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DANES DOWNUNDER:AN EXPLORATION OF SOME DANISH CONTRIBUTIONS TO THE BREWING INDUSTRY IN AUSTRALIA AND NEW ZEALAND

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Beer in Australia in the nineteenth century was made principally by brewers who had come from the United Kingdom, either directly or by way of some other British colony. This is not surprising given Australia's British colonial origins, and the global significance of the brewing industry in the mother country. It was estimated in the 1890s that England alone possessed nearly 13,000 breweries (about one quarter of the world's total of 51,000) and produced 2,600 megalitres of beer per year (an amount at the time exceeded only by Germany and the United States of America). The English consumed beer at a rate (143 litres per capita) surpassed only by the people of Belgium (169 litres per capita) and of some German states (such as Bavaria, >252 litres per capita, and Württemberg, 195 litres per capita).[1]

A visiting brewery engineer remarked in 1900 that brewing in the Australian colonies had long been guided by British practice, and that it remained difficult to introduce new ideas and methods.[2] Nevertheless, Continental beer styles and brewing methods did gradually displace those of the colonising British throughout Australia. It is not surprising that German brewers were largely responsible for this transition. In the 1890s, Germany possessed about 26,000 (slightly more than half) of the world's breweries, produced 4,750 megalitres of beer per year, and its people were among the greatest consumers of beer on a per capita basis.[3]

Other European countries also contributed significantly to the evolution and development of the Australian brewing industry in the late nineteenth and the twentieth centuries. One of these was Denmark, despite its tiny population (compared to many European countries, especially neighbouring Germany), and its consequently small beer output. Denmark, however, had a long cultural association with beer, and became one of the top beer-consuming nations of the world on a per capita basis (nearly 100 litres at the end of the nineteenth century).[4] Moreover, important technical and scientific advances in brewing occurred in Denmark from the late nineteenth century, giving the Danish brewing industry an international significance disproportionate to its size. Of particular relevance were the Copenhagen laboratories of Emil Christian Hansen and Alfred Jorgensen and their advances in yeast propagation.

It would be a difficult task to compile a complete list of Danes with Australasian brewing connections, let alone to trace their brewing careers. For the most part the Danish connections described herein were discovered during research undertaken for other purposes. Nevertheless, the following account covers what I believe to be the most significant Danish contributions to the brewing industry in Australia and New Zealand over the period of time from the mid-nineteenth century to the mid-twentieth century.

The Cohn brothers

The three brothers Moritz Cohn (1822–1878), Julius Cohn (1828–1877) and Jacob Cohn (1830–1911), all born at Horsens in Denmark, landed in Victoria together in August 1853, and promptly made their way to the gold diggings at Sandhurst, later known as Bendigo, about one hundred miles north of Melbourne. After first opening a general store, then the Criterion Hotel, then starting a factory for the manufacture of cider, cordial and malt vinegar, they established the Victoria Brewery in 1858.

The Victoria Brewery operated on a gravitation system, the liquor falling 'without any aid' through the various processes, from boiling and mashing to the gyles and ultimately to cellar storage.[5] It was established and operated as a partnership by the three brothers, Moritz, Julius and Jacob Cohn.

According to a Cohn family history, Moritz Cohn went to Melbourne when the brewery at Bendigo was being built, and underwent some instruction in the technicalities of brewing. He reputedly did so at Albert Terry's West End Brewery, but that is not possible as that brewery did not

exist until the 1870s.[6] There were, however, other breweries in Melbourne in the late 1850s, including the Victoria Brewery at Prahran, where one of the partners was Albert Terry, later of the West End Brewery. Cohn may have been taught by Terry, but if so it was at Prahran, not at the West End Brewery.

In 1861, Moritz went to Talbot, about 50 miles south-west of Bendigo, and established a second but smaller brewery for the partnership. In 1863 he quit the partnership, and took on the sole ownership of the brewery at Talbot, while Julius and Jacob carried on as joint owners at Bendigo.[7]

Late in 1871, the partnership between Jacob and Julius Cohn at Bendigo was dissolved, and Julius went to live in Melbourne.[8] He returned to Bendigo about a year later, commencing business there early in 1873 on his own account as a wine and spirit merchant.[9] Two years later he was arranging to open a brewery in the Murray River town of Echuca, but the scheme failed, leading to his insolvency in mid-1875.[10] In 1877 at Bendigo he went into the business of bottling beer that he obtained in bulk from his brothers' Victoria Brewery. Julius died at Bendigo in July 1877, aged 47 years.

As a consequence of the departure of Julius in 1871, Moritz Cohn returned to Bendigo, placing his brewery at Talbot under the management of a Dane named George Jacobsen.[11] He again became a partner with Jacob in the Bendigo business, while Jacob became a partner in the business at Talbot.[12]

In February 1873, Jacob Cohn convened a public meeting in Bendigo to consider what steps might be taken to assist sufferers from storms and floods along the eastern coast of Denmark in the previous November. Nearly thirty gentlemen were in attendance, most of them Danish born. Jacob was voted to the chair, Moritz was appointed secretary, and a committee was formed, with Jacob as treasurer, to collect subscriptions. By mid-year the Danes of Bendigo, liberally supported by their English and German friends, were able to submit to the central relief committee in Copenhagen a sum of £250.[13]

Moritz Cohn died in January 1878 at the young age of 55 years, after which the brewing business at Bendigo was continued by Jacob in partnership with Röschen Cohn, Moritz's widow. Two years after his father's death, Julius Cohn, the eldest son of Moritz and Röschen, and nephew of Jacob, was sent to Europe for a brewing education. He studied at Schneider's 'brauakademie' at Worms, near Frankfurt, and particularly received training in the brewing of lager beer, and afterwards went to a brewery in Frankfurt where he obtained some practical experience. He had left Victoria in March 1881 and returned in May 1882. Prior to going to Europe, Julius Cohn had been a student at the Bendigo School of Mines and Industry, where he won a prize for practical chemistry at the end of 1880.[14]

A few years after the death of Moritz, a dispute arose between his many children, on the one hand, and the partnership between Jacob and Röschen on the other. The matter was settled in the Supreme Court in June 1882, the outcome being that the business would be wound up and offered for sale, with the proviso that Jacob could bid for it.[15] He did so, and with the help of a mortgage from Röschen, became the sole owner of the business.

