

# A prickly business—Edward Shelton, Henry Tryon and the mysterious pineapple disease

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Published: 24 November 2023

## Cite this:

Ryley, M. J. and Drenth, A. (2023)  
*Historical Records of Australian Science*,  
doi:[10.1071/HR23008](https://doi.org/10.1071/HR23008)

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## ABSTRACT

The earliest record of pineapple plants being grown around Sydney in the British colony of New South Wales was that of Governor King in 1803. However, the climate of a new northern settlement at Moreton Bay (later Brisbane) soon proved to be far more conducive to growing the fruit. Pineapples prospered for over 50 years around Brisbane until a mysterious disease appeared in the late 1890s. In April 1891, Professor Edward Shelton, an American who had been appointed as the Queensland government's first Instructor in Agriculture, was the first scientist to inspect the affected crops and concluded that the disease was caused by a fungus. In the following year, Shelton, Henry Tryon (then assistant curator at the Queensland Museum) and others again inspected the diseased pineapple crops. Tryon described the symptoms in detail as spores which were composed of two rounded elements, each having a double contour (chlamydospores). There is no doubt that the disease was caused by the oomycete *Phytophthora cinnamomi* that was described decades later. In 1897, Shelton was passionate about agricultural education and was appointed as the first principal of the Gatton Agricultural College, but his disciplining of some students of the college led to his forced resignation just 18 months later.

**Keywords:** chlamydospores, disease, Edward Shelton, Gatton Agricultural College, Henry Tryon, *Phytophthora cinnamomi*, pineapple, symptoms.

## Introduction

Most of the 35 million pineapple (*Ananas comosus* var. *comosus*) fruit produced in Australia each year are grown in the Sunshine Coast, Wide Bay, Yeppoon, north coastal and Atherton Tableland regions of Queensland.<sup>1</sup> In 2020 over 66 000 t of fruit was produced worth AUD\$ 52.2 million, 64% for the fresh market and the remainder for processing.<sup>2</sup> The earliest pineapples grown in Australia were small-fruited, rough-leaved varieties such as 'Queen' until the introduction of the large-fruited, smooth-leaved variety 'Smooth Cayenne' from Kew Gardens, England in 1858.<sup>3</sup> The largest pineapple in Australia is the heritage-listed 'Big Pineapple' that was erected at an entertainment venue in Woombye, Queensland; it is made of fibreglass, 16 m high and is the only pineapple in the world from which a view of the surroundings can be made comfortably.<sup>4</sup>

In this paper, we outline the development of the pineapple industry in Queensland, focusing on the early pioneers, then report on the outbreak of a disease in the late 1880s in and around Brisbane, and finally sketch out the roles that Henry Tryon (1856–1943), the then assistant curator at the Queensland Museum, and Professor Edward Shelton (1847–1928), the first agriculture instructor in the Queensland Department of Agriculture ('The Department') and later the first director of the Lawes Agricultural College, had in the study of the disease. Most of the material for this paper was sourced from newspaper articles (Trove; <https://trove.nla.gov.au/newspaper/>), with the remainder from books, reports,

<sup>1</sup>Anonymous (2017).

<sup>2</sup>Anonymous (2022a).

<sup>3</sup>King (1803). Anonymous (2022b).

<sup>4</sup>Anonymous (2018).

scientific papers and other sources. Many of the books and scientific papers were sourced through the following e-libraries—Biodiversity Heritage Library (<https://www.biodiversitylibrary.org/>), Hathitrust Digital Library (<https://www.hathitrust.org/>), Internet Archive (<https://archive.org/>) and Project Gutenberg (<https://www.gutenberg.org/>).

## The pineapple in the early days of English colonisation of Australia

The pineapple was not in the list of plants brought to New South Wales on the First Fleet that arrived at Sydney Cove on 25 January 1788,<sup>5</sup> so the source of the first pineapple plants in the colony is unknown. The first record of the fruit is by Governor Phillip Gidley King (1758–1808) who included the pineapple in his 1803 list of plants that were not indigenous to New South Wales; at the time there were only a few ‘suckers’ of the variety ‘Queen’ growing in the colony.<sup>6</sup> Some claim that the first pineapple planting material grown in Australia was brought from India in 1838,<sup>7</sup> but that assertion is incorrect, because pineapple plants imported from Rio de Janeiro were grown in the Sydney Botanic Gardens in 1826.<sup>8</sup> The settlers around Sydney soon realised that pineapple plants would not grow well in the region, and over time the subtropical climate of the newly established convict settlement of Moreton Bay proved to be far more suitable.

The first mention of pineapples in that colony was by the explorer and botanist Allan Cunningham (1791–1839) who was on board *HMS Amity* with convicts and marines, under the command of the first commandant of the colony, Lieutenant Henry Miller (1785–1866). The group landed at Red Cliff Point (in the now Brisbane suburb of Redcliffe) in September 1824 and began to build huts and clear land for agriculture. Cunningham wrote that young plants of tropical fruits including pineapples, mangoes, bananas, plantain, guava, stone fruit and others that had been brought from the government botanic garden in Sydney were unpacked and ‘committed to the soil’.<sup>9</sup>

Redcliffe proved to be unsuitable for a convict settlement because of the poor soil and conflicts with the local Aborigines, so in May 1825 the site was abandoned and the convict settlement moved about 37 miles (~60 km) to a site on the Brisbane River. There the town (1834) and later city (1859) of Brisbane became established. Within a year an



**Fig. 1.** Portrait of Johann Christian Simon Handt, ~1827, creator unknown, BMArchives Reference BMA QS-30.001.0054.01.

agricultural garden of 58 acres (~23.5 ha) had been established on part of the now Brisbane City Botanic Gardens, that ultimately supplied the settlement with 1 t of vegetables and fruit every day.

