

BEER 101 – The Basics of Beer

Beer is the simplest and most complex of beverages, all at once.

Simple enough that the first beer was probably an accident. Grain, water and wild yeast from the air combined by chance, and fermented. Some brave passer-by tasted the foamy result, and was no doubt amazed at its intoxicating effect (See also: The Dawn of Religion). By 4,000 BC, the Sumerians had perfected ways to replicate that miraculous process.

Simple, because it is made from as few as four ingredients: grain, water, hops and yeast. But beer is also complex. Given those few ingredients, brewers have crafted seventy or more distinct beer styles and thousands of individual interpretations. By varying the amounts or characteristics of the four ingredients, adding new ingredients, or by altering even a little the timing or temperature of the brewing process, master brewers create today's astounding variety in the beers you drink.

The Craft Beer Revolution

Over the past three decades, the United States has been the international epicenter of brewing innovation, as brewers have explored the range of styles variously known as “craft beer,” “specialty beer” or “micro-brewed beer.” We'll stick with the first term, but all three generally refer to the seventy or more beer styles outside of the mainstream lager style that dominates the market.

In 1981, there were 40 breweries operating in this country. Prohibition early in the century and national consolidation in the years after its repeal had reduced American brewing variety to an all-time low.

American beer drinkers had little exposure to any beers except the dominant pale lager style. However, thanks to a growing (if underground) homebrewing community, military service overseas, and international travel, some consumers experienced alternatives to mass-marketed lager. Our domestic beer monoculture motivated a few individuals on both coasts to redirect American brewing in a new, exciting direction.

Initially, the new brewing businesses, whether microbreweries or brewpubs, specialized in beer styles drawn from the English brewing tradition, still the mainstay of craft brewing. American brewers embraced pale ales and stouts, and even resurrected styles, including porter or barley wine, which had gone extinct in their native land.

But, even in the early days of the American craft beer movement, American brewers were putting their own twist on traditional recipes, adopting new hop varieties, increasing hop rates or alcohol content, and exploring novel ingredients. Within a few years, many American interpretations had diverged enough from the European originals to constitute brand new styles, one source of all the heady diversity we see today.

Every year or so, another wave of innovation seemed to overtake the brewing community: English ales were joined by fruited wheat beers, or beers flavored with coffee or honey. A growing affection for more highly-hopped, stronger beers led to the phenomena of double or imperial India pale ales—and the sometimes ill-judged attempts to “imperialize” a wide range of other styles.

Brewers also turned for inspiration to the influential brewing traditions of Belgium, and again adopted and adapted styles and techniques in ways that both excite and puzzle. Belgian-style beers are now a mainstay in most brewpubs. More recently, brewers and drinkers have taken a fresh look at archaic brewing techniques, including the aging of beer in wooden containers and the deliberate souring of beer.

Some of these experiments are thrilling; other style hybrids disappoint. But when we look at the over 1,900 craft breweries operating in the U.S. today, it’s clear that the excitement that greets each new brewery opening is entirely justified.

How is Beer Made?

In the broadest sense, “beer” is any alcoholic beverage made by the fermentation of grain, just as wine is any alcoholic beverage made by the fermentation of fruit. In the vast majority of the world’s beers, the grain base is barley.

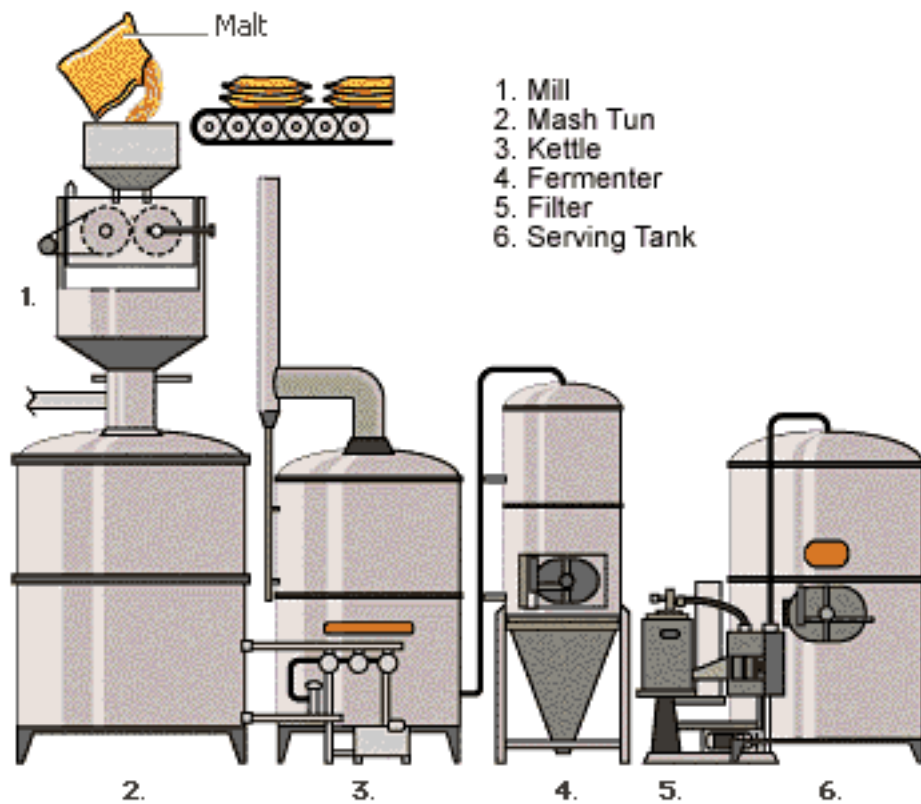
The brewing process commonly begins with malted barley—barley that has been germinated then roasted. The brewer mills the malt, cracking the grains between rollers to expose more surface area. Then, just as coffee grounds are steeped in water to extract their flavors, the malt is heated with water in a large kettle called a “mash tun.” At the end of mashing, the starches in the malt have been converted into simple sugars, resulting in a liquid known as “wort.”

