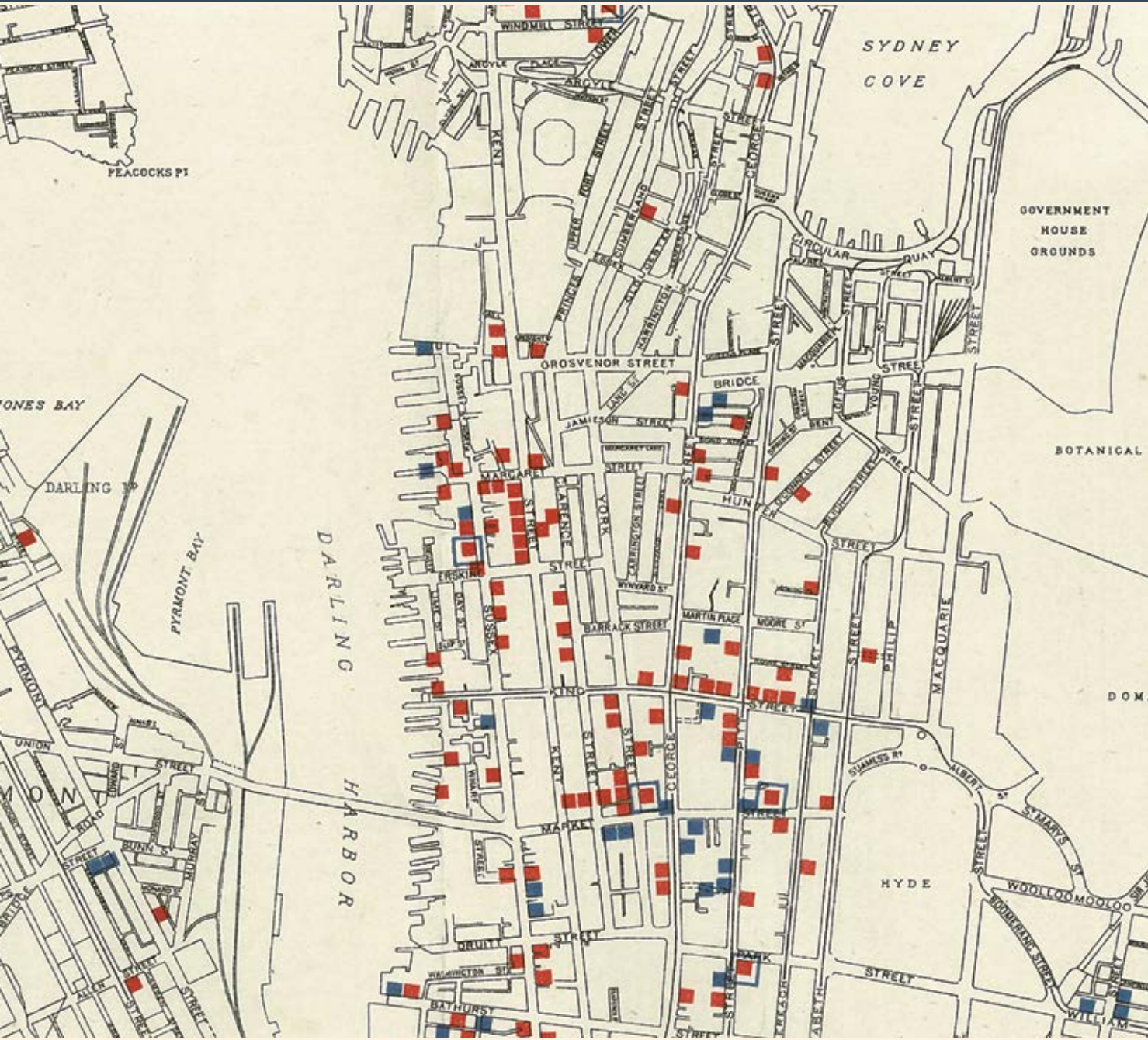


INTERNATIONAL MAP COLLECTORS' SOCIETY

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FOR PEOPLE WHO LOVE MAPS

JOURNAL OF THE INTERNATIONAL MAP COLLECTORS' SOCIETY

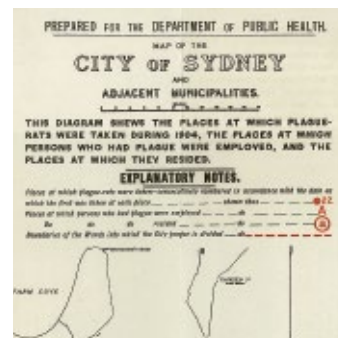
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Front cover J.A. Thompson, detail from 'Map of Sydney and Adjacent Municipalities', (1903) comparing places of plague infection in 1900 (blue) with those in 1902 (red). Private collection.

