

11.05 Glass

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a. window glass

Window glass was wholly imported until the twentieth century, and is therefore of limited interest here. It was so scarce in early years that it was not unknown for glass or complete sashes to be stolen out of buildings. In 1804 John Lovell removed every sash from the windows of one Mann's house, off South Row, Sydney. He tried to sell them to a carpenter, who was too suspicious to take them, and then removed the panes and sold them separately. The thief was caught when the discarded frames were found nearby.¹ The use of calico and other materials as glass substitutes has been discussed already, and in more remote inland areas glass continued scarce for a long time. Sometimes there was no attempt even to provide a glass substitute, and the windows were open holes which would be closed, when required, using square wooden traps hinged from the top with strips of greenhide.² Near the ports the question was simply one of cost, with larger panes far more expensive than smaller ones. At George Russell's hut in 1839 each room had 'a glass window, a thing as seldom to be seen as deal floors'.³ When Moses Garlick built his hut at Adelaide and installed glass window panes at either end, the local Aborigines were fascinated by their reflections, and embarrassed the occupants by continually peering in at the windows.⁴

Generally speaking, crown glass comes first, and in small panes, typically six to a sash. Not only was this the traditional British glass type, and the cheapest, but it was also of a clearer quality than the new sheet glass, came in thinner pieces, and was shipped in packets which could be transported even to outback areas. The glassmaking process produced a disc or 'table' of glass with a bull's eye or knob at the middle, where it had been attached to the punty whilst being spun. This meant that two long rectangles could be cut from either side of the bull's eye, and the rest of the

¹ *Sydney Gazette*, 4 November 1804, p 3; 11 November 1804, p 2.

² Judith Wright, *The Generations of Men* (Melbourne 1959), p 20.

³ William Russell to his Scottish relatives, 20 August 1839, in P L Brown [ed], *Clyde Company Papers*, I (Melbourne 1941), p 241.

⁴ Obituary of Daniel Garlick, *Observer*, 4 October 1902, cited in E & R Jensen, *Colonial Architecture in South Australia* (Adelaide 1980), p 76.

glass wasted, or else a number of much smaller rectangles arranged all around the circle, with much less loss. Smaller pieces were therefore more economical, at least until sheet glass became common and size was less at a premium. In 1880 a British merchant, J Welsman, still sold crown glass either in tables, to be cut up by the glazier on site, or in crates of 'slabs of the usual sizes'. These were 24, 23³/₄ and 21¹/₂ square inches [155, 147 and 139 cm²]. The price for thirty-six such pieces of best glazing quality decreased from £8.10s to £7.10s which, surprisingly, makes the smaller pieces slightly dearer, per area, than the larger ones.⁵

The manufacture of sheet glass was introduced to England from the Continent, and improved upon, by R L Chance in 1832.⁶ Instead of blowing a sphere, opening it out and spinning it into a flat disc, the maker swung the sphere around to elongate it, cut off the curved ends with a wire to leave an open cylinder, then split the cylinder on one side and re-heated it until it flattened out. This created a rectangle with no bull's eye at the centre, which could be used with very little wastage, but the reheating reduced the brilliance of the finish.. This product very soon reached Australia, and was quite common by the early 1860s, though relatively expensive. Mayes listed sheet glass in sizes up to thirteen square feet [12,080 cm²] at from 1s 4d to 3s 2d per square foot, depending upon weight and quality, though the very smallest sizes were cheaper than the equivalent in crown glass.⁷

Sheet glass in larger sizes was used in the main windows of a house, and smaller ones for the lesser rooms. It is not unusual for houses as late as the 1870s to have the front sashes glazed in single sheets, the secondary rooms (say, the second room in a terrace house, lit from the cutback) with sashes divided in two, and then six-paned sashes in the rear wing for the kitchen, servants' rooms &c. A specification of 1854 seems to assume large sheets for the front windows (they appear in the drawings) but all the back sashes were to be of crown glass 'taking care to keep the convex side outwards'.⁸ In contrast to Europe, double glazing was not much in demand in Australia's temperate climate, but at the E S & A Bank headquarters in Melbourne, where everything was of the first quality, the windows of the upstairs living quarters have two complete sets of sashes, with a space of about 300 mm between.

A ubiquitous form of decoration for door sidelights, transom margins and stair window margins, was flashed glass, generally red or blue, with designs cut through the coloured layer to reveal the clear glass below. The confused terminology in this area makes it quite difficult to give any coherent account of it. In 1862 Mayes listed coloured glass in yellow, lemon, orange, red, ruby, purple, blue and green, at prices for the first quality - depending upon the colour - from 1s 6d to four shillings per square foot. This would appear to be integrally coloured glass, in contrast to the flashed ruby, blue, purple and green, which were all costed at four shillings. Mayes does not give prices for work on the flashed glass, and we must assume that the

⁵ J R Welsman, *Trade Prices of British and Foreign Plate and Window Glass, &c* (Bradford 1880), p 6.

⁶ Raymond McGrath & A C Frost, *Glass in Architecture and Decoration*(London 1937), p 25.

⁷ C B Mayes, *The Australian Builders' Price-Book* (2nd ed, Melbourne 1862), p 89.

⁸ Russell, Watts & Pritchard, 'Specification for ... dwelling houses ... at Elwood .. for Joseph Docker', 13 December 1854, Docker Papers, Manuscript Collection, SLV, p 21.

treatment had not yet become common.⁹ He does refer to 'embossed' glass, which has confused some readers, but this refers to a textured finish created by a hydrofluoric acid treatment,¹⁰ and indeed, as the price is still four shillings, it clearly does not represent further work undertaken upon flashed glass.

In 1877 Mayes lists coloured glass, which has become cheaper, and embossed glass, which has become more expensive, and also lists obscured glass, brilliant cut borders, by the foot, and brilliant cut rosettes in sets (presumably of four).¹¹ Brilliant cutting is cutting into the glass surface with a stone wheel,¹² and obscured is another name for flashed glass. Welsman's English catalogue illustrates a range of designs for brilliant cut borders and rosettes to be executed on ruby, blue, orange or white obscured glass.¹³ The colours are those one finds in Australia (with ruby and blue far the most common) and the designs seem very similar. What proportion of Australian examples are in fact imported from Britain rather than cut locally it is impossible to say.

b. plate glass

Plate glass was simply poured onto a large table, and could be made in very large sizes but it was much thicker, very expensive, and difficult to transport. It was used in shop windows and in prestigious buildings in Australia from about the 1850s, but it was almost preceded by a more utilitarian type. In 1847 James Hartley of Sunderland had patented a method of ladling the metal [molten glass] directly from the foundry pot to the casting table, instead of by way of the refining cuvette. These sheets lacked the clarity of common plate glass, but were cheap, and were suitable for skylights and glass roofs.¹⁴ In 1854 '350 panes of Hartley's Patent Glass 32 oz to the foot superficial', each 3 ft 11 in by 14 in [1194 x 356 mm] were ordered for use in the Sydney Mint.¹⁵ There were also various forms of rough and/or rolled plate glass, deliberately designed to be wholly or partly obscure,¹⁶ a local example of which was the 'quarter-inch rough rolled glass used at the Art Gallery of New South Wales in 1885.¹⁷

⁹ Mayes, *Australian Builders' Price-Book* (1862), p 87.

¹⁰ Raymond McGrath & A C Frost, *Glass in Architecture and Decoration* (London 1961 [1937]), p 335.

¹¹ Charles Mayes, *The Australian Builders' Price-Book* (3rd ed, Melbourne 1877), p 94.

¹² McGrath & Frost, *Glass in Architecture and Decoration* (1961), pp 333-4.

¹³ Welsman, *Trade Prices*, p 16.

¹⁴ McGrath & Frost, *Glass in Architecture and Decoration* (1961), p 46..

¹⁵ Captain E Ward to Captain Collinson, November 1854, Archives Office of New South Wales 3/16662, letter book 7 January 1854, to 19 June 1857, p 132, quoted in Fiona Starr et al, *The Royal Mint, Sydney (1853-1926): a Survey of the Documents Associated with the Mint* (Sydney 2001), p 19.

¹⁶ Captain E Ward to Captain Collinson, November 1854, Archives Office of New South Wales 3/16662, letter book 7 January 1854, to 19 June 1857, p 132, quoted in Fiona Starr et al, *The Royal Mint, Sydney (1853-1926): a Survey of the Documents Associated with the Mint* (Sydney 2001), p 19.

¹⁷ Captain E Ward to Captain Collinson, November 1854, Archives Office of New South Wales 3/16662, letter book 7 January 1854, to 19 June 1857, p 132, quoted in Fiona Starr et al, *The Royal Mint, Sydney (1853-1926): a Survey of the Documents Associated with the Mint* (Sydney 2001), p 19.

By 1850 panes of glass in sizes in sizes from 29 by 19 inches [740 x 480 mm] to possibly 38 by 38 inches [970 x 970 mm] were being imported to Sydney,¹⁸ while in Hobart the *Courier* reported a shopfront in which larger windows, probably of plate glass, replaced the old multi-paned type. Watchorn. Perkins & Co of Liverpool Street had opened out their existing building with a 'covered arcade' extending across the footpath, containing four bays of glazing along the front and one at each side, in which 'Each compartment or window, springing on each side from stout iron pillars encased with wood, is divided into two portions, forming at their summit a pair of semi-circular arches with appropriate terminating ornament.'¹⁹

The earliest complete shop fronts using plate glass were imported in the early 1850s, and dramatically changed the character of city streets. Melbourne's first was designed by either James or Charles Webb and imported from Glasgow in 1851 for David Carson's shoe shop in Collins Street East.²⁰ In 1853 John Gill called tenders for the erection of a shop and dwelling, including a shop front with plate glass etc.' which had been prepared in London, to be supplied by the proprietor,²¹ and it became common during the 1850s to import complete shop fronts of mahogany, complete with sashes, plate glass, shutters and fanlights.²² Some of the grander prefabricated buildings similarly arrived complete with plate glass display windows.²³ Plate glass cannot have been much used in private houses, but in 1855 Oswald Bloxsome of Sydney had a dining room window ten feet [3 m] square of plate glass set in stone mullions,²⁴ and a house in Melbourne was likewise advertised as having windows of plate glass.²⁵ In 1859 British plate glass was used in the (not overly large) windows of the Sandhurst [Bendigo] Town Hall, and it was reported that it was slotted into the frames instead of being puttied as in the 'old method'.²⁶

As in England, plate glass shop windows caused great affront to architectural propriety because, as G G Scott put it, the way in which 'a building is supported is totally ignored, and fronts of towering altitude are erected with no apparent substructure but plate-glass.'²⁷ By 1855 nearly every shop on the right hand side of

¹⁸ *Sydney Morning Herald*, 7 February 1850, p 1: the advertisement is by W Nimmo & Co, and the second size is not clearly legible.

¹⁹ *Hobart Town Courier*, 29 March 1850, p 2: the architect was W Dawson.

²⁰ Alexander Sutherland [ed], *Victoria and its Metropolis* (2 vols, Melbourne 1888), II, p 709.

²¹ *Argus*, 9 June 1853, p 3.