The brewer rinses the malt (“sparging”) and strains it to get the last of the sugars into solution. The malt is now “spent grain,” useless for beer, but still good for baking, or for animal feed.

The wort is piped into the next large tank in the brewery, the brew kettle. Here, hops (green, cone-like flowers) are added and boiled with the liquid, providing bitterness and aroma.

After boiling, the wort is rapidly cooled until it is at the right temperature to add yeast, the unicellular organisms that do the work of fermentation. The yeast is pitched in to the sweet wort, where it metabolized the sugar, releasing alcohol and carbon dioxide in the process.

After a while, the food runs low, and the increasingly alcoholic atmosphere becomes unfriendly: the yeast slow down, or even die. Fermentation is complete. The “green” beer is transferred to conditioning tanks to age, a process that can go from a few days to several weeks (or, occasionally, years) depending on the style. When the brewer deems the beer ready, the public gets to enjoy this work of art.



Beer's Essential Ingredients

The Role of Yeast

The most important ingredient in brewing was the last one discovered, because yeast is a single-celled organism that is invisible to the naked eye. Still, brewers have long known that some unseen agent turned an innocuous, sweet liquid into beer. Long ago, the action of yeast was such a blessing, yet so incomprehensible, that English brewers called it “Godisgood.”

How does yeast work? When it is added to a sugar-rich solution, it immediately begins to ingest the sugars and create more yeast. But from the brewer's point of view, the important thing is not the proliferation of more yeast, but the waste products of yeast metabolism: carbon dioxide and alcohol.

As the food supply is depleted and the alcohol levels rise, the environment becomes literally toxic to the yeast, which becomes dormant. The brewer may harvest some of the yeast for the next cycle of brewing.

Different strains of yeast behave differently, such that it's possible to divide the world of beer according to the yeast. The sixty or more defined beer styles in the world can almost all be sorted by their yeast into two broad families: the ale family and the lager family.

Beers in the ale family are produced at warm temperatures by a group of yeasts termed “top fermenting.” These yeasts are active towards the top of the fermenting vessel. Ales are ready to drink in days rather than weeks, and the yeasts produce extra flavors in addition to creating alcohol: fruity, spicy, or earthy flavors are not unusual. Ales are the traditional beers of England and of Belgium.

Beers in the lager family are fermented at cooler temperatures by yeasts that are “bottom fermenting.” As you might guess, these yeasts are most active at the bottom of the brewing vessel. These beers need to be conditioned or cellared (“lager” in German) for several weeks or more to reach peak drinkability. The lager beers are the traditional beers of Germany, the Czech Republic and central Europe.

The action of yeast can generate a range of interesting beer flavors and aromas as varied as apple, pepper or apricot. Some, such as banana or clove, are the signature flavors of particular beer styles; others, such as butterscotch, may be considered defects.

In an interesting modern development, some craft brewers are experimenting with the most ancient of brewing technologies, that of relying on so-called “wild yeast” that is endemic to the

brewing site. These yeasts, most of the genus *Brettanomyces*, result in beers that are variously described with terms including “barnyard,” “funky” or “horse blanket.”

The Importance of Malt

Although wheat, rye, oats, millet, sorghum, rice and corn have all been used for brewing, barley is the preferred grain for beer. But in order to make the sugars in barley available for fermentation, the barley is generally converted into malted barley, or “malt.” The process of malting involves soaking the barley, allowing it to germinate, then halting germination with heat.

