# St John the Evangelist, Howsham – Safeguarding Precious Windows

This is the story of how a chance approach from a researcher, who was undertaking a dissertation for her MA, led to the identification of the reasons behind and treatment of serious deterioration in the precious Clayton and Bell stained glass windows of this Grade 1-Listed nineteenth-century church. Merlyn Griffiths of The York Glaziers Trust selected this church and its windows as the primary case study for her recent MA dissertation. We are very much indebted to her for her work and to The Trust for its subsequent support. Much of the technical text that appears in this article is from Merlyn's evaluation.

In 1857, Lady Hannah Cholmley of Howsham Hall chose to commemorate her late husband with the donation of a church to the village of Howsham. Aware of the church built for Lady Lechmere at Whitwell-on-the-Hill two miles away, Lady Cholmley commissioned the same architect, George Edmund Street (1824-1881), renowned for Gothic Revival structures, to design her church, at a cost of £3000. The church at Howsham contains eleven windows, three with painted diamond quarries and eight containing coloured stained glass. Of particular note is a window on the south side (see picture) that depicts Jesus with little children (Suffer little children to come unto Me) and commemorates the fact that all the Cholmley children passed away during her lifetime.

The phenomenon often referred to as 'crizzling' is usually associated with vessel glass and its occurrence in stained glass has not been studied extensively to date. Historically, it was thought that in windows the problem only occurred with green glass, leading to the name 'green glass disease', but we now know that it also occurs in other forms of glass. Purple crizzled glass is found in the windows of the church of St John the Evangelist in the small North Yorkshire hamlet of Howsham.

The deterioration process that results in 'crizzling' (most commonly recognized by a network of fine cracks on the glass surface) is caused by a chemical imbalance in the glass itself – when the material's composition is characterized by an excess of alkali and insufficiency of calcium oxide. The process of deterioration occurs in a number of stages. Generally speaking, the glass first appears to 'sweat' or 'weep'; this is caused by the appearance of alkali on the surface of the glass, either as droplets (in higher relative humidity) or as crystals (in lower relative humidity). The glass can then become cloudy and opaque and develop a fine silvery network of cracks, a stage known as 'incipient crizzling'. These cracks become deeper and the surface of the glass begins to spall away, eventually leading to full fragmentation of the glass. Although medieval examples of the phenomenon may be found in Germany, almost all instances of crizzling in Britain date to c.1860 and instances of such deterioration are found in windows produced by many of the major glass firms of the Gothic Revival.

In the mid-nineteenth century, a renaissance in the production of glass was under way. Thin and watery glass available in the early nineteenth century became supplanted by a higher-quality product, based on medieval methods of manufacture. The latter was produced only after a great deal of experimentation and it is therefore understandable that some discrepancies occurred, leading to batches of crizzle-prone glass. Today, crizzling poses a real problem for conservators, yet there is no remedy that is both readily available and cost- and time-effective. The most popular treatment in the past has been the removal and replacement of affected glass, but the resultant loss of many examples makes it difficult to identify windows that once contained crizzled glass and assess the scale of the problem.

Because it relates to a chemical imbalance, the potential for crizzling is inherent in some batches of glass from the moment of manufacture. However, the process of deterioration is triggered and accelerated by moisture and the effects of fluctuating relative humidity. Indications of the problem are therefore not usually evident until after some years of exposure to the environment. While the trigger is no different to that by which all glass corrosion is initiated, with crizzling the lack of sufficient stabilizer – calcium oxide – means that the glass is much more prone to the leaching of alkaline compounds. Many examples of stable glass contain approximately 10% calcium oxide, but crizzled glass can contain as little as half of this amount.

Confusingly, 'crizzling' is also used to describe the surface not just of damaged glass paint, but also of enamels and ceramic glazes. As noted above, the word only describes the visual characteristics of a late stage in the deterioration process (the appearance of cracks) and earlier stages in the process, where these fault lines are not yet visible, are often described as something else. Glass disease', as it is sometimes called, is not specific enough, so Merlyn Griffiths has coined the expression 'low lime glass degradation' (LLGD for short).