²² See advertisements by Alfred Bliss & Co in the *Argus*, 2 April 1854, and Callender, Caldwell & Co in the *Mount Alexander Mail*, 1 February 1856. The leasehold of a shop in Elizabeth Street with a 'modern plate-glass front' was advertised in the *Argus* of 29 July 1854.

²³ For example a building by Samuel Hemming, also advertised (ahead of its arrival) in the *Argus*, 29 July 1854, had a complete front of mahogany sashes and doors, with 'the best plate glass'.

²⁴ *Argus*, 3 March 1855, p 9.

²⁵ *Argus*, 29 September 1855, p 3.

²⁶ *Bendigo Advertiser*, 6 August 1859, quoted in Mike Butcher & Y M J Collins, *An American on the Goldfields: the Bendigo Photographs of Benjamin Pierce Batchelder* (Strathdale [Victoria] 2001), p 32.

²⁷ G Scott, *Secular and Domestic Architecture*, p 177, quoted in Stefan Muthesius, 'The "iron problem" in the 1850s', *Architectural History*, XIII (1970), p 61. Similar comments are made by a writer in the *Builder*, VI, 287 (5 August 1848), p 381, and in J L Tarbuck, *The Builder's Practical Director* (Leipzig, no date [c 1858]), p 212.

Collins Street, Melbourne, was said to have a handsome plate glass window,²⁸ and it was becoming common for 'all propriety and architectural character' to be sacrificed²⁹

to the attainment of window surface. The effect of this, in many cases, appears to be that the lower part of the elevation becomes in appearance a mere gap without masonry, piers or visible support to the mass above, which rests apparently on nothing more than a substantial wall of plate glass.

By 1860 the use of plate glass in Collins and Bourke Streets was said to have exceeded that of most English towns,³⁰ and the *Australian Builder* lamented that in these shopfronts the glazier was 'the chief, almost the sole architect'.³¹ In one example, the Monster Clothing Company of Bourke Street, the ground floor facade was entirely of glass to within 150 mm of the ground, divided only by thin mullions, and no attempt was made to arch or ornament the top of the window.³²

Next the mullions were steadily obliterated in favour of single sheets of glass. In 1881-2 the largest sheets of plate glass in Melbourne were installed at the Collins Street premises of George Douglas & Sons, chandelier and mantelpiece manufacturers, measuring fifteen by ten feet [4.5 x 3.0 m].³³ In 1888 the largest size held by Goodlet & Smith of Sydney was much the same, 4.34 x 3.10 metres,³⁴ and in 1889 Nathan's Furniture Warehouse in Swanston Street, Melbourne, had five sheets installed, each 2.4 metres wide by 4.8 high.³⁵ In 1900 W J Overell's dispensary in Fortitude Valley, Brisbane, designed by Addison & Corrie, had twelve 'specially imported' glass windows said to be the largest in the southern hemisphere.³⁶ However the report does not state the size, and the claim seems rash in relation even to Australia, and still more the more sophisticated cities of South America.

By the early twentieth century G E Crane & Sons Ltd, Sydney building materials suppliers,³⁷ were marketing patent shopfronts, the first of these in Melbourne being a building in Swanston Street in 1907.³⁸ The Wunderlich company introduced a range of crystal glazed showcases designed to be attached to or set against a wall. A model designed specifically to market Love Brothers' new soap, 'Plantol', was described as

²⁸ F T Honey, in the *Builder*, XIII, 632 (17 May 1855), p 126.

²⁹ *Australian Builder*, 5 (30 August 1855), p 40.

³⁰ F Just, *Australia, or Notes taken during a Residence in the Colonies* (Dundee 1859), pp 281-2:

'This has been carried to such a ridiculous extent that in some sections the houses seem as if they were suspended in the air, from the transparent medium in which they *appear* to be supported. However much the glass system may be approved in a commercial point of view, I protest against it as an outrage on good taste.'

³¹ *Australian Builder*, 4 February 1860, p 25.

³² Victorian Exhibition 1861, *Catalogue with Prefatory Essays* (Melbourne 1861), advertisements.

³³ *Argus*, 31 January 1882, p 5. Two years later two sheets almost as large were installed by Brooks Robinson & Co at the Tangye Bros premises in the same street: *Argus*, 9 February 1884, p 9.

³⁴ *Australasian Builder & Contractor's News*, 29 December 1888, p 596.

³⁵ *Australasian Builder & Contractor's News*, 23 November 1889, p 505.

³⁶ *Queenslander*, 28 July 1900, p 26.

³⁷ See their advertisements in C E Mayes, *The Australian Builders and Contractors' Price-Book* (7th ed, Sydney 1908), advertisements p ii; C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1914), advertisements p 2.

³⁸ *Australasian Decorator and Painter*, 1 March 1907, p 143.

being in 'stout steel' with ornamentation of embossed copper in a dull finish, though brass, nickel, or bright or oxidised silver plate could also be used.³⁹

c. local glassworking & manufacture

While it has been claimed that the bottle glass industry in Australia was begun by Felton & Grimwade of Melbourne in 1866,⁴⁰ the story is in fact longer and more complex. The discussion is academic for present purposes, for though some minor glass products may have been produced for the building industry, sheet window glass was not made locally for a number of decades. However, in 1847 glass was made in the Melbourne suburb of Collingwood, using sand discovered at Brighton, and soon after - at least by 1851 - there was glassworks in operation in Collingwood near where Glasshouse Road commemorates the fact today. In 1866 Joseph Ross established a glass bottle factory at Darling Harbour, Sydney, which was continued by his sons until about 1922.⁴¹

Other works seem to have been established in Melbourne by William Nixon, later Thomas Brothers, in 1866, and by McNeilage in 1870. Felton Grimwade & Co were proprietors of the Melbourne Glass Bottle Works by 1874, and they may well have bought out Nixon's former establishment, for this had already passed from Thomas Brothers to one Mount, and a man of that name was then employed by Felton Grimwade as manager.⁴² This is more or less consistent with the information that 'Mount's glass and bottle works' was established in 1871, adjoining the gas company which was set up in the same year on the sandy waste adjoining the Port Melbourne lagoon. This enabled it to make use of charcoal and other gasworks by-products, as well as the local sand.⁴³

Glass bending had been advertised in Sydney by F Peterson as early as 1833, but seems then to have fallen into abeyance until the 1850s. In 1858 John Wiper of Melbourne showed bent glass for windows and domes at the Victoria Industrial Society Exhibition.⁴⁴ Wiper was doubtless responsible for the 'glass bent in Melbourne' for the Queens Hall of the Public Library, completed in two stages in 1859 and 1864.⁴⁵ In 1860 Wiper was the only glass bender listed in the *Australian Builder's* building trades directory.⁴⁶ In 1861 he showed specimens of cut, bent and

³⁹ Wunderlich Patent Ceiling Co. Ltd., *You Cannot Afford to Hide the Goods you want to Sell* (Sydney no date [c 1915]), p 7.

⁴⁰ *Looking Backward and Forward through Glass* [Australian Consolidated Industries] (Sydney, no date [c 1941]), no page.

⁴¹ Ambrose Pratt [ed], *The National Handbook of Australian Industries* (Melbourne 1943), p 312.

⁴² Miles Lewis, 'Tradition and Innovation in Victorian Building' (3 vols, PhD, Melbourne University 1972), II, pp 400-401.

⁴³ Susan Priestley, *South Melbourne: a History* (Melbourne 1995), p 100.

⁴⁴ Victoria Industrial Society, *Catalogue of the Eighth Annual Exhibition of Manufactures, Produce, Machinery, and Fine Arts &c* (Melbourne 1858), p 12.

⁴⁵ Allom Lovell Sanderson Pty Ltd & Heritage Group, Public Works Department, Victoria, *State Library and Museum of Victoria Buildings Conservation Analysis* (2 vols, Melbourne 1985), I, p 11, ref *Annual Report of the Trustees*, 1870-71.

⁴⁶ *Australian Builder*, 14 January 1860, advertisements, no page.

blown glass at the Victorian Exhibition,⁴⁷ and in 1870 he displayed his bent and cut glass at the New South Wales Intercolonial Exhibition, and received a high commendation for it.⁴⁸ In 1873 Farmer's store in Sydney had show windows of plate glass, curved on a 1.8 metre radius, returning in at the three entrances.⁴⁹

In 1851 a looking glass factory was established in Melbourne by G B Campi, and two years later he was joined by his brother and the firm became Campi Brothers. In 1861 T & A Campi exhibited a large glass, silvered in the colony, set in a frame of colonial fancy woods.⁵⁰ Only a few hands were employed at this stage, but in 1874 Abbondio Campi became the sole proprietor, and in 1888 he had sixteen employees and was doing a large business.⁵¹ Meanwhile another firm, Flint, Ramsay & Co, was able in 1858 to exhibit two mirrors which they had silvered,⁵² and in 1860 the Melbourne *Argus* reported that the firm of Ramsay Brothers had been able to make a mirror ten feet by seven [3 x 2.1 m], using a layer of tinfoil alloyed with mercury. By international standards this was not a remarkable feat, for in 1865 a Paris firm supplied two mirrors more than twice as big for the Liverpool Town Hall.⁵³ Sandblasting and acid etching were made popular by the influence of the Art Deco, and an early example of sandblasting was in Werner's, an optician's shop in Collins Street, Melbourne, designed by Edward Billson in 1919. The glass designs were by the architect Cynthia Teague.⁵⁴

In 1916 various glass manufacturers, principally concerned with bottle manufacture, amalgamated to create Australian Glass Manufacturers Company Ltd, which built a factory in New Zealand in 1923, and launched a substantial program of expansion from 1924,⁵⁵ and by 1934 claimed to manufacture a greater variety of glass products than any other company in the world.⁵⁶ One of the subsidiary companies was Australian Window Glass Pty Ltd, which by 1933 made 'Koala' brand sheet glass, wired cast glass, figured rolled glass, and milled rolled glass at its Alexandria factory,⁵⁷ and a few years later was also making, anti-actinic 'Coldlite' glass, bent glass, and the Insulux blocks already referred to.⁵⁸ The sheet and polished plate glass

⁴⁷ Victorian Exhibition 1861, *Catalogue*, p 221.

⁴⁸ *The Industrial Progress of New South Wales* (Sydney 1871), p 48.

⁴⁹ H M Franklyn, *A Glance at Australia in 1880* (Melbourne 1881), p 347; also Peter Reynolds & Joy Hughes, 'Private Practice: Works 1869-1904', in Peter Reynolds, Lesley Muir & Joy Hughes [eds], *John Horbury Hunt: Radical Architect 1838-1904* (no place [Sydney] 2002), p 102, citing *Sydney Morning Herald*, 20 September 1873.

⁵⁰ Victorian Exhibition, 1861, *Catalogue*, p 211.

⁵¹ Alexander Sutherland [ed], *Victoria and its Metropolis* (2 vols, Melbourne 1888), II, p 596. The spelling 'Abboundio' in some directories is incorrect.

⁵² Victoria Industrial Society, *Catalogue*(1858), p 12.