According to the family history, upon his return from Europe Julius persuaded his uncle to begin making lager beer.[16] He soon succeeded, as in December 1882 Jacob Cohn applied to register a trademark for the design of a label to be applied to bottled Cohn Brothers 'lager beer'.[17] Lager beer made under the direction of Julius Cohn was among the exhibits at the Bendigo Agricultural and Horticultural Society's Spring Show in October 1883. Jacob Cohn had erected a separate building for the purpose, specially constructed and insulated with a view to attaining the low temperatures required during fermentation and storage.[18] He subsequently built an ice factory to supply the ice required for cooling the new fermenting chamber and lager room.[19]

The purpose-built building in which the lager beer operations took place was on two levels. On the upper level was a storage compartment for blocks of ice, and six fermenting vessels, each with a capacity of 15 hogsheads. Below was the lager beer cellar, kept cool by the downward drainage of cold air from the ice stored above, and in which there were 30 oak casks, each with a capacity of 10 hogsheads. The lager was kept in the cool, dry cellar for several weeks before being forced by means of compressed air to the separate bottling department. Lager brewing took place only during the colder months of the year, generally from April to October. The production of colonial ale, however, in the separate original brewery with its 20-hogshead plant, could be kept going the whole year round.[20]

Various measures were taken to achieve and maintain the low temperatures required for the production of lager beer. The building comprised a timber compartment with double walls, the space between which was packed with sawdust; a surrounding layer of thatched straw; and an outer shell of corrugated iron, with a distance of two feet between it and the straw walls and roof of the second building. In addition to the cooling effect of the large mass of ice stored on the upper floor, floaters containing ice were placed in the fermenting vats.[21]

It is often stated that Jacob Cohn's new lager brewery was the first in the Australian colonies.[22] This is not strictly true, as several colonial breweries had produced lager beers before. It was observed of Cohn's, however, that none of the others had 'so genuine a stamp'. 'There appears to be little doubt that Mr Cohn had succeeded in brewing the genuine article', and he may have been the first to do that.[23]

In its edition of July 1885, *The Australian Brewers' Journal* reported on the establishment of a new lager beer brewery in Melbourne, stating 'that it is the first time that we are aware of that a brewery specially fitted up and devoted solely to the production of lager beer has been started in Australia.' The article elicited a swift response from the Cohn Brothers, who wrote that they had had their lager brewery 'erected for three years', during which time they had 'turned out a large quantity of lager beer, which has been pronounced by critics as being quite equal to the imported article'.[24]

The matter is further clarified by some observations about the lager beer sent by Cohn Brothers to the Colonial and Indian Exhibition in London in 1886. A South Australian report of that event stated that the Sandhurst beer had been 'brewed entirely upon the German principle, that is, by the decoction mash process and under-fermentation', and that the lager cellars were 'constructed on the German principle'.[25]

In April 1887 Jacob admitted his nephew, Julius (born 1862), and his eldest son, Magnus (born 1865), as partners in the firm, which continued to be known as Cohn Brothers.[26] Later in the same year the brewing and hotel business of Cohn Brothers was sold to a new limited liability company, The Cohn Brothers Victoria Brewery Company Limited, formed for the purpose and registered in November 1887. Both Jacob and Röschen Cohn became large shareholders in the company, and Jacob became its first managing director. Magnus became the manager of the business, and Julius was placed in charge of the brewing department under the company.[27]

One of the achievements of Julius Cohn, according to the *Australian Brewers' Journal*, was to establish a 'capital laboratory' at the Victoria Brewery for the 'examination and analysis of beers and brewing materials', but this may not be entirely correct.[28] Instead he seems to have made arrangements with the Bendigo School of Mines and Industries to use the laboratories there. In 1892 Julius Cohn was given permission by the School of Mines, of which Jacob Cohn was a committee member, to use the school's laboratories, upon payment of a fee, to conduct brewing analyses, and to teach 'analyses applicable to brewing' to one of his assistants.[29]

Jacob Cohn became the chairman of the company in 1896, and remained in that position until his death in 1911, at the age of 57 years. He toured Europe for several months in 1900, returning in December. While away he was awarded a medal and certificate by the Danish Government for services rendered as a young volunteer during the Schleswig-Holstein war in 1848–49.[30] Shortly after his return to Bendigo, Cohn was tendered a banquet by the Danish Association, a mark of the high esteem in which he was held by his countrymen.[31] In 1901 Cohn was awarded a knighthood by King Christian IX of Denmark. Since his arrival in Bendigo he was said to have 'identified himself with everything pertaining to the welfare of that city'. He was then president of the Art Gallery committee and vice-president of the Agricultural Society, and in the past had occupied the mayoral chair.[32]

In 1908 several breweries in Bendigo, Castlemaine and some other Victorian towns joined in the formation of the Northern District Brewers' Association, the main object of which was to regulate prices and the general conduct of the trade. Magnus Cohn, the son of Jacob, was the inaugural chairman of the association.[33] Upon the death of Jacob Cohn, Magnus became managing director of Cohn Brothers Victoria Brewery Company Limited, while Jacob's nephew, Julius, continued as head brewer. Julius died at Bendigo in December 1919, aged 57 years. His place in the company was taken by his son, Marc Cohn (born 1889), who had been trained at Bendigo, but who lately had been assistant brewer to Albert Lanfear at the Towers Brewery, Charters Towers, Queensland.

Magnus continued as managing director until 1925, when the company's brewery and hotel interests (but not its soft drink, cordial and wine and spirits arms) were sold to Carlton and United Breweries Limited of Melbourne, and brewing ceased at the Bendigo brewery. Magnus took a seat on the board of Carlton and United Breweries Limited as part of the sale agreement, retaining it until his death in Melbourne in 1939.

Ernst Ernstsen

Ernst Ernstsen[34] (c.1823–1908), another Dane, also arrived in Victoria in 1853, only a week after the Cohn brothers. He was married in Melbourne (at the then Roman Catholic Cathedral of St. Francis) in 1863, and his several children were born during the following decade at Dunolly, near Bendigo. There he had gold-mining interests, and ran the Criterion Hotel.

In the 1870s Ernstsen moved from Dunolly to Deniliquin, in New South Wales, and in 1878 he established a brewery

there, on the southern side of the Edward River. For more than ten years prior to the opening of Ernstsen's brewery, Elliott's Riverine Brewery had had the field to itself at Deniliquin. Ernstsen's brewery was situated roughly the same distance south-east of the commercial centre of the town as the Riverine Brewery was north-west of it.

Ernstsen died at Deniliquin in June 1908, at the reported age of 85 years. His remains were interred at Dunolly, where his death is recorded as a small footnote on a gravestone already crowded with the names of five of his children whom he outlived.[35] Ernstsen's brewery had closed several years before his death, probably in 1901, after which Elliott's again became the only beer manufactory at Deniliquin.

The Kofoed brothers

The three brothers Jens Christian Thorsen Kofoed (1831–1887), Johannes Thorsen Kofoed (1839–1901) and Jorgen Thorsen Kofoed (1843–1899), all born at Ronne on the Danish island of Bornholm, were active in the brewing business in both Victoria and New Zealand during much of the second half of the nineteenth century. Unlike the Cohn brothers, the Kofoed brothers mostly operated independently of each other, so, as far as is possible, they are treated individually below.

