The role of geology in the fall and rise of local brewing

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Abstract. Beer has an ancient heritage and brewing was almost ubiquitous by the Middle Ages in the British Isles. It later became progressively more regional. The East Midlands had good waters, and barley from both the sandy soils on the Sherwood Sandstone and the fertile, clayey soils on the Lower Jurassic of the Vale of Belvoir. Hops were grown in the heavy soils on Mercia Mudstone of the 'North Clays' district, and Nottingham's sandstone caves provided ideal storage conditions for the beer. Subsequently the water, especially at Burton upon Trent, proved ideal for the newly fashionable pale ale or bitter. Gypsiferous Triassic aquifers gave the water a perfect ionic balance for this style of beer. Moreover, the calcium sulphate allowed high hopping rates, and hence the development of the Export and India Pale Ale styles, now of international fame. By the 20th century, brewing science had showed how Burton waters could be emulated elsewhere, and the brewing industry became highly commercialised and centralised. The craft beer movement is now heralding a return to local values, including the importance of local ingredients, some of which show a geological influence.

Beer is often seen as the simple quaffing drink of the masses, a contrast with the sophistication of wine. In fact, in many ways beer is the more complex drink of the two. One wit has pointed out that simply treading on grapes inevitably leads to fermentation and some kind of wine, whereas treading on cereal grains just hurts your feet. Another has suggested that when Jesus performed the miracle of turning water into wine he avoided doing it to produce beer because that was too technically demanding.

Beer can reflect local conditions just as much as wine, and this can involve geology, to at least the extent much trumpeted in the wine world. This can be appreciated by tracing the historical ups and downs of local brewing, especially when related to the East Midlands.

Ancient beginnings

Beer has an illustrious heritage. In the British Museum there is a clay tablet engraved with the oldest known writing. It came from Mesopotamia and is over 5000 years old – and it gives a recipe for beer. The royals of ancient times drank beer, though they sipped it through a straw. Also in the British Museum is the beer straw used by the Queen of Ur around 2600 BC, made of gold and lapis lazuli, no less. It wasn't long before waves of settlers from these eastern lands brought their brewing methods to the British Isles, perhaps first the Beaker people around 2500 BC, then, possibly, the Phoenicians, and certainly Celtic tribes from around 500 BC onwards. After that, there was no looking back. Even the wine-loving Romans, judging by the Vindolanda tablets at Hadrian's Wall, enjoyed their beer (and bought it from local brewers). And by the time of the Norman Conquest, the state – no surprise here – was attempting to intervene in its production and taxation.

The local heyday

By the Middle Ages, brewing was everywhere in England and Wales, with many people believing that drinking plain water was actually dangerous. It has been estimated that around one in 25 households produced beer for sale (Unger, 2005). Beer was drunk with every meal: the consumption was something like two pints every day, *per person*. Incidentally, the brewing was done by the woman of the house (rather like men always doing the barbecuing today), although the brewer was usually named as her husband (Bennett, 1996). Some things change little.

In addition to domestic beer, any monasteries or large estates were likely to be brewing hubs for the community, as were universities (unlike being major consumers nowadays). The beers of these times would probably appear to us as rather weird concoctions. They were based on whatever grains were available at the time, together with whatever additives could be foraged locally. That didn't include hops, which weren't found in the British Isles. Geology had no role at this stage, but never again would beers be so local, and so representative of local conditions.

Hops (Fig. 1) probably originating in Egypt, were being used by German brewers in 820 AD and their use spread rapidly across the continent. Their antiseptic properties were much valued, especially as the importance of good sanitation in brewing was little understood and consequently beers were prone to 'going

***Figure 1**. The hops that are essential to good beer.*

off'. In England, however, although there is evidence that hops had reached Kent by the year 900 or so, the earliest mention of their use is not until 1412, and at that by a German alewife using imported hops. The cultivation of hops in England didn't start until around 1520, in Kent. It is as though the English were suspicious of the way things were being done on the continent…

Centralisation begins

Inevitably, beer gradually evolved to more standardised styles, and 'street-corner' brew-houses became less ubiquitous. At the same time, certain parts of the country became noted for their beers, partly through the suitability of the natural waters, though at first this was little understood, and because the preferred ingredients were more reliable. A case in point is the East Midlands, and some of its advantages lay in the geology.