⁵³ *Argus*, 5 August 1860, quoted in Charles Mayes, 'Essay on the Manufactures more immediately Required for the Economical Development of the Resources of the Colony, &c', in *Victorian Government Prize Essays, 1860* (Melbourne 1861), pp 313-314.

⁵⁴ Carol Hardwick, 'The Influence of Art Deco on Architecture in Victoria' (2 vols, MArch, University of Melbourne 1980), I, pp 108-9.

⁵⁵ *Looking Backward and Forward through Glass*.

⁵⁶ Pratt, *National Handbook*, p 312.

⁵⁷ Royal Victorian Institute of Architects, *Journal*, XXXI, 3 (July 1933), advertisement p 5.

⁵⁸ *Looking Backward and Forward through Glass*.

were both marketed under the 'Koala' brand,⁵⁹ which was appropriate enough, as these were effectively the first glass building products made in Australia, though it is not clear when the manufacture of each commenced. Other more specialised glass products continued to be imported, especially for the pioneering curtain wall structures of the 1950s.

*d. stained glass*⁶⁰

Stained glass proper is more a decorative issue than a technical one, but it is worth noting the transition from a situation in which simple quarries were assembled locally while sophisticated windows were imported, to that in which local stained glass artists assembled imported elements - such as illustrations of the saints for churches, or roundels of the four seasons for domestic stair windows - into a design with lesser elements partly or wholly of local manufacture.

It is commonly supposed that stained glass was one of those medieval crafts which had died out until revived by A W N Pugin in the 1830s and 40s, but this is far from being the case. Stained glass first came to Australia from a British tradition which had revived long before the time of Pugin, and from other sources which are not British at all. That the craft had died out in Britain is true, to the extent that after the Great Fire of London nobody local could produce new glass for the churches, and it had to be imported from Holland. Traditional stained glass had begun to show Renaissance influence in the sixteenth century, and had then died out under the influence of the Reformation. In the early seventeenth century enamelled glass began to appear, achieving pictorial realism at the expense of the translucent radiance of the real thing. It was either imported from overseas or made in England by Dutch craftsmen such as the Van Linges. The east window of Wadham College, Oxford, is signed and dated by Bernard Van Linge in 1622, and various works of Abraham Van Linge survive, including a fragment of his glass for Oxford Cathedral of 1630.⁶¹ An important description of the glass at Gouda in Holland appeared in an English translation in 1718,⁶² then during the eighteenth century the craft was revived in England. A window designed by Sir Joshua Reynolds and executed by Thomas Jervais at New College Oxford in 1777 was in this enamelled tradition and, it has been said, might easily be mistaken for parchment or porcelain.⁶³ This, together with another at St George's Chapel designed by West and executed by Forrest, were said to

⁵⁹ F W Ware & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (Melbourne 1949), §30/3.

⁶⁰ I have published much of the following material in Miles Lewis, 'Stained Glass: the Victorian Context', *Historic Environment*, XII, 2 (1996), pp 7-16.

⁶¹ E A G Lamborn, 'Painted Glass in Oxford', *Oxford*, V, 3 (Spring 1939), pp 30-32.

⁶² *Explanation, of the Famous and Renowned Glas-Work, or Painted Windows, in the Fine and Eminent Church at Gouda. For the Use and Commodity of both Inhabitants, and Foreigners that come to see this Artificial Work* (Gouda [Netherlands] 1718). This is reportedly a translation of Pierson, *Uitegginge van de Wyndbervende en Vermaar de Glazen*. Listing (for the English work) in Charles Wood, *Catalogue 106, Conservation & Restoration, &c* (Cambridge [Massachusetts] 2000), p 44. Wood refers to a text in Duncan, *Bib of Glass*.

⁶³ Lamborn, 'Painted Glass in Oxford', pp 32-3.

show that 'paintings on glass might be produced finer much than the ancient masters could boast of'.⁶⁴

One of the first to revive the tradition of translucent glass is said to have been Francis Eginton (1737-1805),⁶⁵ though this seems doubtful. Eginton began to paint glass at Soho, Birmingham, in 1784, and is credited with further windows at St George's Chapel, Windsor, as well as others at Salisbury Cathedral, Lincoln Cathedral, St Aleph's College and Magdalen College, Oxford. William Beckford commissioned windows from him for Fonthill to the value of £12,000. However he showed no knowledge of medieval principles of glass painting, and in fact seemed to deliberately challenge them. The design stretched across the whole light, without borders or architectural frames, were divided mechanically into squares with an iron grid, and according to J H Powell were executed entirely in enamel colours, not translucent.⁶⁶ Eginton was also responsible for the armorial glass of Pembroke College, Oxford, and his disciple in Oxford was J H Russell.⁶⁷ Amongst the subsequent stained glass artists was W R Eginton, probably a son, and H H Peacock, of whose work nothing is known, while the glassmakers Chance Brothers, established a glass painting department under the direction of Georges Bontemps. More is known of Robert Henderson, who started business in 1820 at Temple Row, Birmingham, and worked entirely in enamel, but developed some more medieval and heraldic themes. He did work at Castle Hill Alton Towers, and elsewhere, and his ecclesiastical work included the 'Carriage of the Cross' for Bilston Catholic Church.⁶⁸

One proponent of stained glass was Edmund Bartell, who in 1804 rather surprisingly advocated its use in cottages, and must of course have meant the enamelled rather than the translucent variety. He referred to 'painted or stained glass', but argued for muted colours in place of the glaring effects and lack of gradation in current work. He referred to two people in Norwich who had recently brought into the country and put on display some of the finest specimens of painted glass then in existence. He also quoted Horace Walpole on the subject, naming some of the English practitioners of the mid-eighteenth century.⁶⁹

By the 1820s Nathaniel Whittock thought that the art was 'approaching perfection' in Britain,⁷⁰ but he was still referring to the enamelled type, for he directed that 'in all cases, the body of the strain must be thick and opaque'.⁷¹ He went into considerable detail about the processes of manufacture, the forms of kiln, the art of painting, and the motifs and forms to be used. He refers to one of his kilns as being particularly compact, therefore occupying less space and using less fuel to vitrify the colours of

⁶⁴ Nathaniel Whittock, *The Decorative Painters' and Glaziers' Guide* (London, no date [1827]), p 206.

⁶⁵ Lamborn, 'Painted Glass in Oxford', p 36.

⁶⁶ J H Powell, 'The Art of Stained Glass in Birmingham', in Samuel Timmins [ed] *The Resources, Products and Industrial History of the Birmingham and Midland Hardware District* (London 1866), pp 520-522.

⁶⁷ Lamborn, 'Painted Glass in Oxford', p 36.

⁶⁸ Powell, 'Stained Glass in Birmingham', pp 522-3.

⁶⁹ Edmund Bartell, *Hints for Picturesque Improvements in Ornamented Cottages, &c* (London 1804), pp 35-40, ref Horace Walpole, *Anecdotes of Painting*, sv Peter Olivar.

⁷⁰ Whittock, *Decorative Painters' and Glaziers' Guide*, p 206.

⁷¹ Whittock, *Decorative Painters' and Glaziers' Guide*, p 246.

the glass, making it better suited to a small scale business.⁷² Such practical comments indicate that the craft was well established on a commercial basis. He illustrates examples in colour - as I believe, for the first time - using hand tinted lithographs, and he discusses them in terms both of technology and of style. Of one, an ornamental cross, he comments that it is an easy subject and, though it includes a variety of colours, can be finished in two burnings.⁷³ Of another, an ornamental border, he notes that it can easily be painted by a student who can't draw.⁷⁴ One of his illustrations is a Carriage of the Cross, which may well be related to that at Bilston.

The next generation of glass stainers was that which made the transition to translucent glass in the earlier medieval tradition. It included Thomas Willement (1786-1841), who was responsible for windows in the Lady Chapel of St Peter's-in-the-East, Oxford, of 1839,⁷⁵ Warrington of London,⁷⁶ and William Wailes of Newcastle-upon-Tyne, all of whom remained essentially in the Georgian tradition in terms of style.⁷⁷ Wailes was one of the first to export stained glass to Australia. Wailes's business was established in 1838, before Pugin became influential, and Pugin patronised him exclusively until 1845, when he persuaded the Birmingham metalworker John Hardman to take up the craft.⁷⁸ Hardman had to acquire the basic technology by entering into an agreement with the two sons of Robert Henderson and their chief painter, one Hinckley,⁷⁹ but he must also have had to experiment to achieve the translucency already to be seen in the works of Wailes and Warrington.⁸⁰ †

Pugin had sketched designs for stained glass as early as 1832, at the age of twenty, but there is no reason to suppose that he knew anything of the technology involved, and it seems likely that he was the pupil and Wailes the master, rather than the reverse. An example of Wailes's work for Pugin is the east window, finished in 1842, at St Giles's, Cheadle, Staffordshire, of 1841-6.⁸¹ Written information on the craft was now becoming available. Charles Winston published his *Inquiry into the Difference of Style Observable in Ancient Glass Paintings* in 1847,⁸² establishing a stylistic chronology for stained glass, as well as proposing techniques to emulate it.⁸³

⁷² Whittock, *Decorative Painters' and Glaziers' Guide*, pl LXV & p 218.

⁷³ Whittock, *Decorative Painters' and Glaziers' Guide*, pl XLVII & p 242.

⁷⁴ Whittock, *Decorative Painters' and Glaziers' Guide*, pl LI & p 247.

⁷⁵ Lamborn, 'Painted Glass in Oxford', p 36.

⁷⁶ Powell, 'Stained Glass in Birmingham', p 524.

⁷⁷ Geoffrey Down, 'Stained Glass Windows in 19th Century Melbourne: a Study in Taste', in Anne Galbally & Margaret Plant [eds], *Studies in Australian Art* (Melbourne 1978), p 34 note 22, cites C E Wright, 'The Work of Thomas Willement, Stained Glass Artist, 1812-1865', *British Museum Quarterly*, XXIX (1964-5), pp 1-5.

⁷⁸ Peter & June Donovan, *150 Years of Stained Glass* (Netley [South Australia] 1986), p 15.

⁷⁹ Powell, 'Stained Glass in Birmingham', p 524.

⁸⁰ Powell, 'Stained Glass in Birmingham', p 524.

⁸¹ Pugin writes to the Earl of Shrewsbury in May 1842 that 'Wailes has written to me to pay him for the Cheadle window £42 which I think is moderate for such rich glass'. W G Short, *A Brief History of the Roman Catholic Church of St Giles, Cheadle in the County of Staffordshire* (Cheadle [Staffordshire] 1981), p 7.

⁸² Charles Winston, *Inquiry into the Difference of Style Observable in Ancient Glass Paintings, especially in England: with Hints on Glass Painting* (Oxford 1847), p 7.

⁸³ Down, 'Stained Glass Windows', p 32.

