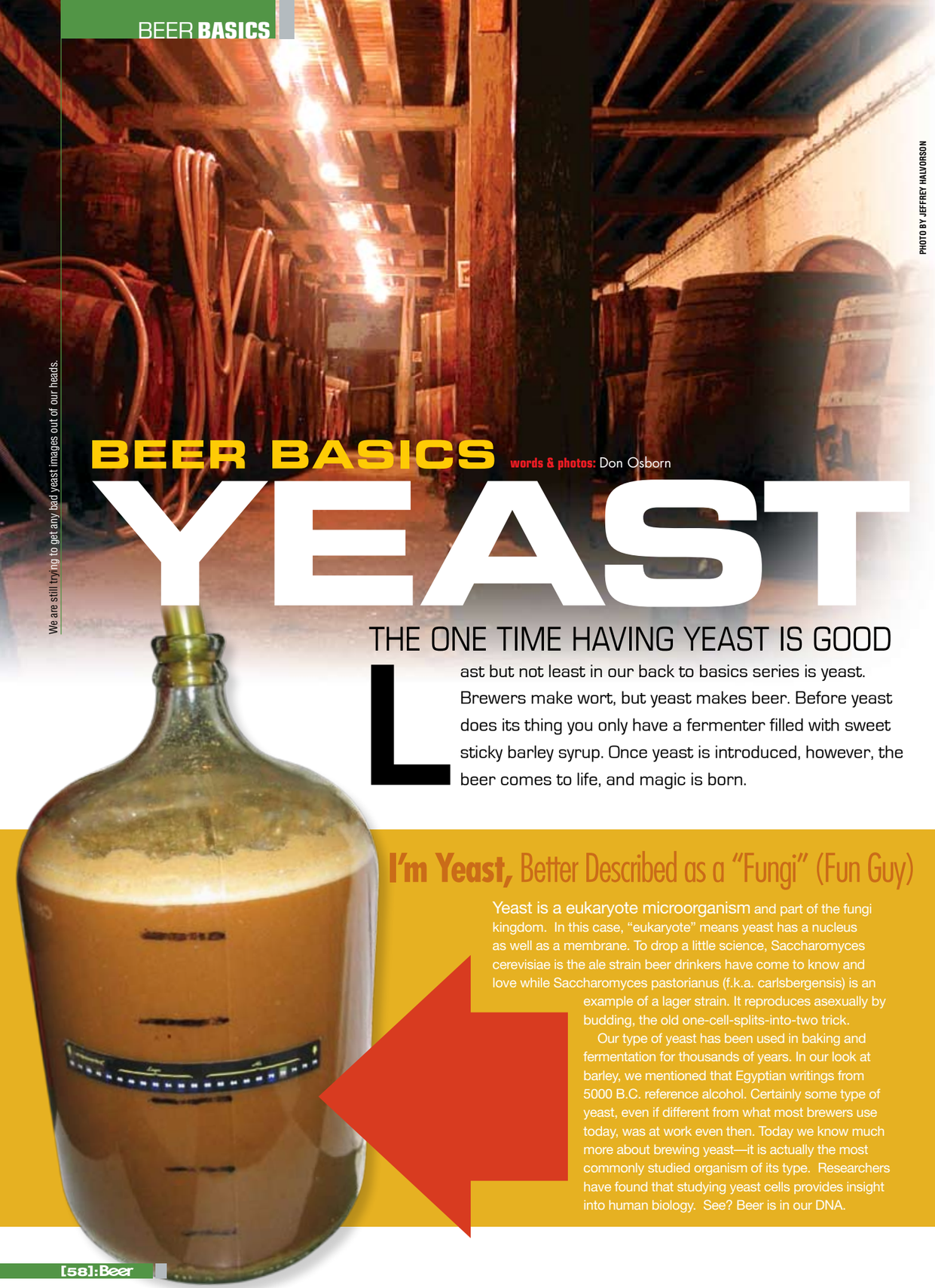

PHOTO BY JEFFREY HALVORSON

We are still trying to get any bad yeast images out of our heads.

BEER BASICS YEAST

words & photos: Don Osborn

THE ONE TIME HAVING YEAST IS GOOD

Last but not least in our back to basics series is yeast. Brewers make wort, but yeast makes beer. Before yeast does its thing you only have a fermenter filled with sweet sticky barley syrup. Once yeast is introduced, however, the beer comes to life, and magic is born.