The degree of heating that barley malt receives has profound effects on the character of the beer that can be brewed. All the color in beer comes from the malt. A lightly-roasted barley will produce a very pale beer. Deeply roasted, charred or smoked malts produce dark or black beers.

So, take lightly roasted malt and make a beer from it. Use an ale yeast, and the result will be a pale ale, the classic English pub beer, or a bitter or golden ale. Use a lager yeast, and the result will be a style such as pilsner.

Roast the malt a little more, and the ale variant will be an amber ale or a Scottish ale; if a lager, perhaps it will be a Märzen, a festbier or an Oktoberfest beer.

Give the malt a little more heat, and the beers become darker, the color of root beer. Brown ales—Newcastle Brown is a classic—are the ale variant. In the lagers, the cleaner tasting German dunkels—dark lagers—are the counterparts.

The popular wisdom is that these dark beers are stronger than light beers. On the contrary, the roasting may have the effect of “locking up” some of the starches in the beer so they cannot be fermented. There is less food for the yeast to turn to alcohol; the beers may be lower in alcohol, and the unfermentable material stays in the beer, giving it a thicker texture in your mouth. The beers can feel rich, but actually may be less intoxicating than a mass-marketed lager.

More roasting. The next darker beers are porters (which are ales) and the rather rare schwarzbiers (which are lagers). In keeping with the differences between the two families, porters will have a lot more spin-off flavors, such as fruity notes, than the schwarzbiers, which will be malty (sweet) but still very clean. Both styles acquire coffee or chocolatey notes from their dark malts.

Like any classification system, this one ignores a lot of inconvenient diversity in order to fit examples into a neat model. But it is handy to know that lagers and ales both come in a full range of colors, strengths, and characters.

Water, the Foundation of Beer

Brewing has traditionally been an activity based on local materials. Agricultural ingredients—barley and hops—might be transported to the brewery from the countryside, and, with improvements in trade, from even further afield. But the heaviest and most ubiquitous ingredient, water, has always been—and still is—local.

That means that the chemical composition of a brewery's water, which is a reflection of local geology, has had a profound influence on the character of local beer, shaping the styles we associate with particular locations.

In particular, the hardness or softness of the water (meaning water with a higher or lower mineral content, mainly calcium and magnesium, and also bicarbonate) is behind the unique qualities of beer styles that are sourced to specific locations.

For example, regions with high levels of bicarbonate in their water, such as London or Dublin, have become known for their darker beers. This is because bicarbonate affects the pH (acid-alkaline) of the water. Yeast don't perform well faced with too high a pH (higher alkalinity). Brewers gradually learned that if they roasted their barley, the resulting beer was better: though they didn't realize it, the addition of roasted barley had the effect of lowering the pH.

By contrast, the Czech town of Pilsen has very soft water, the purity of which contributed to the startling clean, fresh flavors of Pilsner Urquell, the original and revolutionary pilsner beer.

Compare that to Burton-on-Trent, birthplace of pale ale. The water of the Trent is very hard, and especially rich in calcium sulphate (gypsum), which allowed the town's famous pale ales to showcase hops so elegantly, and added a whiff of characteristic sulphur. In fact, the water of Burton is so renowned that brewers the world around who want to brew pale ales may "Burtonize" their water, adding minerals to mimic the original.

Today, brewing chemists can alter the composition of any water supply to suit the style of beer being brewed. Despite the attention given to beer's other three ingredients, the old ad got it right with the tag line "It's the water."

Hops, the Spice of Beer

Of the four basic ingredients to beer, but only three are essential: malted barley, yeast and water. However, this poor three-element beer will be sickly-sweet and dull. Throughout brewing

history, brewers have added something extra—usually a plant part of some sort—to give their beer balance and depth.

They've added heather flowers, spruce tips, borage or bog myrtle. In the Middle Ages, a compound called “gruit” mixed herbs and spices in recipes that varied from place to place.

But by the 15th century, one vigorous weed crowded out all other competitors as the fourth ingredient in beer: hops. Hop plants are climbing vines (more accurately, bines: vines without tendrils) of the species *Humulus lupulus*, related to hemp but not smokable. The plant part used in brewing beer is the hop flower, a delicate, pale green, papery cone laden with perishable resins. They impart bitterness when used early in the brewing process, and aroma when used at the end. As a bonus, hops are a preservative, and extend the life of beer.

