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PUTREFACTION
AND PESTILENCE:
THE RETICENT
PROGRESS OF
SANITARY
ARCHITECTURE
IN NINETEENTH
CENTURY PERTH

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The Western Australian response to nineteenth century sanitary reform that swept Britain and large cities in eastern Australia was not impressive. Health and building bylaws that developed to govern architectural space and sanitary technology over the course of the nineteenth century were slow to be implemented by colonial authorities despite adverse medical opinion and the perceived filthy state of Perth. However, this began to change under the weight of disease and the opinion of gold rush immigrants who had known better conditions elsewhere.

Architectural sanitary practices were undercut by a complex and often discontinuous array of competing theories of disease. The introduction of regulation is discussed against the background of public health theories and knowledge in Britain. Architectural space was regulated through practices of ventilation, the quarantine of certain domestic spaces, construction techniques and removal systems for dangerous and purulent human waste.

In this context the paper discusses the 'progress' of architectural and sanitary technology in nineteenth century Perth and how architectural and sanitary practice responded to concepts of disease and health in the face of colonial government reticence.

INTRODUCTION

Living in Perth's vast tent city in the 1890s, the Australian poet Henry Lawson mused on the sanitary condition of the city.

I think the sand has been the salvation of Perth. If the soil were clayey half the present population would probably be dead or dying of fever by now. You see, forty or fifty thousand are camped in and about a town built and drained for seven or eight thousand. The sand absorbs the filth that should be carried off by sewers; but, in summer, much of it comes to the surface again; then the hospitals are filled – and the graveyard fences extended.¹

Hordes flooded into the small settlement of Perth in the 1890s on their way to the rich goldfields of Coolgardie and Kalgoorlie in Western Australia's interior. Lawson's observation indicates that the sanitary condition of the colony was parlous, a result of neglect and inactivity since the founding of the colony in 1829 and brought to a head by the influx of gold seekers. He also touches on an important aspect of nineteenth century sanitary thinking – the connection between filth and disease.

At the time of Lawson's encampment the so-called sanitary revolution had matured in Britain and America. Driven by a desire to create a healthy population, the sanitary movement was manifest in large-scale water supply, sewerage works, sanitary education and the regulation of towns and buildings through the enactment of sanitary by-laws. Britain was particularly active though the efforts of reformers such as Edwin Chadwick. Chadwick's work was instrumental in the creation of public health statutes and a system of environmental health inspection. His reports had highlighted a perceived connection between ponds of foul water and illness and promoted Benthamite ideas about the cause and spread of disease.² In the USA the Civil War and its aftermath highlighted the perilous lack of sanitation and public cleanliness and stimulated a raft of educational and sanitary reforms.³ During the late nineteenth century large Australian cities also embraced proper water supply and sewerage drainage.⁴ Melbourne in the 1890s was often held up as a sanitary exemplar for "backward" cities such as Perth.⁵

Despite the reticence of nineteenth century colonial Perth to emulate the progressive sanitary revolutions of other places, the colony did slowly employ new practices in sanitary building design and construction and waste disposal – spurred by the weight of population, the agitation of immigrants used to better conditions and rampant epidemics. Sanitary regulations and practices in Perth were a direct response to the prevailing concepts of health and the transmittal of disease and resulted in simple strategies which aimed to make architectural environments healthy. These strategies included the disconnection of living spaces from dangerous material: such as moisture, polluted earth and human waste, and the ventilation of atmospheres in rooms.

This paper is concerned with the progress of sanitation in Perth in the nineteenth century. In this paper the introduction of regulation is discussed against the background of the corresponding situation in Britain of which Perth was a subject colony sharing loyalty, sentiment and laws. This paper opens up the possibility of further study into Perth's sanitary relationships with the other colonies in Australia – to be addressed in future research. There has been no recent research on sanitation in Perth and on the effect that regulation had on architecture in the nineteenth century. The implication of this research is that nineteenth century architectural practice can be interpreted and analysed in terms of the prevailing concepts of health.

As Anne Hardy shows, building and health regulations in London and other places were not always universally applied and carried into practice.⁶ However there is sufficient evidence to support the notion that regulation in Perth was 'generally' enforced and that sanitary practices were supported by architectural authorities.⁷

To canvas the above issues this paper begins with a discussion of the Perth environment in the latter half of the nineteenth century as a context for examining nineteenth century medical theories and the resultant strategies which drove the development of sanitary and building regulation in Perth.

