Glass – from everyday utility to decorative luxury – a little history

In 1850, the incredible structure which came to be known as the Crystal Palace took shape in Hyde Park. Completed in just five months, it required no bricks, no mortar, cement or foundations. It was comprised of cast iron trusses and nearly a million square feet of glass and a large quantity of guttering. The glass, which was a type called sheet glass, had first been made in 1838 and large quantities could be made quickly to supply the construction of the building. It has been estimated that 18,000 panes could be installed each week. Some achievement!

Glass is one of those everyday luxuries that over the years has acquired an everyday utility. Glass is made by heating ordinary sand to the incredibly high temperature of 1,700 degrees Celsius or 3,090 degrees Fahrenheit, until it melts and turns into a liquid. When molten sand cools, it undergoes a complete transformation and gains an entirely different molecular structure. It becomes more of a frozen liquid or what materials scientists refer to as an amorphous solid.

In a modern commercial glass plant, sand is mixed with waste glass from recycling collections, soda ash, also known as sodium carbonate, and limestone, scientifically known as calcium carbonate and then heated in a furnace. The soda reduces the sand's melting point, but it alone has an unfortunate drawback -it produces a kind of glass that would dissolve in water. The limestone is added to stop that from happening. The resulting material is called soda-lime-silica glass. That's the everyday glass in your house and car.

Once the sand is melted, it is either poured into moulds to make bottles, glasses, and other containers, or 'floated', poured on top of a big vat of molten tin metal, to make perfectly flat sheets of glass for windows. Glass makers use a slightly different process depending on the type of glass they want to make. Usually, other chemicals are added to change the appearance or properties of the finished glass. For example, iron and chromium based chemicals are added to the molten sand to make green-tinted glass. Oven-proof borosilicate glass or more commonly known by its brand name Pyrex, is made by adding boron oxide to the molten mixture. Borosilicate glass is currently in high demand for medical vials to ensure the delivery of Covid 19 vaccines when they become available. Vaccines, like most injectable drugs, need to be packaged in sterile glass: glass is essentially impermeable to corrupting gases like oxygen while even high-grade plastic lets some air inside.

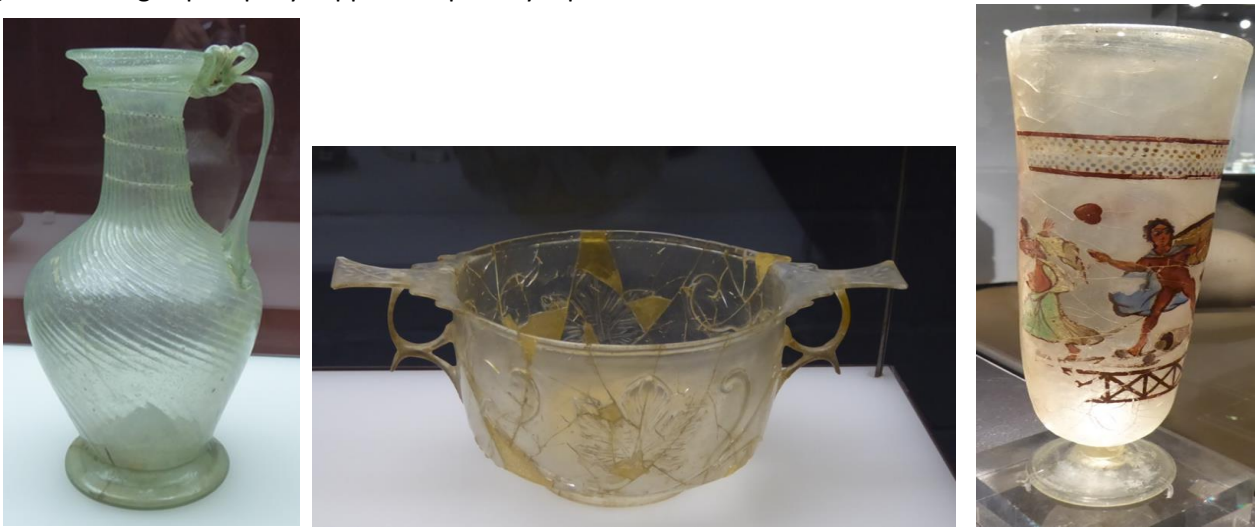
Glass is still an essential commodity in the twenty first century, even though its manufacture has been taking place for thousands of years. Naturally occurring glass, especially the volcanic glass obsidian, has been used by many prehistoric societies across the globe for the production of sharp cutting tools and, due to its limited source areas, was extensively traded. The history of glass-making dates back to at least 3,600 BC in Mesopotamia, however some claim they may have been producing copies of glass objects from Egypt. Other archaeological evidence suggests that the first true glass was made in coastal north Syria, Mesopotamia or Egypt.