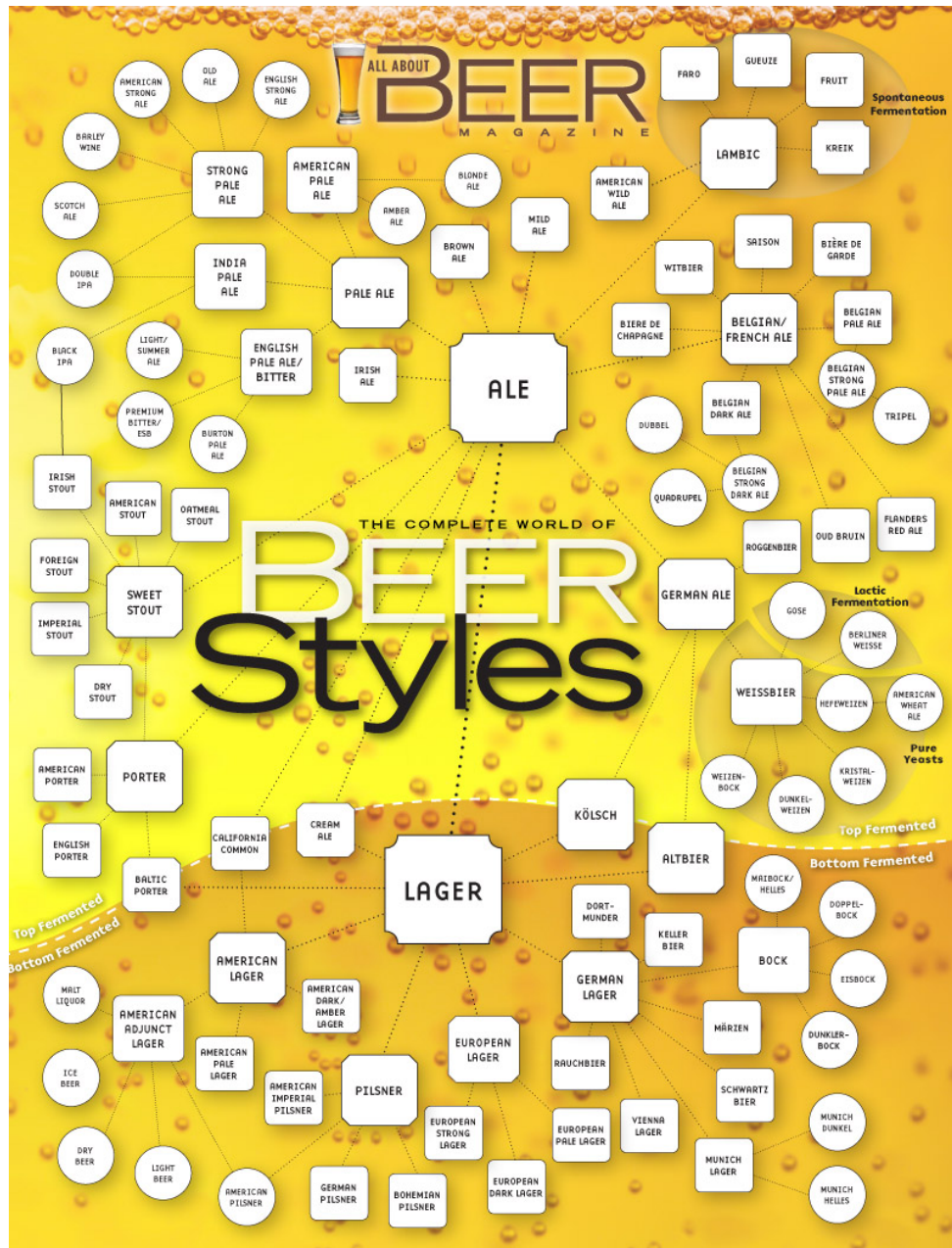
In the hands of American microbrewers, hops have moved from their position as the supporting actor in the beer ensemble to the leading man of the quartet, and a pretty dominant one at that.

West Coast microbrewers led the way in delivering beers where the character of hops—bitter, piney, grassy, floral, or grapefruity—took center stage. Beer lovers took pride in seeking out the brews with higher and higher IBUs—international bittering units, the measure of the concentration of hop compounds in beer.

High-hopped beers are not for every taste. But for the IBU counters out there, there is a stunning array of hop varieties—with new ones developed all the time—that brewers employ singly or in combination.

Now, American brewers have boosted the hopping levels of their IPAs to such an extent that a new beer style has emerged: so-called “imperial” India pale ale. Borrowing the “imperial” moniker from the Imperial Russian stouts—another style that was super-sized—these big beers feature even more hop power and alcohol to match.

The Styles of Beer



American beer drinkers can feel a little bewildered by the array of beers on the shelves, and for good reason. Brewers in this country have invigorated American beer by drawing from the brewing traditions of many countries—then blending and bending the styles for American audiences. As a result, there are probably more beers and a greater range of styles available here in the Triangle than there are in any European capital.

