BREWERY HISTORY

Brewery History (2022) **189**, 53-61

THE OLDEST MASH FORKS IN BRITAIN AND OTHER ARCHAEOLOGICAL EVIDENCE FOR ALE IN THE NEOLITHIC

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Archaeologists are often described as having stumbled upon things, unexpectedly, when they undertake an excavation. Sometimes they find things that cannot easily be explained, mysterious objects that defy interpretation. Guesses are made. Theories are proposed. This is what happened during archaeological excavations at Stainton West, near Carlisle in Cumbria, England, prior to the construction of a new road. Excavations began in 2009. The road opened in 2012. Archaeologists from Oxford Archaeology (North) discovered what they have described as 'nationally important prehistoric remains' from the Mesolithic, Neolithic and Bronze Ages.[1] Photographs of the excavations and the finds can be seen on their website (https://cndr.oxfordarchaeology.com/).

There was evidence of hunter gatherer occupation from the Mesolithic era as well as some rare wooden artefacts from the time of the first farmers, the Neolithic era, around 6000 years ago. Several piles of fire cracked stones and the remains of troughs dating to the Neolithic and Bronze Age were also discovered. The site at Stainton West spans several thousand years of prehistory and encompasses one of the most important changes in human prehistory: the transition from a hunter gatherer lifestyle to a way of life that involved the cultivation of grain and keeping domesticated animals, such as cattle, sheep and pigs.

This was a huge and significant change in the way people lived. It is said that people became farmers. In the 1930s Vere Gordon Childe called this the Neolithic Revolution. But what does this really mean? Were people laboriously grinding grain into flour to make bread? Were they boiling it up to make some sort of porridge or gruel? Or were they making malt, mashing in and brewing ale for their ceremonies and rituals? There is good archaeological evidence for the latter, once you know and understand the processes involved.

The Stainton West wooden tridents: mash forks

One of the most exciting and enigmatic finds from the excavations at Stainton West were two mysterious wooden tridents, so named by the archaeologists because of their size and shape (Fig 1). Expertly carved from solid oak, these tridents were almost six feet long (two metres) and each originally had three tines, hence the name that was given to them. According to radiocarbon dates they were found to be around six thousand years old, making them among the oldest wooden artefacts found in Britain.

They had survived, almost intact, for so long because of the wet and boggy conditions of the estuary where they were discovered in an ancient river channel. Usually wooden objects just rot away in the ground. Their survival alone makes them rare, important and significant archaeological discoveries. Their form and shape makes them enigmatic and unusual.

The tridents, usually housed in the Tullie House Museum in Carlisle, were included in the recent British Museum 'The World of Stonehenge' exhibition in London (17 February to 17 July 2022) as an example of the amazing things from Neolithic and Bronze Age Europe together with gold objects and fine stone axes. On the accompanying museum label they are described as 'pitchforks, net forks or even mash forks for brewing beer.' I don't understand why archaeologists often say 'even for brewing beer' as if it is an amusing, unusual or peculiar thing. However, this is what they do. Perhaps it is because they do not understand the process. It is a mystery to them.

At first archaeologists had no idea what these tridents were or how they could have been used. They were puzzled. When Fraser Brown, Director of excavations, presented the results of their discoveries at Stainton West to the IfA Finds Group (Institute of Field Archaeologists) in October 2013 he said

Figure 1. The carved oak trident, pictured both sides: Radiocarbon dated to c3650 BC. Were they used as eel spears, hay forks, fishing net supports or as mash forks for brewing beer? With permission from Tullie House Museum, Carlisle.

that 'despite detailed study of the Stainton West tridents the function of these objects still remains a mystery – they do not appear to be well suited for use as digging forks or fishing spears, being too fragile, and of the wrong proportions, for the former, and too heavy, and lacking in barbs for the latter'.[2]

At around the same time the tridents were being discussed on archaeological social media. There was huge interest because they were such a rare and unusual find. Interpretations of eel spears or perhaps hay forks were proposed and discussed. Some thought that they were supports for fishing nets. And there were a few suggestions that they may have been used as mash forks. At the time there was no agreement and no consensus view. The so called tridents stayed in the Tullie House Museum in Carlisle and there was no more public discussion. Interest in them faded away.

