housewife’ became a cause for housing reform.

Williams wanted to survey both urban and rural buildings of different construction methods. Ideally he wished to carry out the survey between September and December when “the heat is great and constant” and before the onset of storms. He outlined his methodology as follows:

What I intended to do was to experiment with a few thermometers, wet and dry bulb, in my own house to arrive at the variations in the various parts of the building, and from this data be guided as to suitable places to suspend the thermometers in the various buildings. I would then choose a few buildings, good bad and indifferent, and for the course of a week or so keep the maximum and minimum charts. These temperatures could then be compared with the wet and dry bulb readings of the thermometers in the Post Office louvre box. After collecting sufficient evidence in Cloncurry I would take the thermometers to some of the outback stations where there are stone and pise' houses, place one in a louvre box and the others in the different station buildings (Williams, 1922b).

Just who could be trusted to undertake thermal surveys of buildings at this time is of interest. The Chief Quarantine Officer, JSC Elkington, saw in Williams’ proposal, the potential to get a wider range of climate data for the institute(Elkington, 1922a). He initially requested the names of potential volunteers to help with such work. Williams however dismissed his request for as impractical, reasoning that those in poorer dwellings would not be interested and were unreliable(Williams, 1922a). Though Williams himself later admitted that he did not “profess to be a scientist”, he looked to Cilento for direction and felt that “my early scientific training will probably assist me in understanding and carrying out your instructions”(Williams, 1922b p.4). Williams and his staff could carry out the survey of urban residences while the managers and bookkeepers on the rural stations could be relied on to chart the temperatures of the pisé and stone buildings. They may not have been trained in science but they were reliable and respected.

Cilento offered minimal advice to Williams as to how best to actually carry out the surveys, using the letters more to disseminate the latest thinking within tropical medicine on housing design. He corrected Williams’ reliance on air temperature and humidity data as evidence of discomfort by claiming that ‘heat stagnation’ was the primary cause of discomfort. By way of illustration Cilento noted that “if you put a man in a closed respiration chamber where the air is absolutely still, it becomes unbearable between 80°F and 90°F. If, in the same temperature, a fan is turned on in the small chamber, it is fairly cool and not very uncomfortable”(Cilento, 1922). Though Cilento claimed to have made some inquiries about how best to carry out the study, he never followed up on this advice with Williams.
In the end Williams was left to purchase the thermometers for himself, by which time he had moved to the outback town of Longreach in Central West Queensland. He wrote to Cilento a year later in November 1923 informing him of his plans and that he was about to carry out the survey (Williams, 1923). Williams’ proposed method was largely the same as he had elaborated the previous year, only now he had narrowed taking measurements to just the kitchen and living room, at a point in the centre of the room, six feet from the ground. The central positioning of instruments was to minimise the influence of draughts, he claimed, while the high location of the thermometers may have been influenced by Cilento’s previous observation that “the chief cause of discomfort in either a ceilinged or unceilinged room is a dead cushion of hot air that starts about six feet up and reaches to the to the roof” (Cilento, 1922). Cilento himself approved of Williams’ methodology and requested he send on the results.

Unfortunately no documentation exists of Williams’ findings and it would not be another twenty five years before another attempt was made at observing internal temperatures for various construction methods in a range of climate zones in Australia (Drysdale, 1947). Instead it was the presence or absence of certain features that Raphael Cilento and his colleagues used to indicate the level of climatic adaptation of a building. Just as Williams was refining his methods, Cilento was contacted by the newly formed Queensland Country Women’s Association (Q.C.W.A.) to produce pamphlets on family health. However he sought to undertake a ‘sociological survey’ of Northern Queensland and use the branches of the QCWA to facilitate the inquiry by both spreading propaganda for the institute and offsetting travel costs by hosting a researcher for lectures.

4 Surveying the Servantless House

The QCWA acted as the catalyst for both Williams and the Australian Institute of Tropical Medicine’s studies on housing conditions. It was after speaking at their first conference in 1922 that Williams decided to undertake a thermal survey of different domestic construction methods and it was the QCWA who gave Raphael Cilento the impetus to start a ‘sociological unit’ in 1923. Cilento turned their initial request into a much wider survey of living conditions in Northern Queensland. Strategically, he viewed the emergence of the QCWA as an opportunity to set an agenda for the QCWA and spread the influence of work of the Australian Institute of Tropical Medicine (AITM) to a much wider audience. As he noted in a private memo to the Directors of the Division of Tropical Hygiene in Brisbane:

   It appears to me that this would be a magnificent opportunity to take advantage of a popular movement during the stages of its early and rapid spread, and to impose upon it a programme which might orientate the party towards the Institute and the Division, without identifying us in any sense with the Association other than as a benevolent mentor for this or any similar activity. (Cilento, 1923b)