DISAGREEABLE EFFECTS

In 1874 the Acting Colonial Surgeon for Perth, Frederick Shaw, reported on the sanitary condition of the colony in understated style.

A few yards behind each house is a closet, with an open unbricked cesspit, and again a few yards from this the well, usually about twelve feet deep, from which the water is drawn for drinking and all other purposes. The cesspits are sometimes emptied, the soil either carted away and used as manure or buried in the stable dung-heap. On a still night the passer through the streets of Perth is made to feel most disagreeably the effect of these arrangements.⁸

The proximity of the cesspit to the well was of major concern since the water drawn was often of "muddy colour, nauseous taste, and putrescent smell". In terms of advice on the best sanitary practice, nineteenth century Western Australia was served badly.

Fred Shaw was not the first medical person to complain about Perth's poor sanitary state. Shaw was acting in the office for only a year but felt the problems that Perth faced keenly as did the regular medical officer Alfred Waylen. The majority of Perth dwellings and most businesses used open cesspits for the containment of sewerage. More affluent residents enjoyed the comfort of earth closets – contraptions that used loam earth to cover and deodorise faeces. Most water was obtained from private wells and was polluted from leaking cesspits and other rubbish. The Medical Officer at Fremantle, Henry Barnett, complained in a report published in 1876 that through this practice "...earth, air and water alike [are] poisoned by these vile cesspools".⁹ Barnett, moved enough to pay for the printing of the report himself, advocated a compulsory earth closet system.

While there was concern for the pollution of well water, it was felt in some quarters that the sandy nature of the soil in Perth would filter out impurities. A relatively clean piped water supply was not available in Perth until 1891 and then it only served a small portion of the population, was unreliable and sometimes polluted. Typhoid bacillus was found in Perth tap water in 1897. Even in 1891, after the introduction of a pan system, cesspools were still quite common despite repeated concerns.¹⁰ Regulation for the continued use of cesspits developed over the course of the century. Even in 1892, Perth bylaws still allowed their construction in certain areas. Although sewer drainage was a preferred method of disposal, sewers were expensive to construct and required a good supply of water – which for many years Perth did not have. Work was started on a sewerage system in 1906 and was finished in 1912 although only 700 houses were connected.¹¹ From time to time there were comments from prominent citizens and visitors on the malodorous state of affairs. These however were usually greeted with apathy and inertia by those who had paid for their own arrangements and were reluctant to open the public purse to improve conditions.

Building regulations aimed at improving the health of the population were also slow to be framed and meagre compared to the myriad regulations governing parts of Britain.¹² However, by the end of the nineteenth century, sufficient bylaws were in place in Perth to regulate broad aspects of building construction, the size and location of privies and room ventilation.

The principal trigger for more aggressive regulation in Perth was the discovery of gold, the subsequent influx of immigrants and the disease epidemics, chiefly typhoid, that followed. In 1897 there were 1408 cases of typhoid in Perth, double that of the previous

year. The total state toll also rose significantly and was blamed on the poor sanitary arrangements of the goldfields and lack of potable water. Typhoid was a common fever among the poor but it democratically attacked the well to do with equal regularity. In the late nineteenth century its occurrence and severity was seen as a trustworthy indication of poor sanitary condition.¹³ The increase in population during the gold rush had stretched the meagre sanitary and health systems. There were concerns that Perth would be perceived as an unhealthy place to visit despite its benign and beneficial weather, and that investment in the colony could be damaged. The general public was fully aware of the situation. Letters to the editor of the *West Australian* newspaper in 1895 contain an array of public opinion on the unhealthy state of Perth. One correspondent grumbled that the government was energetic enough in developing resources but was lax in changing "the disgustingly dangerous sanitary condition of Perth into what would be, and can be made, one of the healthiest and one of the most beautiful cities in the world"(sic).¹⁴

However it was the medical and health officers that fully understood the nature of Perth's problems and the reasoning behind sanitary reform. Many had been in Britain during the Chadwickian sanitary reforms and were familiar with the arguments for public sanitation and water supply. Most were steeped in the medical theories of the time and were aware of the health dangers faced by Perth inhabitants. These ideas and theories generated strategies which became manifest in building practices and regulation. In order to understand these practices and their importance it will be necessary to briefly explore the state of medical knowledge in the nineteenth century.