Other sources describe the making of translucent stained glass, though they are in no way Pugin-linked. *The Painter, Gilder and Varnisher's Companion*, published in Philadelphia in 1850, shows a more up-to-date kiln than Whittock's, with a muffle of terra cotta rather than cast iron, and it gives the usual recipes for mixing the various colours. It gives no guidance on style except for a few rules as to which colours go with each other, and there are no Puginian or Camdenian overtones.⁸⁴ But it clearly refers to glass of the translucent type, stating that 'the effect of the picture on glass is produced by transmitted and not by reflected light'⁸⁵ and describing how the shades must be laid on the face towards the spectator, and the lights on the other face.⁸⁶ The standard British text, published in Weale's *Rudimentary Treatise* in the 1850s, was M A Gessert's *Rudimentary Treatise on the Art of Painting on Glass*, which again refers to translucent glass, describing how the shades are put on the spectator's side and the 'illuminating colours' on the reverse. It is purely technical in character, though it does state that the 'beautiful art of glass painting is ... restored, in our day, to the perfect fullness of its ancient splendour'. But the author was a German, and the book was translated from his writings in German extending over a number of years previously. It was in no way an outcome of the British Gothic Revival.⁸⁷ There was later to be some French influence from Viollet-le-Duc, who discussed stained glass extensively in his *Dictionnaire Raisonné*.⁸⁸

Pieces of stained (painted) glass, coloured glass and plain glass must all be mounted in lead cames or their equivalent. Early on it seems that folded zinc bars were used, as has been discussed above. In Britain there was something referred to as the patent fan-light sashes containing divisions - probably not folded zinc - which James Malton recommended as applicable to the ordinary cottage window. They seem to have been much like a regular glazing bar in section:

and having a rabbet on each side, the glass could be neatly fitted in, and fixed with putty, and thereby made perfectly air tight; while the bars themselves need not be broader, but rather narrower than the usual breadth of leaden divisions; at the same time, the uniform neatness of the whole, by excluding the necessity of iron bars, and having a small projecting bead on the inner face ... would add considerably to the acknowledged beauty of casement windows.⁸⁹

Although early stained glass windows in Australia were generally imported, in 1837 a raffle was conducted by Day and Clamp of Sydney, for a 'painted enamel and stained glass window adopted [*?adapted*] for a gentleman's residence', which was said to be the first manufactured in the colony, and which illustrated the death of Prince

⁸⁴ *The Painter, Gilder and Varnisher's Companion* (Philadelphia 1850), pp 137-158.

⁸⁵ *Painter, Gilder and Varnisher's Companion*, p 138.

⁸⁶ *Painter, Gilder and Varnisher's Companion*, p 137.

⁸⁷ M A Gessert, *Rudimentary Treatise on the Art of Painting on Glass, or Glass-Staining* (3rd ed, London 1857), p 1.

⁸⁸ Eugène-Emmanuel Viollet-le-Duc, *Dictionnaire Raisonné de l'Architecture Française de XIe au XVIe Siècle* (10 vols, Paris 1854-68), X, pp 373-462, sv 'Vitrail'. See also Paul Lacroix, *Les Arts au Moyen Age et à l'Époque de la Renaissance* (Paris 1869), pp 257-273, 'Peinture sur Verre', which is far less substantial, but includes a colour illustration

⁸⁹ James Malton, *An Essay on British Cottage Architecture* (London 1798), p 18 & pl 2.

Arthur.⁹⁰ In 1843 the newly arrived architect Edmund Blacket, painted glass quarries for the Anglican pro-cathedral in Sydney, though these were meant to be temporary and were apparently unfired.⁹¹ In 1844 Major Mitchell ordered leadlight Gothic windows from John Shipley,⁹² which James Broadbent takes to be coloured, though the basis for this assumption is unclear. In 1848 J H Widrington of Hobart painted scriptural subjects 'in a "stained glass" manner', for the new house which James Thomson had designed for W Rout.⁹³ Also in 1848 John Chamberlain 'installed' a window at Walkerville, South Australia which the Donovans seem to believe to have been of stained glass, though the basis for this is unclear.⁹⁴

The first imported window, from William Wailes, was installed at Christ Church, Longford, Tasmania, by 1844. It had been designed and ordered by William Archer, the architect of the church, when he was studying in Newcastle in 1842, but it seems very advanced in style when compared with Wailes's contemporary window at Cheadle. A number of other windows from Wailes were to follow, though a patterned window which he sent out in 1845 for Christ Church St Laurence, Sydney, was rejected because it included the Virgin Mary and 'savoured strongly of something more than Puseyism. It was sent back to Wailes to be reworked, and finally installed in 1853, now depicting St John, Christ as the Good Shepherd, and St Peter.⁹⁵ In 1864 Wailes supplied St Peter's College, Adelaide, with what was said to be the first window in South Australia by any eminent English artist. Subsequently the successor firm of Wailes & Strang supplied a number of windows for St Peter's Cathedral, Adelaide.⁹⁶

Still more windows came from Pugin's proteges, Hardman & Co of Birmingham, the first being a figurative window for the east end of St Patrick's Church, Sydney, in 1849, ordered by Bishop Polding.⁹⁷ Three early examples were installed in St Mark's Church, Darling Point, in 1852-3,⁹⁸ and there are many prominent examples of later dates such as those in St Patrick's Cathedral, Melbourne. Here all but three of the windows are from Hardmans, or the successor firm of Hardman Powell, dating from

⁹⁰ *Sydney Herald*, 6 February 1837, cited in James Broadbent, 'Aspects of Colonial Architecture in New South Wales 1788-1847 (3 vols, PhD, Australian National University, 1985), II, p 439, by reference from Maisy Stapleton.

⁹¹ Joan Kerr, 'Select list on stained glass' (typescript, Sydney 1996), p 1, ref her DPhil thesis.

⁹² Broadbent, 'Aspects of Colonial Architecture', II, p 437, ref Mitchell Diary, 1843-6, Mitchell Library, MLC61, 29 February & 25 July 1844.

⁹³ *Hobart Town Guardian*, 29 January 1848, p 3, cited in Kerr, 'Select list on stained glass', p 3.

⁹⁴ Donovan, *150 Years of Stained Glass*, p 32. the reference is presumably to St Andrews Church, Walkerville, the foundation stone of which had been laid in October 1847: E & R Jensen, *Colonial Architecture in South Australia* (Adelaide 1980), p 78.

⁹⁵ Joan Kerr, 'Designing a Colonial Church: Church Buildings in New South Wales 1788-1888' (DPhil, University of York, 1977), I, p 193, quoting [Richard Thomas], 'Progress of the Oxford Heresy - St Laurence's Church', *Commercial Journal*, 27 September 1845. According to Kerr a fire in 1905 destroyed most of the window, whereas Donovan & Donovan, *150 Years of Stained Glass*, p 15, state that the window was moved in 1861 to St Barnabas's Church, Broadway.

⁹⁶ Donovan & Donovan, *150 Years of Stained Glass*, p 15.

⁹⁷ Kerr, 'Select list on stained glass', p 3, ref her 'Designing a Colonial Church', chapter 3; Beverley Sherry, *Australia's Historic Stained Glass* (Sydney 1991), p 14, ref *Sunday Mail Magazine* (Brisbane), 10 February 1963), p 2.

⁹⁸ The M E Tooth memorial window of 1852 and two other memorial windows of 1853, the design of which was supervised by William Butterfield" Kerr, 'Designing a Colonial Church', I, p 194.

about 1861 to 1910. There are also two windows by Franz Mayer of Munich.⁹⁹ Elsewhere glass from F X Zettler of Munich was quite widely used, especially in Catholic churches. The New Valley Wesleyan Church, Brisbane, was planned in 1887 to have all the windows 'filled with Munich stained glass',¹⁰⁰ though whether by Zettler or Mayer is unclear.

Nothing of the sort was produced locally. When in 1851 St James's Church in Melbourne was reported to have had a 'coloured window' installed,¹⁰¹ we can assume it was just that. Local plumbers and glaziers made up windows of coloured quarries, installed imported windows, installed imported window elements amidst their own quarries or other elements, and probably repaired and filled in for broken and missing sections of the imports. Only after this came the further stage when local firms employed their own artists and were capable of creating the full range of stained glass, though even then they were never able to displace imports entirely. In Adelaide the early windows were all non-figurative, and the most prominent maker, Edward Brooks, was a plumber and painter by trade.¹⁰² He made only patterns of coloured and flashed glass, and later sometimes incorporated medallions within them.¹⁰³ In 1856 he made a window, which no longer survives, for Christ Church, North Adelaide.¹⁰⁴ After his death in 1874 no further stained glass was made in South Australia until 1890.¹⁰⁵

In Melbourne a Bourke Street plumber called Eden offered in 1856 to glaze all the windows of Christ Church St Kilda at his own expense, the principal ones in stained glass suited to C R Swyer's architecture.¹⁰⁶ Whether he intended to import these latter is unclear, but it is unlikely that he could have made them. In 1858, however, the Melbourne plumbers Ferguson & Urie showed four stained glass windows, of their own manufacture, at the Victoria Industrial Society's exhibition,¹⁰⁷ and these are more likely to have contained some input by Ferguson & Urie themselves, who were to become the first local makers. It is in fact in 1858 that they are believed to have approached the English stained glass artist D R Drape,¹⁰⁸ who duly emigrated to Australia, but then went to the goldfields, and did not take employment with Ferguson & Urie until 1863.

⁹⁹ Arthur Andirons, 'The Conservation of the Fabric: the Leaded Windows of St Patrick's Cathedral, Melbourne', *Historic Environment*, XII, 2 (1996), p 19.

¹⁰⁰ *Australasian Builder & Contractor's News*, 3 September 1887, p 275.

¹⁰¹ *Argus*, 21 June 1851, p 2. This seems likely to be the window surviving in the base of the tower, 'made of small rectangular panes in neutral tones of green and beige', which Geoff Down rashly attributed to George Beaver's original glazing contract of 1842: Down, 'Stained Glass Windows', p 28.

¹⁰² Peter & June Donovan, *A Guide to Stained Glass Windows in and about Adelaide* (Blackwood [South Australia] 1983), p 15.

¹⁰³ Donovan & Donovan, *Guide to Stained Glass Windows*, p 33.

¹⁰⁴ Donovan & Donovan, *Guide to Stained Glass Windows*, p 15.

¹⁰⁵ Sherry, *Australia's Stained Glass*, p 15.

¹⁰⁶ *Australian Builder*, 33 (30 October 1856), p 295.

¹⁰⁷ Victoria Industrial Society, *Catalogue of the Eighth Annual Exhibition*, p 45.

¹⁰⁸ E M Bradshaw [née Drape], 'David Relph Drape, Artist, Architect and Glass Stainer' (ms 1107, State Library of Victoria).

In 1861 Ferguson & Urie exhibited '4 Specimens of Ornamental Glazing in Lead',¹⁰⁹ a description suggestive of something less than true stained glass. However J L Lyon of Maldon showed glass of his own design,¹¹⁰ and during that year joined the staff of Ferguson & Urie.¹¹¹ In February 1862, when extensions to St Paul's Church, Ballarat, were proposed, a local man acting as agent for Ferguson & Urie offered to donate the central window provided that the company was commissioned for the balance. The window was completed on this basis by May of 1862.¹¹² It is still not clear whether there was any locally painted component in this window.