I'm Yeast, Better Described as a "Fungi" (Fun Guy)

Yeast is a eukaryote microorganism and part of the fungi kingdom. In this case, "eukaryote" means yeast has a nucleus as well as a membrane. To drop a little science, Saccharomyces cerevisiae is the ale strain beer drinkers have come to know and love while Saccharomyces pastorianus (f.k.a. carlsbergensis) is an example of a lager strain. It reproduces asexually by budding, the old one-cell-splits-into-two trick.

Our type of yeast has been used in baking and fermentation for thousands of years. In our look at barley, we mentioned that Egyptian writings from 5000 B.C. reference alcohol. Certainly some type of yeast, even if different from what most brewers use today, was at work even then. Today we know much more about brewing yeast—it is actually the most commonly studied organism of its type. Researchers have found that studying yeast cells provides insight into human biology. See? Beer is in our DNA.

Yeast Through Time

Before Louis Pasteur ruined the mystery of fermentation, drinkers had thought that yeast was a whimsical, awesome act of God. Hundreds of years before Pasteur, English speakers referred to the sludge at the bottom of the fermenter as "God is good," for lack of awareness about fermenting wort. But in his 1857 paper, "Mémoire Sur la Fermentation Alcoolique," Pasteur showed that beer was fermented by living organisms and not some mysterious chemical reaction.

An interesting, immortalized example of yeast ignorance is evident in the original German purity law of 1516, the Reinheitsgebot. The law was designed in part to protect bakers who needed rye and wheat by barring brewers from using them. Brewers could only use three ingredients in the production of beer—hops, barley, and water. Yeast was not mentioned because although they knew that you needed to add sediment from a previous batch into the next batch in order for it to ferment, they did not know what it was.

YEAST PRODUCTION

Unlike barley, hops, and water, yeast does not grow in amber waves of grain, snake up along cords, or flow cleanly from glacial mountain streams. Once upon a time these ingredients mysteriously appeared out of nowhere and fermented beer. Now breweries often have their own science labs, where they grow and maintain pure yeast cultures.

There are at least two suppliers producing high quality liquid yeast: Wyeast and White labs. Less is known about their production methods than we know about hops, barley, or malt extract producers. Nevertheless, a brewer can buy an extremely wide variety of wine, ale, lager, and cider yeasts, and even wild yeast and bacterial cultures.

In addition to liquid yeast producers are companies that make dry yeast. Dry yeast is cheaper and can be stored longer, but is thought to have less flavor than liquid yeast cultures. There are also far fewer varieties available in dry form as compared to liquid yeast.

ALES AND LAGERS AND HYBRIDS, OH MY!

Most yeast can be categorized as either ale or lager yeast.

Ale yeasts are perhaps those that first fermented that sweet water in Mesopotamia thousands of years ago. They prefer warmer temperatures (60-75°) and tend to gather at the top of the beer when fermenting, thus the label "top fermenting." They typically create fruiter and more noticeable flavors than lager yeast (ex: Belgian yeasts are typically ale yeasts). Attenuation of ale yeast is moderate, and so they will leave a certain amount of unfermented sugars in the beer. This affects a brew's final flavor and may contribute to an ale's somewhat full, round mouthfeel and flavor.

Lager yeasts came to be known in colder-fermenting conditions in Germany. Certain strains thrived in the cold lagering caves and

over generations of mutating continued to exist in these cool caves. Lager yeasts ferment at cooler temps (45-58°) and produce a smoother, cleaner beer. They also have a higher attenuation than many ale strains, so even though they work more slowly, they consume a higher percentage of the sugar in the wort, leaving a drier, crisper beer than an average ale yeast.

Muddying the border between lager and ale yeasts are hybrid strains. These contain elements of both main categories of yeast. One example is the yeast used to make Anchor Steam, which can be called San Francisco or California lager, depending on which company the yeast is purchased from. This yeast is technically a lager strain, but ferments about 10 degrees warmer than a typical lager yeast, almost as warm as an ale. The resulting flavors of this yeast strain are malty and clean, yielding a brilliantly clear beer.

Going the opposite way are ale yeasts that ferment cooler than normal, like a Kolsch or Alt strain. These can ferment as low as 55 degrees, the upper end of a lager yeast range. At warmer temperatures they produce more fruitiness, but if fermented cool, will be pretty clean. This yeast will not drop to the fermenter barrel bottom as readily as lager yeasts, though, so more time or filtering is needed for very clear beer.

Most breweries won't really share their yeast with you.

"Honey I got the yeast!" Is that good to hear or bad?