MAPPING A PANDEMIC

Australian plague maps, 1902 and 1904

Robert Clancy

On the 19 January 1900 Arthur Paine, a carman employed on the wharves at Sydney Harbour, was seized with headache, fever and severe pain in his left groin. Diagnosis of his condition using the ‘new bacteriology’ identified the plague bacillus. Six years earlier it had been independently described by bacteriologists Alexandre Yersin and Kitasato Shibasaburō, both who were in Hong Kong investigating the plague outbreak there. The third great plague pandemic had arrived in Australia! Over the next twenty-two years six hundred cases of bubonic plague with 196 deaths would be recorded in Sydney. Between 1900 and 1909 Government reports by the Chief Medical Officer John Ashburton Thompson described ground-breaking observations that gave a clearer understanding of the disease’s natural history and pathogenesis. This new knowledge underpinned major changes in the management of the plague and resulted in a significant reduction in deaths, cost to the economy and social disruption. The data on which these discoveries were made are presented in a series of maps that, from an epidemiological viewpoint, stand second only to John Snow’s famous cholera map which he presented to the London Epidemiological Society on 4 December 1854. On that map Snow had plotted the sites of water pumps in the Soho area of London and the distribution of fatal cholera cases, and from the data was able to identify the Broad Street water pump as the source of the infection. The importance of Thompson’s maps can be understood in the context of the three ‘great’ plague pandemics, with their impact on history and the confusion that persisted regarding the manner by which the infection developed up to the time of the Sydney outbreak in 1900.

Earlier plague pandemics

There have been three pandemics of plague over the last 2,000 years. The first, or the Plague of Justinian (540–750 CE) arrived in the Mediterranean from the east via Egypt and is credited as a major influence on the decline of the Roman Empire and the breakup of Europe that followed. The second, the Black Death

(1347–1671), spread along the Silk Road to Kaffa (today Feodosiya) in the Crimea where the Mongols had the Genoese traders under siege causing some anxiety by catapulting plague infected bodies over the walls; then (very quickly) by boat to Messina, Genoa, Venice, Pisa and Marseilles, before travelling for twelve months along the trade routes to England and northern Europe. The initial wave (1347–51) killed one third of Europe’s population, signalling the end of feudalism and the beginning of the Renaissance. The third pandemic began in the province of Yunnan in southwestern China (by extraordinary coincidence, the same region where Covid-19 began) in 1855. Though it would spread to most parts of the world by the international maritime trade routes, its major impact was in India where 10 million deaths were recorded. It was the first plague pandemic to involve America and Australia where it presented in twelve outbreaks between 1900 and 1925. It wasn’t until the mid-twentieth century when plague numbers fell below an annual number of 200 that the World Health Organisation (WHO) considered it ‘inactive’. Sporadic cases continue to be reported across many countries as the bacteria remains in a latent form in the native rodent populations of all continents except Australia. It remains in the news as one of the most feared forms of potential germ warfare in an aerosol form, as inhaled plague bacillus causes untreatable fatal pneumonic plague which cannot be prevented by current vaccines. To date and counting, plague has caused 200 million deaths – more than any pandemic disease.

John Ashburton Thompson (1846–1915)

The two maps which are the focus of this discussion, present data which John Ashburton Thompson obtained from the first four waves of infection that gripped Sydney between 1900 and 1905. Thompson was an English physician with training in public health and epidemiology, who visited New Zealand and Australia ‘for his health’ (which in those times usually meant he had tuberculosis). He migrated to Australia in 1883, and the following year joined the

New South Wales Board of Health, of which he became Chief Medical Officer and its President in 1896. His record at tracing disease and enforcing change through government regulation (helped anonymously by his journalist brother) was nothing short of amazing, gaining him an international reputation and respect for his contributions to public health initiatives.

Thompson was waiting for plague to arrive on Australia's shores, and was prepared for it. The most recent thinking and public health practice advanced by the English and French who were working in India at the time of the crisis, was that it involved person-to-person transmission, and the response was to quarantine the source patient together with all their contacts, and institute massive cleaning programmes based on the idea of 'place infection'. Thompson was aware of 'best practice' but had noted a number of inconsistencies such as Paul-Louis Simond's hypothesis that an insect (such as a flea) may be transmitting disease from rats to humans, and that rats became sick alongside humans with plague (called an epizootic). Simond's concept was poorly supported, and the appearance of sick rats was thought simply to indicate that both humans and rats were targets of infection. Thompson deduced that the rat carried a latent form of infection which, under certain conditions, became overt with positive cultures and was sick (or epizootic): fleas could transmit infection from this 'plague rat' to man. He logically stated that the total focus on management should be to isolate the rat, not quarantine the patient. He summarised his views in *Report of the Board of Health on a second outbreak of plague at Sydney, 1902* (published in 1903), and explained the accepted contemporary thinking thus:

the maintenance and spread of plague are ascribed to human intercourse directly with the sick or indirectly through articles which have been infected by them ... the share which may be played by the rat ... has been left a doubtful matter ... as all that has been ascertained is that man and the rat are susceptible of an identical infection.