(i) The eldest brother, Jens Christian, stated in his application for naturalisation in 1863 that he had arrived in Victoria in 1852 from Boston, USA, in the ship *Queen of the Seas*. More probably he was the 'Yens Kofoed', second mate on the barque *Alfred* of Hamburg, which arrived in Melbourne in December 1853 and from which he deserted. Anyway, by 1859 Kofoed had established himself in business in Victoria as a brewer, on the gold diggings at Armstrongs, near Ararat. He advertised that year under the heading 'Fountain Head Brewery' that he could supply malt ale of two qualities to publicans, restaurant-keepers and 'inhabitants generally'.[36]

Jens Kofoed, who became known casually as John, continued to run the Fountain Head Brewery until his early death in May 1887, at the age of 55 years.[37] His widow, Isabella, then continued it for several more years, selling out in 1891 to Joseph William Block, a jeweller from Hamilton, Victoria.[38] Isabella's brewer, Charles Long, had resigned in mid-1891, possibly precipitating her retirement.[39]

Aside from being proprietor of the Fountain Head Brewery for nearly thirty years, Kofoed was a member of the Stawell Shire Council in the early 1870s, served as shire president in 1871, and was appointed as a magistrate at Armstrongs in 1871.

(ii) Johannes Thorsen Kofoed, younger brother of Jens, emigrated to New Zealand by way of Victoria in 1868. He was a passenger on the ship *Kent* from Gravesend in that year, arriving at Melbourne in June. He subsequently took over an existing brewery at Wetherstones, a gold-mining settlement near Dunedin in New Zealand, in partnership with Horace Bastings, formerly of Victoria. The pair operated as the Black Horse Brewery and were advertising their 'first class ales and porter' by the end of 1868.[40]

Early in 1869, being unable to meet the demand for their product, Bastings and Kofoed decided to build a second brewery at the same place. The new building was constructed of brick and stone, and was fitted with plant obtained from Melbourne. Brewing in it commenced in November 1869.[41]

There exists a record of a 'J. Kofoed' travelling from Melbourne to Otago in the steamship *Gothenberg* in 1871. Probably this was Johannes, and possibly he was returning to New Zealand after visiting his brother at Armstrongs, or visiting equipment suppliers in Melbourne.[42]

In 1872 Bastings and Kofoed resolved to erect their own malthouse, and announced to local farmers that they would purchase locally-grown barley 'in the coming season'.[43] Construction of the malthouse and store was commenced early in 1874, but its completion was delayed by a scarcity of both material and skilled labour, and by the dissolution of the partnership of Kofoed and Bastings.[44]

Bastings left the partnership in July 1874, selling his share to William Hayes, and the business was continued as Hayes and Kofoed.[45] The malt house was completed under the new partnership, and it could be said in October 1874 that Hayes and Kofoed were 'now supplying a splendid beer brewed from malt of their own manufacture'.[46]

In June 1879 Kofoed filed for bankruptcy, being unable to meet his obligations to his creditors. His interest in the Black Horse Brewery was sold to his partner, William Hayes, who thereupon became the sole owner of the business.[47] Not until February 1880 did the Supreme Court grant to Kofoed his discharge from bankruptcy.[48]

In the interim, in July 1879, Johannes Kofoed and his younger brother, Jorgen Kofoed, recently arrived in New Zealand, together acquired and resurrected an idle brewery at Milton, about twenty miles south-east of Wetherstones.[49] Their partnership allowed Johannes to continue in business despite being an undischarged bankrupt. This brewery, originally known as the Milton Brewery, was re-christened the Black Horse Brewery by the brothers. A convivial and well-

attended party was held at the brewery early in September to celebrate its revival.[50] The renaming of this brewery resulted in the simultaneous existence of two nearby breweries called Black Horse.

Several months after Johannes was granted his discharge, his partnership with Jorgen was dissolved.[51] A new partnership was simultaneously formed between Johannes Kofoed and Stephen Clive, who traded as Kofoed and Clive.[52] The input of capital from Clive enabled substantial improvements to be made to the brewery, including the installation of a new steam engine, mash tun, and refrigerator. The services of Jorgen Kofoed, previously a member of the partnership, were secured by the new firm of Kofoed and Clive as its brewer.[53]

The partnership between Kofoed and Clive was formally dissolved in February 1882, and Clive's share was purchased by Johannes Kofoed, who carried on the business on his own account.[54] He announced a year later that he had procured new plant to enable him to brew 'upon the celebrated Bavarian principle', which the local press believed would add to Kofoed's 'already great popularity as a brewer'.[55] It is not clear precisely what was meant in this case by 'Bavarian principle', but it may have meant all or most of the following: his beer was made with malt and hops only (no cane sugar was employed), using the decoction mash process and bottom fermentation at low temperature, followed by prolonged cold storage.[56] To regularise his supply of malt, in 1885 Kofoed leased an existing malthouse at Milton, and invited farmers to supply him with barley.[57]

Alfred Lawrence, who toured New Zealand in 1889 and reported on its breweries for the *Australian Brewers' Journal*, noted that J.T. Kofoed of Milton had a twelve-hogshead plant and one of Burt's refrigerators. He 'boils by direct fire'.[58]

In November 1889 Johannes Kofoed was prosecuted by the Collector of Customs for a breach of the Beer Duty Act. He was found guilty, but the court was lenient because the offence was considered to be a technical and not a fraudulent one.[59] In June 1891 he was again declared bankrupt.[60] At a meeting of his creditors held in that month, Kofoed stated that he had by then parted with his brewery, plant and stock, handing possession to his first mortgagee. He gave the reasons for his bankruptcy as heavy losses incurred in the business, largely through the bankruptcies of others, particularly hotelkeepers, over the previous four years. At one time he brewed up to 117 hogsheads a month, but the amount dwindled to about 20 hogsheads a month owing to his 'want of means to procure malt and other commodities in sufficient quantities'. He now had 'not a shilling in the world', so was not in a position to make any offer to his creditors.[61]

The court found of Kofoed during a discharge hearing in October 1891, that he had 'not been fraudulent', but had been 'exceedingly careless in the conduct of his business', and had been 'practically insolvent for some years past'. It therefore suspended the order of discharge for twelve months.[62] He was eventually released from bankruptcy in February 1893.[63]

Meanwhile, Johannes Kofoed was involved in the resurrection of his Black Horse Brewery at Milton. There was talk in September 1891 of it being reopened under his management, after the machinery had been 'thoroughly overhauled' and 'everything put in first class order'.[64] In October 1892, despite the excellence of the local water and Kofoed's brewing skill, the Black Horse Brewery was reported to be 'under a cloud' for financial reasons; it was 'only waiting for a touch from the magic wand of capital to develop into a very lucrative local industry'.[65] It continued in operation, but perhaps intermittently, and certainly not to its full potential.

The desired injection of capital came late in 1893 when the brewery was leased by Hills and Scudamore, who intended to 'push' the business.[66] It could soon be said that 'the business done has been greatly increased' by the new proprietors.[67] It is supposed that Johannes left Milton when the brewery changed hands.