In July 1829, Charles Fraser (1788–1831), the New South Wales colonial botanist and director of the Sydney Botanic Gardens, wrote that there were 34 pineapple plants growing in the Moreton Bay settlement’s garden. It is not known if they were descendants of those originally planted at Redcliffe. On a visit to the colony in 1836, the Quaker missionary James Backhouse (1794–1869) recorded that pineapples were growing in Brisbane,<sup>10</sup> and a newspaper article from 1839 mentioned that the pineapple, guava and plantain banana had been cultivated ‘with great success’ at the settlement.<sup>11</sup>

The Evangelical Lutheran minister Johann Christian Simon Handt (1794–1863) (Fig. 1) has been credited with growing the first substantial number of pineapples in the colony.<sup>12</sup> He was initially sent to the Wellington Valley mission, New South Wales, in 1831 but was then posted to the Moreton Bay settlement in 1837 after being appointed chaplain to the convicts. Handt left in 1842 after the cessation of convict transportation.<sup>13</sup> He grew pineapple plants in

<sup>5</sup>Collins (1798) section 2, paragraph 67, sourced from <https://www.gutenberg.org/>.

<sup>6</sup>King (1803).

<sup>7</sup>Anonymous (2009) p. 3.

<sup>8</sup>Anonymous (1826).

<sup>9</sup>Information in this section draws on Steele’s history of early Brisbane. Steele (1975) pp. 7, 17.

<sup>10</sup>Backhouse (1843) p. 358.

<sup>11</sup>Anonymous (1839).

<sup>12</sup>Major sources for this section were Gunson (1961) and Langbridge and others (2022).

<sup>13</sup>Ganter (2022).

the 0.25 acre (~0.1 ha) mission garden in Brisbane, the location of which in 1839 is shown in Supplementary Maps S1 and S2. The available evidence suggests that his house block was on the site of the current Queens Gardens on the southwestern corner of Elizabeth and George Streets, Brisbane and his garden was on the opposite northeastern corner of those streets.

Some researchers state that Handt had brought plants from the West Indies but others believe that he probably introduced them from Samoa.<sup>14</sup> However, there is no evidence that he visited either country. Perhaps he sourced his original planting material from the colony's government garden nearby. It can be debated if Handt was the first person to grow pineapples on a large scale in the new settlement, because Tryon wrote that the postmaster of the settlement (possibly Gilbert Whyte)<sup>15</sup> was also growing pineapples in 1837 and was the first person to export the fruit to Sydney.<sup>16</sup>

The love of growing pineapples must have been in the blood of postmasters, because in a map of Brisbane Town drawn in 1844 by Carl Friedrich Gerler (1817–94), 'Slade's pineapple garden', adjacent to the post office building and both fronting Queen Street, is depicted (Supplementary Map S3). It is extremely likely that Slade was George Milner Slade (1787–1848), who in 1844 was the colony's postmaster, clerk of the bench and registrar of the Court of Petty Sessions. Born in England, as a young man Slade joined the 6th Battalion, 60th Foot Regiment of the British army, became its paymaster in 1815, and was dismissed from that post five years later after it was found that he had embezzled Battalion funds.

Soon after arriving in Sydney he was appointed coroner in 1821 and later secretary to the Australian Agricultural Company. In 1828 he resigned from those positions and opened a general store at Port Stephens, north of Sydney, but when that venture failed he declared bankruptcy and was sentenced to a year in goal. Despite this failure he was appointed by Governor Bourke as the clerk for the assignment of convicts and later as its commissioner in New South Wales. Slade and his wife returned to England in 1838 but a short time later emigrated to Brisbane where he opened a store, and was appointed to the government positions mentioned above. Upon his sudden death in 1848 one newspaper article described him as being 'universally respected in public and private life'.<sup>17</sup>

## The Zion Hill missionaries

Others were growing pineapples around Brisbane in the early days of settlement. After lobbying from the Reverend John Dunmore Lang (1799–1878) and others, the New South Wales authorities, who were overseeing the conversion of the settlement from a convict colony to a free town, set aside 650 acres (~263 ha) for a Christian evangelical mission approximately eight km north east of Brisbane Town. The Zion Hill Mission opened in 1838. Lang had travelled to Europe to recruit (mostly German) Lutheran, Presbyterian and Pietist missionaries, as well as laymen, to work at the mission, whose main aim was to convert the local Aborigines to Christianity.