The tridents remained quietly mysterious and enigmatic for many years. The announcement that they could have been 'even mash forks for brewing beer' in the prestigious 'World of Stonehenge' exhibition came as a big surprise to me. I was so surprised that I wrote a blog about it.[3] I had been communicating with archaeologists from Oxford Archaeology (North) in April 2018, explaining to them about mash forks, what they are and how they are used in the brewing process. These were private conversations, via social media messages, and there seemed to be some interest from the team in this interpretation. The next thing I knew was that the interpretation of mash forks was included on the label in the British Museum temporary exhibition in 2022. The idea was also mentioned in the book that accompanies the exhibition.[4] Here the tridents are described as "mashing forks" which is not quite the correct terminology. In some ways these brief references might be a good thing because it means that the idea of making ale in the neolithic is finally acceptable, after decades of controversy and disbelief.[5]

A few similar wooden tridents have been discovered (Fig 2). One was found in 1874 near Ehenside Tarn in Cumbria.[6] It is held in the British Museum collection but, sadly, is in poor condition. Others were discovered in Ireland, also in the mid nineteenth century, but their whereabouts is unknown.[7] Perhaps they no longer exist. Skilful and expert conservation work means that the six thousand year old Stainton West Neolithic tridents, or perhaps we can now safely call them mash forks, are the oldest and best preserved examples in Britain.

The mash forks were carved from a solid piece of oak. The tree was felled and the wood was probably worked immediately, as green wood. The trunk of the tree was split into planks that were then worked using stone axes. In his presentation to the IfA (2013) Fraser Brown included a diagram (Fig 3) that shows the probable techniques used.[8] It would have been a strong design and suitable for the task of mashing in. The fact that the neolithic folk could make planks is of interest because this means that they could have built rectangular timber buildings and used them as grain barns for storage and processing, such as making malt, and also for gatherings.

Mash forks are a well known and familiar piece of kit for an all grain brewer to use. The idea of three prongs and a long handle seems to have persisted for a long time and, as technology developed over the millennia, the design has changed. Struts were added, for strength, when the mash fork was not carved from a single piece of wood as the Neolithic people had done.