It was Raphael Cilento’s wife Phyllis who formed the bridge between the interests of the AITM and that of the QCWA. She was also a doctor and a keen advocate of improving the medical welfare of women. Though she was not attached directly to the AITM, she shared many of her husband’s concerns about the reform of tropical lifestyles, lecturing to the Women’s Club in Townsville on dress reform in March 1923 and at the QCWA’s 1923 Northern conference in Charters Towers on ‘Women in the Tropics’ (Cilento, 1923a).
It was after her lecture that she obtained the support of the second conference of the QCWA, to approach the AITM to appoint:

1. a capable travelling female officer
2. To investigate and report on conditions affecting the well being of women resident in remote areas or living under unfavourable conditions.
3. To lecture and give demonstrations to these women on problems of tropical life.

(Anon., 1923)

While the QCWA had backed the proposed ‘sociological survey’ of rural women as a means to gain information on rural women’s living conditions, the AITM used it as a pretext to survey the physical development of rural women and children. At the time, geographers such as Ellsworth Huntington, propagated the belief that the climatic environment affected the mental and physical development of races(Huntington, 1915). The long-term presence of Europeans in the tropics, it was feared would lead to their degeneration. The settlement of tropical Queensland to climatic determinists like Huntington and F. Griffith Taylor was a risky experiment, whose apparent success could only be explained by the ‘fact’ that it had a selected population. Even open air crusaders like Leonard Hill, the inventor of the katathermometer, were concerned: “the evidence seems to show that…in Queensland…the women leading an indoor life fade and become sterile”(Hill, 1921).

Though climate determined which towns were chosen to partake in the survey, the survey of houses themselves was limited to questions of sanitation and kitchen design. The kitchen layout itself was measured against the standard for residences in Quarantine stations set by the public works department and department of tropical hygiene, all of which were located along Queensland’s coastal fringe. The female participants were not themselves systematically questioned about their own opinion of their housing conditions and nor did the survey instrument check for any design features that might be specific to the climate.

The survey had not set out to find examples of ideal conditions, but rather to study women living in the most difficult of circumstances. While the QCWA may have wished to use this to find out how bad conditions were to enable reform, in the end the survey gave another reason in favour of Europeans settling the tropics. Instead of arguing for housing reform, the AITM’s physical measurements were used to show conclusively that Europeans could maintain their health in the tropics despite their environment.

Yet this is not to suggest that the thermal conditions of buildings were of little interest to the director of the Australian Institute of Tropical Medicine, Raphael Cilento. In fact, Cilento’s advice to Williams formed the basis for his chapter on housing in the tropics in his seminal publication ‘the White Man in the Tropics’(Cilento, 1925). In it he distinguished between two approaches to housing in the tropics, the bungalow for the ‘wet tropics’ and the Spanish courtyard house for the ‘arid tropics’. Such binary distinctions would continue well into the 1970’s with the Public Works Department continuing to label house types in tropical Australia based on only two types of climate – ‘arid’ or ‘tropical’. It also demonstrates the engraed belief that housing in the tropics was principally a technical question of climatic design, not a socio-cultural one of lifestyle.
5 Conclusion

Systematic reform of thermal conditions of housing did not happen in Australia until well into the 1940’s with the establishment of the Experimental Building Station and their program of model test huts in different parts of Australia. Cilento’s repeated statement that the European population of Queensland were healthy despite the conditions gave little medical reasons to aim to improve the design of housing. A number of attempts at organising competitions for an ‘ideal tropical house’ failed and it was largely the post-war masterplanning of Darwin and the wish to redevelop war manufacturing to deploy lightweight, cheap, mass housing throughout Australia that gave renewed impetus to the systematic study of the thermal design of housing.

Reports on the sociological investigations of Queensland homes highlighted the perception among the wealthy that the thermal reform of the house was a matter for the poor, while also claiming that the poor themselves were not interested in attending her lectures(Gorman, 1925 p.18). In addition any change to the standard design of a house was perceived to be more expensive, something that neither landlords nor homeowners were willing to pay for.

Williams’ methodology is not hugely different to today’s residential thermal surveys with temperature and humidity readings taken roughly in the centre of a room and compared to local weather readings(De Dear et al., 2010). The difference is that temperature and humidity alone were used to indicate comfort, with no occupant surveys. In addition we can see that where today the objectives of thermal surveys are to reduce energy expenditure or carbon emissions, in 1923 the survey was designed with the objective of improving the wellbeing of women. Such an intention was not wholly benign, for at its core was the belief by Europeans that they had the right to settle anywhere in the world. The tropics were merely a thermal frontier that could be tamed with the correct technology.

References

Anon. 1913d. Women in the Tropics - Their Sad Lot - As described by one of them. The Catholic Press, 17 July, p.25.