The first datable work by Lyon is the Threlfall window at Holy Trinity Church, Maldon, of 1862, and he was almost certainly responsible for the stained glass at Longeronong homestead in the same year, remarkable for its nationalistic motifs. Lyon was later to be admitted to partnership as Ferguson, Urie & Lyon, and later still left for Sydney. Until 1880 any significant work in Victoria can confidently be attributed to Ferguson, Urie & Lyon. In Sydney W Palmer had already produced stained glass in 1861, and a number of local makers were to follow. In 1863 came John Falconer, who by 1875 was in partnership with Frederick Ashwin, and in 1873 John Lyon joined Daniel Cottier in Cottier & Co (later Lyon, Cottier & Co, then Cottier, Lyon & Wells.) In the 1880s the existing building materials supplier, Goodlet & Smith, diversified into stained glass.¹¹³

Imported elements also continued to be incorporated within locally designed and fabricated windows, none more conspicuous than the roundels of the four seasons which were commonly used in staircase windows, for the scenes they depict are unmistakably European. A good example is the three light hall window at 'Rupertswood', Victoria, of 1875, made by Ferguson & Urie. It incorporates small panels of northern hemisphere birds, actually labelled 'siskin' &c, and these are clearly imported. It also has larger pieces showing a kookaburra, platypus, &c, which seem likely to be locally made, but could easily have been produced in Britain for the Australian market. Then there are large central panels of rural and hunting scenes, which do not look particularly Australian but are signed by D R Drape. They no doubt represent the Rupertswood estate, where Sir Rupert Clarke, Australia's first baronet, hunted, drilled his volunteers, and entertained visiting royalty. That it should look English was probably of the essence. One of the most important commissions of Ferguson & Urie as the glass for the E S & A Bank headquarters in Collins Street, Melbourne, of 1883-7. It is reported that the architect, Wardell, insisted on 'Chance's best patent 26 oz. glass' set in narrow five by four inch [125 x 100 mm] quarries 'of extra strength in the core'¹¹⁴ - whatever that might mean.

¹⁰⁹ Victorian Exhibition 1861, *Catalogue*, p 213.

¹¹⁰ Victorian Exhibition 1861, *Catalogue*, p 215.

¹¹¹ Sherry, *Australia's Stained Glass*, p 15.

¹¹² Information from David Rowe, March 2005. The local man was Thomas Robson of Sturt Street, and though the firm he represented is not named, it could only be Ferguson & Urie, and it was indeed they who actually carried out the work.

¹¹³ Sherry, *Australia's Stained Glass*, p 15.

¹¹⁴ D M Cash, *The Gothic Bank of Collins Street* (Melbourne 1989), p 14, ref W W Wardell, 'Specifications for the Erection of the E. S. and A. Chartered Bank, Melbourne (ANZ Bank Archive E/102/4), p 86. The meaning becomes even more obscure when relayed by Robyn Riddett, 'A Building "Worthy of the City"', in U M De Jong [ed], *W W Wardell: the Architect and his Era* (Geelong [Victoria] 2000), pp 115-6, as 'narrow 5" x 4" **lead** quarries'.

Most has been written of the stained glass artists active in the last two decades of the century, but even these remain enigmatic because their work is rarely signed.¹¹⁵ Smyrk & Rogers operated in Melbourne from the 1880s to 1903, and August Fischer, who arrived in 1881, continued until 1916.¹¹⁶ Henry Brooks had reached Melbourne in 1853, but it was a long time before he concerned himself with stained glass. At first he was an agent for his father, Henry Brooks & Co of Bishopsgate, in the importation of glass, glassware, china and earthenware. In 1869 he was joined by Edward G Robinson as Brooks, Robinson & Co, and in 1882 this firm supplied a stained glass window for St John's Church, Heidelberg. Down surmises that their artists were trained by Clayton & Bell of London, a firm with whom, by the end of the century, Brooks Robinson were closely linked.¹¹⁷ The firm continued to supply stained glass into the 1960s. William Montgomery was active in Melbourne from his arrival in 1887 to his death in 1927.¹¹⁸ Barend & Montague Barnett worked in Melbourne only quite briefly in 1895-9 before emigrating (like so many architects and others during the depression) to Western Australia. Down reports a small window of about 1904 in the porch of St Mary's Cathedral, Perth, signed 'Barnett Bros. Perth'.¹¹⁹ E L Yencken & Co began in Melbourne in 1900 and continued until 1940.¹²⁰ While much earlier glazing had been simply coloured glass set within lead comes, and then, as time went on, incorporating some proportion of imported figurative lights, at the end of the century the process was reversed. Now windows built up of coloured glass, with few or no painted elements, became increasingly popular.

The Melbourne firms also dominated the Adelaide market for two decades, and in 1889 Smyrk & Rogers undertook the stained glass for the first stage of Parliament House.¹²¹ However in 1892 William Montgomery opened an Adelaide branch with Herbert Grimbley, as Montgomery & Grimbley,¹²² and in the mid 1890s E F Troy, who had previously used glass imported from Melbourne firms, began to manufacture in his own right.¹²³ In Brisbane the partnership of Exton & Gough was formed in 1882, and soon afterwards established the first stained glass studio in Queensland. After they separated in 1895 Robert Exton specialised more in stained glass, and his firm dominated the Queensland market until the 1950s.¹²⁴ Between the wars the Wunderlich company introduced 'Wunderglaze' or electro-copper glazing, in which the glass was set into a copper framework rather than lead comes. This tends to be

¹¹⁵ Exceptions include the glass at 'The Acacias', Adelaide, signed by the Melbourne firm of Smyrk & Rogers, and 'Warwillah', St Kilda Road, Melbourne', where a stair window signed by W Montgomery of Melbourne contains a figure labelled with a quotation which purports to be from Scott, though it has so far proved impossible to identify: 'A merlin sat upon her wrist / Held by a leash of silken twist'.

¹¹⁶ Sherry, *Australia's Stained Glass*, p 15.

¹¹⁷ Down, 'Stained Glass Windows', p 30.

¹¹⁸ Sherry, *Australia's Stained Glass*, p 15.

¹¹⁹ Down, 'Stained Glass Windows', p 28, relying upon Sands & McDougall directories for their time in Melbourne.

¹²⁰ Sherry, *Australia's Stained Glass*, p 15.

¹²¹ Donovan, *150 Years of Stained Glass*, p 33.

¹²² Sherry, *Australia's Stained Glass*, p 16; Donovan, *150 Years of Stained Glass*, p 40.

¹²³ Donovan, *150 Years of Stained Glass*, pp 33/36.

¹²⁴ Sherry, *Australia's Stained Glass*, p 15.

associated with work in the Art Deco style. Another product was 'Metalite', a Monel metal moulding for structural glass.¹²⁵

e. transparencies

In 1833 Frederick Peterson of Sydney had been advertising 'transparencies' for glass,¹²⁶ which were temporary decorations designed to glow when illuminated from behind.¹²⁷ In 1862 Lewis Steffanoni, whose family business in Holborn did gilding, coats of arms in gold bullion embroidery, badges and flags, emigrated to Sydney. To celebrate the wedding of the Prince of Wales in 1863 Steffanoni painted transparencies for the five front windows of the Sydney Morning Herald building, and many others were to follow.¹²⁸ In 1870 Reading, Son & Steffanoni showed what may well have been something more permanent at the New South Wales Intercolonial Exhibition - 'Imitation stained glass, called diaphanie'.¹²⁹ The heyday of the glass transfer was to be later still. Buxton's Artistic Stationery Company in Melbourne acquired an agency in about 1884 for the 'Patent Glacier Window Decoration' made by McCaw, Stephenson & Orr of Belfast,¹³⁰ and in 1887 James Lang & Co of Brisbane also became agents. The material was claimed to be inexpensive, but distinguishable from stained glass only by an expert.¹³¹ In 1888-9 McCaw, Stephenson & Orr obtained a bronze medal for their Glacier window decoration at the Centennial Exhibition in Melbourne,¹³² thus surpassing the Glass Decoration Co of Hatton Garden, London, whose 'glass decorations'¹³³ may have been a similar product.

In 1889 'Glacier' was described as a semi-transparent paper which could be used to block out 'dingy and undesirable prospects',¹³⁴ but both 'Glacier' and 'Crystal' transfers became highly decorative in character, with a role going far beyond this negative one. A Glacier catalogue of about 1905 came in five sections. The first was centre-pieces, which included religious scenes, floral patterns, knights and heraldic designs, scenes such as the Niagara Falls, and Chinese designs by Chinese artists. The second category was borders, including curves of various gradations; the third was rosettes and panels; the fourth ground fillings in the form of geometric or floral patterns; and

¹²⁵ Hardwick, 'Influence of Art Deco', pp 102-3.

¹²⁶ Frederick Peterson's advertisement in the *New South Wales Calendar and Directory ... 1833*, reproduced in Barrie Dyster, *Servant & Master* (Kensington [New South Wales] 1989), p x.

¹²⁷ Joan Kerr, 'Select list on stained glass' (typescript, Sydney 1996), p 8, ref Anita Callaway in *Transition*.

¹²⁸ Annette Butterfield, 'Lewis Steffanoni (1835-1880) and Sophia Elizabeth Steffanoni (1873-1906)', in Christopher Cunneen [ed], *Australian Dictionary of Biography Supplement 1580-1980* (Melbourne 2005), p 370.

¹²⁹ *Industrial Progress of New South Wales*, p 48.

¹³⁰ *Australasian Builder & Contractor's News*, 24 September 1887, p 318.

¹³¹ *Australasian Builder & Contractor's News*, 10 September 1887, p 292.

¹³² Centennial International Exhibition, Melbourne, 1888-1889, *Official Record* (Melbourne 1890), p 967.

¹³³ Centennial Exhibition, *Official Record*, p 962.

¹³⁴ *Australasian Builder & Contractor's News*, 24 August 1889, p 186.

the fifth letters and figures suitable for commercial windows.¹³⁵ Existing transfers, at 'Tudor House', Williamstown, which may be some of the earliest surviving, are pictorial scenes set in square decorative borders.¹³⁶ Others at 'Boisdale' near Maffra, of 1892, are standing figures in rectangular decorative surrounds. Branded 'Glacier' transfers are found at 'Rosedale', Portarlington, Victoria, probably dating from the early twentieth century.

f. skylights

Glass roofing tiles, conceived as a simple way of admitting light through a tiled roof, are virtually unknown in Australia but for those on the stable of Cook's Cottage, Melbourne, which presumably were brought from England with the rest of the building's components in 1934.¹³⁷ Though the house seems to date in part from 1756, much of it is from the nineteenth century, and the tiles quite probably from the twentieth. Glazed pantiles were known in the early nineteenth century, but these were cast iron frames in the form of a pantile, each with three parallel strip openings to be glazed separately, so that the flat facets approximated to the curve of the tile.¹³⁸ Glass tiles proper seem to have been first imported from Antwerp and were said to be of common green glass, similar in form to a common clay tile - probably meaning a pantile - and in varying weight and thickness. Nicholson's *Encyclopedia* ascribes this information to a report in the *Builder*, without giving a date,¹³⁹ but it must have been towards mid-century. The glass tile proper appears to have been the subject of a British patent by John Russell in 1846,¹⁴⁰ and by the 1860s they were available in one plain and two fluted patterns.¹⁴¹ Glass pantiles such as those at Cook's Cottage, as well as others in the Roman pattern, were being advertised by Jennings & Co of Bristol in 1912.¹⁴² Marseilles pattern glass roofing tiles were available in Australia by 1914,¹⁴³ and at a later date were manufactured locally by Australian Window Glass.¹⁴⁴

¹³⁵ M'Caw, Stevenson & Orr Ltd, Belfast & London, *Glacier Window Decoration. Book No. 7* (c 1905), cited in Richard Neylon, *List 80: Some Recent Acquisitions* (Sydney 2003), p 2, no 121.