CONCEPTS OF DISEASE IN THE NINETEENTH CENTURY

Medicine in the nineteenth century was characterized by diverse concepts of disease and its agency. Over the course of the century there were two dominant arms of theory explaining the incidence of disease. One was the idea of 'infection' and the other 'contagion'.¹⁵ However these were no simple binary opposites. Medicine and the theories that explained disease and epidemics was a very complex field and not a simple progression from miasma to bacteriology. For instance, politics, morality and professional interests could also affect medical knowledge and preventative measures.¹⁶

Theories of infection had their roots in the process of putrefaction where decomposing organic matter, often characterised as 'filth', gave off miasmas or aerial poisons which, according to atmospheric conditions and the constitution of victims, became manifest as disease. The amount of decomposing matter was often proportional to the virulence of disease.¹⁷ As Alain Cobin shows, a major justification for miasmatic theories was that of bad odour.¹⁸ Influential commentators such as Florence Nightingale reinforced this view that there was danger in foul smells. Stagnant, musty and corrupt air was "...quite ripe to breed small pox, scarlet fever, and anything else you please."¹⁹ Moreover, as Chadwick famously said, "all smell is disease".²⁰ The miasmatic theory did not rest solely on these notions but it was good propaganda for the advance of the sanitary movement and could be used to identify unwholesome situations.

Another justification for miasmatic theory was the difficulty that theories of contagion had in explaining the sometimes-random nature of the appearance of diseases – despite quarantines, which were the traditional contagionist response to epidemics. Under these circumstances, spontaneous local atmospheric conditions rather than direct contact with diseased persons appeared more likely to some to be the agency of disease.

The concept of contagion and quarantine responses to it was one major aspect of medicine that developed in the European Middle Ages. It grew out of experience of the plagues – particularly the Black Death.²¹ Contagionists believed that it was direct contact with infected persons or material goods that was the medium for

the spread of diseases. However, it was not a simple matter of contagionists versus the miasmatis. During the nineteenth century most medical men were 'contingent contagionists' accepting that diseases were sometimes contagious and some times infectious depending on a range of environmental and predisposing factors.²² Even germ theorists used the concepts of contagion, infection and miasm – "as if they were difficult to distinguish, overlapping, or even interchangeable".²³

The filth theory was the cornerstone of the sanitarian movement of the early nineteenth century – overseen by the reformer Edwin Chadwick and his associates.²⁴ Concern about putrefaction had its roots in contemporary disease theories and was not confined solely to the sanitarians camp. Many views relied on Justus von Liebig's zymotic analogy. Disease itself was a form of decay of the body induced from outside by decaying material. For Liebig, disease transference was an analogy of fermentation processes (thought of as a chemical not organic event) where the smallest amount of contaminated product could infect and rapidly spread in healthy material, finally contaminating and ruining the whole. As there was no measure of the amount of contamination needed to infect healthy material it was thought best to remove all putrefying material and material that had the propensity to decompose.²⁵ This particular view dominated British sanitarian thought from the 1840s to the 1870s and drove the idea that all waste needed to be removed from dwellings as quickly and as far away as possible.

The filth theory became the 'official doctrine' of the sanitarian reform movement despite scarce scientific evidence and to the chagrin of many in the medical profession.²⁶ However while accepting some of the miasmatic views most of the medical profession saw the developments of the first half of the century as a modification of contagion rather than supplanting that view. The overall situation was one of complexity and compromise rather than a wholehearted acceptance of one view or the other although the miasmatic view did become entrenched during the first half of the nineteenth century and held public imagination for very much longer – well into the twentieth century in fact. The zymotic analogy allowed an array of evils as contributing factors towards disease including polluted water and air, sewer gas emanations, overcrowding and the accumulation of refuse.²⁷ 'Pollution' was a concept that that was common to most theories of the time.

By about 1860 theories of filth had become more sophisticated. Putrefaction still presented a danger but modifications to the theory allowed the idea that cholera or typhoid could be transmitted through water from the waste of infected persons.²⁸ However there was also a growing body of evidence over the course of the century that microorganisms caused disease.²⁹ This culminated in the work of Louis Pasteur and Robert Koch identifying bacteria as a possible cause of disease. However, regardless of whether it was miasma or a bacterium that was the cause of disease, the responding building practices and strategies were, curiously enough, similar.