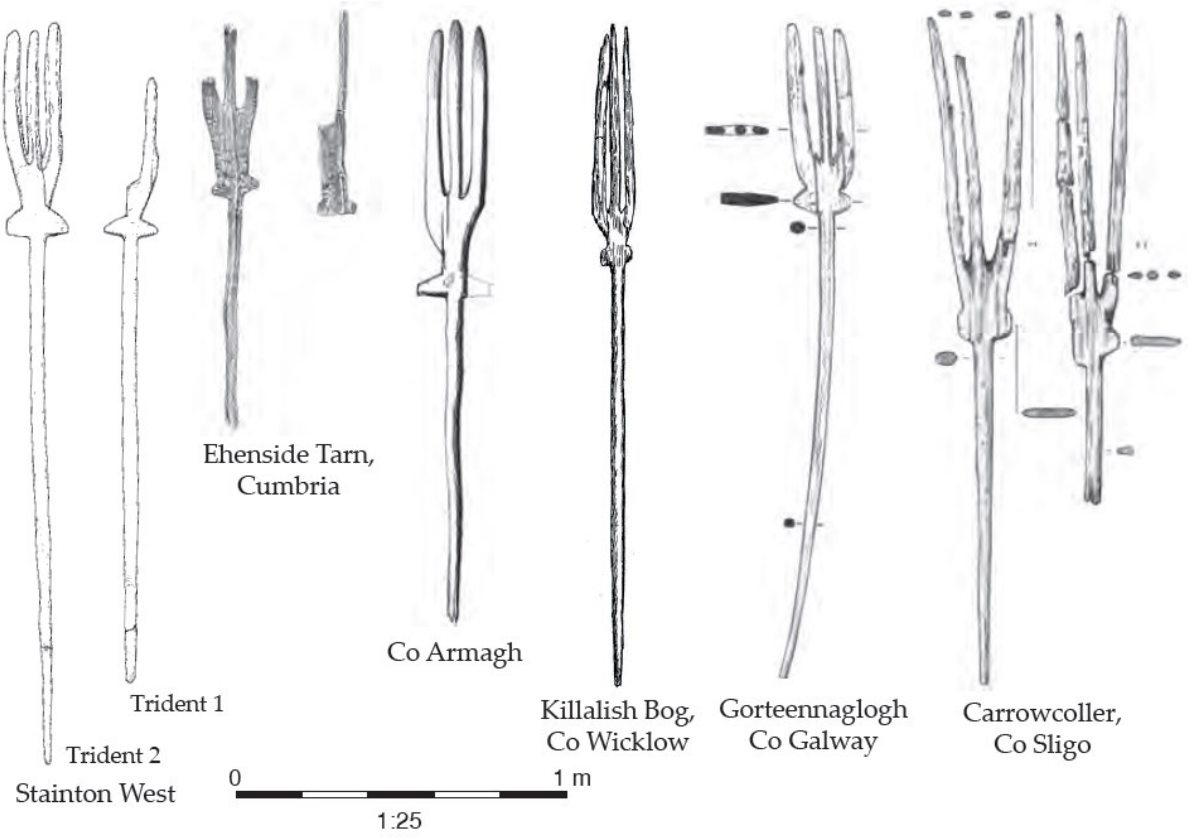

Figure 2: Six thousand year old wooden mash forks, aka tridents, that have been discovered over the years. From *Bridging Time's Deep River: An Archaeological Journey Along the Carlisle Northern Development Route*. Copyright Oxford Archaeology Ltd.

These days brewers can buy mash paddles made from plastic and other modern materials. They look nothing like forks but, sometimes, brewers still refer to them as mash forks.

There is a well known image that many brewers and brewing historians are familiar with. It's an image of Saint Arnold of Soissons, one of the patron saints of brewing, in a stained glass window in the Sainte-Glossinde Chapel in Metz, Moselle, France (Fig. 4). He is depicted with his Bishop's mitre and his mash fork. He lived around a thousand years ago, from 1040 until 1087 and combined his role as a Bishop with that of a brewer.

Burnt mounds, troughs, hot stones and mash tuns

The use of hot stones in mashing and beer brewing is well known and understood by brewers and brewing historians with an interest in ancient and traditional mashing techniques.[9] Modern breweries are beginning to take up these techniques and there is a lot of interest in farmhouse brewing methods.

A mash fork obviously needs a mash tun. Is there any archaeological evidence for a suitable mash tun at Stainton West? There is indeed but they have been misinterpreted as saunas, steam baths or sweat lodges, places for ritual cleansing and bathing.[10] Close by where the tridents, aka mash forks, were discovered the archaeologists excavated several piles and large scatters of burnt stone with evidence of a trough in the ground close by. Sites such as these are common throughout Britain and Ireland. There are several thousand of them. In Ireland they are called fulacht fiadhs and elsewhere archaeologists describe them as burnt mounds. This is because there are many burnt and fire cracked stones in a big pile where they have been discarded after being immersed in the trough to heat lots of water.

Some archaeologists have interpreted burnt mounds as a place to boil meat, a cooking place. This is certainly not the best way to cook meat, as observed by archaeologists and beer brewing technologists Declan Moore and Billy Quinn. They did a number of mashing experiments in a wooden