Johannes Kofoed's final brewing berth was at Invercargill, where in June 1899, in partnership with James Albert Curtis, he restarted the business formerly carried on by John Tice Martin as the Black Eagle Brewery.[68] The event seems to have escaped the notice of the New Zealand newspapers, although it was vaguely reported in August 1899 that Kofoed had been seen recently at Invercargill, where he was 'engaged in brewing business'.[69] The business eventually failed, and bankruptcy proceedings concerning Curtis reveal the following details. Curtis had supplied all the capital for the business. He had no prior experience in the brewing trade, and Kofoed provided the brewing expertise. Their partnership was dissolved in November 1899, after which Curtis struggled on for some months with a new brewer.[70]

Johannes Kofoed died about two years later. It was reported very early in 1902 that Kofoed, 'at one time a brewer at Wetherstones and Milton', had died 'a few months ago on the West Coast', and that his body had been taken to Milton for burial.[71] He was about 62 years of age.

(iii) Jorgen Thorsen Kofoed, the youngest of the three brothers, was briefly in partnership with Johannes at the Black Horse Brewery at Milton in 1879 and 1880. After the dissolution of that partnership in 1880, Jorgen seems to have remained at the Black Horse Brewery for several years as a

brewer in the employ of his brother. Records of the annual agricultural and pastoral shows at Tapanui, near Milton, reveal that 'Kofoed Bros' donated a cask of XXXX ale as a prize for the best buggy pair in each of the years 1884, 1885, 1887 and probably 1888.[72]

After the years when he was a partner then an employee of his brother at the Milton brewery, Jorgen Kofoed was otherwise involved in the brewing industry, both in New Zealand and in Australia. He went to Europe in the late 1880s, returning early in 1892 (he was a passenger from London on the steamer *Ionic*, departing in November 1891 and arriving in Wellington in February 1892). He spent some of this time in Denmark; on the date of the Danish census in February 1890 he was visiting his sister and her family in Aarhus.

For the next few years, Jorgen was a resident of Dunedin, where he was in business as the agent and patentee in the colonies for two Danish inventions, the 'Vacuum' syphon filling machine and the 'Triumph' corking machine, manufactured by Anders Andersen Pindstofte of Copenhagen. In respect of these, Kofoed was the applicant for patents for 'an improved machine for corking bottles' in 1892 and 'an improved machine for bottling liquids' in 1893.[73] A public demonstration of the operation of these machines was given by Kofoed at McGavin's brewery at Water of Leith, near Dunedin, in December 1892.[74] In addition to being an equipment supplier, it seems that Kofoed was also associated with the bottling department of one of the Dunedin breweries (perhaps McGavin's Union Brewery or Speight's City Brewery), but this has not been confirmed.

Jorgen Kofoed went to Melbourne in 1895 to establish a new base from which to market the corking and filling machines. Later that year he went to Western Australia to bring his machinery to the notice of the bottlers in that colony, where new breweries were springing up with great frequency on account of the recent gold discoveries. His return to Melbourne, after disposing of some of the machines to brewers, was noted by the *Australian Brewers' Journal* in February 1896. He was still a resident of Melbourne in 1897 when he became a subscriber to the journal, and later that year he went again to Western Australia. He died at Fremantle, Western Australia, in June 1899 at the age of 55 years.[75]

One of the executors of Kofoed's estate was Charles Edward Keast of Melbourne, formerly a brewery proprietor in Dunedin. He was the father of Charles Edward Keast jun., who from late 1894 in partnership with Richard Powley operated the bottling stores of Speight's City Brewery in Dunedin. In 1900, Alfred Lawrence and Co., publisher of the *Australian Brewers' Journal*, arranged with Kofoed's trustees to execute orders for 'Triumph' corking machines and 'Vacuum' syphon filling machines, and subsequently bought from them the patent rights for the whole of Australia for these Danish machines.[76]

Auguste Joseph Francois de Bavay

A Belgian, not a Dane, Auguste Joseph Francois de Bavay (1856–1944) came to Melbourne early in 1884 to take the position of brewer at Aitken's Victoria Parade Brewery. This establishment had passed to the brothers Archibald and Thomas Aitken upon the death in January 1884 of Thomas Aitkin, their father and the brewery's founder. De Bavay stayed in Australia for the rest of his life, becoming a prominent Melbourne brewer and brewing consultant, and the country's foremost expert on yeasts, and achieving considerable success and distinction in the fields of bacteriology and industrial chemistry, about which much could be written. This is not the place, however, for a detailed biography of the Belgian native. His relevance here is largely as a conduit between the seminal work of the Danish scientist Emil Christian Hansen (1842–1909) and the Australian brewing industry.[77]

De Bavay came to Victoria from Ceylon, where he had gone in the late 1870s. When submitting a donation to the Empire War Fund in 1900, be Bavay said that he had been 'the better part of his life (23 years) amongst English people', so since about 1877.[78] There is some confusion about what de Bavay was doing in Ceylon. The historian George Parsons said that he was managing a plantation, whereas a visiting Indian brewer told the *Australian Brewers' Journal* in 1897 that he knew de Bavay 'formerly in connection with a Ceylon brewery—namely that at Nuralia [Nurawa Eliya]'.[79] The latter, at least, is correct, but that is another story.

The partnership between Archibald and Thomas Aitken in the Victoria Parade Brewery was dissolved in April 1885, Archibald buying his brother's half share and continuing the business alone.[80] He subsequently entered into a new partnership with James Nation, a wealthy building contractor whose son, Alfred, was married to Archibald's daughter, Mary. The partnership between Aitken and Nation was dissolved in August 1887, Aitken retiring.[81] Aitken's departure was marked by a dinner in the brewery at which a presentation was made to him by the brewer, de Bavay.[82]

The brewery was continued by James and Alfred Nation, who traded as Nation and Co. They soon sold out to a syndicate, which formed a new company, the Victoria Brewing, Malting and Distilling Co. Limited, to acquire the brewery. The company was floated in March 1888. Alfred Nation was to act as managing director of the company for ten years,



Figure 1: Portrait of Auguste de Bavay, 1888. Source: State Library of Victoria, from an album of security identity portraits of members of the Victorian Court at the Centennial International Exhibition, Melbourne.