¹³⁶ Slides supplied to me by Anne Cahir, who believes them to be original to the house, 1884. At 'Memsie', Bridgewater, Victoria, there are transfers in the entrance door spandrel and sidelights, and panels at the rear of the hall, in the wing believed to date from 1883, but it would be rash to attribute this date to the transfers.

¹³⁷ Miles Lewis, 'The Cottage in Yorkshire and Melbourne', in *Cook's Cottage* (Melbourne, no date), pp 2-31.

¹³⁸ J C Loudon, *Encyclopaedia of Cottage, Farm and Villa Architecture* (London 1846 [1833]), §954, p 471.

¹³⁹ Peter Nicholson [ed Edward Lomax & Thomas Gunyon], *Encyclopedia of Architecture, being a new and improved edition of Nicholson's Dictionary, &c* (2 vols, London 1852), I, p 448.

¹⁴⁰ Wyatt Papworth [ed], *The Dictionary of Architecture* (London 1853-92), sv Tile, ref *Civil Engineer and Architect's Journal*, IX (1846), p 247.

¹⁴¹ G R Burnell [reviser], *The Builder's and Contractor's Price-Book for 1865* (London 1865), p 184.

¹⁴² G Jennings & Co, *Price List* (Bristol 1912), p 262.

¹⁴³ C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1938), p 265. By 12906 Henry Maurer & Son of New York, who were manufacturers of terra cotta roof tiles similar in principle to the Marseilles pattern but of a more elegant appearance, were selling matching glass tiles for use with them: *'Sweet's' Indexed Catalogue of Building Construction* (New York 1906), p 86.

¹⁴⁴ *Ramsay's Catalogue* [1949], §30.3.

In 1887 two conservatories at 'Rippon Lea', Melbourne (one with an arched roof, and one of basilican section) were reported to be roofed in 'corrugated glass',¹⁴⁵ and actual remains of corrugated glass, designed to fit into the corrugated iron roofing, have been found at the Venus Crushing Battery, Charters Towers, Queensland. In 1901 Pilkingtons were advertising it as 'Patent Corrugated Sheet and Rolled Glass' to fit iron of three or five inch [75 or 125 inch] pitch, in sheets twenty-seven inches [690 mm] wide and from 48 to 62 inches [1.2 to 1.55 m] long, or up to 72 inches [1.8 m] in rolled glass.¹⁴⁶ The sizes were much the same in 1937: a thickness of $\frac{3}{16}$ inch [8 mm], a width 27 inches [69 mm] and lengths of 48, 60 or 72 inches [1.2, 1.5 and 1.8 m].¹⁴⁷ Corrugated perspex, which fulfilled much the same role, seems to have been brought onto the market by ICI just after World War II.¹⁴⁸ In 1954 'Savolite', described as an English 'translucent woven fibreglass corrugated sheet' was brought onto the market by Richard Scandrett Co of Sydney, in one sixteenth inch [1.5 mm] thickness, and corrugated to match either iron or asbestos cement.¹⁴⁹

An English product known as wire wove roofing was designed to provide a cheap substitute for skylights. It was patented in 1887 by the Messrs Ford of Regent's Park and Archer of Waverly, as, according to a report, 'an improved non-contracting material, applicable as a light flexible, and translucent waterproof covering for roofs and other such-like purposes.' It was manufactured by coating wire gauze with a mixture of refined linseed oil and litharge [lead oxide], which had been agitated with air to give it 'a drying quality'. The wire was dropped into this mixture repeatedly and allowed to dry each time, until the mixture completely closed the interstices.¹⁵⁰ It was made by a London company and had been used to roof the Westminster Aquarium. The *Australasian Builder & Contractor's News* predicted that it would soon supersede glass for use in overhead lights.¹⁵¹ Wove wire roofing made its appearance in Australia when it was shown at the Centennial Exhibition of 1888-9 by H J Langdon & Co of Elizabeth Street, Melbourne, receiving a second order of merit award.¹⁵²

Skylights, in the conventional sense, fall into two broad categories. Custom-made skylights for mansions, clubs and shops are usually joiner's work of no particular technical interest, but Australia's 'first glass ceiling' was installed by the Colonial Architect, Henry Ginn, as part of the renovation of St Patrick's Hall, Melbourne, to prepare it for the occupation of the new Legislative Council.¹⁵³ In January 1868 Horbury Hunt detailed a dome light with curved glass carried on thin wrought iron

¹⁴⁵ *Leader*, 1 December 1883, quoted in John Foster, *Victorian Picturesque* (Melbourne 1989), p 670.

¹⁴⁶ Raymond McGrath & A C Frost, *Glass in Architecture and Decoration* (1st ed, London 1937), p 642.

¹⁴⁷ J E Sears, *The Contractors,' Merchants,' and Estate Managers' Compendium and Catalogue* (15th ed, London 1901), p 267A.

¹⁴⁸ Robin Boyd, *Victorian Modern* (Melbourne 1947), advertisements, no page; *Ramsay's Catalogue* [1949], §14/3.

¹⁴⁹ *Cross-Section*, no 22 (1 August 1954), p 2.

¹⁵⁰ *Australasian Builder & Contractor's News*, 24 September 1887, p 317.

¹⁵¹ *Australasian Builder & Contractor's News*, 22 June 1889, p 593.

¹⁵² Centennial Exhibition, *Official Record*, pp 621, 852.

¹⁵³ Michael Cannon, *Melbourne after the Gold Rush* (Main Ridge [Victoria] 1993), p 59.

bars, in shops for Lebbens Hordern at Brickfield Hill, Sydney.¹⁵⁴ The extension to the Australian Club, Melbourne, of 1891-3, has a large dome over the dining room made of a number of segments of etched glass, each one curved in two directions. It seems most unlikely that these were produced locally.

Skylighting systems, by contrast, were commonly patented, and based upon metal sections of various sorts, and were most often used in industrial buildings. Such were the 'Patent Ventilating and Unbreakable Skylights' manufactured by Allen Brothers of Redfern, Sydney, in 1888.¹⁵⁵ Even this cannot be assumed to be a local patent, for most such systems derived from overseas, and in many cases they must have used imported components. Early in the twentieth century Malleys Ltd of Sydney sold 'Malley's Patent Skylight', a simple rectangular glass sash, hinged at the upper end so that it could be opened awning-fashion, and held open with a metal stay rod.¹⁵⁶ This is much the same as Verity's iron skylight, advertised in Britain in the 1880s.¹⁵⁷

Goodlet & Smith were the sole local agents for Pennycook bars, which came in lengths of up to 4.5 metres, and which had 'lead overlaps' to make a secure watertight joint without putty, with a claimed reduction of trouble and expense.¹⁵⁸ By 1912 James Sandy & Co of Sydney had become the sole agents.¹⁵⁹ These should not be confused with the products of James Penyuik, the firm which was to become Luxfer, as will be explained below. Pennycook's was a Glasgow company which claimed to have been making its glazing bars since about 1874, though they were not in fact the same product, for the elaborate section of an 1883 advertisement, apparently formed out of sheet metal,¹⁶⁰ in no way resembles the solid steel bar of inverted T section shown in an illustration of 1924).¹⁶¹

Earlier glazed skylights in Australia derived largely from British sources such as Luxfer Ltd of London,¹⁶² and do not appear to have involved much local innovation. Luxfer was the only one of the standard glazing systems to be advertised locally in the first Ramsay's Catalogue of 1931.¹⁶³ It was sold by Brooks Robinson & Co Ltd of Melbourne, who claimed to maintain 'a skilled erection division, who can be sent to any part of the Commonwealth'. The earliest identifiable example is the conservatory at Central Park, Malvern, Melbourne, of about 1927.¹⁶⁴ By 1911 Louis F Bulot of Sydney was the local representative for Griffiths' Ventilating Skylight, a simple rectangular frame designed to be set in a sloping roof, with an openable sash hinged at the top.¹⁶⁵ By 1922 Malleys Ltd of Sydney were making skylights of much the

¹⁵⁴ Peter Reynolds & Joy Hughes, 'The Blacket Years: Works 1863-1869', in Reynolds et al, *John Horbury Hunt.*, p 44.

¹⁵⁵ *Australasian Builder & Contractor's News*, 10 November 1888, p 127.

¹⁵⁶ *Building*, 12 September 1919, p 136.

¹⁵⁷ *Building News*, 20 April 1888, p 111.

¹⁵⁸ *Australasian Builder & Contractor's News*, 29 December 1888, p 596.

¹⁵⁹ *Salon*, I, 1 (July-August 1912), advertisement p viii.

¹⁶⁰ Samuel Timmins, *Examples of Iron Roofs, Vol 1* (London 1883), no page.

¹⁶¹ *The Colonial Compendium & Export Directory of the Building trades* (London 1924), p 87.

¹⁶² J E Sears & J E Sears [eds], *The Architects' Compendium and Annual Catalogue* (London 1936), p 363.

¹⁶³ W L Richardson [ed], *Ramsay's Architectural Catalogue* (Melbourne 1931), §121j, pp 85-7.

¹⁶⁴ Roger Beeston, 'Central Park Conservatory', *Architect* [Melbourne], October 1997, p 10.

¹⁶⁵ *Building*, 12 January 1911, p 20.

same type, with a quadrant stay to keep them open.¹⁶⁶ A prominent skylight of local manufacture was the 'Deluge', made by Florant & Co of Carlton, Melbourne.¹⁶⁷ In 1949 a local company, Leopold Barnett Pty Ltd of Sydney, was advertising skylights which had an extra layer of glass underneath, to improve the appearance and diffuse the light better.¹⁶⁸

In 1954 ICI [Imperial Chemical Industries] was advertising corrugated 'Perspex' acrylic resin sheet, which could be fitted into a conventional roof of corrugated iron or asbestos cement.¹⁶⁹ 'Plastic corrugated roofing' was used in 1957 to admit light to public squash courts at North Adelaide, the first such courts in South Australia.¹⁷⁰ In 1959 ICI advertised the fact that 140 of its corrugated perspex sheets had been used in the roof and walls of No 7 Wharf, Woolloomooloo, Sydney.¹⁷¹

g. prismatic lights

Prismatically shaped glass is said to have been used to illuminate rooms in the eighteenth century.¹⁷² Glazed pavement lights in some form were reportedly coming into use in Edinburgh in about 1810, and were introduced in Glasgow in about 1850. In 1853 the London *Builder* treated with some contempt an American report that one Hyatt of New York was the inventor of glass pavement lights set in a cast iron frame.¹⁷³ This was less than fair, as Hyatt had in fact been taking out patents since 1845, and his invention was much more than a simple light, for he used glass cones and lenses to capture and refract the light towards the rear of the basement rooms.¹⁷⁴ Lenses were produced by pressing the glass in a steel mould, and if necessary buffing it afterwards to produce a fine surface, but the French engineer Falconnier - at a date which is unclear - developed a hollow glass block which was formed by blowing. This, however, suffered the consequent disadvantage that condensation formed inside due to moisture in the glassblower's breath.¹⁷⁵

Prismatic lights were used to light the billiards room, underneath the ballroom, of 'The Acacias', Marryatville, South Australia, where they may date from Thomas English's extensions of 1879. Lights in the pavement of the E S & A Bank headquarters in Melbourne, of 1883-6 bear words including '...borough-London' and

¹⁶⁶ *Building*, 12 October 1922, p 136.