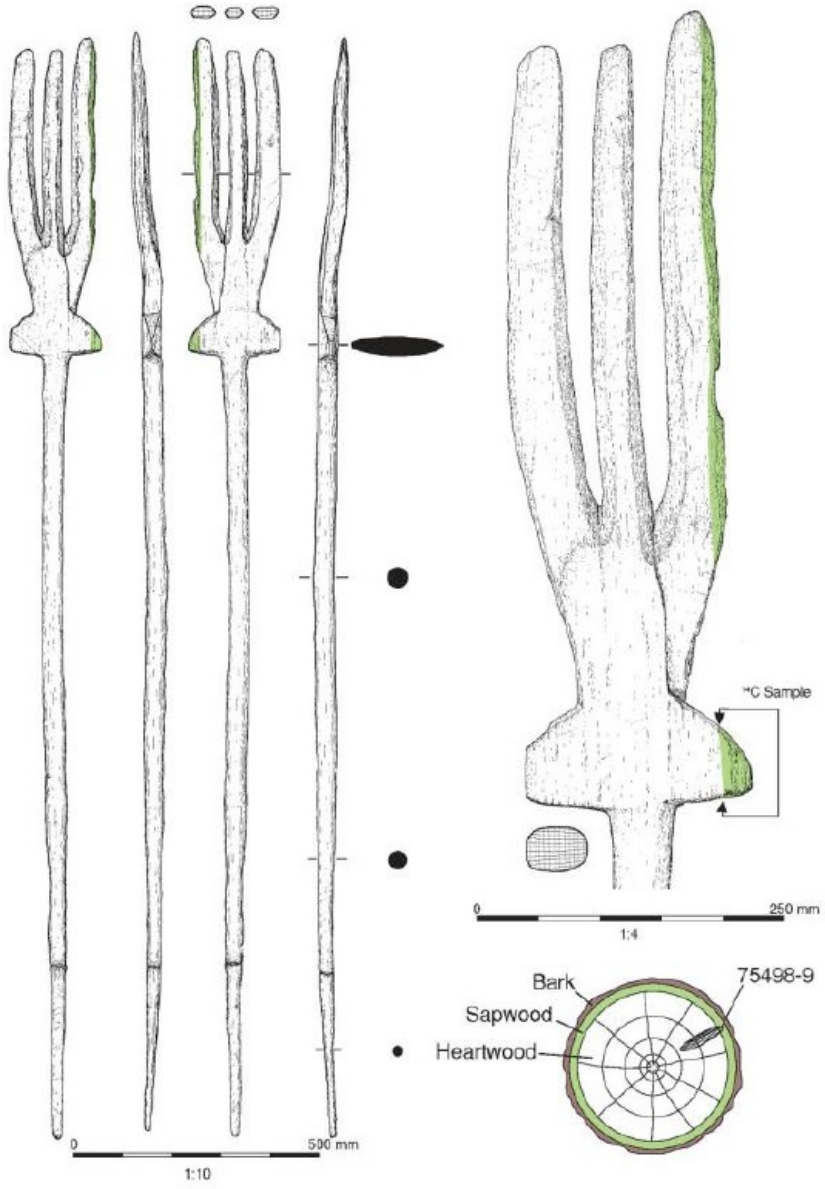

Figure 3: How the mash forks were made. From *Institute for Archaeologists Finds Group Newsletter—Autumn 2013*. Copyright Oxford Archaeology Ltd.

trough buried in the ground using hot stones as the heat source.[11] They went on to do a spectacular demonstration at the World Archaeology Conference in Dublin, 2008. They had built a wooden trough, sealed it with bitumen and took it to the conference. The water was heated with hot rocks, the crushed malt was added and a successful mash was made. Wort was collected and taken away in a plastic vessel for the yeast to be added later and and a Bronze Age style ale was made.

Inspired by their demonstration we travelled to Bressay, Shetland, and mashed in a stone trough in the ground (Fig 5). The original Bronze Age Cruester burnt mound and stone trough has been saved from destruction by the sea and moved inland. A replica hearth and trough has been created for experimental archaeologists to use.

As is explained on the Bressay website (https://scapetrust.org/bronze-age-bressay/) ‘different theories have

Figure 4 :Arnold of Soissons, bishop and brewer with his mitre and mash fork.

been tested about what these enigmatic sites may have been used for. Attempts so far have used the hot stones to heat water in the tank, cleaned wool for spinning, made pots, and even brewed Bronze Age beer.' Once again, the idea of beer brewing is the most surprising of all possibilities. The trough would have been used as the mash tun but, sadly, it seems that this important aspect of the beer brewing process is not recognised in the archaeological literature.

We rolled hot stones down a slope from the hearth into the trough of water. For this we used a garden fork. Once the water temperature was right we added the crushed malt and used the garden fork again to prevent the mash from clumping and to mix the crushed malt nicely into the hot water. We knew when the water was at the right temperature for the strike because we could clearly see our reflection in the hot water. This is an old trick used by brewers before the invention of thermometers.