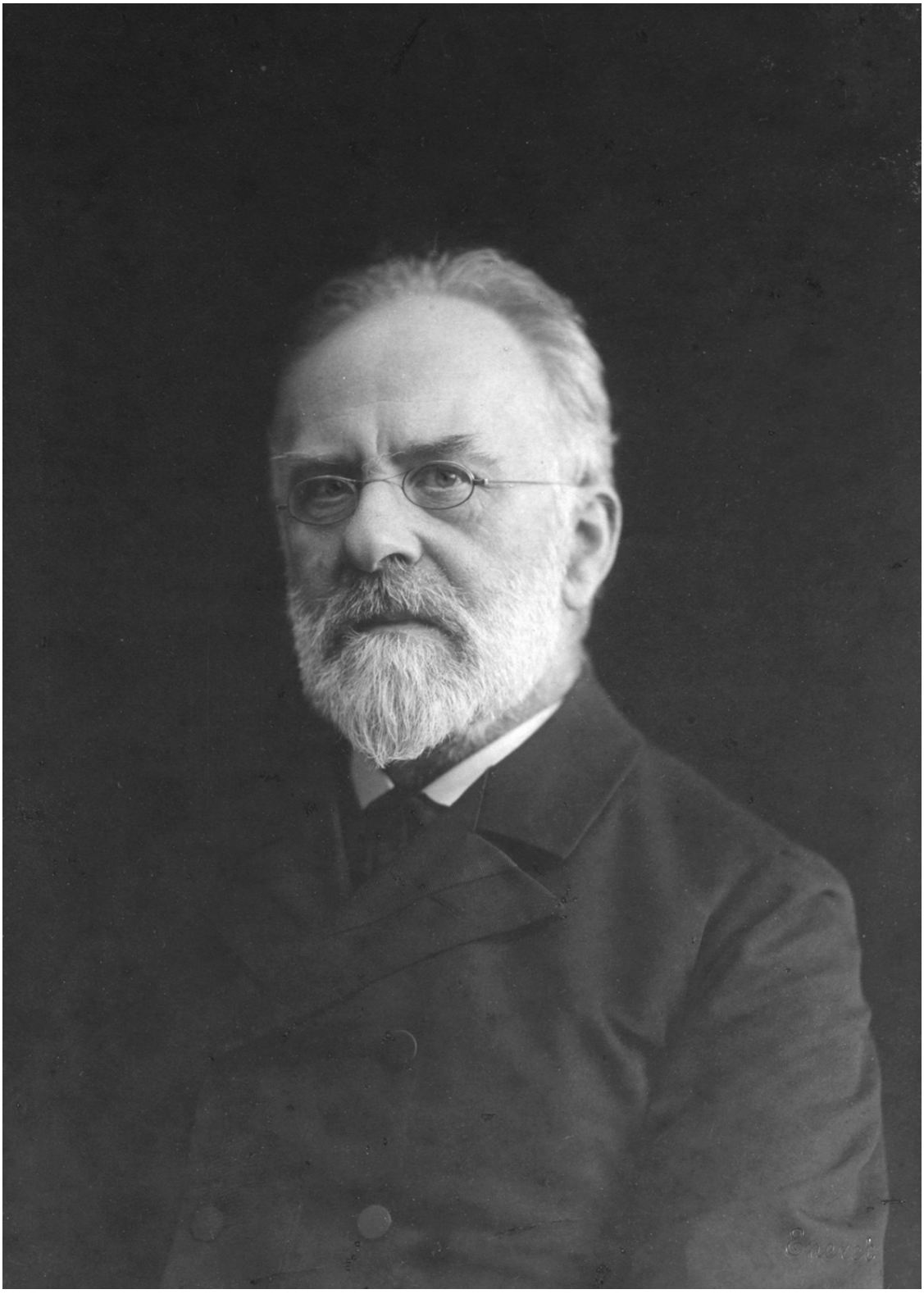


Figure 2: Portrait of Emil Christian Hansen, 1902, by Frederik Riise, Copenhagen. Source: Botanical Garden Library, University of Padua, Italy

and de Bavay would be retained as brewer for a similar period.[83]

The Victoria Brewing, Malting and Distilling Co. Limited became financially embarrassed in 1892 and was wound up voluntarily.[84] Early in 1893 the brewery was purchased from the company's liquidator by a firm in which James Nation was a partner.[85] In 1894 it was resold to the Melbourne Brewery and Distillery Company Limited, newly formed in England.[86] Through all of these changes of ownership except for the last, de Bavay remained as head brewer. He terminated his connection with the brewery early in 1894, after which Thomas Nation, a son of Alfred and one of de Bavay's pupils, superintended the brewing operations.[87]

Early during his ten years (1884 to 1894) at the Victoria Parade Brewery, de Bavay became aware of the work of Hansen of the Carlsberg Laboratory in Copenhagen in isolating pure yeast cultures. Adopting Hansen's methods, he developed pure cultures that became commercially important in Australian brewing. He also discovered an Australian wild yeast, which was dubbed *Saccharomyces de Bavii* in his honour.[88] It was reported in 1886 that he had perfected and patented a process for preserving yeast.[89] Also during those years, de Bavay was an occasional contributor to the *Australian Brewers' Journal* (see Appendix).

On the question of pure yeast cultivation, the *Australian Brewers' Journal* wrote in May 1888 that the teachings of Pasteur, Hansen, Koch, and other scientists who had investigated chemical and biological phenomena in connection with brewing 'were at length bearing practical fruit at this end of the world'. De Bavay of the Victoria Parade Brewery, Melbourne, and C.W.M. Chateau of Terry's West End Brewery, also in Melbourne, had both 'for some time past' been practising the cultivation of pure yeast for brewing purposes, and pitching their worts in the brewery with the pure yeast. Both stated that the beers fermented with the pure yeast kept for a much longer time than those fermented with ordinary commercial yeast, which was 'always impure'.[90]

The *Journal*, which had 'persistently advocated the adoption of scientific teachings' in Australasian breweries, looked forward to the day when a new 'Carlsberg Brewery' could be seen in operation in 'Rule of Thumb' Australia, which hitherto had been the 'happy hunting ground of the quack brewer and the man who brewed after the time-honoured [recipe] of his grandmother'.[91]

In an article on the same topic in July 1888, de Bavay explained that after learning of Hansen's views on pure yeast he 'repeated one by one his experiments'. He was at the time of writing the article occupied in 'trying three different pure species of yeast by themselves in the hope of getting better results by employing one species alone', tedious work as about one month was needed to test each variety. He had also succeeded in isolating one variety of yeast, much smaller than that ordinarily seen, and which was 'the cause of a great deal of mischief' in Australian breweries.[92]

Also in 1888, pure yeast of the Burton variety was sent to de Bavay by Hansen, and by late that year it was said to be 'in constant use in brewing', and to be yielding 'the most splendid beers–clean, stable, and well-flavoured'.[93] Early in 1890 de Bavay began offering for sale to other brewers 'absolutely pure yeast' for £10 per pitching.[94]

When de Bavay terminated his connection with the Victoria Parade Brewery early in 1894, he threw in his lot instead with the Foster Lager Brewing Company Limited, a private company formed in November 1889 to take over a failed lager beer brewery, established in Melbourne about two years previously by the American brothers William and Ralph Foster. The company decided in 1894 to extend its trade into New South Wales by establishing a lager brewery in the neighbouring colony, so it sent de Bavay to Europe to arrange for a complete lager brewing plant to be shipped to Sydney. De Bavay also intended during his travels to interview leading brewing scientists in England and on the Continent.[95]