Thompson's vigorous promotion of his own thesis was to no avail; it was rejected by government, press and colleagues, and following the medical practices of the day, the sick, their household and their contacts were transported to the North Head Quarantine Station some 10 km from Sydney city centre. When the

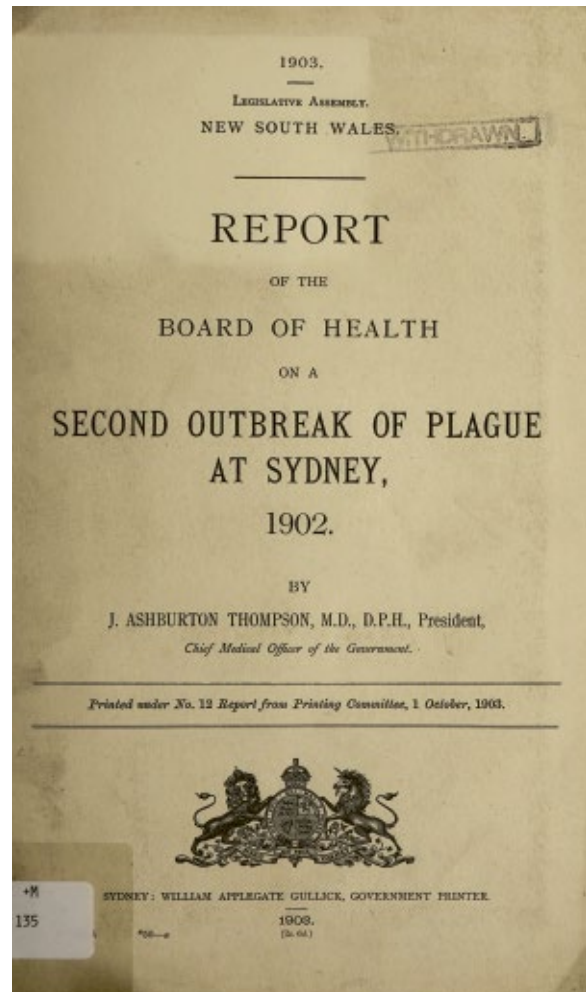


Fig. 1 J. Ashburton Thompson, *Report of the Board of Health on a Second Outbreak of Plague at Sydney, 1902.* (1903). Public Domain Mark.

capacity there of 2,000 persons was reached, the overflow filled transports moored alongside the Quarantine Station. Streets were barricaded and literally awash with disinfectant, which drained into the harbour killing hundreds of fish (which some then blamed as a cause of the plague). The government of Victoria blocked the border with NSW, and quacks extended their imagination to bizarre therapeutic concoctions. It was chaos!

At the onset of the second wave of infection Thompson's views prevailed. In his report of a second outbreak in 1902 the microbiologist Frank Tidswell, with whom Thompson worked closely, documented compelling evidence which endorsed the view that fleas transmitted the infection from rats to humans,

an idea which previously had been poorly supported in contemporary literature.

The maps

The first map accompanying the 1902 report compares the incidence of infections in the 1900 and 1902 outbreaks and dramatically illustrates Thompson's idea that the plague rat is the only source of infection. In the map 208 places of infection are identified as occurring in 1900 compared with 86 in 1902.

Thompson's maxim 'quarantine the rat not the patient' was realised by 'habitually excluding rats from habituated premises'. Following this guideline, the practices of mass quarantining and excessive community cleansing were abandoned and community disruption was reduced.

Thompson initiated a surveillance programme of collecting and culturing rats, and the appearance of 'plague infected rats' correlated with incidences of infection in the human population. There was now both medical and economic evidence of improved outcomes using Thompson's approach: the number of patients in 1900 was 303, compared to 139 in 1902 (a 55 percent reduction in incidence of infection). The fatality rate was a little different between the two groups. The cost of the two waves differed significantly: £176,000 in 1900 compared to £24,000 in 1902 (an 85 percent reduction in costs) which was powerful quantitative data for the government to support Thompson's approach of isolating the rat.

Thompson's second map (of the 1904 outbreak) includes the data Thompson found when testing his hypothesis, based on the preliminary observations of linking the appearance of an epizootic with risk of human disease, and that such a finding would lead to a targeted elimination of rats from all areas of human habitation.