As we worked at the mash tun we thought that a fork with a longer handle would have been perfect. The Stainton West mash forks had yet to be discovered. We collected wort from

Figure 5: Our Bressay trough mash: a successful saccharification using fire heated rocks.

the trough and fermented it in a plastic fermentation vessel. It turned out to be one of the best ancient ales that we have made. It was clear and bright. We used a handful of meadowsweet flowers instead of hops. In the Neolithic and Bronze Age they would have used big ceramic pots to ferment the ale.

These techniques of hot rock mashing in a trough go back to the Fertile Crescent, before grain agriculture began.[12] At a most unusual ceremonial site called Gobekli Tepe, in Turkey, archaeologists from the German Archaeological Institute have been excavating a site that is 13,000 years old. Here there are fabulous carved stone pillars depicting wild animals and birds as well as the remains of stone buildings and, archaeologists believe, there is evidence for feasting. Although grain was not being deliberately grown and harvested, the people were gathering wild grain that grew in abundance in the area. It seems that they were using it to make an alcoholic beverage – beer.

Troughs with a volume of up to 160 litres were found. They had been carved from the limestone rock. Within the troughs were several rocks that had been subjected to heat together with the scapula of a large cow. This would have been ideal for stirring the mash, perhaps, if that is what these troughs were used for. Attempts have been made to recreate the ancient brew using malted einkhorn.[13] This research is in its' early stages and we look forward to more experimental malting, mashing and brewing research from the excavation team.[14] There is a lot of information about Gobekli Tepe online and now it is possible to visit the excavations. Gobekli Tepe is considered to be one of the most important Epi-Palaeolithic sites yet discovered.

Grooved Ware pots, residues, ceremonial sites and ale

Going back to the British Neolithic and the site of Stainton West in Cumbria where those enigmatic and mysterious wooden tridents or mash forks were discovered, we should add that fragments of Grooved Ware and other pottery were found during excavations. The archaeologists were lucky to find any prehistoric pottery at all since it was unglazed and does not survive well in wet ground.

The technical report of the excavation contains details that don't always make it into later publications.[15] By studying this we discover that the archaeologists found, in total, 66 sherds of Neolithic pottery that represented a minimum of three or four vessels. Of these, 53 sherds were from Grooved Ware and 4 sherds were from Bronze Age pottery jars.

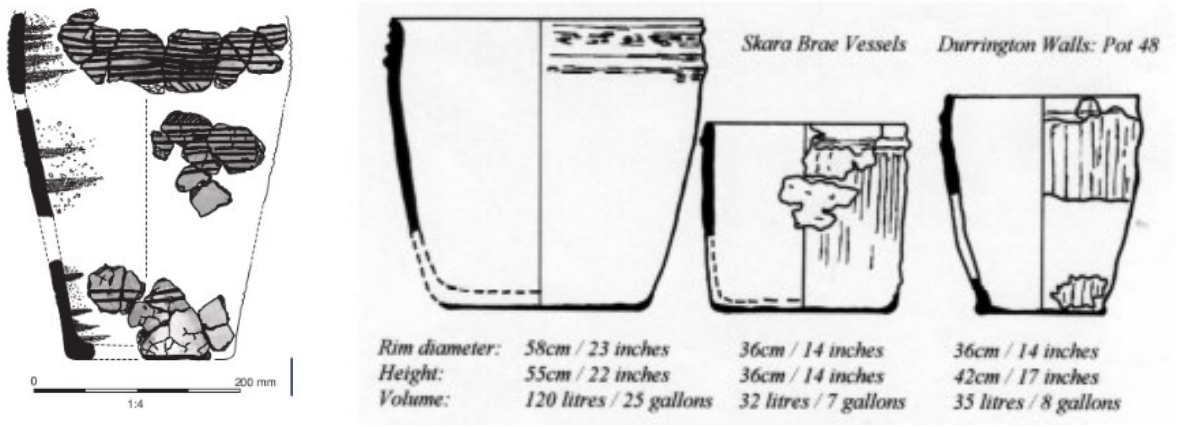

Figure 6 and 7: Reconstructed Grooved Ware pot from Stainton West. From *Bridging Time's Deep River: An Archaeological Journey Along the Carlisle Northern Development Route*. Copyright Oxford Archaeology Ltd.; and three Grooved Ware pots, two from Skara Brae, Orkney, and one from Durrington Walls, near Stonehenge.