The region's water seemed very suitable for brewing. There was plenty of it and it gave good beer, although it would be three centuries and more before the reasons were discovered. And there was a ready supply of barley, which had become the mainstay of most beers. Today in Kent, barley grows well both on the soils overlying Cretaceous Gault Clay and on the sandier soils of the Lower Greensand, although the former siting is better in drier years (Lark et al., 1998). Similarly in the East Midlands, the crop thrived both on

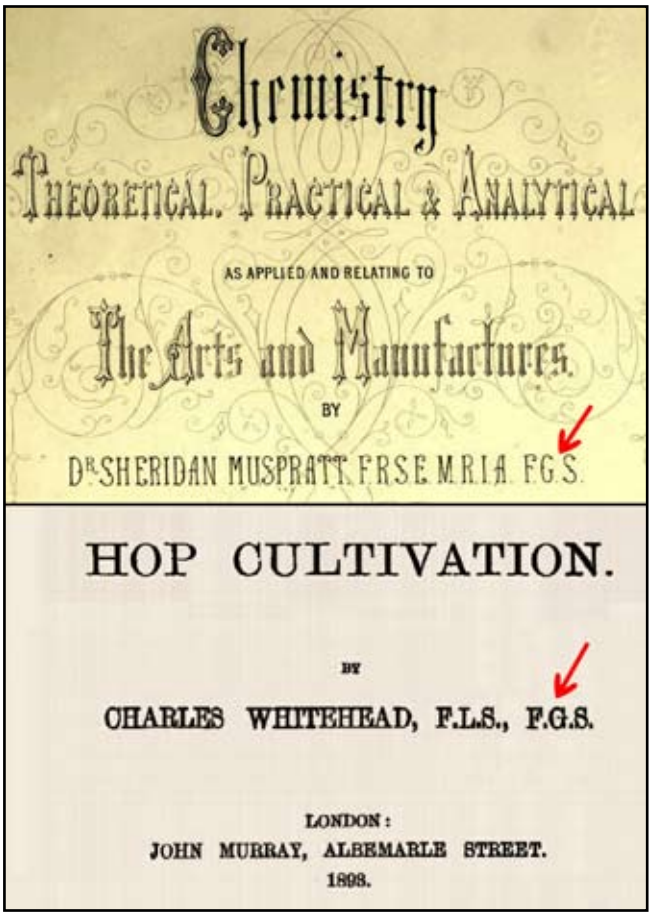


Figure 2. *Parts of the covers of two early books related to brewing, both with authors that were Fellows of the Geological Society.*

Figure 3*. One of the many malt kiln caves in Nottingham.*

the well-drained sandy and coarse loamy soils overlying the Sherwood Sandstone to the north of Nottingham, for instance around Cuckney, and famously on the clayey soils overlying the Lower Jurassic bedrock of the Vale of Belvoir. In fact, the success of barley production in the Vale was remarked on by several commentators in the 18th and 19th centuries.

By the 17th century the use of hops in beer had become the norm. They were probably rather anaemic affairs in comparison with modern varieties, though it seems that, unlike some of today's strains, they would grow adequately on clayey soils, even on land where little else could be cultivated. In Nottinghamshire the hop-growing area stretched from Retford to Southwell, and Retford itself developed into England's most northerly hop fair. Lowe (1794) reported that the hop fields were "in valleys and wet lands not very valuable for other purposes". The area was known as the 'North Clays' district on account of being north of the Trent and of the heavy nature of the soils, developed on the Mercia Mudstone.

Another reason for the East Midlands acquiring some note as a brewing area had been around for centuries: the Nottingham caves (Fig. 3). Many of the city centre inns and taverns, some of which brewed beer, made use of the caves that were carved out below them (Waltham, 2018). Cut in the soft but stable Sherwood Sandstone, the caves were used for malting and brewing; one operation even advertised its products as 'Rock Ales'. The cool, even temperatures they provided were ideal for storing beer: Tizard (1846) found the 'old or vatted ales' from Nottingham to be "truly excellent".