The missionaries and their families were the first free settlers in Brisbane. Ultimately, their efforts to convert the Aborigines failed, other settlers became jealous of the large area of productive land occupied by the mission, and New South Wales was experiencing a recession, so their funding was stopped in 1844, and four years later the mission closed. The Zion Hill land was surveyed in 1848 for sale as smaller farms.<sup>18</sup> The area then became known as German Station where a village developed, and the locality was later renamed Nundah (now a suburb of Brisbane) in 1882.<sup>19</sup>

During the ten years of the mission, the missionaries, laymen and their families had extensive gardens to maintain self-sufficiency, and evidence suggests that pineapples were grown there over that period. Before he left Brisbane in 1842, Handt gave some planting material to the then layman (a cobbler and later an ordained Presbyterian minister) Johan Gottfried Wagner (1809–93).<sup>20</sup> Also, Tryon stated that the postmaster (probably Slade) had given planting material to the 'Moravian missionary' the Reverend F. J. A. (Franz Joseph August) Rode (1811–1903)<sup>21</sup> who was one of the founding members of Zion Hill.

After the demise of mission, many of its members became farmers in the German Station district. In 1851, they purchased 33 acres (~13.5 ha) of freehold land beside Zion Hill and subdivided it into eight small, narrow blocks, one per family, expanded their farming operations and supplied Brisbane Town with a variety of produce.<sup>22</sup> Johan Wagner has been recognised by some as being the first person in the state of Queensland to grow (rough-leafed) pineapples on a commercial scale,<sup>23</sup> but there is no conclusive supporting evidence. Henry Tryon (later the Queensland vegetable

<sup>14</sup>Prowse (2018) p. 2.

<sup>15</sup>Rawlinson (1957) p. 1295.

<sup>16</sup>Tryon (1905) p. 480.

<sup>17</sup>Anonymous (1848). Barbera (2020).

<sup>18</sup>Anonymous (2022c).

<sup>19</sup>Anonymous (2022d).

<sup>20</sup>Gunson (1961) p. 524. Ford (2010) pp. 39–40.

<sup>21</sup>Tryon (1905) p. 480.

<sup>22</sup>Ford (2010) p. 44.

<sup>23</sup>Anonymous (2023).

pathologist) wrote that by 1851 Carl Friedrich Gerler (1817–94), another of the Zion Hill missionaries was growing pineapples on his property.<sup>24</sup> A year later, Gerler and Johann Gottfried Haussman (1811–1901) were the first growers to export substantial numbers of pineapples from Brisbane Town to Sydney markets, by commercial steamer; later, some of the other ex-Zion Hill settlers followed suit.<sup>25</sup> Pineapples must have been growing on a relatively large scale in the German Hill Station district in the 1850s because a local newspaper reported that fruit, including pineapples, were regularly being stolen from plantations there.<sup>26</sup>

In November 1861, six of the original Zion Hill Mission settlers, including Wagner, Zillman, Gerler and Rode wrote to the government Surveyor General requesting pre-emptive rights to purchase 320 acres (~130 ha) of land that they had been occupying at German Station for £ 1/acre,<sup>27</sup> but that request was rejected just under a year later.<sup>28</sup> On 7 November 1862, Zillman who already owned over 68 acres (~27.5 ha) at German Station<sup>29</sup>, then wrote to the Surveyor General outlining the improvements that he had made on his land; of a total of £ 177.2s.0d, almost half was for 330 ‘bunches’ of pine(apples) valued at £ 82.10s.0d.<sup>30</sup>

Subsequently, in March 1863, the government auctioned 11 blocks between 24 and 53 acres each (~9.7–21.4 ha) on both sides of Kedron Brook.<sup>31</sup> It is known that Wagner purchased three of those blocks (total 93 acres; ~37.6 ha), Rode acquired one block of 32 acres (~12.9 ha), and Franz one block of 25 acres (~10.1 ha). There is no information on when or where Wagner allegedly grew the first commercial crop of pineapples.<sup>32</sup>

Pineapples were also being grown on a commercial scale in the Brisbane suburbs of St Lucia, Fortitude Valley and Kangaroo Point, later spreading to Wavell Heights, Zillmere and further north.<sup>33</sup> However, pineapple growing was not without its difficulties. An article in *The People’s Advocate and New South Wales Vindicator* of April 1853 stated that although pineapples flourished in the settlement (Brisbane district), very little was done to ‘cultivate them to

perfection’.<sup>34</sup> Despite this, pineapple production increased rapidly and ultimately growers were complaining of inadequate returns;<sup>35</sup> at Sydney markets in 1855 a dozen pineapples were selling for just 9–12 shillings.<sup>36</sup>

Nothing had changed 17 years later. It was estimated that over 100 000 dozen pineapples would be grown in the Brisbane region in 1871, but an oversupply and poor prices on Sydney and Melbourne markets made it unprofitable for most growers. The only people making money was the shipping company ASN Co. who, the growers believed, charged exorbitant prices. Some growers wondered if local value-adding was the way out of the dilemma—the production of pineapple wine, brandy and cider might be the saviour.<sup>37</sup> However, there is no evidence that those pursuits were followed to any scale. There may have been an oversupply, but the poor lad William McLaren, aged 11, was imprisoned for three days in a Sydney goal for stealing a pineapple valued at 1 shilling.<sup>38</sup>