The earliest known glass objects, of the mid 2000BC, were beads, perhaps initially created as the accidental by-products of metal-working or during the production of faience, a pre-glass vitreous material made by a process similar to glazing. Development of glass technology in India may have begun in 1730BC. The first glassmaking 'manual' dates back to ca. 650BC: instructions on how to make glass are contained in cuneiform tablets discovered in the library of the Assyrian king Ashurbanipal.

Details of the history of glass can be found at https://en.wikipedia.org/wiki/History_of_glass

Casting techniques played an important role in the development of glass from the ninth to the fourth century BC. Roman glass production initially concentrated on the production of intensely coloured cast glass vessels. Glass objects have been recovered across the Roman Empire in domestic, funerary and industrial contexts. Glass was used primarily for the production of vessels, although mosaic tiles and window glass were also produced.

Production of raw glass was undertaken in geographically separate locations to the working of glass into finished vessels and by the end of the 1st century AD, large scale manufacturing, primarily in Alexandria, resulted in the establishment of glass as a commonly available material in the Roman world. The establishment of the Roman industry roughly coincided with the invention of glassblowing. This invention revolutionized ancient glass production, putting it on a par with the other major industries, such as that of pottery and metals. Likewise, glassblowing allowed craftsmen to make a much greater variety of shapes than before. Combined with the inherent attractiveness of glass—it is nonporous, translucent (if not transparent), and odourless—this adaptability encouraged people to change their tastes and habits, so that, for example, glass drinking cups rapidly supplanted pottery equivalents.



Glass from the Roman- German Museum in Cologne

In comparison to glass making, there is evidence for glass working in many locations across the Roman empire. Unlike the making process, the working of glass required significantly lower temperatures and substantially less fuel. By the early-to-mid-1st century AD, the growth of the Empire saw the establishment of glass working sites at locations along trade routes, with Cologne and other Rhineland centres becoming important glass working sites from the Imperial period and Syrian glass being exported as far as Italy. In the Roman period, glass was present in nearly every aspect of daily life –bottles, boxes, jewellery, jars for foodstuffs, mosaics, windows. Glass was regularly recycled to make new vessels during the Roman period.

Establishing the role of glass in daily Roman life is limited by the evidence in the archaeological record. Pottery sherds are common and often comprise a significant percentage of total finds, especially at Roman sites. Our understanding of glass is more limited because significantly less of it is found, and when glass is discovered it is often the fragmented remains which represent refuse or those glass pieces (known as 'cullet') that were intended for recycling.

Examples of Roman glass, from the practical to the purely decorative. ©British Museum

In Roman Britain there is not extensive evidence for glass working, but at least twenty-one glass-working sites have been identified across Roman London[1]. The only common factor is that all these workshops exist on the periphery of the city, a characteristic that has possibly been linked to their potential as a fire hazard.

In their publication on glass-working in Roman London, John Shepherd and Angela Wardle posit that large blocks of glass were transported from the Mediterranean, or alternatively that the industry relied on old and broken glass or 'cullet', which was then melted down to be reformed as new vessels, dishes, windows etc[2]. This theory may not in the first instance sound entirely convincing; after all most of the ingredients required for glass making (silica/sand, soda as a flux to lower the melting point of the silica, and lime as a stabiliser) are available in Britain and surely transporting large and heavy blocks of glass would be and expensive and slow process. However, if one considers the extreme heat required to initially melt down all the raw ingredients in comparison to the still high but rather less intense temperatures needed to melt down already formed glass, this begins to make more sense. Evidence for glass furnaces have been found in Britain but more supportive of Shepherd and Wardle's argument are significant deposits of cullet. These would seem to indicate the industry relied to a great extent on recycling and re-use rather that manufacturing glass from raw materials.

Illustrations of weathered Roman glass ©University of Pennsylvania Museum, Philadelphia

What is found in excavations of Roman glass owes its survival in large part to the fact that glass was often a grave good and was sheltered against the elements. Nevertheless, weathering takes its toll on glass from the persistent effect of moisture in the soil, creating some beautiful aesthetic effects. Leaching out of certain elements leaves a gel on the surface of the glass which dries into a thin film of silica. Over time, this can become a thick crust which in turn often hardens into an enamel-like shell over the whole of the vessel or (more likely) the shard. It can have a golden lustre or a colourful iridescence. Eventually, acid breaks into the glass structure creating pits and eventual disintegration and loss of the glass[3]. Above are some examples of weathered glass, showing different patinas and the iridescence brought about by weathering.

So what does all this have to do with Somerset? Or even Britain? That will be for the next issue of the newsletter when I will bring this all together with more about regional and local Roman glass. And moving forward in time, medieval glass in Somerset. Watch this space!

References:
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3 Stuart J Fleming. Roman Glass: reflections of everyday life. 1997. University of Pennsylvania, Philadelphia.

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