Some of the brewing within the region still centred on traditional sites such as those that had previously been abbeys (e.g. Rufford and Burton upon Trent) and some of the big houses (e.g. Osberton Hall). But by the 19th century a new phenomenon was appearing: purpose-built, mechanised breweries designed to brew on an industrial scale. They supplied the surrounding region, and thus made brewing less locally intimate. In the East Midlands, none of these more centralised breweries operates today (Pearson & Anderson, 2010), although remnants of some later buildings can be seen, such as Shipstone's in Nottingham (Pearson, 2010).

The Industrial Revolution, and boom for Burton upon Trent

This trend to regional centres of brewing was greatly accelerated by the advent of the industrial revolution, partly because of greater mechanisation but especially because of the improved transport links. Ingredients no longer had to be produced in the local area: grains and hops could now be brought in. The local agricultural production therefore had to compete with the rest of the country. Barley on the fertile soils of the Vale of Belvoir could compete, and at first the relatively isolated position of the East Midlands allowed the survival of hop growing. But when the decline did come it was precipitous: in the twelve years following 1837 the hop acreage halved, and by 1866 it was down to a mere 76 acres (Pocock, 1965).

New strains of hops were being developed, especially in Kent, and the railways allowed them to be imported into the East Midlands. The new hops had a high bitterness and were suited to a newly fashionable lighter type of beer. However, they were prone to damp-induced diseases such as mildew, and so preferred relatively dry air, together with deep, free-draining soils. For reasons like these (and socio-economic factors), hop growing in the British Isles largely withdrew to just two regions, Kent and the Herefordshire-Worcestershire area, as is still the case today.

In the latter region, lying in the rain shadow of the Welsh Hills, the sandy soils derived from the underlying Devonian and Triassic sandstones provided ideal depth and drainage. In Kent, although hops had traditionally been grown on the moisture-retaining soils of the Low Weald, by 1893 Whitehead (Fig. 2) was reporting that in the "*Bastard East Kent district…hops of inferior quality are produced on the heavy soils of the Gault and Weald Clays*". In contrast, he claimed, "*the finest hop land in England, or, as some would say, in the world*" is situated "*on loams on the Thanet, Woolwich and Oldhaven beds*". Nottinghamshire's North Clays district couldn't compete with this; by 1885 the once-famous Retford hop fair had ceased.

Although the new transport system, coupled with the unsuitability of the area's geology, virtually destroyed hop production in the East Midlands it was, literally, a two-way street. Beer was still produced there so if it was any good it was now easy to ship it out to external markets (Fig. 4). And the beer was good. It seemed nowhere could produce a more agreeable version of the new style of beer, paler and lighter than its predecessors, than Burton upon Trent. The style became known as 'bitter' or pale ale, or even, before long, 'Burton Pale Ale'. Burton set the benchmark. The town's brewing industry trebled in size every ten years between 1850 and 1880. At its height, this town with a population of just 30,000 had 31 commercial breweries (Owen, 1987); a quarter of all the beer sold in Britain was produced there. The Bass brewery was the largest in the world, its Pale Ale the single best-selling beer in Britain.

***Figure 4**. Early beer transport in Burton upon Trent.*

A major advantage of beers brewed in Burton was that they could accept high levels of hop additions. This not only led to a taste that balanced well with the slightly sulphurous taste still known to beer lovers as the 'Burton snatch', but, very importantly in these days before pasteurisation, it made the beers more stable than those from elsewhere – less prone to 'going off'. But what was it about Burton that enabled all this? There was a strong suspicion that it was something to do with the groundwater, but at first no one really knew. And, of course, if the secret was discovered and it could be emulated elsewhere, it would be bad news for Burton.

Brewers had long argued about which kind of water is best for their purposes, for example whether it should be from a pond, a spring, or a river. One author specifically argued that well water should not be used – apparently brewers in Burton hadn't read his book. But by the mid-18th century, Burton brewers had become aware that their well waters had a high calcium sulphate content, which presumably had something to do with their suitability for producing pale ale, and that this was due to the geology. For example, Tizard (1846) wrote that *"Burton ales principally owe their superior qualities and uniform permanency to the nature of the water there used, and which, according to the best evidence, is strongly impregnated with this hardener of water, gypsum or sulphate of lime; the principle geological feature of the place and environs being described as a tolerably perfect gypsum, occasionally interspersed with carbonates"*. Similarly, Muspratt (1853; Fig. 2) remarked that *"as nearly every one at all acquainted with brewing knows, that water which contains a large quantity of gypsum – sulphate of lime – earthy carbonates… is best adopted for his purposes"* and he continued that at Burton *"the geological formation from which this water appears to emanate is New Red Sandstone; in the immediate vicinity of Burton there are large strata of new red marl, with a considerable amount of gypsum"*.