While de Bavay was abroad, the company abandoned its intention of starting a brewery in Sydney, and recalled him to Melbourne. He brought back a new brewer for Fosters, to replace Josef Peska, who had been the company's chief brewer for the previous four years and who was about to return to Austria. Peska initially had been selected for the job by Hansen, in Copenhagen. He had reportedly been a pupil under Professor Thausing in Austria, and had worked at Jorgensen's laboratory in Copenhagen.[96]

Upon his return to Melbourne in September 1894, de Bavay took on the management of the Foster Lager Brewing Company Limited.[97] He had had an earlier close association with the company while working at the Victoria Parade Brewery, a fact that caused some concern in the ranks of the latter company. At its meeting in June 1891, it was reported that orders had been shortening, which was accounted for by the Foster Lager Brewing Company 'cutting them out of their bottling trade'. The younger company was 'really getting the benefit of the experience of the Victoria Brewing Company', including 'many valuable hints' from its brewer, de Bavay.[98] These cryptic remarks gain some meaning from the later observation that it had been Montague Cohen's 'friendship and intimacy' with de Bavay that had induced the lawyer, with others, to revive the Foster Brewery in 1889, and to embark upon the production of lager beer on a large scale.[99]

De Bavay reportedly was also a shareholder in the Foster Lager Brewing Company Limited.[100]

By 1893 it was widely accepted that the use of pure yeast cultures was highly advantageous in lager breweries, but the applicability of Hansen's methods to top fermentation beers was still being 'warmly debated', especially among conservative English brewers. In December 1893, the *Australian Brewers' Journal* published an article on the subject by Alfred Jorgensen, who had written it for the International Brewers' Congress in Chicago (see Appendix). He argued that 'Hansen's system possesses exactly the same value for top fermentation as for bottom fermentation'.[101]

Jorgensen read a paper at the Institute of Brewing, London, in May 1894 on the application of Hansen's system of pure yeast cultivation in English top fermentation. He supplied reprints of his paper to the *Australian Brewers' Journal*, which offered to forward copies to its readers upon request.[102] It subsequently published a contributed article from an anonymous English brewer who admitted to having been a great sceptic as to the suitability of pure yeast in top fermentation breweries, but to having through experience seen the error of his ways.[103]

Carlo Waldemar Muller Chateau

Carlo Waldemar Muller Chateau (c.1858–1921), born in Paris but raised in Copenhagen, Denmark, considered himself to be Danish, not French. He trained in Copenhagen as an analytical chemist, and became a brewer at the Carlsberg Brewery. He came to Australia in 1886, settling in Victoria where he was married in 1888.[104] Very little is known of his early life and career. Indeed, at the time of his marriage, although he nominated Paris as his place of birth for the register, he was not able to give the names of his own parents. Many years later he described his nationality as Australian and his 'race' as Danish.

At the time of his marriage, Chateau was working as an analyst and consulting brewer for the West End Brewery Limited of Melbourne, based at the company's branch brewery at Williamstown. The West End company had purchased the brewery at Williamstown, formerly the Artillery Brewery, in 1883, and improved it and continued it as a branch plant, retaining its former brewer and manager. In 1888, the company decided to build a working miniature brewery as part of its display at the forthcoming Centennial Exhibition in Melbourne, and Chateau was given the job of erecting the display and of operating the model brewery. It came into operation in August 1888, making beer in one-hogshead batches once or twice a week.[105]

During the months of the Melbourne Exhibition, a prior arrangement for the amalgamation of the West End Brewery Company Limited with the Melbourne Brewing and Malting Company Limited (the Carlton Brewery) was being carried into effect. It would involve the closure of the West End Brewery and the sale of its valuable inner-city site for redevelopment, the continuation of the Carlton Brewery where most beer production would in future take place, and the continuation of the smaller brewery at Williamstown. As a result of the merger, Terry's West End Brewery Limited became known as Carlton and West End Breweries Limited. Displaced West End brewer William John Suiter took over the brewing at Williamstown, with Chateau remaining in charge of the laboratory there.[106]

Albert Terry, the founder of the West End Brewery, continued to be a large shareholder in Carlton and West End Breweries Limited after the amalgamation in 1889. In 1888, as the amalgamation was proceeding, Terry undertook to start a new brewery in Melbourne for his two sons, Albert Augustus and Richard Alfred. To equip them to run it, both were sent to Europe for a brewing education, at least one of them as a pupil of Hansen in Copenhagen. It is supposed that Chateau had a hand in arranging that placement.

Chateau and de Bavay both were credited by the *Australian Brewers' Journal* in 1888 with having 'for some time past' been practising the cultivation of, and fermenting their beers with, pure yeast.[107] Historian George Parsons, biographer of de Bavay, recognised that Hansen's research was also applied by Chateau to his work as consulting brewer to Terry's West End Brewery in the late 1880s.[108]

A few years after the amalgamation, brewing was discontinued at the Williamstown branch of Carlton and West End Breweries Limited, and Chateau and Suiter left the company. The cessation in December 1892 of advertising in the *Williamstown Chronicle* for the 'West End Brewery (late Artillery Brewery)' indicates its closure around that time.[109]

Early in 1893, soon after his departure from Carlton and West End Breweries Limited, Chateau took over the small brewery formerly carried on at Armstrongs by Jens Kofoed and his successors.[110] He made various alterations and additions to it, including a new steam boiler, and renamed it the Chateau Brewery.[111] He also established a brewing school at Armstrongs, offering to take 'young gentlemen' as pupils, and to teach 'practical and theoretical brewing, bacteriology, and analytical chemistry'.[112] Later in 1893, Chateau took into partnership James Calvert, a former bank manager and stock and station agent, and the business was conducted thereafter as Chateau and Calvert.[113]



Figure 3: Portrait of C.W.M. Chateau, 1888. Source: State Library of Victoria, from an album of security identity portraits of members of the Victorian Court at the Centennial International Exhibition, Melbourne.