It is uncertain what varieties of pineapple were being grown in and around Brisbane on a commercial scale. In 1861 there were twelve varieties growing in small plots in the Brisbane Botanic Gardens, including ‘Cayenne’, ‘Enville’, ‘Black Jamaica’, ‘Queen’, ‘Ripley Queen’ and ‘Moscow Queen’. The first smooth-leaf variety to be grown in Queensland, ‘Smooth Cayenne’, was imported from Kew Gardens, England in the late 1850s.<sup>39</sup> Despite that, an article in the *Queensland Times, Ipswich Herald and General Advertiser* of 12 December 1867 stated that ‘Queen’ (which had been mentioned by Governor King in 1803) was the best to grow.<sup>40</sup> Seventeen years later there were 52 cultivated varieties being grown in Queensland, but ‘Queen’ was still the preferred variety, especially for export in cans.<sup>41</sup>

## The pineapple disease

As discussed previously, pineapples had been grown in and around Brisbane without any issues since at least 1837,<sup>42</sup>

<sup>24</sup>Tryon (1905) p. 480. Langbridge and others (2022).

<sup>25</sup>Ford (2010) p. 45.

<sup>26</sup>Anonymous (1859).

<sup>27</sup>Franz and others (1861).

<sup>28</sup>Herbert (1862).

<sup>29</sup>Anonymous (1863).

<sup>30</sup>Zillman (1862).

<sup>31</sup>Anonymous (1863).

<sup>32</sup>Anonymous (2023).

<sup>33</sup>Anonymous (2009).

<sup>34</sup>Anonymous (1853a).

<sup>35</sup>Anonymous (1855).

<sup>36</sup>Anonymous (1853b).

<sup>37</sup>Anonymous (1870).

<sup>38</sup>Anonymous (1878).

<sup>39</sup>Anonymous (2009).

<sup>40</sup>Anonymous (1867).

<sup>41</sup>Anonymous (1884).

<sup>42</sup>Anonymous (1893a).





**Fig. 2.** Photo of Edward Shelton (front right), part of portrait of attendees at Intercolonial Rust Conference, Sydney, June 1891, courtesy of R. F. Park.



**Fig. 3.** Symptoms of soft rot of pineapple caused by *Phytophthora cinnamomi*, courtesy of A. Drenth.

but a mysterious disease in several north Brisbane pineapple plantations became so severe in the late 1880s and early 1890s that growers wanted information on its cause and control. In April 1891, Professor Edward Shelton (1846–1928) (Fig. 2) visited several pineapple farms at Zillmere to inspect the problem.<sup>43</sup> Shelton, an American, had been appointed as Queensland's first Instructor in Agriculture in 1890, later becoming the first principal of the then Queensland Agricultural College (now University of Queensland, Gatton campus) at Lawes, west of Brisbane.<sup>44</sup> He concluded that a fungus was causing the disease.<sup>45</sup> At a meeting of about 40 pineapple growers at Nundah in November 1891, the attendees asked Under Secretary of Agriculture, Peter McLean (1837–1924) to have specimens of healthy and diseased plants sent south to an 'expert'.<sup>46</sup>

During question time in the Queensland Legislative Assembly in April 1892 it was revealed that two plants (one healthy, one diseased) had been sent to the New South Wales vegetable pathologist Nathan Augustus Cobb (1859–1932), who replied that because the disease was new he would need to inspect the site (of collection) to provide a definitive diagnosis. A request by the Queensland government to the New South Wales government to allow the visit

was left unanswered.<sup>47</sup> In July of that year it was reported that McLean and Shelton of the 'Department' and Henry Tryon (1856–1943), then assistant curator of the Queensland Museum, had visited pineapple farms at Nundah and that Mr Tryon would, in due course prepare a report for parliament.<sup>48</sup>

That report, not presented to Tryon's superiors until early 1893, was reproduced in the *Annual Report of the Queensland Department of Agriculture for 1892–3*.<sup>49</sup> Tryon described the above-ground symptoms as a red-brown discolouration of leaves, stunting of plants, premature yellowing of fruit and rotting of apical shoots and leaves (Fig. 3). Below ground, the roots started rotting from the tips and ultimately the entire root system decayed. He noted that a fungus that was colourless, and consisted of an intricate network of mycelium supporting 'conidia', that had 'two rounded elements having a double contour', was found consistently in affected plant parts. The 'conidia' were 'almost sessile upon the mycelium, or were supported on slender pedicels'.<sup>50</sup> Based on later findings there is no doubt that Tryon had observed the chlamydospores of the oomycete *Phytophthora cinnamomi* (Fig. 4) which was not taxonomically described until 1922.

<sup>43</sup> Anonymous (1891a).

<sup>44</sup> Anonymous (1891b).

<sup>45</sup> Anonymous (1891c).

<sup>46</sup> Anonymous (1892a).

<sup>47</sup> Anonymous (1892b).

<sup>48</sup> Tryon (1893a) pp. 6–9.

<sup>49</sup> Tryon (1893a) pp. 6–9, 1905, pp. 478–479.