Some of the sherds of Grooved Ware came from a pot which perhaps could have been suitable as a small fermentation vessel. There is a reconstruction drawing in the CNDR booklet (Fig. 6). Most Neolithic pottery was round bottomed, bowl shaped and suitable for cooking. Grooved Ware is different. It is so named because of the common decoration of lines and grooves and is bucket shaped and flat bottomed, the first of its' kind in Britain. Pot sizes range from around ten to twenty or twenty five gallons in volume to tiny thimble sized pots and everything in between.

The largest Grooved Ware pot that I know of was discovered in the 1920s, during Vere Gordon Childe's excavations at the Neolithic village of Skara Brae, Orkney.[16] Pieces of a very large pot were found beside the hearth of House Number 7. This pot, when reconstructed, was around two feet in diameter and two feet high, giving it a volume of around 25 gallons (Fig. 7). A pot placed beside the fire would have been a perfect place for a Neolithic style ale hurry and this pot was potentially large enough to ferment a good amount of ale. Residue analysis has not been done on any of the Skara Brae pot sherds but there has been some investigation into the potential contents of Grooved Ware pottery.

Other places on Orkney where lots of Neolithic Grooved Ware pottery of all sizes has been found include Barnhouse Village, not far from the Stones of Stenness, and the Ness of Brodgar excavations which are continuing at the moment. The Ness, as it is affectionately known, is a huge complex of stone buildings beside the Ring of Brodgar. Residue analysis of the Barnhouse pottery reveals barley lipids and 'unidentified sugars', a discovery that has long intrigued us.[17] Pots at the Ness are under investigation as we write this.

A small amount of some sort of burned residue was noticed on a sherd from a large pot found during excavations at Balfarg Riding Stables, the location of a large Neolithic ceremonial site in Fife, Scotland.[18] When analysed the residue was found to be a cereal based preparation with added meadowsweet. This was apparently indicated by both pollen and macro plant remains. Clumps in one sample indicated that a whole flower head of meadowsweet was added to the pot. The consistency of the residue was described as being like a course porridge, with added potherbs and flavourings.[19] Meadowsweet is a traditional brewing herb that was used before hops were introduced. Orcadian brewers who could not afford to buy hops have been using it to flavour and preserve ale until recent times. The analysis of such a residue on Neolithic pottery is rare and unusual. It is a convincing piece of archaeological evidence that people in Neolithic Britain were able to make malt, malt sugars and ale from the grain.

The discovery of Grooved Ware at Stainton West is significant. According to the technical report of the excavations there was a small amount of organic residue on one of the sherds. This was used to obtain a radiocarbon date of 2880 to 2610 cal BC . The report notes that analysis of the residue may help elucidate its function. Others have suggested associations between Grooved Ware and feasting comestibles such as pork[20] and ale[21] which in turn may be related to its common selection for structured deposition and association.[22]

Remains of a prehistoric henge at Stainton West close by the River Eden and not far from the location of the large wooden tridents, or mash forks, were identified. Sadly, because the excavation was only in the location of the new road development the archaeologists were unable to investigate this site any further.

If archaeologists are looking for an ancient ritual activity then they need look no further than the transformation of grain into malt, malt sugars and ale. The first field systems in Britain were quite small, not enough for grain to have been a staple crop. These field systems were big enough however to provide enough cereal for malting, mashing and making ale for their celebrations and ceremonies. Grain was not a staple crop but a high status, or perhaps even a sacred crop. Field systems have been found beside stone circles, for example, at Calanais, on Lewis, Scotland[23] and also at Machrie Moor on Arran.[24] When you understand the processes involved then the archaeological evidence is clear and obvious. The first farmers were growing grain to make ale for their special gatherings and feasts. The latent dormancy of grain means that the first malt and ale could have been prepared just in time for the midwinter Solstice, a Neolithic Yule celebration. The magnificent mash forks of Stainton West are just the latest piece of archaeological evidence.

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