Thompson had established an extraordinary and meticulous surveillance system based on culturing upwards of 50,000 rats that had been collected from the wharves by professional and trained rat catchers (Hygiene Officers). Nothing of this scale had ever been done before. Not only did he develop the idea of mass screening to detect an infection source, but he enacted procedures to ensure that infection in humans was curtailed.

Summarising the data before, during and after the fourth outbreak, human infections occurred over a nine-month period. During that time of the 43,822 rats collected, and cultures established,



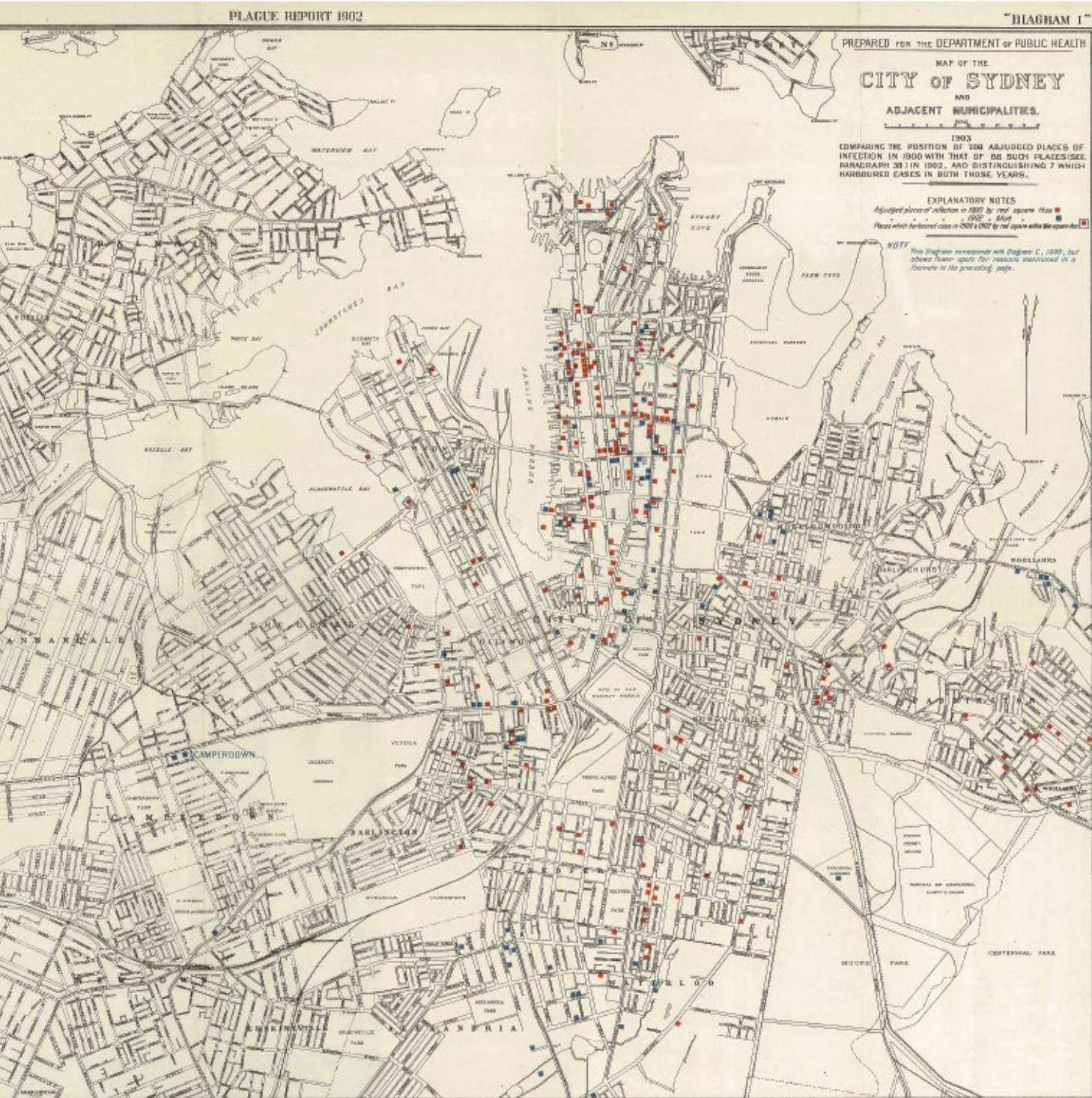


Fig. 2 J. Ashburton Thompson, 'Map of the City of Sydney and Adjacent Municipalities', 1903, 50 x 74.5 cm. The map accompanied the report of the 1902 outbreak of bubonic plague in Sydney. It focusses on Darling Harbour area. It contrasts the number of sites where humans contracted the plague in 1900 compared to the number of infections in 1902 (when public health measures concentrated on eradication of 'plague rats' rather than exhaustive quarantining of human contacts). Note the substantially fewer infected sites in 1902. Private collection.