An obvious implication of this is that brewers elsewhere wishing to produce Burton-type pale ales presumably could simply add gypsum to their brewing water. Indeed, Tizard remarked he *"would suggest that when brewers are compelled to use soft water, for want of a better, they should impregnate them at second*

Ion	Effect on brewing	Effect on taste
Ca	Determines hardness, increases pH, essential to many enzyme and protein reactions, stabilises sugars, reduces colour	Extracts fine bittering compounds from hops
Mg	As calcium but lesser effect; yeast nutrient	Accentuates flavour
Na	Does not participate	Rounds out and accents flavour (in low amounts)
CO_3	Precipitates out with calcium	Promotes rounded malt flavour
HCO_3	Strong buffer against pH fluctuations	Allows greater hop use
SO_4	Sulphur is essential in yeast fermentation	Promotes a dry taste and characteristic eggy smell.
Cl	Increases stability and clarity	Promotes fullness and to an extent sweetness

***Figure 5**. Significant ions that occur in brewing water, and some of their roles.*

hand with gypsum, or with such limestones more easily procurable." And Muspratt claimed that he had added gypsum to some water and *"the ale obtained from such artificial water has nearly equalled the renowned product of Burton"*.

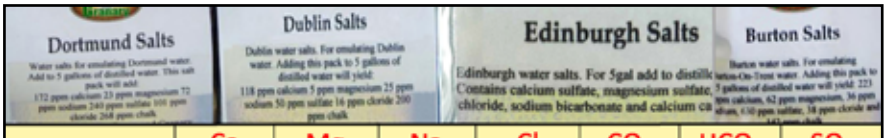
Consequently, for a time, a small industry developed to extract gypsum from the Burton area, presumably from the numerous mines and quarries around Fauld and Hanbury, and sell it to breweries elsewhere in the country. Brewing journals carried advertisements for 'gypsum specially prepared for brewers' use' (Cornell, 2011). By 1866 Whitbread was adding gypsum to its brewing water in London, and by the early 1890s Fox's brewery in Farnborough, Kent, had a tank filled with 'gypsum quarried from the Trent side'. He reports that in 1904 more than 150 tons of gypsum a year were being quarried from around Burton for use in breweries. In Burton itself, the Bass brewery company had the balustrades to its offices made of Tutbury Gypsum (Stevenson & Mitchell, 1955).

The question therefore arises as to why brewers kept building breweries in Burton, rather than use their existing facilities elsewhere and simply add gypsum. The reasons may involve the prestige of a Burton *cachet*, the additional taxation incurred if additives were used, and the possibility of falling foul of another law that restricted tampering with water. There must have also been the problem that simply adding gypsum to the brewing water can't have worked very well. For one thing, chunks of gypsum are not very soluble.

The rise of brewing science, and doom for Burton upon Trent

Brewers have always been ready to absorb scientific and technological advances (Sumner, 2015), such as utilizing early thermometers and hydrometers, and adopting the pH scale (which was devised in the Carlsberg brewery in Copenhagen). And in the late 1800s there were two advances that hastened the end of the supremacy of Burton brewing. First, Hooper (1882) pointed out that simply throwing lumps of gypsum into water won't do much because of their low solubility, which would be even less in hot water. So he devised a mixture that included finely ground calcium sulphate and various salts that improved its solubility and effectiveness. He called it 'burtonising' the water, a term which is still used today. Then Vincent (1878) introduced an improved method for adjusting the water composition. and in 1891 obtained a patent along these lines. Second, it became realised that it wasn't calcium sulphate in isolation that was important, but its balance with a number of other ions that gave a water that was hard yet of suitable alkalinity.