PRACTICE AND PROGRESS

Although it was challenged, the idea of putrefaction generated the strategies of disconnection and ventilation. Dwellings and buildings needed to be isolated from polluting situations where possible and the damaging effects of unhealthy atmospheres diluted and rendered harmless. Pollution of atmospheres could come in many guises, such as standing water or rotting vegetation, but it was chiefly ground gas, the emanations from uncovered faeces, sewer gas and exhaled carbon dioxide that received attention in building regulation. Dampness was also of concern since moisture could trigger the decomposition of organic materials and the power of miasmas could be increased in moist situations.³⁰ Dampness in building structures could be the source of rheumatism, colds, neuralgia and consumption.³¹

Ground gas was the product of rotting organic matter in the soil. It was pumped out of the earth by the rise and fall of the water table and could also be affected by barometric pressure. The main concern was that it could infect domestic atmospheres poisoning inhabitants and causing illness. Moisture could intensify the effect and there were a number of strategies in the late nineteenth century to combat the twin evils of moisture and ground gas in buildings. The principal strategies were to drain the soil around the building to reduce the presence of moisture and to isolate the structure from the ground using barriers such as damp proof coursing. London bylaws from 1877 insist that the whole of the ground under a building be covered with a 150mm thick layer of concrete to prevent dampness and gases from entering a building.³² While this extreme measure was not a feature of Western Australian regulation, except in damp situations, there was early concern that under floor spaces be ventilated to reduce dampness and to dilute polluting gases.³³

Within the spaces of a dwelling, regulation governed the volume of rooms and their ventilation. Salient pollutants included carbon dioxide from the exhaled breath of inhabitants. From the mid century onwards there was an emphasis on the importance of levels of carbon dioxide in a room. High levels of this gas caused stuffiness and poisoned the brain. It also signaled the presence of organic matters such as lung and skin tissue particles ripe for putrefaction. Poorly ventilated rooms could also be aligned with specific diseases and ailments.³⁴ Nineteenth century hygienists also believed that damaging exhalations and emanations from family members circulated throughout a dwelling, filling the atmosphere and penetrating the structure. While ventilation could disperse atmospheric contaminations, residual emanations in the structure kept alive endemic disease leading to anxiety about the porosity of building materials.³⁵ However the main concern of regulation was to ensure that rooms received an adequate supply of fresh air and that room volumes could support specified numbers of inhabitants. Regulation responded by ensuring that rooms had access to an adequate supply of fresh air through windows and ventilators with specified minimum opening sizes. Room volumes were partly controlled through specifying a minimum ceiling height. In Perth this averaged 2.6 metres. Air requirements were also regulated by room volumes stipulated by room areas in combination with ceiling height or a minimum volume per person. Proper ventilation provided a constant surveillance of the health of inhabitants by diluting and deodorising polluted atmospheres. These regulations were part of a wider system of control of the atmosphere surrounding Perth buildings including street widths and the external volume of air to which rooms had access – manifest in boundary setbacks and stipulating the size of back and front yards.

By 1900 many of these regulations had finally become a feature of WA legislation, although in a much diluted form than British counterparts. However, it was the removal of human waste that remained a major problem for Perth residents. In domestic landscapes there were two basic systems dealing with human waste. The first was the conservancy system which included privies, earth closets and pan systems where waste was held for a period of time for later removal. The second, was the sewerage system which connected a water closet to a public drain or septic tank, providing quick removal of waste. Perth relied principally on conservancy systems for most of the nineteenth century. As discussed previously, the cesspool loomed large in the domestic landscape of late nineteenth century Perth and until the 1886 Public Health Act their construction and siting were governed by local councils through lenient provisions in successive Municipal and Building Acts from 1871.³⁶ However it wasn't until the gold rush was in full swing that the 1893 Health Act sought to restrict the construction of new cesspools and the closing of unsanitary ones.³⁷ Despite constant agitation for a public sewer drainage system the pan system and earth closets were common privies in Perth. In line with the need to isolate such structures from dwelling spaces privy closets were usually banished to 15.2 metres from a house.³⁸ For the pan system this had practical considerations as the closet needed to be on the rear boundary for access by the night cart

which removed the used pan replacing it with a clean empty one. This distance was reduced by some councils to 6 metres, echoing London by laws of 1891.⁴² There were strict considerations regarding the size and construction of closets and the ease of cleansing if necessary. These conditions applied whether it was a water closet, pan or earth closet. Ventilation was a high priority in closets with gaps at the top and bottom of doors to allow air to dilute the dangerous gases from the pan.