In 1895, Chateau dissolved his partnership with Calvert, who continued to run the brewery at Armstrongs. Chateau moved to Queensland, where he had been appointed as head brewer for the West End Brewery Company Limited, Brisbane, to replace Charles Lanfear. Chateau retained his partnership share in the Armstrongs brewery with the intention of disposing of it eventually to a working brewer to join Calvert. The whole affair was sold in 1899 to a new proprietor.[114]

At least two 'young gentlemen' are known to have availed themselves of Chateau's tuition at Armstrongs. One was Elfeck Arthur Cane (1874–1945), who took over the brewing there and remained for about four years after Chateau went to Queensland.[115] Another was Thomas George Stacey (c.1865–1955). Stacey later boasted of having been, among other things, a pupil of Chateau, 'a gentleman whose technical knowledge is second to none in Australasia, and who had been analytical chemist and bacteriologist in the New Carlsberg Brewery, of Copenhagen'.[116] Chateau was annoyed that Stacey had used his name to attempt to exaggerate his skills and experience. To set the record straight, he wrote that Stacey had been his pupil for three months only, and that his instruction had been confined to practical brewing, not analytical chemistry and bacteriology, as at the time Chateau had no laboratory in which to conduct experiments.[117]

Chateau remained at the West End Brewery, Brisbane, for only five weeks. That brief posting was followed by stints of a year at the Esk Brewery, Launceston, then nearly three years at the South Australian Brewing Company's brewery at Broken Hill. Next he returned to Queensland in 1900 to establish the North Queensland Brewing Company's operation at Mareeba, inland from Cairns. Construction of the North Queensland Brewing Company's brewery was supervised from start to finish by Chateau, who was also the company's brewer. Production began in the 30-hogshead brewery in 1901, but the operation was short-lived, and early in 1902 Chateau was seeking a brewing engagement elsewhere.[118]

Chateau, who had returned to Melbourne from Cairns early in 1902, soon moved to Western Australia where he brewed for the Carlton Brewery at Broad Arrow and the Bunbury Brewery at Bunbury, and served briefly as Acting Health Inspector to the Perth Board of Health.[119] Returning to the east in 1905, he retired altogether from brewing and became the manager and licensee of the Hotel Mansion at Darlinghurst, Sydney. In 1907 he became the licensee and proprietor of the Grosvenor Hotel, also in Sydney, in which position he remained until his death in 1921.[120]

Mention was made in the *Australian Brewers' Journal* at various times during Chateau's brewing years in Australia of his early work as a brewer at the New Carlsberg Brewery in Copenhagen, and of his having been a student of Hansen.[121] It has not been possible to verify either of these claims, but I have no cause to doubt them. The same journal once warned the proprietors of breweries in the colonies to 'exercise great caution when engaging brewers who come to Australia from England or the Continent (especially the latter) with no better credentials than their own statements, and no other recommendation than their self-confidence'. It gave the example of an unnamed 'gentleman engaged in a certain large Australian establishment who has stated that he was at one time at one of the famous Copenhagen breweries, and studied pure yeast cultivation under Dr Hansen'. This person was, however, unknown to Alfred Jorgensen (1848–1925), who also had a laboratory in Copenhagen and was in constant touch with Hansen.[122] The imposter was not Chateau; it is highly unlikely that the journal would frequently have repeated such claims in regard to Chateau if their truth had been in doubt, and unlikely that Chateau could have maintained such a deception for many years.

During his time with West End Brewery Limited and its successor Carlton and West End Breweries Limited, Chateau contributed several articles to the *Australian Brewers' Journal* (see Appendix). They included 'Some Remarks on Breweries and Brewing in Australia' and 'Pure Yeast Cultivation', both in 1888, and 'Electric Light in a Brewery' in 1890.[123] The second of these, at least, must have tended to verify his claimed Danish credentials.

Jens Morten Jensen

A visitor to the Great Western Brewery at Bathurst, New South Wales, in 1890 was shown around by the head brewer and manager, a 'Mr Jensen', whose name in full was later revealed to be Jens Morten Jensen.[124] Jensen left the Great Western Brewery soon after, and in March 1891 he was engaged by Martin and Sons, brewers of Townsville, Queensland, but resigned after a short time, perhaps because the Dane disliked the harsh tropical climate.[125]

Jensen was next appointed as the brewer at the Cornwall Brewery, Launceston, but had resigned by January 1892.[126] He returned to Bathurst where he again became brewer and manager at his former post, the Great Western Brewery.[127] He remained there until January 1895, when he was discharged by a new owner on account of the dullness of business.[128] By early 1896 Jensen had taken a brewing job not far away from Bathurst, for the Lithgow Burton Brewing Co. Limited at Lithgow. A few months later he had left and was seeking a new appointment.[129] Nothing has been discovered about Jensen's subsequent life.

He seems to have been the Jens M. Jensen, aged '26' years, who arrived in Melbourne from Hamburg as a steerage passenger in the steamer *Pemptos* in July 1885. Jensen may have worked in the late 1880s at the Victoria Brewery in Melbourne; reports of his engagement to the Cornwall Brewery in Launceston in 1891 mentioned that he had been 'connected with some of the largest breweries in the sister colony, notably the Victoria Brewery' in Melbourne. From this, together with his many brief appointments, his generally ordinary career, and his sudden disappearance from the record, it might be wondered whether Jensen was the person alluded to by the *Australian Brewers' Journal* in 1889 in its cautionary note about un-credentialled Continental brewers.

Axel Schack Steenberg

Born in Northern Jutland, Denmark, Axel Schack Steenberg (1896–1987) came to Brisbane in 1930 to work for Queensland Brewery Limited, the owner of the Queensland Brewery in the suburb of Fortitude Valley. Its Queen brand of lager beer, introduced into the market in mid-1918, was said to be 'the first lager brewed in Queensland'. Although this statement may not be entirely correct, the new lager nevertheless proved to be very popular, necessitating extensions to the brewery's plant by the year's end, and motivating the company's chief competitor, the Castlemaine Brewery, to embark upon lager brewing in mid-1921.[130] It was due to its increasing focus on lager production that Steenberg was recruited to the company.

Steenberg studied science and chemical engineering at the University of Copenhagen, and gained practical training in brewing in Copenhagen. He gained further experience in the 1920s in various breweries in Germany and Czechoslovakia. He then practised his profession in Denmark and Norway, and visited many breweries in England, before embarking for Australia in 1930.[131]

From the time of his arrival in Brisbane, Steenberg engaged with Heimdal, the city's Danish Association, becoming its vice-president for 1931 and its minute secretary for 1932. It was as assistant secretary that he attended a reception at the Danish Consulate in recognition of the birthday of Christian X, the King of Denmark, in September 1932. In 1937, after a residency in Australia of seven years, Steenberg became a naturalised British subject. He became president of the Danish Association in 1952. He attended the Association's dinner-dance in 1954 in that capacity; the formal function was to celebrate the anniversary of the Danish Liberation Day on 5 May 1945. The award of Chevalier of the Royal Danish Order of Dannebrog was conferred on Steenberg in 1959 by the King of Denmark, and presented at a ceremony in Brisbane in April 1960.[132]

At the Queensland Brewery, Steenberg worked on the development of new products in the Continental style, of which one was Bulimba Pilsener, released as a bottled product in August 1933.[133] He was also responsible for the draught 'New Brew' Bulimba Pilsener released in April 1934, and bottled Bright Star pale ale, released in August 1934. The 'New Brew' was described by the company's advertising to be 'a Continental style of beer, brewed by an expert Continental brewer'.[134] Its release was accompanied by the simultaneous publication in several Queensland newspapers of biographical articles celebrating its creator, Steenberg, who thus emerged from relative obscurity.[135]

When Steenberg arrived at the Queensland Brewery, the brewhouse was ruled by Irish-born Gerald Cecil O'Beirne (1872–1942), who had occupied the positions of brewer and head brewer since 1897, prior to which time he had been a brewer in England and in New Zealand. It was O'Beirne who had overseen the introduction of Queen Lager in 1918, and of Q.B. Lager in 1927, and various additions to buildings and plant that were needed for the production of lager beer. Steenberg succeeded O'Beirne as head brewer in February 1934 when the latter retired.