Street's design included the building, its glass and interior fittings. Despite its rural location, the church contains a full scheme of windows made by the prolific London company of Clayton & Bell, a firm still in its infancy at the time. Much of the glass has not been altered from its original condition and despite not having protective glazing, remains in an excellent state. Where issues arise, the Howsham glass (before treatment) was an example of the problem at an advanced stage: the glass had browned and become opaque, and developed micro-cracks across both interior and exterior surfaces; holes had also formed, which would expand as the deterioration continued, until the glass disappeared almost entirely. The fact that the affected windows have remained untouched means that the full effects of the degradation process could be seen at first hand.

In the early stages of research, Dr. Manfred Torge of the Bundesanstalt für Materialforschung und -prüfung (BAM) in Berlin analyzed a fragment of the Howsham glass, and the results were revealing. They confirmed that the elevated levels of alkali and insufficient levels of calcium oxide made this form of degradation inevitable. Energy-dispersive X-ray analysis (EDX) conducted with an environmental scanning electron microscope (ESEM) did not pick up any calcium oxide in the core of the glass (known as the 'bulk', essentially the area as yet unaffected by the corrosion process) which was particularly surprising and further highlighted the instability of this material.

The two major types of glass made in the Middle Ages were soda glass and potash glass. The former was made with a sodium-oxide flux obtained from kelp and is less susceptible to corrosion that the latter. Potash glasses were made with a potassium-oxide flux obtained from wood ash and became the most common type of glass from around 1000 AD. It was also prevalent in stained glass after the Gothic Revival and the Howsham sample is most certainly made from potash glass. Wood ash however cannot have been a component of the purple sample, since calcium oxide, a natural component of wood ash, would have been present. This may be explained by the fact that English nineteenth-century glasshouses used synthetic ingredients and generally acquired their potash from chemical manufacturers, who supplied them with dry potassium carbonate. This had been purified, so calcium oxide was absent and therefore also absent from the finished glass itself unless added separately. Calcium oxide could be added in the form of lime, but in the case of the Howsham glass it was left out, either accidentally, or because glasshouses were still experimenting with ingredients at the time of manufacture.

The readings showed that no conservation treatment could decrease the rate of degradation unless the climate were first regulated. Regulation of the church's climate, for example through the installation of a protective-glazing system, was not an option given that the budget is incredibly tight and it is within these buildings that many examples of LLGD glass are found. Protective glazing necessitates the removal of the glass from the stone and this may cause more immediate damage than the cumulative effects of direct exposure to the environment. Each window needed to be assessed individually.

The original estimate for repair and preservation amounted to over £170,000 incorporating a scheme of internally ventilated protective glazing. Desirable as this would have been, this figure was way beyond reach in an acceptable timescale. Nonetheless, the churchwardens felt that some form of resolution had to be found to preserve the heritage so far as was practicable. Options were explored and they elected to accept the proposal from Barley Studio costing over £18,000; still a large sum of money. Remedial works included: cleaning the windows internally and externally; rubbing down and treating support bars with rust inhibiting paint; resealing the external surface of the leadwork in-situ with linseed oil cement; raking out loose areas of mortar pointing and re-pointing with hydraulic lime mortar; fitting new copper wire ties to the spring line position and re-tie to the support bars; painting and staining new repair pieces and fitting them.

To enable the work to proceed. the churchwardens began an extensive process of applying for grants, enabling the work to begin in the middle of 2019 with completion in early 2020. The churchwardens are extremely grateful for the encouragement and support of the following, who made this possible:

- Yorkshire Historic Churches Trust
- The Allchurches Trust
- The Glaziers Trust
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- York Diocese
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*This article and the summary on the Benefice website have been compiled by Simon Littlejohn. The article and summary quote very extensively from Merlyn Griffiths' communications addressed to the Rector and Churchwardens. She in turn acknowledges many contributors and publications in her original submission to the churchwardens that are extensive and too complex to cite here. Anyone interested in more detail on these sources should contact Simon Littlejohn who will direct the enquirer as appropriate.*

The pictures that follow show some of the windows that were treated.