Today there is a vast literature on brewing chemistry, and the role of water seems well understood. (And brewing beer uses an awful lot of water; according to the World Water Organization (2008), from growing the barley through to getting the finished beer in your hand takes no less than 300 litres of water – per glass.) It is



	Ca	Mg	Na	Cl	CO_3	HCO_3	SO_4
Plzeň	10	4	3	4	12	3	4
Dortmund	225	40	60	60	270	220	120
Edinburgh	110	24	35	45	170	120	<250
Burton	352	24	54	16	171	320	820
Dublin	118	4	12	19	164	319	54

***Figure 6**. Typical ionic composition of waters from some major brewing centres, each producing a different style of beer. Home brewers can buy sachets of 'brewing salts' to emulate these waters as desired. Pilsener lagers (originating in Plzeň, Czech Republic) use waters with low ionic content (though balanced), hence additions are not appropriate.*

Figure 7*. Labels from around the world of two classic styles of beer, Export Ale and India Pale Ale or IPA, both of which largely originated in Burton upon Trent.*

now known that the key ions are calcium, magnesium, carbonate, bicarbonate, sulphate and a few others, each playing a particular part (Fig. 5) but also interacting with each other.

For example, the water at Burton upon Trent contains significant magnesium and a remarkably high sulphate content (Fig. 6). Magnesium sulphate, Epsom salts, was once celebrated for its purgative properties (Harte, 2009), at one stage with people drinking up to sixteen pints a day of Epsom water – with 'various funny results'. At Burton, however, the magnesium is balanced out by the high calcium (though some capacious drinkers may not entirely agree). In turn the calcium allows higher hop contents, and while this could lead to the water being excessively hard, the high bicarbonate content provides an appropriate buffer. In short, Burton water has a perfect ionic balance for brewing pale ale or bitter, leading to a product with unrivalled flavour.

Furthermore, the extra hops allowed by these ions gave a finished beer with sufficient stability to withstand being transported long distances. Indeed, if the grain and hop content were increased, the resulting strong beer would be stable enough to be exported away from Britain – the origin of Export Ale. And if the ale was brewed to be yet stronger it could even survive the long sea journey to the colonies in India – the birth of today's almost ubiquitous India Pale Ale or IPA (Fig. 7). Nowadays all this knowledge is standard in brewing text books around the world, but there is usually little acknowledgement of the more fundamental influence, that the ionic profiles come about because of the aquifer geology.

Late in the Quaternary, the River Trent built a 'Second Terrace' (Stevenson & Mitchell, 1955), then, after a period of erosion involving the gypsum-bearing bedrock, a lower 'First Terrace'. Much of Burton's water comes from the gravels of this First Terrace (Fig. 8). However, the breweries supplemented their water supply by drilling wells deep into the Triassic bedrock, which at Burton is the Mercia Mudstone overlying the Sherwood Sandstone. The latter is an aquifer of regional importance (and, intriguingly, in places hosts fresh water that is probably of Pleistocene age, at depths of about 500 metres among the deepest known fresh water in Britain (Smedley et al., 2018)). Whereas the aquifer is largely of fluviatile origin, the overlying mudstones accumulated in a land-locked desert and are in places evaporitic, leading to them being somewhat saline and highly gypsiferous. This is the key to Burton water.

The gypsum occurs as thin beds and nodules (with anhydrite) throughout the Mercia Mudstone Group, but about 50 metres from the top the massive Tutbury Gypsum Formation locally reaches a thickness of 3 metres and more (Stevenson & Mitchell, 1955). In a well sunk for Burton's Worthington brewery, just the uppermost 100 metres encountered 22 meters of gypsum-bearing beds, some of which approached 4 meters in thickness. And a borehole at the Peter Walker brewery in Clarence Street (demolished in the 1970s) met a 6 metre thickness of almost pure gypsum just 12 meters below the surface. In other words, the vital calcium, sulphate, and related ions in the Burton brewing waters essentially come about because of the evaporitic origin of some of the local bedrock.