Victoria-based Carlton and United Breweries Limited gained possession of the Queensland Brewery early in 1961, by winning ownership of Queensland Brewery Limited against a counter bid from the leading Brisbane brewer, Castlemaine Perkins Limited.[136] At a meeting of the board of Queensland Brewery Limited on 1 June 1961 it was arranged that Steenberg would retire from the end of that month.[137] He went to Canada later in 1961 on engagement as a technical advisor to the Newfoundland Brewery Limited.[138] In August 1962, the Newfoundland Brewery was taken over by Molson's Brewery Limited, bringing to nine the number of breweries in its expanding Canadian portfolio. Steenberg returned to Brisbane in October that year.

Around the time of his retirement from Queensland Brewery Limited, Steenberg left the committee of the Australian Section of the London-based Institute of Brewers. He had been a member for several years, and had attended the inaugural convention of the section in Adelaide in August 1953.[139] In July 1962, soon after his return from Canada, Steenberg stood down as president of the Danish Association in Brisbane.

At the Queensland Brewery, Robert Ernest (Bob) Phillips (1925–2007) was promoted to head brewer upon Steenberg's retirement in mid-1961. Carlton and United Breweries Lim-



Figure 4: Portrait of Axel Schack Steenberg in the early 1930s. Source: *Carlton Trader*, June 1977.



Figure 5: Newspaper advertisement for Bulimba 'New Brew', 1934. Source: *Telegraph* (Brisbane), 27 April 1934 .

ited also created the position of Superintendent Brewer for the several breweries under its control in Queensland (at Brisbane, Toowoomba, Cairns and Rockhampton). It appointed its head brewer at Cairns, Walter Thomas Fisher (1924–2023), to that new role.[140]

Also upon the change of ownership and Steenberg's departure, a consultation agreement between Queensland Brewery Limited and the Alfred Jorgensen Laboratory in Copenhagen was terminated. This appointment as 'brewing consultant and analyst' to the company had commenced in 1956, and had been made on the recommendation of Steenberg, the head brewer.[141]

In 1977, long into Steenberg's retirement, his Danish origins and his early work at the Queensland Brewery were celebrated in a television commercial for Carlton (formerly Bulimba) Pilsener, of which he had been the original creator. Carlton and United Breweries Limited had changed the name of its Brisbane subsidiary from Queensland Brewery Limited to Carlton and United Breweries (Queensland) Limited in 1971.[142]

Kai Frederik Jeppesen

For reasons similar to those of Queensland Brewery Limited in appointing Steenberg at its brewery in Brisbane, Tasmanian Breweries Limited appointed the Danish brewer Kai Frederik Jeppesen (born 1902) to its Boag's Esk Brewery at Launceston later in the 1930s. Jeppesen was responsible for the creation of new products using new equipment installed at the Esk Brewery. At the launch of one of the 'new brews' in March 1937, Jeppesen was introduced as the 'new brewer'. His international experience included breweries in Denmark and Colombia.[143]

Jeppesen and his wife arrived in Australia late in 1936, landing in Launceston in November, having abandoned a Europe that was on the brink of war. When the war did commence in 1939, Australia's automatic involvement meant that Mrs Jeppesen's German nationality created difficulty for both of them. Hostility was directed at the Jeppesens by some elements of the Launceston community, and even his beer came under suspicion. In June 1939 Kai was asked to leave the Esk Brewery, and he withdrew on full pay for six months to his small farm in the hills outside Launceston. In 1940, shortly after the German invasion of the Netherlands, Kai was recruited by Dutch interests to go to Jakarta, on the island of Java in the Netherlands East Indies. There he was required to re-open a German-owned brewery whose staff had all been interned by the Dutch government. His residency in Tasmania thus came to a premature and unhappy end.[144]

Conclusion

The foregoing describes the contributions to the brewing industry of some Danes who came to Australia and New Zealand and who subsequently became brewers (Cohn, Ersntsen, Kofoed), some who were already brewers or brewing scientists when they came (Chateau, Jensen, Steenberg, Jeppesen), and some who did not come at all, but exerted their influence on the colonial breweries from a distance (Hansen, Jorgensen). It is suggested that collectively these contributions are disproportionate to the small output of the Danish brewing industry, the explanation for which is probably a combination of: the country's long cultural association with beer; the comparatively large per capita consumption of beer by its population; and the high level of technical and scientific competence achieved in the Danish brewing industry from the late nineteenth century.

Acknowledgements

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Appendix

1. Articles by C.W.M. Chateau in the *Australian Brewers' Journal*

'Some Remarks on Breweries and Brewing in Australia', June 1888, pp.247–248

'Pure Yeast Cultivation', July 1888, pp.281–282, August 1888, pp.308–309

'Vitality of Yeast and other Organisms', July 1889, pp.270–271

'Some Hints about Vinegar-making', August 1889, pp.299–300

'Pneumatic Malting', October 1889, pp.15–16

'Sinkers in Malt', November 1889, pp.40–41

'Low Attenuation of Beer and Artificial Refrigeration', November 1889, p.41

'Tepid v. Cool Drinks', March 1890, pp.160–162

'Electric Light in a Brewery', May 1890, pp.213–215

'Some Notes About Sugar', September 1890, pp.324–325

2. Articles by A. de Bavay in the *Australian Brewers' Journal*

'Pure Yeast in Australia', July 1888, p.276

Review of *Les Fermentations Visqueuse* [Ropy Fermentation] by H. Van Laer, December 1889, pp.65–67

Review of *The Microscope in the Brewery and Malt-house* by C.G. Matthews and F.E. Lott, January 1890, pp.93–94

3. Articles by A. Jorgensen in the *Australian Brewers' Journal*

'On the Proceedings in Forwarding Hansen's Absolutely Pure Yeast', March 1889, pp.156–157

'M. Jorgensen on Yeasts' (letter to the editor), March 1890, pp.159–160

'The Preservation of the Selected Type of Yeast', November 1890, pp.44–45

'Pure Yeast—a Comparison between Pasteur and Hansen', September 1891, pp.403–404

'On the Application of Hansen's System in Breweries with Top Fermentation', December 1893, pp.72–73

4. Articles by E.C. Hansen in the *Australian Brewers' Journal*

'Investigations on the Technology of Fermentation' (translated and condensed from *Zeitschrift fur das gesammte Brauwesen*, 1888), October 1888, pp.15–17, November 1888, pp.40–42

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