**Fig. 4.** Chlamydospores of *Phytophthora cinnamomi*, scale bar approx. 20 µm, courtesy of A. Drenth.

Tryon recommended the cultivation of pineapple be abandoned in soils where the disease was rampant. Apparently, the Queensland Minister for Lands (and Agriculture) Andrew Henry Barlow (1837–1915) was not satisfied with Tryon's observations and conclusions. He ordered the government chemical laboratory to conduct analyses of the soils in which healthy and infected plants were growing.<sup>51</sup> The analyses showed that there were no significant differences in physical and chemical properties between the soils, with the laboratory recommending that other crops be grown in infested ground for one or two years.<sup>52</sup>

One could ask: 'Why did Tryon take over six months to write his report on the pineapple disease?'. The answer is that he had other things on his mind. The trustees of the Queensland Museum had suspended his services in early March 1893 while an enquiry into his alleged inappropriate behaviour at the museum was undertaken.<sup>53</sup> On page 2 of *The Brisbane Courier* of 7 March 1893 an article entitled 'Civil Service Enquiry—the charges against Mr Tryon' outlined several accusations of alleged impropriety by Tryon while working at the museum.<sup>54</sup> The charges against Tryon will not be detailed here, but they are outlined in the article. Ultimately, the enquiry acquitted Tryon of all charges and noted that his relationship with the curator of the Museum, Charles Walter de Vis (1829–1915), was 'not cordial'. The

enquiry members suggested that Tryon would be a suitable person to fill the new role of Government Entomologist,<sup>55</sup> which happened a year later.<sup>56</sup> Interestingly, the latter article mentioned that Tryon would not come under the provisions of the Queensland Civil Service Act. Was the enquiry a set-up, or was there some substance to the allegations? We will never know.

Tryon's less-than-cordial relationship with de Vis may be reflected in an interaction with the Government Botanist Frederick Manson Bailey (1827–1915). Bailey had been transferred from the museum to the department in 1887,<sup>57</sup> so Tryon would have known him well. In a letter to the *Brisbane Courier* of 17 March 1893, Tryon criticised Bailey's plan to write a supplement to the seven volumes of *Flora Australiensis* that had been written by George Bentham (1800–1884) and assisted by Baron Ferdinand von Mueller (1825–96) between 1863 and 1878. Tryon believed that von Mueller was the best person to do that job because (i) he had the specimens from the *Flora Australiensis* in his possession, (ii) 95% of the species added to the flora of Australia were described by von Mueller, and (iii) von Mueller had a unique understanding of systematic relationships of the Australian flora.<sup>58</sup>

Unfortunately, Tryon wrote that although Bailey's 'knowledge of some departments of this science [Botany] is probably unrivalled', his 'great work, however, has been in compilation.' There is more to the story, because Bailey was a devotee of Bentham's taxonomic approach to botany used in *Flora Australiensis*, which was at odds with that of von Mueller's. Between 1893 and 1896 (when von Mueller died) there was lengthy and sometimes vitriolic correspondence between them.<sup>59</sup> The planned supplement to the *Flora Australiensis* was never written.

A few days after the article appeared, Tryon was summoned by the Minister for Agriculture to explain his criticisms of Bailey,<sup>60</sup> but neither the substance of the meeting nor its outcomes are known. Tryon's article was no way to make or maintain friendships. Like the leaves of the rough-leaved pineapple, Tryon was perhaps a little prickly, a view shared by the Queensland plant pathologist John (Jack) Howard Simmonds (1901–92), who knew him well. Simmonds wrote that: 'He had a brilliant brain, a sarcastic tongue and a cantankerous nature. He was the terror of inexperienced or ill-prepared speakers. He resigned and

<sup>51</sup>Anonymous (1893b).

<sup>52</sup>Wain (1893) pp. 8–9.

<sup>53</sup>Anonymous (1893c).

<sup>54</sup>Anonymous (1893d).

<sup>55</sup>Anonymous (1893e).

<sup>56</sup>Anonymous (1894).

<sup>57</sup>Anonymous (1895).

<sup>58</sup>Tryon (1893b).

<sup>59</sup>Clements (1998).

<sup>60</sup>Anonymous (1893f).

re-joined the Society several times owing to rows with its officers'.<sup>61</sup>

After Tryon's report had been submitted, Mr McLean and Professor Shelton addressed 'a considerable gathering' of pineapple growers at Zillmere on 25 August 1893.<sup>62</sup> In Tryon's absence they presented his findings and conclusions that the disease was caused by a 'peculiar' fungus and that poor drainage was the prominent factor in the disease. It was the latter conclusion that caused the most debate. Mr Lee, the meeting chairman, pointed out that pineapples planted in well-drained (virgin) scrub soil also developed the disease, but others agreed with the poor drainage scenario. The meeting must have been lively because the newspaper article reported that it 'involved a more than ordinary energetic debate'.

In two long, detailed, anonymous (but most likely written by Tryon) articles entitled 'Scientific & useful—the pineapple disease' in the *Queenslander*,<sup>63</sup> information and opinions on the symptoms, cause and management of the new pineapple disease were provided. The articles reported that growers in the northern suburbs of Brisbane became alarmed about the severity of the disease in 1887, but one older grower was convinced that he had seen the disease at least ten years before.<sup>64</sup> Similar to his 1893 report, Tryon stated that the disease was caused by a fungus that attacked the roots of compromised plants and possessed 'simple' conidia 'composed of two rounded elements, each having a double contour'.<sup>65</sup> The northern pineapple-growing suburbs were described by Tryon as being an 'immense experiment station' where there was a variety of soils, drainage, growing history and practices that could reveal the true nature of the disease. He methodically discussed the various theories on the cause of the disease and dismissed the possible roles of manuring and a run-down in the 'vitality of planting stock'. He concluded that there was a very obvious connection between the presence of the disease and the condition of the soil and subsoil. Soils in which the water remained near the surface after heavy rain due to poor percolation or a sub-surface impervious layer favoured the disease.<sup>66</sup>