But that means that American beer lovers also have to make sense of a greater variety than drinkers in any other country. German beer drinkers won't understand the distinctions between English pale ale and India pale ales; English beer drinkers won't have to discriminate between Belgian dubbel and tripel ales; Belgians won't face a choice between a German kölsch and a helles. American shoppers can face all of these choices—and more—at a single (very good) retailer's store.

The Ale Family: Top Fermentation Styles

British Styles

Pale ale. The classic English beer, golden in color, with a bready, estery aroma, mingling with obvious hops. *Related styles:* bitter, extra special bitter

Brown ale. In its home in the north of England, these medium brown, sweetish beers were brewed to quench the thirst of laborers. Soft fruit notes and mild nuttiness, with low bitterness. *Related styles:* amber ale, mild

India pale ale. Originally brewed with higher alcohol and more hops to withstand the voyage to the British colonists in India, in the hands of American brewers, the IPA has become a full-bodied, assertively bitter beer. *Related styles:* black IPA, double IPA

Scottish ale. Copper to deep brown in color, with sweet maltiness and fruit, and low hopping rates. *Related styles:* Scotch ale

Porter. Originally a London beer, probably named for the porters who carried goods around the city, porter was developed as single beer that resembled a popular blend of beers known as “three threads.” Deep brown, with malt aromas, a medium body and smooth notes of chocolate and mocha. *Related styles:* robust porter, Baltic porter

Stout. Descended from porters, stouts are the darkest of the ales, near black to black in color. Brewed with a measure of roasted barley that give stouts a burnt-toast gristiness lacking in porters. Expect stouts to be rich with espresso tones. *Related styles:* dry stout, sweet stout, oatmeal stout, Russian imperial stout

Barley wine. Sweet, strong, malt-dominated beers, with good hop balance. Rich, with notes of caramel and stone fruit, and some winery or Madeira character as they age. *Related styles:* old ale, strong ale, winter warmers

Belgian Styles

Belgian ale. Blonde and amber commercial Belgian beers, all of which display a distinctive Belgian yeasty character.

Belgian red ale. These deep red, wine-like beers from Flanders acquire a deliberately lactic sourness during their long aging, traditionally in huge oak barrels. *Related styles:* Flemish brown ales

Belgian golden ale. Duvel is the original of this style, a pale golden beer with a huge white head, marked hoppiness balancing sweet tropical fruit notes, and a deceptively light body for such high alcohol.

Saison. Seasonal (saison) farmhouse ales traditionally brewed in spring for summer consumption. Aromatic and spicy—a wonderful food beer. *Related styles:* bière de Garde

Wheat Ales

Bavarian wheat. Hefeweizens are pale, cloudy ales fermented with a proprietary yeast that gives the beer notes of banana, clove or bubblegum. Refreshing and spicy. *Related styles:* kristall weizen, dunkelweizen, weizenbock

Berliner weisse. Called “the champagne of the North” by Napoleon, this highly carbonated, strikingly acidic beer is often served with a dash of syrup to cut the tartness.

American wheat. Ales brewed with a measure of wheat, but using conventional yeast, thus avoiding the more exotic esters present in a hefeweizen. Often flavored with fruit.

Belgian witbier. Brewed with a measure of unmalted wheat, which gives a witbier (“white beer”) a slightly creamy mouthfeel. Spices—most often coriander, or Curaçao orange peel—are typically added, and the beer undergoes a degree of lactic fermentation for a touch of sourness.

The Lager Family: Bottom Fermentation Styles

Pale lager. The dominant world beer style, believed to represent 95 percent of world beer sales. Light lagers, a less flavorful spin-off of the pilsner style, are clean, light-bodied, lightly hopped with a crisp malt character. Most are brewed with added adjunct grains such as rice or corn. *Related styles:* Light beer

Pilsner. The first pilsner originated in Plzeň, now in the Czech Republic. Striking gold in color, highly aromatic, medium bodied, delicate and refreshing. Great pilsners are a showcase for the

varieties of hops grown in the region. *Related styles:* Dortmunder, German pilsner, Munich helles, Imperial pilsner

Vienna. Originating in Austria in the 19th century, these amber lagers have a noticeable toasted malt character. *Related styles:* Märzen, Oktoberfest, amber lager

Bock. Strong, sweet lagers, with a deep malt aroma. The different varieties range in color from pale gold to dark brown. Labels often feature a goat, an allusion to the German word, *bock*, for a billy goat. *Related styles:* maibock, doppelbock, eisbock

Dunkel. These dark lagers predate the pale pilsner lagers, and display sweet, roasty, sometimes chocolate notes from the use of dark malts, slight round sweetness, with balancing hops and a dry finish.