¹⁶⁷ Royal Victorian Institute of Architects, *Journal*, XXI, 3 (July 1933), advertisement p xxiv.

¹⁶⁸ Ware & Richardson, *Ramsay's Catalogue* (1949), § 14/1.

¹⁶⁹ F W Ware & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (Melbourne 1954), § 14/1.

¹⁷⁰ *Cross-Section*, no 57 (1 July 1957), p 3.

¹⁷¹ *Architecture in Australia*, September 1959, p 27.

¹⁷² Dietrich Neumann, 'Prismatic Glass', in T C Jester [ed], *Twentieth-Century Building Materials* (Washington [DC] 1995), p 189, cites British patent no 3058 to Apsley Pellatt, in 1807, for 'Lighting the interior of Ships, Buildings, &c'. McGrath & Frost, *Glass in Architecture* (1937), p 180, cites a report in *Ackerman's Repository*, of May 1909, of Pellatt & Green's 'glass illuminators'.

¹⁷³ *Builder*, XI, 528 (19 March 1853), p 1, in part quoting the *Boston Journal*.

¹⁷⁴ Dietrich Neumann, "'The Century's Triumph of Lighting": the Luxfer Prism Companies and their Contribution to Early Modern Architecture', *Journal of the Society of Architectural Historians*, LVI, 1 (March 1995), pp 124 ff.

¹⁷⁵ Raymond McGrath & A C Frost, *Glass in Architecture and Decoration* (London 1937), p 48.

'... house St,' but it is unclear what brand this represents. Certainly prismatic lights were on sale in Melbourne and Sydney by 1883¹⁷⁶ and probably much earlier. They were mainly imported from England, most coming from Haywards of London,¹⁷⁷ for whom Mark Abrahams & Co of Melbourne and Sydney seem to have been the local agents in 1886,¹⁷⁸ whereas Barnett Brothers of Collins Street were the Melbourne agents by 1889.¹⁷⁹ At the Centennial Exhibition, Hayward Bros & Eckstein showed a 'collection of floor lights' and 'semi-prism pavement lamps', both of which obtained a first order of merit.¹⁸⁰

It was now reported that Hayward's Semi-Prismatic Pavement, Floor and Stall-board Lights were being used in every Melbourne building of consequence, including the Melbourne Safe Deposit Company at Queen and Collins Streets, a new office block at 11 Queen Street, and the Mercantile Bank in Collins Street.¹⁸¹ In the Melbourne Stock Exchange the giant prismatic light in the floor of the ground floor chamber is branded:

HAYWARD BROTHERS
COLLINS STREET MELBOURNE

as if there were a fully fledged local branch. In Adelaide the Australian Widows' Fund Assurance Company building in Grenfell Street, of 1887, had a basement lit with prismatic lights.¹⁸² The Martin Brothers building had a basement lit at the front with a pavement of prismatic lights 10.3 metres long by 1.95 metres wide.¹⁸³ In these cases the maker is unnamed, but it need not have been Hayward, for there were other makers such as the St Pancras Iron Works, St Pancras Road, London.¹⁸⁴ Hyatt's pavement lights were also being imported, presumably from America, and were sold by Neave & Co of Sydney as the sole agents for New South Wales.¹⁸⁵ In 1914 John E Tonks of Sydney was advertising another brand, Keppler's Ferro-Glass, as suitable for basements, roofs, floors and stallboards.¹⁸⁶

A development related to Hyatt's lenses was 'factory ribbed glass', a corrugated glass with horizontal ribs used in New England, USA, in the 1880s to give an evenly distributed light to factories. In England H R Johnson in about 1871 patented forms

¹⁷⁶ Charles Mayes, *The Australian Builders' Price-Book* (4th ed, Melbourne 1883), p 99.

¹⁷⁷ For example the Premier Permanent Building Society, Melbourne, *Australasian Builder & Contractor's News*, 9 July 1887, p 140; Victoria Palace, Pitt Street, Sydney, of 1888, *Australasian Builder & Contractor's News*, 26 January 1889, p 93; the Commercial Bank of Australia headquarters in Melbourne, of 1890, G W Blackburn, 'The Commercial Bank of Australia Limited, New Premises, &c' [bill of quantities] (Melbourne 1890), p 8.

¹⁷⁸ Charles Mayes, *The Australian Builders' Price-Book* (5th ed, Melbourne 1886), p xxxi.

¹⁷⁹ *Australasian Builder & Contractor's News*, 7 September 1889, p 278.

¹⁸⁰ Centennial Exhibition, *Official Record*, pp 459, 464, 854, 893, 983.

¹⁸¹ *Australasian Builder & Contractor's News*, 26 October 1889, p 394.

¹⁸² *Australasian Builder & Contractor's News*, 9 July 1887, p 140.

¹⁸³ *Australasian Builder & Contractor's News*, 30 November 1887, p 524.

¹⁸⁴ Outside the former Academy of Music, Lydiard Street, Ballarat.

¹⁸⁵ Mayes, *Australian Builders' Price-Book* (5th ed, 1886) advertisements p xxviii; *Australasian Builder & Contractor's News*, 6 April 1889, p 334.

¹⁸⁶ C E Mayes, *The Australian Builders & Contractors' Price Book* [8th ed, Sydney 1914], advertisements, p 51.

of glazed gratings for use in both roofing and pavements,¹⁸⁷ the precise principle of which is unclear, and in 1883 a 'stallboard light' was developed, which soon became a standard element of commercial architecture. It was built up of square glass tiles with horizontal V-shaped ribs on the inside, to help throw the light into the interior. The same blocks could also be used in a strip above display windows.¹⁸⁸

There were other inventions and patents about this time, including an American patent of 1882 filed by a Briton, James Penycuik, who joined local partners in 1886 to form the Radiating Light Company of Chicago. In 1897 the company adopted the name 'Luxfer' (or light-bearer). The company was to become by far the biggest maker of pavement lights, glass blocks and related products, and was at pains to improve the optical properties of these, though more of its developments were aesthetic than strictly technical.¹⁸⁹ By 1906 it was claimed that upwards of twelve thousand buildings in the world had been equipped with Luxfer products.¹⁹⁰ By the 1920s Brooks Robinson & Co of Melbourne were manufacturing Luxfer glazing bars under licence,¹⁹¹ and by the 1930s pavement lights - presumably Luxfer - were made by T S Gill & Son of South Yarra, Victoria, and B G Plummer & Co of Sydney.¹⁹² By the 1950s Plummers were also making precast concrete framed windows,¹⁹³ but were challenged in the pavement light business by another Sydney company, Leopold Barnett Pty Ltd.¹⁹⁴ Concrete pavement lights had now largely superseded cast iron ones, and even Haywards, so prominent in the old business, made their own 'Crete-O-Lux'.¹⁹⁵

h. glass blocks & double glazing

About the turn of the century the modern form of glass brick was invented, apparently in Germany, where it was reported by the Technisches-Militar-Comité in 1902.¹⁹⁶ Such units were now made not by blowing but by sealing together two separately created dishes at a high temperature, which created a partial vacuum between them as they cooled. The largest, made by Corning-Steuben was 286 x 286 x 102 [a nominal foot square by four inches thick].¹⁹⁷

¹⁸⁷ Papworth, *Dictionary of Architecture*, sv Pavement Light.

¹⁸⁸ Dietrich Neumann, "'The Century's Triumph of Lighting': the Luxfer Prism Companies and their Contribution to Early Modern Architecture", *Journal of the Society of Architectural Historians*, LVI, 1 (March 1995), pp 124 ff. See also Dietrich Neumann, 'Prismatic Glass', *Building Renovations*, March-April 1993, pp 57-60.

¹⁸⁹ Neumann, "'The Century's Triumph'", pp 49, 199.

¹⁹⁰ *Sweet's Catalogue* [1906], p 262.

¹⁹¹ *Building*, 12 October 1922, p 28.

¹⁹² W L Richardson [ed], *Ramsay's Architectural and Engineering Specifications [Volume 1]* [Melbourne, no date [1934]], p 65.

¹⁹³ *Ramsay's Catalogue* [1954], §14a/1.

¹⁹⁴ *Ramsay's Catalogue* [1954], §§14/4, 14/5.

¹⁹⁵ Oscar Faber & H L Childe [eds], *The Concrete Yearbook 1949* [1954], p 932: see also pp 973-4 for J A King & Co's 'Glas-Crete' and Lenscrete Ltd's 'Lenscrete'.

¹⁹⁶ McGrath & Frost, *Glass in Architecture and Decoration* (1937), p 189.

¹⁹⁷ McGrath & Frost, *Glass in Architecture and Decoration* (1937), pp 468-70.

By the 1930s, when glass blocks had become a fashionable element in architectural design, Luxfer had substantial rivals in the United States. The Owens-Illinois company was a major manufacturer, and its range of glass bricks was also manufactured in England by Pilkingtons, presumably under licence. Though glass bricks were used like structural masonry they were not intended to be load-bearing, and were in effect more an aesthetic than a technical innovation. Their alleged optical properties had been largely forgotten. B K Boyd and W S Lowndes, writing in 1943, draw all their illustrations from the Owens Illinois Glass Co of Toledo, Ohio. They show smart modern designs using the blocks, but these are discussed simply as a means of admitting light in cases where transparency was unnecessary or undesirable, rather than a way of directing the light in any particular fashion.¹⁹⁸

In 1935 a writer in the *Royal Victorian Institute of Architects Journal* predicted the extensive use of glass bricks in the future,¹⁹⁹ and in the following year Australian Window Glass of Sydney began manufacturing their "'Insulux" (Agee)' glass bricks, in various forms including a curved block for corners.²⁰⁰ Their hollow brick was made of two dishes sealed together at a high temperature with a metal alloy, and measured 6¹/₂ x 6¹/₂ x 4 inches [155 x 155 x 100 mm]. There was also a solid glass brick measuring 7⁷/₈ x 7⁷/₈ x 1³/₈ [200 x 200 x 35 mm], with a figured pattern on the external surface and a convex internal face, which was supposed to disperse the rays of light and prevent heat concentration. In Victoria the first known use of Agee bricks was in interior partitions in Navaretti's restaurant, in the Centreway Arcade, Collins Street by the architects H W & F B Tompkins in 1936. Later in the same year they were first used externally as a vertical panel up the centre of the façade of Alkira House, Queen Street.²⁰¹ Curved corner glass blocks were first used in the Holeproof Factory, Brunswick, Victoria, in 1937.²⁰² As late as 1947 glass bricks were regarded in Queensland as being innovative. When Guilford Bell designed the Boonah Anglican Church with two walls of them, they were described as something which had been much used in Britain and the United States, but with no reference to their previous use in Australia. In reality the only innovative aspect was the choice of turquoise as the colour.²⁰³

In 1954 Frank G O'Brien Ltd of Waterloo, Sydney, was advertising 'Thermopane' insulating panels, consisting of two sheets of glass with a spacer-cum-seal connecting them around the perimeter, and dry air within.²⁰⁴ Another such product was the English 'Vitra-Slab' used in the Alliance Assurance Building in Melbourne, of 1955-7. It was described as a sandwich of heat-resistant outer glass, plastic film and plain inner glass.²⁰⁵ 'Polyglass' double glazed units were introduced soon afterwards, and seem to have been very similar. They were used in Melbourne at the Alliance

¹⁹⁸ D K Boyd & W S Lowndes, *Building-Unit Construction* (Scranton [Pennsylvania] 1943), pp 62-90. For an English discussion of the glass block see Percy Thomas, *Modern Building Practice* (4 vols, London, no date [c 1935]), III, pp 168-276.