Others had their own ideas on the cause of the pineapple disease that did not involve a mysterious 'fungus'. Mr Soutter, the secretary and manager of the Queensland Acclimatisation Society wrote that he had been studying

the pineapple disease for almost four years and had concluded it arose from (i) selection of unsuitable land, (ii) an absence of drainage, (iii) the application of 'active ammoniacal' manures especially those containing sawdust, (iv) exhaustion of the soil by continued monoculture, (v) planting 'suckers' from worn-out crops, and (v) planting suckers too deeply.<sup>67</sup>

In a short article in the *Queensland Agricultural Journal*, C. F. Gerler (the Zion Hill missionary, pineapple grower and producer of the map depicted in Supplementary Map S2) pointed out that no one knew the cause of disease, blaming 'slipshod farming practices', especially around Brisbane as the root cause. He had three main gripes—the soils were not 'deep worked' and therefore did not drain well, the mixture of sawdust, manure and coal ashes (from the new-fangled Brisbane trams) used by pineapple growers were deleterious, and too much manure close to the roots was burning them. However, he did appreciate one of the key epidemiology factors that during dry weather the pineapple plants grew well, but when it became cold and wet the plants turned yellow and died.<sup>68</sup>

## Identification of the causal agent of the pineapple disease

It was not until 1929 that the causal agent of the pineapple disease in Queensland was confirmed after the Queensland plant pathologist J. H. Simmonds sent samples to the Commonwealth Mycological Institute in Kew, England, whose scientists identified the organism as the oomycete *Phytophthora cinnamomi*.<sup>69</sup> It had been described by the American agronomist and mycologist Robert Delafield Rands (1890–1970) in 1922 from samples of bark cankers on *Cinnamomum burmani* (Indonesian cinnamon) that had been collected from poorly-drained plantations in western Sumatra, Indonesia.<sup>70</sup> A disease with the same symptoms, later attributed to three species of *Phytophthora* including *Ph. cinnamomi* had been reported from Puerto Rico in 1905, Hawaii in 1910 and Jamaica in 1920.<sup>71</sup>

Rands described chlamydospores (asexual, thick-walled, resting spores) as occurring in the affected bark tissue that *in vitro* culture were globose-pyriform, mostly 31–50 µm in diam., and which developed terminally or on short branches.

<sup>61</sup>Simmonds (1986) pp. 3–4.

<sup>62</sup>Anonymous (1893g).

<sup>63</sup>Anonymous (1893a, 1893h).

<sup>64</sup>Anonymous (1893h).

<sup>65</sup>Anonymous (1893h).

<sup>66</sup>Anonymous (1893h).

<sup>67</sup>Soutter (1893) p. 4.

<sup>68</sup>Gerler (1898).

<sup>69</sup>Simmonds (1929) pp. 398–399.

<sup>70</sup>Rands (1922).

<sup>71</sup>Johnson (1935) p. 161.



He also described sporangia and zoospores (asexual spores which are responsible for infection) that developed after flooding colonies growing on agar plates with three changes of water, and noted that the disease was worse in poorly-drained situations.<sup>72</sup>

Tryon's description of the symptoms caused by *P. cinnamomi* on roots and plants of pineapple are so accurate that no further information needs to be included here. Heart rot and root rot of pineapple are favoured by soil with impaired drainage, long periods of heavy rain in autumn and winter and temperatures between 19 and 25°C. *Phytophthora cinnamomi* survives in soil as chlamydospores that either germinate directly by germ tubes or by production of sporangia that release zoospores, both of which infect roots. The disease green fruit rot of pineapple, also caused by *P. cinnamomi*, is characterised by a water-soaked, dark rot of fruit that come into contact with *Phytophthora*-infested soil.<sup>73</sup>

Although there are only five specimens of *P. cinnamomi* on pineapple in the Australian Plant Pest Database (in New South Wales and Queensland, all collected after 1951), the diseases caused by *P. cinnamomi* are considered to be the most serious diseases of pineapple in Queensland. An integrated management approach is necessary to minimise losses and consists of—(i) avoiding deep planting, (ii) ensuring that soil does not enter the 'hearts' during planting, (iii) using various methods to improve the drainage of soil, and (iv) using systemic fungicides before and after planting. *Phytophthora cinnamomi* is not considered to be indigenous to Australia, and it is not known when or how it was transported to the Australian continent. The oomycete has become a significant pathogen of Australian native plants in natural ecosystems, resulting in significant losses of biodiversity in some locations.<sup>74</sup>

## Edward Shelton and the first agricultural college in Queensland

Henry Tryon is not the only person in this story whose relationships with others could be held in question. Professor Edward Mason Shelton, previously the director of the Kansas Agricultural College (USA), was appointed as Queensland's first agricultural instructor in September 1889 after a request from the Queensland government to the USA government. He did not take up his position until the following year after arriving in Brisbane in *Aramac* on

13 February 1890.<sup>75</sup> Shelton was born in England in 1846, migrated to the USA with his family eight years later and was appointed professor at the Kansas State Agricultural College in 1874. In an interview on his arrival in Australia he stated that he liked to be thought of as a practical farmer first (like his father) and a scientific person second, and that he wished to establish an agricultural training college in Queensland, similar to those in the USA.<sup>76</sup>

Almost immediately after arriving in Queensland, he travelled by coach and buggy to far-flung parts of Queensland from 8 March until 25 May, visiting farms, gathering information on the state of agriculture and holding numerous meetings with growers where he gave his thoughts on the agricultural practices, suggestions for improvements and the need for a training college.<sup>77</sup> The newspaper reports of these meetings suggests that his opinions were well received and appreciated by farmers.