Schwarzbier. These black lagers feature roasted coffee, licorice and bitter chocolate notes against a clean background, with restrained hop character.

Hybrid Fermentation Styles

Alt. Originating in Düsseldorf, altbier (meaning “old beer”) predates the lagers that dominate German brewing. Fermented at warm temperatures in the manner of an ale, but conditioned at lager temperatures, altbiers are deep amber, with light fruitiness.

Kölsch. Like Düsseldorf, the city of Cologne (Köln) retained some ale-brewing practices as Germany generally changed to lager brewing. Kölsch is straw-colored, with a large, white head: it is a delicate beer with herbal hops.

Cream Ale. Indigenous American style, fermented at warm temperatures in the manner of an ale, but conditioned at lager temperatures. Expect some ale complexity balanced with lager-like crispness. *Related styles:* steam beer/California common

Specialty and Emerging Styles

Lambic. One of the oldest beer styles in the world, lambic is brewed by spontaneous fermentation and aged in wood, resulting in extremely complex flavors that are often termed “horse blanket,” or “barnyard.” Lambics of various ages are blended, some are sweetened, others have fruit added, traditionally cherries (*kriek*) or raspberries (*framboise*).

Smoke beers. Smoky-flavored malts were once unavoidable, as all barley malt was cured over fires. Today, a few brewers still use smoked malt, notably the brewers of Bamberg in Germany.

A variety of base beers can be made with this method, with the smoke character varying from a hint to barbeque-intensity.

Trappist/Belgian abbey style. Six monasteries in Belgium and one in Holland are designated “Trappist” ale breweries. Each monastery produces between one and three beers, often labeled “dubbel” or “tripel.” Most are sweet, complex and strong. *Related styles:* abbey ales

Wild ales. Where most beers are fermented with commercial yeast, some brewers rely on the action of wild yeast. Lambic beers are the most traditional examples, but modern craft brewers are utilizing atypical yeast strains and specialized bacteria to create new flavors.

Barrel-aged beers. Not a style, but an old technique that is attracting new attention. Wooden barrels can impart to the beer some of the character of the liquid previously stored in the barrel, such as bourbon; or the wood can house microorganisms that contribute novel flavors to the beer—or sometimes both.

Beer and Health

When we toast one another, it never strikes us as strange to associate alcohol with good health. After all, as far back as we have records, there are accounts of revelers raising their tankards to their leaders, their gods, and each other’s well being.

Beer, being based on grain, was traditionally a wholesome household product, like bread. Beer was the healthful mealtime beverage for young and old alike and a source of valuable nutrients. It was certainly safer than drinking plain water. Brewers didn’t realize they’d stumbled on the most fundamental of public health measures, but by boiling the water during brewing, they killed off some very nasty bugs that could otherwise have killed the drinker.

Over the past two decades, a growing list of medical studies have demonstrated that moderate drinkers tend to enjoy better health and lower mortality than either heavy drinkers or total abstainers.

Beer has no fat, no cholesterol, no caffeine, no nitrates, and very little sodium. It is full of vitamins, as anyone knows who has purchased brewer’s yeast as a source of B vitamins. Depending on the style and the brand, it is also packed with iron, potassium, magnesium, and phosphorus. Dark beer is an excellent source of heart-protecting flavinoids.

The hops in beer have antibacterial properties. Brewers have exploited this property for over five centuries, relying on hops not only for the balance they contribute to a beer’s flavor, but for the

hops' power to preserve. Hops also contain phyto (plant)-estrogens, and compounds that aid sleep.

But aren't these health benefits cancelled out by the weight a beer drinker gains? After all, that prominent overhang isn't called a "beer gut" for nothing, is it? Well, beer may be getting the blame for the company it keeps: we might as well call that a "nacho gut" or a "buffalo wings gut." Given that alcohol does stimulate the appetite, making a peanut binge more likely, a filling beer might be a better choice of drink than wine or spirits.

In terms of calories, a 12 ounce serving of most commercial beers contains around 150 calories, about the same number as one of those dinky pots of fruit yogurt. "Light" beer will save you another 50 calories, a trade-off many beer lovers are unwilling to make for the loss of flavor.

The key here is, of course, moderation. In the US, moderate intake is generally defined as one standard drink a day for women; two for men. (In Europe, three to four drinks a day is considered moderate, an interesting difference.) At these reasonable levels, beer is a wholesome component of your diet, as well as a welcome accompaniment for meals, recreation and social occasions.

The Enjoyment of Beer

Beer Glassware



There aren't a lot of rights and wrongs in the world of beer, fortunately. If you enjoy the beer you're drinking, you've found the right beer for you, whether it's a domestic or an import; a light lager or a sturdy stout.