¹⁹⁹ Hardwick, 'Influence of Art Deco', p 107.

²⁰⁰ C E Mayes, *The Australian Builders & Contractors' Price Book* (10th ed, Sydney 1938), pp 24, 232-8.

²⁰¹ Carol Hardwick, 'Glass Bricks', *Historic Environment*, I, 3 (1981), pp 9-14.

²⁰² Hardwick, 'Influence of Art Deco', p 107.

²⁰³ *Courier-Mail* [Brisbane], 1 April 1947, p 3.

²⁰⁴ *Ramsay's Catalogue* [1954], §30/6.

²⁰⁵ *Cross-Section*, 52 (1 February 1957), p 1.

Insurance Co building by Leith & Bartlett, and the adjoining Atlas Insurance building by Garnet Alsop.²⁰⁶

i. Vita Glass

A particularly interesting though totally imported innovation of the twentieth century was 'Vita Glass', which was promoted for its health-giving properties.²⁰⁷ It was invented by F E Lamplough of Oxford²⁰⁸ and was one of a range of glasses developed in recognition of the beneficial properties of sunshine, and therefore designed for optimum transmission in the therapeutic range. They differed little from ordinary glass except that they included boric acid, and carefully excluded impurities which would reduce ultraviolet transmissivity, particularly iron oxides. It was first made in England by Chance Brothers in 1925, but they were soon joined by Pilkingtons in establishing a 'Vita Glass Marketing Board', which seems to have been a duopolistic cartel, as no other manufacturers are known.²⁰⁹

Oswald Barnett, the Victorian social reformer, was persuaded that it allowed 'the curative rays of the sun to enter' and (being something of a salesman himself) persuaded Pilkingtons to supply the Vita Glass at wholesale prices for his pet project, 'the first slum baby home in the world' (the Copelen Street Methodist Babies Home of 1926-7).²¹⁰ The modernist Best Overend proposed its use in a model design for minimal flats which he published in 1933,²¹¹ but the popularity of the product seems to have been almost as short-lived in Australia as it was in Britain. In the United States, on the other hand, the Hires Turner Glass Company, of Philadelphia and elsewhere, was still making Vita Glass in about 1935,²¹² and production continued at least into the 1960s.²¹³

By now, however, priorities had been inverted, and the greater demand was for anti-actinic glass designed to reduce rather than to facilitate the transmission of ultraviolet rays. This glass was used in Australia in 1955 for the new Colonial Mutual Life Assurance office in Toowoomba, Queensland,²¹⁴ and in 1956 double glazing with heat-resistant glass was used in Murray House, Grenfell Street, Adelaide, designed by E A Keal.²¹⁵ Also in 1956 the Alliance Insurance Building in Collins Street,

²⁰⁶ *Architecture in Australia*, September 1959, p 131. A reference to the acceptance of these units over a period of six years suggests that they originated in 1953 - presumably elsewhere.

²⁰⁷ McGrath & Frost, *Glass in Architecture and Decoration* (1937), pp 468-70.

²⁰⁸ McGrath & Frost, *Glass in Architecture and Decoration* (1961), p 483.

²⁰⁹ Marian Bowley, *Innovations in Building Materials* (London 1960), p 286, citing F E Lamplough, 'The Properties and Applications of Vita Glass', *Glass*, August 1929.

²¹⁰ Oswald Barnett, 'I Remember' (typescript, 1965, held by Copelen Street Family Services, Victoria), p 79. Alternatively, it was reported that the glass was donated not by Pilkingtons but by the philanthropists Alfred and George Nicholas: *Methodist Spectator*, 11 December 1929, p 9.

²¹¹ *Australian Home Beautiful*, 1 September 1933, p 29.

²¹² Hires Turner Glass Company, *Glass in the Home* [brochure bound in the set *Home Owners' Catalogs*, produced by the F W Dodge Corporation, c 1935] (Philadelphia c 1935, unpaginated).

²¹³ McGrath & Frost, *Glass in Architecture*, p 483.

²¹⁴ *Cross-Section*, no 28 (1 February 1955), p 3.

²¹⁵ *Cross-Section*, no 46 (1 August 1956), p 2.

Melbourne, was clad in Vitra-slab, an English product consisting of an outside layer of heat-resistant glass, a layer of plastic film, and an inner face of plain glass. In window glazing the film was almost totally clear, but for spandrels it was an opaque body colour.²¹⁶

j. Vitrolite & cognate materials

'Vitrolite' was a rolled opal glass with a brilliant finish, which was used in locations where ceramic tiling, mirror or other materials would have been normal, and it was to become an integral element of what is now known as the Art Deco. It was available in America in the early 1920s, though only in white,²¹⁷ and competed with the similar snow white finish of 'Sani Onyx',²¹⁸ which was claimed to be made of rock ingredients fired at a temperature of 2,600°F [1,410°C]. The Pittsburgh Plate Glass Company's 'Carrara Glass' was said to be a beautiful white, opaque, structural material, and both this and their black glass were made 'from secret batches' similarly to plate glass 'but with the addition of special chemicals to produce the colors and also to impart to the products their characteristic molecular structure.' They were also subjected to a longer melting process than plate glass, and three to seven days of annealing, according to thickness.²¹⁹

Black glass was used in Mies van der Rohe's Barcelona Pavilion in 1929, and soon Vitrolite structural glass was made available in a wide range of integral colours. It could be made in large sheets, but was often used in standardised 'ashlar sizes' with flat ground edges, which could be laid in cement like tiles.²²⁰ It was commonly rolled with a ribbed back, which was thought to improve the bond, and was laid in mastic or cement when used internally. On the Continent it was at first applied in the same way externally, but this proved unreliable.²²¹ In 1932 black Vitrolite was used in the spandrels of the Daily Express building, London, as has been mentioned to above.

In Britain black glass and opal glass for wall facing were made by Pilkingtons from about 1930, but the American Vitrolite was superior, and was being marketed in competition, until in 1932 Pilkingtons acquired the rights and established the British Vitrolite Co as a subsidiary.²²² In 1933, however, the British Vitrolite Company was still advertising only from a London address, and was probably not in production, while the parent company advertised Vitrolite in a variety of colours, such as Wedgwood Blue and Pearl,²²³ possibly indicating that they were importing the material at this stage. After World War II, Cheesman referred to 'Monoglass' as an opaque glass made by Pilkingtons and 'combining textured face and vitreous

²¹⁶ *Cross-Section*, no 52 (1 February 1957), p 1.

²¹⁷ *Sweet's Architectural Catalogue* (17th ed, New York 1922), pp 1576-9.

²¹⁸ P H Simpson, *Cheap, Quick, & Easy* (Knoxville [Tennessee] 1999), pp 124-6; .

²¹⁹ Pittsburgh Plate Glass Company, *Glass Paints, Varnishes and Brushes* (Pittsburgh [Pennsylvania] 1923), pp 159-160.

²²⁰ McGrath & Frost, *Glass in Architecture* (1961) p 188.

²²¹ McGrath & Frost, *Glass in Architecture* (1937) pp 157-8.

²²² Bowley, *Innovations in Building Materials*, p 286. According to McGrath & Frost, *Glass in Architecture* (1937) p 44, Vitrolite was manufactured in England from 1930, but this must be an exaggeration.

²²³ *Architectural Review*, LXXIV, 443 (October 1933), pp xxix, xxiii. CHECK

enamelled back' for external cladding, which sounds like a development of the Vitrolite type.²²⁴ Vitrolite was produced in 'standard ashlar sizes' with the edges already ground, and the fire finish gave it a brilliant surface. However this surface was wobbly and irregular, unlike another opaque glass, 'Marmovite', which had a ground and polished surface but was expensive.²²⁵ In America Vitrolite was produced by the Vitrolite Division of the Libbey Owens Ford Glass Company, of Chicago, in a range of bright marbled and solid colours,²²⁶ whilst in competition Hires Turner produced a seemingly blander and more limited spectrum of 'structural glass tiling',²²⁷ and the Pittsburgh Plate Glass Company offered 'Carrara Structural Glass' in a range limited to ivory, jade, gray, black and white.²²⁸

In 1936 a horizontal strip or frieze of black Carrara glass was used in the McPherson's Building, Melbourne,²²⁹ the first known example in Australia, and 'Opalite' tiles were locally available by 1938.²³⁰ Vitrolite seems to have had a very limited impact in Australia, until 1958-61, when black Vitrolite was used for a large part of the curtain walling in Frederick Romberg's Eta factory and administration block in the Melbourne suburb of Braybrook, and it seems even then to have been regarded as a novelty. In about 1961 an area of Vitrolite was proposed on the face of the Transport Commission Building, Hobart, but in the event it was altered to black glazed tiles.²³¹ 'Vitroflex', a coloured glass that could be curved around a corner, was used on the Orrong Hotel, Caulfield, Victoria, in a shining black finish.²³²

²²⁴ K Cheesman, 'Glass', in Eric de Maré [ed], *New Ways of Building* (London 1958 [1948]), pp 142, 157.

²²⁵ Norman Westwood & Bryan Westwood, *The Modern Shop* (London 1952), p 76.

²²⁶ Libbey Owens Ford Glass Company, *Glass* [brochure in the *Home Owners' Catalogs*] (Toledo [Ohio] c 1935, unpaginated).

²²⁷ Hires Turner, *Glass in the Home*.

²²⁸ Pittsburgh Plate Glass Company, *Practical Suggestions for the Use of Glass and Paint in your Home* [brochure in the *Home Owners' Catalogs*] (Pittsburgh [Pennsylvania] c 1935), pp 11-15.

²²⁹ Mayes, *Australian Builders Price Book* (1938), p 373.

²³⁰ Mayes, *Australian Builders Price Book* (1938), p 373.

²³¹ District Architect to Chief Architect, 30 August 1963, Public Works Department, Tasmania.

²³² Hardwick, 'Influence of Art Deco', pp 110-111.