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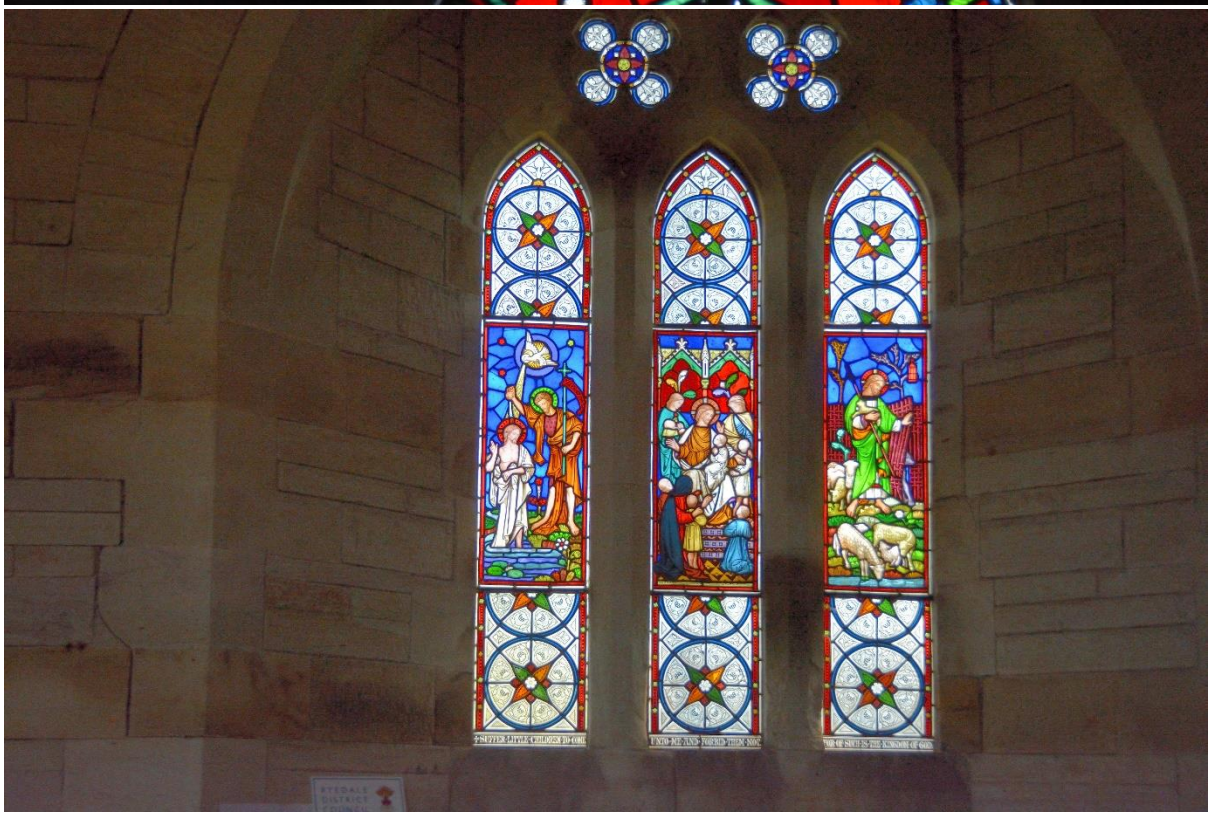

Postscript:

Clearly the work of Clayton and Bell was far reaching. In the museum about the 2011 earthquake in Christchurch, New Zealand, there is an exhibit featuring shattered pieces of the damaged window from the Cathedral and this is the explanation by the exhibit.

## The Rose Window

These shattered pieces of stained glass and twisted lead cames are from the celebrated Rose Window, which was lost along with much of the west wall of the already damaged ChristChurch Cathedral on Monday 13 June 2011, when a M5.7 quake was followed by a M6.3 aftershock.

The rose window was a magnificent example of Gothic decorative art designed by Benjamin Mountfort, superintending architect of the Cathedral and made by Clayton and Bell of London. The installation of the window was completed on 10 May 1882.

On loan from Church Property Trustees on behalf of ChristChurch Cathedral

## Spire Cross

This stainless steel cross fell 63m from the Cathedral Spire on 22 February 2011. It was not the first time that the Cathedral spire and tower had been damaged by earthquakes. Stones had been dislodged in two earthquakes in December 1881 and, seven years later, in September 1888, the top eight metres of the spire fell to the ground. On 16 November 1901, another earthquake caused further damage to the Cathedral. The cross was lowered to the ground for repair and the spire was reconstructed in Australian hardwood and sheathed in copper. Up until 22 February there had been no further earthquake damage to the spire for close to 110 years.

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