The strategies and measures described were some of those employed in response to particular ideas about the transmittal of disease. Up until the 1870s sanitary measures were governed principally by miasmatic theories although most opposing disease theorists agreed in principle to the idea of cleanliness and the rapid removal of filth from the environment. As Mary Douglas argues, filth is a concern with disorder – a notion that interweaves through most disease theories and their strategies.⁴³ Elimination of dirt “represents reorganizing the environment in the name of purity”.⁴⁴ The elimination of polluting materials, whether in the atmosphere or embedded in the fabric of the building becomes fixed in the act of designing structures and space. Even with the onset of bacteriology the practice of hygiene and sanitary engineering remained essentially the same. Decomposing filth ceased to be the source of miasm and instead became the playground of disease causing bacteria – another form of pollution. Even so, the idea that smell signaled disease remained strong as bacterial theory was at first difficult to understand and slow to take hold of the public imagination.⁴⁵

Although very slow in development, by 1900 Perth had a reasonably effective array of health and building bylaws governing the removal of waste and the construction of buildings and closets enforced by local authorities.⁴⁶ Unfortunately Perth had a poor water service and a very small and polluting sewerage system. Sewerage drainage was seen by many as the best solution to the prevention of disease as it removed the source of disease directly into a sealed pipe and carried it far away. Such a system also had important aesthetic and psychological advantages over a conservancy system. Throughout the latter half of the nineteenth century there were many attempts to interest the authorities in establishing a sewerage system in Perth – without success.

CONCLUSION

Perth's slow sanitary progress has often been blamed on the lack of leadership provided by the Premier at the time, Sir John Forrest.⁴⁷ Schemes for sewerage were ignored by Forrest's government despite a rise in deaths from typhoid in the late 1890s – even after a desperate petition by doctors in 1898 during a particularly virulent epidemic. Forrest was reluctant to intervene even when lack of adequate water and sanitation facilities were causing widespread distress.⁴⁸ However the situation was more complex than just Forrest's *laissez faire* tardiness. In the 1890s government services including health, hospitals and sanitation were all but overwhelmed by the influx of gold seekers into the colony. Also, there was no certainty, in the initial stages of the gold rush, that the gold fields would last and hence there was a reluctance to spend money on developments beyond basic services.⁴⁹ There was also a general perception that the public did not want to be burdened with the cost of a sewerage system which by 1897 was estimated at half a million pounds. Sewerage drainage was also dependent on a good supply of water which Perth lacked. In the public mind lack of water was seen more as an inconvenience rather than as a danger to health. Despite public complaints about unsanitary living conditions there was surprisingly little social conflict or political expression on the part of the suffering people of Perth given their hardships.⁵⁰ Nonetheless, as Anne Hardy has said, through our higher levels of health we are now less tolerant than our forebears of discomfort from sickness.⁵¹ Disease and death were part of the daily landscape of Victorians and they did not dwell on them. Their perspectives on conditions at the time were less critical and therefore less important in daily life.

We have seen how some of the practices of sanitation and sanitary building in Western Australia were generated by concepts of health and disease. Regulations sought to ensure that waste was quickly removed, even if practice in Perth did not exactly match the more rigorous sanitary norms of British laws. Regulation tried to reduce the polluting effect of moisture and gases from the ground by drainage and isolating the structure. Ventilation controlled the volumes of rooms and the size and position of ventilators and windows. Buildings such as privies and closets were sized, cleansed and sited on a block of land in accordance with practices that recognized their potentially dangerous nature.

Although much research remains to be done, this paper helps to illustrate linkages between nineteenth century medical thought and regulatory sanitary building practices through the Western Australian experience.

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- 3 Sevellan Hoy, *Chasing Dirt; The American Pursuit of Cleanliness*, New York: Oxford University Press, 1995, p. 57.
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- 5 Ian Phillip Kelly, *The Development of Housing in Perth (1890-1915)*, Unpublished Masters Thesis, Perth: University of Western Australia, 1992, p. 86.
- 6 Anne Hardy, *The Epidemic Streets: Infectious Disease and the Rise of Preventative Medicine 1856-1900*, Oxford: Clarendon Press, 1993.
- 7 C. T. Stannage, *The People of Perth, Perth*: Perth City Council, 1979, p. 252 also see Hillson Beasley, 'The Sanitation of Dwellings' *Australasian Builder and Contractors News*, May 27 1893, pp. 215-216 and June 3 1893, pp. 227-229. Hillson Beasley became Chief Architect at the W.A. Public Works Department in 1905 but was not untypical in his strong support for sanitary reform and regulation.
- 8 Fredrick Shaw, *Dispatches, Etc. Relative to the Sanitary Condition of the City of Perth*, Perth: Legislative Council, 1874, p. 3.
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