The idea of an agricultural college had been first suggested in the Queensland parliament in 1874 and again in 1886, but the financial depression of the early 1890s delayed its construction. In 1896, 1692 ac (~685 ha) of timbered, but fertile land was purchased at Lawes near Gatton, bordering the train line from Brisbane.<sup>78</sup> Shelton was appointed as the first principal of the college and oversaw most of the construction of buildings and roads during the early half of 1897. The college began operation on 1 July 1897 with 24 students, who included the sons of the Honourable Robert Philp (1851–1922), Acting Treasurer of the government, and of George Jackson (1856–1938) MLA and vice-president of the Australian Labour Party. The college was officially opened by the governor Lord Lamington (Charles Wallace Alexander Napier Cochrane Baillie, 1860–1940) on 9 July 1897, who had arrived by train from Brisbane with other 'distinguished' guests, including Henry Tryon.<sup>79</sup>

In the 1897 progress report for the college Shelton wrote that he was impressed with the zeal and ardour of the students who spent half the week in lectures and the remainder in labouring at the college, including road making, stumping, erecting buildings, gardening, cattle work and favourite of all, ploughing. He considered that 'no students could have a more enjoyable and instructive, if somewhat labourious life'.<sup>80</sup> At the start of the new term in early 1898 there were 54 students at the college and many more on a waiting list.<sup>81</sup> However, the outwardly harmonious life of the college (as reported by Shelton) was not to last. In May

<sup>72</sup>Rands (1922).

<sup>73</sup>Pegg and Anderson (2009) pp. 212–213.

<sup>74</sup>Burgess and others (2021).

<sup>75</sup>Anonymous (1890a).

<sup>76</sup>Anonymous (1890b).

<sup>77</sup>Anonymous (1890b).

<sup>78</sup>Anonymous (2000).

<sup>79</sup>Anonymous (1897a).

<sup>80</sup>Anonymous (1897b).

<sup>81</sup>Anonymous (1898a).



of 1898 newspaper articles about a serious disturbance at the college started to appear.

One newspaper reported that at the end of (term) proceedings, stones had been thrown by some students and one had hit Shelton on the side of the head. Later, students had damaged buildings at the nearby railway station and written profane and insulting 'insertions' on their walls. As a result, one student was expelled, another suspended for twelve months and five told not to return to the college.<sup>82</sup> At a subsequent assembly many students asked Shelton to remit the sentences but he refused, with one student calling out: 'You'll hear from this through the minister'.<sup>83</sup>

Most of the student population (37 students) signed a petition outlining their grievances against Shelton that was sent to the under secretary of the department in late May. These accusations included that (i) the amount of (labouring) work was excessive, (ii) the student's compulsory study time (7–9.30 pm) was conducted in hot, unventilated rooms, (iii) the Principal frowned on sports and 'innocent' pastimes, and (iv) he did not allow the College's wagonette to be used by the students on occasions.<sup>84</sup> Ten of the older students and all of the teachers were taken to Brisbane where they were interviewed by the under secretary and a report was prepared. Shelton was not interviewed and according to him was not given a copy of the report at that time.

In the following month Shelton was asked to resign by Minister for Agriculture James Vincent Chataway (1852–1901) without apparently having the opportunity to read the report and defend the accusations that had been brought against him.<sup>85</sup> Most of the newspaper articles at that time were on the Shelton's side, but one reported that although that the professor was an excellent agriculturalist, as principal of a college he had been a costly mistake, the boys (students) disliked him, and there was no love lost between him and the masters (teachers).<sup>86</sup>

Shelton kept quiet until late July, when he decided to explain his side of the story to the general public. He outlined the student's disturbances in early May and answered each of the student's complaints with clarity. He suggested that some of their complaints may have been influenced by the fact that over 40% of them were from Brisbane and other

towns where they were used to numerous holidays and distractions and who resented hard work.<sup>87</sup> Shelton finished the article by writing that 'for years it (the college) has been my hope, latterly my pride and joy' and that he parted the college with many regrets.<sup>88</sup>

The state of affairs had brought some lively debate in the Queensland parliament. In late June, Andrew Joseph Thynne (1847–1927), who had been the previous Minister for Agriculture, expressed regret at the loss of Professor Shelton and at certain changes that had recently occurred in the department. He also stated that too much had been made of the trouble at the college and that he was in the dark about the charges that had been brought against Shelton.<sup>89</sup> In the parliamentary sitting on 11 August, the current Minister for Agriculture, Mr Chataway, had his opportunity to criticize into Shelton. He stated that Professor Shelton had been asked to resign because he did not have the confidence of teachers and students at the college and farmers throughout the state, he possessed only a theoretical knowledge of farming and that he did not give the colony value for money for the £ 750 per annum salary when he was employed as an Instructor and the principal of the college.<sup>90</sup>

Previously, Chataway had been on good terms with Shelton and had kept him aware of the issues during his inquiry. At that sitting he refused to table the report to parliament because some of the statements of the students and teachers in the report might affect the reputations of some of the students.<sup>91</sup> Perhaps one or more of these students were the sons of prominent people in Queensland society, including politicians. Within a few months the report was released to parliament and excerpts were reported in the press.