Returning to history, the growth of this new hydrogeological knowledge, together with an Act of Parliament in 1880 (Gladstone's so-called 'Free Mash Tun Act') that removed the tax on water additives, meant that the Burton heyday was over. Moreover, it had gradually been discovered that broadly similar water chemistries existed at some other brewery towns. Yorkshire's Tadcaster also became noted for its pale ales. In 1890 Tadcaster had a population of less than 3000 but had four commercial breweries, three of which are still flourishing. The Old Brewery of 1758 was bought by a John Smith in 1847, who in 1886 started a new brewery under his own name and left the old one to his nephew, Samuel. And right from the start, the Smith regime at both breweries replaced the old-fashioned sweet porters with bitter. 'Samuel Smith's Old Brewery Bitter' is brewed to this day.

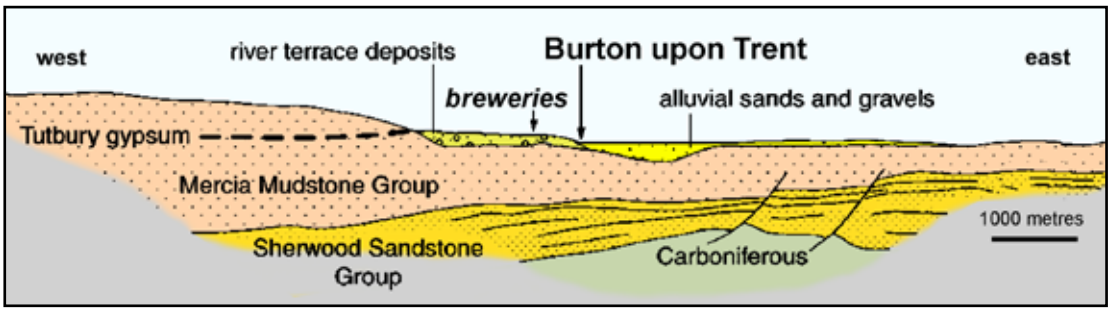


Figure 8*. Simplified cross-section through Burton upon Trent. Breweries obtain water from both bedrock and surficial deposits, but both are gypsiferous and rich in Ca, Mg and SO_4 and other ions.*

***Figure 9**. Tadcaster, Yorkshire, made its name with pale ales affectionately called 'Taddy' beers; its hard, sulphate-rich waters came from the easterly-dipping aquifers (the Magnesian Limestones as they were once known, which are pale blue and dark blue on this map) intercalated and overlain by anhydrite and gypsum-bearing formations (contains map data from BGS).*

The water at Tadcaster has a lot in common with Burton, though in detail the geology differs (Fig. 9). At Tadcaster, the river terrace deposits are insignificant hydrogeologically, and the relevant bedrock is of Permian age, though formed in an inter-montane arid setting like the Triassic at Burton (Cooper & Lawley, 2007). It comprises the aquifers of the Cadeby and Brotherton formations (previously Lower and Upper Magnesian Limestones), separated by series of carbonates and massive evaporites of formations such as the Hayton Anhydrite (or Gypsum) Formation and overlain by the Billingham Anhydrite. However, widespread extensional faults, together with disturbance due to gypsum dissolution and collapse (solution subsidence of the ground surface is a major problem in this region) have put the various formations in hydrogeological continuity. So these also are hard waters with a high sulphate content; as Cooper and Lawley (2007) put it, the Tadcaster waters are "naturally burtonised".

When Samuel Smith's recently considered selling their brewery's well-water in bottles, they had to abort the plan because the high level of calcium sulphate was outside the parameters allowed in 'spring water' (Christian Horton, 2019, *pers. comm.*). These Burton-type, hard, high-sulphate waters (Fig. 5), ideal for brewing pale ales, differ from the natural waters of some other brewing towns, where very different styles of beer are produced.

However, while geology was clearly important in places like Burton and Tadcaster, beer as a local product was continuing to disappear from most places. Many breweries still had a regional identity, even if their beers were sometimes being consumed far away from their source. Even if they weren't strictly 'local' beers, their provenance was usually pretty clear and recognised. But even this was to change.

All change, and local brewing fades

The 20th century saw great changes in the brewing scene, which many would see as for the worse. Among other things, beer became progressively weaker but vastly more expensive, mild took over from bitter in popularity, eventually to be replaced by undistinguished lagers, and mergers and take-overs greatly reduced the number of breweries. It follows that not only did the localisation of beer decrease still further but even regional identities became blurred or lost. Geology became largely irrelevant. Arguably the later decades of the century were a nadir for brewing (other than in terms of financial profit) – all a far cry from where the story began.