But there are ways to make the right beer taste better, and one way is to choose a glass that lets you appreciate all the elements of the brewer's work.

The first guideline in selecting a glass is the simplest and will do more to bring out the best in your beer than anything else: do select a glass. Only glug a beer directly from a bottle if you don't really like beer: the only sensations you'll have to experience will be wetness and gas. Anyone who has had a terrible cold knows that, without smell, there is very little flavor to enjoy. A glass-any glass- allows the carbonation to lift the beer's aromas to your nose, and the aroma is half the pleasure.

Guideline two of glass selection is almost as easy and will contribute nearly as much to your enjoyment. If someone serves you a beer and a frosted glass, consider sending the glass back and asking for one at room temperature. This is a living beer, not a frozen margarita. As soon as beer hits a frosted glass, the temperature of the beer plunges, and cold is as effective a killer of taste as holding your nose.

Guideline three is cleanliness. Any residue from grease or detergent will kill the head on a beer. A glass that is "beer clean" is one that is being refilled with beer: the first pour clears the last traces of anything unwanted, and the next beer should be perfect. Hang onto that glass!

Beyond these basics, what does a glass really do, besides distinguishing your drinking style from your dog's?

Beer and glassware have evolved together. Once, murky beer was hidden in opaque clay mugs. The first affordable glass drinking vessels arrived on the scene around the same time as the first bright, pretty beers. For the first time, a beer could appeal to the eye-as well as the nose and the tongue.

The shape and thickness of the glass affect the temperature of the beer and the size and retention of the head, and these influence the flavor you perceive.

Temperature first. A thick-walled glass will maintain the temperature of beer longer. (So will a glass with a handle, which protects the beer from the warmth of your hand.) In cultures that prize cold beer, glasses are either thick, as in the case of many wheat beer glasses, or, if thin, the glasses and portions are small and frequently replenished.

The relationship between glass shape, foam, aroma and flavor is trickier. A glass that is deep in relation to its width will allow the formation of a thicker head; it can focus the fragrance of more delicate, aromatic beers. A shallower glass with a wide mouth limits the depth of the head; more of the beer is exposed to the air. These chalice-like shapes are traditionally associated with stronger, more vinous ales.

Between these two extreme profiles-long, narrow and straight-sided; and shallow, wide and cupped- lie a great variety of designs: tulip-, thistle-, flute-, and barrel-shaped. Do you really need a different glass for every beer? Research from the University of Leuven in Belgium says no. Trained tasters determined that light- flavored lagers did indeed taste best in the familiar narrow glasses. Likewise, rich ales fared well in glasses with a wide brim that allowed a head of only a couple of centimeters. However, the dense heads promoted by some glasses-particularly those like the thistle that narrow near the top-seemed to trap some flavor components in the foam, to the detriment of taste.

So, should you ignore the best promotional efforts of your favorite brewers? Of course not. Certainly, stock up on a couple of basic shapes, and be confident that these will take good care of your beer.

But don't ignore the appeal a beautiful glass has for the other senses. The fragility of the thinnest possible pilsner glass; the architectural solidity of an Art Deco chalice-these are the perfect marriage of taste, character and design, and glasses worth having.

Other Resources

If you want to expand your beer knowledge, here are authoritative resources to help you.

The Beer Judge Certification Program or BJCP (www.bjcp.org) was founded “to promote beer literacy and the appreciation of real beer, and to recognize beer tasting and evaluation skills.” By certifying and ranking the judges who serve at the thousands of amateur and commercial beer competitions that take place in the US every year, the BJCP supports uniform standards and the appreciation of beer styles. Aspiring judges must amass a number of points by participating in sanctioned competitions, and sit rigorous written exams.

The Cicerone Certification Program (www.cicerone.org) serves the beer and hospitality industries, by designating “those with proven expertise in selecting, acquiring and serving today’s wide range of beers.” The three levels—Certified Beer Server, Certified Cicerone and Master Cicerone—reflect increasing levels of professional experience in selling, serving or managing beer. All three levels require exams.

All About Beer Magazine’s website (www.allaboutbeer.com) contains an unequalled archive of material on beer, brewing, tasting notes and beer culture.

In addition, here are just a few of the outstanding books available on the world of beer:

Michael Jackson’s Beer Companion, Michael Jackson (Running Press, 1997). The late English journalist, Michael Jackson, practically invented the field of beer writing in the early 70s. Someday (but not yet), this book will be out of date, but the writing will always be fluent and enjoyable.

The Oxford Companion to Beer, ed. Garrett Oliver (Oxford University Press, 2011) features more than 1,100 A-Z entries written by 166 beer experts, covering every aspect of beer.