The *Brisbane Courier* of 25 July 1898 reported that Shelton, his wife and a daughter were travelling from Brisbane to Sydney on 27 July to board the *Moana* that was departing for San Francisco five days later. Shelton told the reporter that he was leaving for five or six months and that he and his family were intending to return and make Queensland their permanent home.<sup>92</sup> Upon returning to Brisbane in late December 1898 or early January 1899,<sup>93</sup> he formed a partnership with a Mr Brown, exporting butter to London,<sup>94</sup> selling shares in companies,<sup>95</sup> acting as agents for the sale of farming properties<sup>96</sup> and selling imported

<sup>82</sup>Anonymous (1898b).

<sup>83</sup>Shelton (1898a).

<sup>84</sup>Shelton (1898a). Anonymous (1898c).

<sup>85</sup>Shelton (1898a).

<sup>86</sup>Anonymous (1898d).

<sup>87</sup>Shelton (1898a).

<sup>88</sup>Shelton (1898a).

<sup>89</sup>Anonymous (1898e).

<sup>90</sup>Anonymous (1898f).

<sup>91</sup>Anonymous (1898f).

<sup>92</sup>Anonymous (1898g).

<sup>93</sup>Anonymous (1899a).

<sup>94</sup>Anonymous (1899b).

<sup>95</sup>Anonymous (1899c).

<sup>96</sup>Anonymous (1899d).

farm machinery.<sup>97</sup> This partnership must have lasted for a period of time after Shelton and his family departed from Queensland on 23 June 1899, bound for Seattle, USA.<sup>98</sup>

The available evidence suggests that he never visited Australia again. In early April 1900, Shelton wrote that he had settled in Seattle, Washington.<sup>99</sup> A report of a private letter revealed that Shelton had become a mining broker, president of the Provident, Security and Trust Company and fiscal agent for the Montezuma Mining Company in Seattle,<sup>100</sup> where he died in 1928.<sup>101</sup>

After he departed, the evidence suggests that Shelton may have exaggerated his accusations of poor treatment from the government. An article in the *Brisbane Courier* of 31 August 1898 contains reproductions of documents relating to the disturbance at the college, namely, (i) the petition from thirty seven students detailing their grievances, with a note—‘The principal of the college for report 20 May 1898’, (ii) a document entitled ‘Professor Shelton’s reply’ dated 23 May 1898, in which Shelton replies to the specific grievances of the students, (iii) a letter written to the under secretary of the department by Shelton on 24 May in which actions against five students (those not to be readmitted to the college) are outlined, (iv) a report on the disturbance and actions taken against two students written by Shelton on 26 May, and (v) reports written in early June on the inspection of the dairy herd at the college.<sup>102</sup>

## Conclusions

There is no doubt that Edward Shelton and later Henry Tryon quickly realised that the pineapple disease that suddenly appeared in southern Queensland in the late 1880s was caused by a biotic agent, probably a ‘fungus’. Four decades later the pineapple pathogen was identified as the oomycete *Phytophthora cinnamomi*. The genus *Phytophthora* was described by Heinrich Anton deBary in 1876, based on the morphology of the pathogen which had devastated potato crops (the disease late blight, brown rot, or Irish blight caused by the oomycete *Ph. infestans*) in Europe a few decades before. For almost a century after the genus *Phytophthora* was described it was believed to belong in the ‘Lower Fungi’, but members of the genus are more closely related to brown algae and diatoms than true fungi.

Interestingly, Henry Tryon discovered *Ph. infestans* in potato tubers from farms in south-eastern Queensland in 1909, and was familiar with the morphology of its asexual morph (sporangiophores bearing sporangia, in which zoospores develop). Although both *Ph. infestans* and *Ph.*

*cinnamomi* produce their asexual morphs in abundance under conducive conditions, Tryon did not realise in hindsight that the ‘fungus’ that he had found in diseased pineapple tissue in the late 1880s was a species of *Phytophthora*.

Another common thread between Shelton and Tryon is that they both experienced some personal difficulties during their employment, which had significant influences on their later lives. In the case of Tryon, the ruckus at the Queensland Museum ultimately resulted in his being appointed Queensland’s first Government Entomologist and later Vegetable Pathologist. He laid the foundation for both disciplines in Queensland. On the other hand, Shelton’s demise and loss of tenure as the director of the Gatton Agricultural College deprived Queensland of a passionate and competent agricultural educator.

## Supplementary material

Supplementary material is available [online](#).

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**Data availability.** Not applicable.

**Conflicts of interest.** The author declares no conflicts of interest.

**Declaration of funding.** This research and the preparation of this paper did not receive any funding.

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