Few British breweries now had much regional identity, and the number of inns, taverns and pubs brewing their own beers – once numbered in thousands – by the 1970s was down to just four. Brewing as any kind of local endeavour was all but extinct. The complete loss of a great national tradition was looking inevitable. The Campaign for Real Ale (CAMRA) fought valiantly to stem the rate of brewery closures and to some extent was successful. It certainly raised consciousness about the threat facing this deeply historic heritage and heightened the public's awareness of beer. And the Campaign's aims did chime with a growing revolution in taste that was breaking out all over Britain, including a new notion of matching beer with food, and a general heightening of expectations. A mood was growing for a change.

Craft beers and a return to local brewing

Some British commentators of the time sought comfort in the brewery situation being even worse in the U.S.A. There, in 1983 there were a mere 80 breweries in the entire country, and 92% of the beer was produced by only six of them. Moreover, many would say that American beers of this time were indistinguishable in their lack of flavour, though perhaps Coors was the blandest of all. But although it might have been tempting in England to be smug about this even more dire situation, things were deceptive. You could still buy Bass ale in America, but it was brewed there and not in Burton. The Bass brewery in Burton was still in operation – but now producing Coors.

There was no CAMRA or its equivalent in America, but these were rebellious times among America's youth, and increasing numbers were travelling abroad and experiencing first-hand Europe's brewing heritage.

Then in 1979, around half a century after Prohibition, home brewing again became legal. So it was America that saw the explosion of the craft beer movement. A pent-up energy and creativity was unleashed. The American craft brewers certainly had respect for the classic styles of beer; IPA was rescued from near extinction to become a mainstay. But in other ways, unfettered innovation and originality became a hallmark of the movement. All sorts of ingredients were tried, including those available locally, so in a way this was harkening back to the early days of brewing, when whatever happened to be at hand was used.

Motivated by this upheaval in America, and by Gordon Brown's 2002 budget tax-breaks for small brewers, a British equivalent erupted, and took inspiration from the new, hop-driven American styles of beer. Thus, ironically, brews such as New England IPA and California IPA are today on the lists of many British craft brewers. But in parallel with this, as in America, experimentation was limitless and the movement, so far, has flourished. The number of British breweries has grown from 403 in 2002 to 2274 in 2019; the East Midlands now have nearly 300, including the re-born Nottingham Brewery with its 'Rock' beers, and have seen the revival of monastic brewing at Mount St Bernard Abbey, near Coalville. Beer lovers have always regarded the finest bottled beers as those that are 'bottle-conditioned' (unpasteurised). In the 1970s only four such beers remained in Britain; today there are more than 2000. (This should, however, be kept in volume context; the recent $100-billion-merger between brewing colossi Anheuser-Busch InBev and SABMiller means that this single company will be producing almost a third of all the beer drunk in the world.)

Nevertheless, those who are interested can now buy craft beers that reflect their local environment. Many craft brewers attempt to source ingredients locally and try to operate with a local ethos. Craft beer is notoriously tricky to define, but Floy's (2014) attempt in this direction mentioned that "craft brewers engage in locality not only on the supply side, but also on demand through involving themselves with the local community".

The notion of 'terroir' is an old one, but in recent decades has gained much exposure with wine (Maltman, 2018). Craft brewers are now making concerted efforts to create beers that reflect their locality. Hence, there is much talk of beer terroir. At a 2019 trade show in London, Susan and Judith Boyle explained how their brews involve wild yeasts, honey from local bees, barley grown and malted locally, and vary according to the season. Some breweries are now using hops grown locally, together with local ingredients such as sea buckthorn, bog myrtle, heather, yarrow, and sorrel. Some believe the flavours of these ingredients depend on the soils in which they grew (Cornell, 2014), which suggests that even if nowadays the nature of the local brewing water is usually artificially adjusted, geology is once again having some role.

Where the currently frenetic, no-holds-barred craft beer movement is heading only time will tell, but right now it seems that in many ways, after a century and more of decline, local brewing has come full circle.

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