1001 Beers You Must Taste Before You Die, ed. Adrian Tierney-Jones (Universe, 2010), presents an international collection of experts, each of whom contributed a few essays on what they felt to be the world’s best beers today.

The Brewmaster's Table: Discovering the Pleasures of Real Beer with Real Food, Garrett Oliver (Ecco, 2003) isn’t a cookbook, it’s a celebration of flavor: a round-the-world tour of breweries and beers, with an emphasis on food and beer pairings.

Ambitious Brew: The Story of American Beer, Maureen Ogle (Harcourt 2007). Historian Ogle concentrates on the nineteenth century German immigrants who created the world’s dominant

beer style. Despite the attention we lavish on craft beer, American lager is arguably the most influential beer ever brewed.

How to Brew: Everything You Need To Know To Brew Beer Right The First Time, John J. Palmer (Brewers Publications, 2006) covers the basics for the novice brewer, and guides more experienced homebrewers through intermediate and advanced techniques.

Glossary

ABV: alcohol by volume, the common method of measuring alcohol content in beer.

Acetobacter: an aerobic bacteria that produces acetic acid in a beer, generally undesirable except in a few styles, such as lambic and Flemish red or brown ales.

ale: family of beer that ferments at warmer temperatures, also called “warm-fermenting” or “top-fermenting” because of the action of ale yeast

attenuation: the degree to which fermentable sugars are converted into alcohol as influenced by yeast, mash conditions and ingredients among other things.

bottom-fermenting: a term for the lager family of beers, based on the tendency of lager yeast to be active at the bottom of a fermentation tank

barley, two-row and six-row: refers to the number of kernel rows in the head of the stalk, two-row is the more commonly used, whereas six-row is employed when extra amylase enzymes are required to convert other grains.

Brettanomyces: a yeast that produces horsey, cheesy or barnyard aromas and flavors, generally undesirable in beer except in lambics and a few others.

cask: the traditional container for all beer, in modern times it has come to mean a barrel-type container that is used for real or cask-conditioned ale, dispensed via gravity or hand pump at cellar temperatures.

decoction: a traditional German procedure where a portion of the mash is heated to boiling separately and returned to the main mash to raise the whole stepwise through ideal enzymatic ranges.

drum kiln: a cylindrical kiln used to produce malts of myriad colors and properties without the application of direct heat.

fermentation: the process by which yeast metabolizes simple sugars into alcohol

gravity: short for specific gravity, or the measure of density of a liquid.

grist: crushed or milled grain before it is mixed with hot water to form a mash.

hops: the cone-shaped flowers of the vine *Humulus lupulus*, used to give beer its bitterness and aroma, and as a preserving agent.

hydrometer: an instrument that measures the specific gravity of a liquid; in the case of brewing, it enables brewers to measure the concentration of sugars in wort or the progress of fermentation as the sugars are converted to alcohol.

IBU: International Bittering Units, a measure concentrations of various hop compounds in a beer, an indication of the beer's bitterness.

Lactobacillus: an anaerobic bacteria that produces sour notes in a beer, generally undesirable except in a few styles, such as lambic and Flemish red or brown ales.

lager: family of beer that ferments at cooler temperatures, also called "cold-fermenting" or "bottom-fermenting" because of the action of ale yeast.

malt: grain (usually) barley, that is allowed to germinate, with the process stopped by heat. The amount and duration of the heat determines the color and other qualities of the malt, which govern the color of the beer and many flavor components.

mash: a mixture of milled grain (grist) and water used to produce fermentable liquid.

mashing: the process by which a mash undergoes temperature-dependent enzymatic changes to create wort for fermentation by breaking down proteins and converting starch into both fermentable sugars and unfermentable dextrine.

melanoidins: heat-catalyzed chemical reactions that enhance color, aroma and flavor of malt or wort via the interaction of sugar and protein components.

modified/under-modified: the degree to which barley starches are converted by a malt-producer; under-modified malt requires more manipulation by the brewer during mashing than highly-modified.

noble hops: hop varieties, including Hallertauer Mittelfruh, Tettnang Tettnanger, Spalt Spalter and Czech Saaz, prized for their aromatic qualities

parti-gyle: an ancient brewing practice where successive beers are produced by draining the mash and re-saturating several times to create incrementally weaker beers from a single mash.

***Reinheitsgebot* or the Bavarian Purity Law of 1516:** A law that mandated that beer could be made only from malted barley, hops and water; amended later to include yeast.

sparge: the process where hot water is sprinkled on the top of the mash at the same rate as it is drained into the boiling kettle to leach all of the components out of the grist.

top-fermenting: a term for the ale family of beers, based on the tendency of ale yeast to be active at the top of a fermentation tank

yeast: in the making of beer, the micro-organism that ferments sugar into alcohol