IT TAKES YEAST TO MAKE BEER

At the outset we said that brewers make wort but yeast make beer. While this is true, most brewers want more control over their beer than making the wort, stepping back, and hoping that "God is good" will magically turn their labors into a quaffable brew. They take many pains to ensure that the health, quality, and quantity of their yeast are sufficient to make great beer.

After yeast's anonymity started to slowly unravel, the quest began to maximize this no-longer-mysterious ingredient. One of the earliest discoveries relates to how some yeasts perform better at different temperatures, as we have discussed. To this day breweries have elaborate, often automated systems to keep fermenting beer at the proper temperature.

Homebrewers are often concerned about having enough yeast to pitch into their brew, but this is not often as much a factor in commercial brewing. With the frequency and repetition of brewing the same batch, there is more than enough yeast to go around.

A more serious concern is the ongoing quality. In the lab they keep a close eye on the yeast as it is used from batch to batch. The types of yeast that thrive in certain conditions may continue, while others die. A particular yeast strain might mutate after a few batches, thus changing the behavior and performance of the yeast and ultimately the flavor of the beer. Most breweries have a limit to the number of times they will reuse a batch of yeast, or they might go through a clean-up process to make sure it is pure.

Some breweries use only one or two strains for all their beers, but others use multiple different strains. These must carefully be kept separated as well as uncontaminated. Otherwise, the bad kind of surprise might result. This goes double for breweries employing wild yeast and/or bacterial strains.

PHOTO BY JEFFREY HALVORSON

Coolship at Cantillon lambic brewery.

The Secret Life of YEAST

The way different breweries view their yeast—sometimes, as uniquely their own—is a funny thing. The biggest breweries might use the same malt and hops as everyone else, but their proprietary yeast strain may be a closely guarded treasure, and public information about it might be nonexistent.

Then you have breweries like Rogue in Oregon that not only let everyone know they use a unique strain called "Pacman," buthave also made it available to yeast manufacturers to culture and sell to the public!

Home or commercial brewers can sometimes use the same yeasts as other commercial breweries. While the sources are usually qualified as "speculated," you can possibly buy the same yeast used by the brewers of Fullers, Pilsner Urquell, Chimay, Westmalle, Weihenstephan, and Sierra Nevada.

But you could also just use your great-grandfather's yeast source, like his wooden brewing stick: Norwegian farmhouse brewers sometimes hand these stir sticks down from generation to generation. The pores in the wood harbor unique living yeast strains passed from batch to batch.

Where the Wild Yeasts Are

From the pristine sterility of a scientific yeast lab, let's take a step back toward ancient Egypt and the airborne yeast fermenting the bread-water left outside overnight. The first fermentation was spontaneous, and indeed for the majority of beer's history it resembled an unknown, wild style of fermenting. It follows then that there are still beer styles made that way today, and revered for their unique and complex flavors.

While "sour" or "wild" are words describing many different styles (Oud Bruin, Flanders or Flemish Red, etc.) we will briefly touch upon the granddaddy of them all, lambic beer. True lambic brewing is known as "spontaneous fermentation." It flourishes in a small area around Brussels, Belgium. Brewers pump hot wort to flat, wide coolships where it is allowed to be inoculated with wild yeasts floating through open slats in the walls or roof.

This lax attitude toward caring for fresh wort is unheard of in most modern breweries. But wild yeasts such as Brettanomyces are cordially invited to this party, and when combined with other bacteria and years of aging in critter-laden oak barrels, will produce some of the world's most eye-opening beers. Sour, tart, puckering—they take some getting used to, but devoted (fanatical) fans will swear it is work worth doing.

Wild beers have also caught on in the US, probably a result of either trips to Belgium or the imported authentic lambic that we can buy stateside (Cantillon, Boon, 3 Fonteinen, Girardin, Oud Beersel, etc.). American Breweries like Russian River, New Belgium, Deschutes, New Glarus, Allagash, Flat Earth and others are experimenting with either spontaneous fermentation or barrel inoculation to produce sour beers of varying complexity and polarizing ability.

In the end, though, one thing remains true. Mankind should be thankful for yeast: Without it, there would be no beer.

Brettanomyces can be cultured from a bottle of Orval.

Every homebrewer has sat by his fermenting carboy and watched the magic bubble-and-swirl of active fermentation. Every beer lover has savored the variety of beers he enjoys.

We started with hops, moved on to barley, broke down water, and have now discovered yeast. Now go have a beer.

Wild yeast and bacteria forming a pellicle.

beer. We started with hops, moved on to barley, broke down water, and have discovered yeast. Now go have a beer.

Who the hell tasted a horse blanket?

HERE IS A SHORT LIST OF SOME YEAST STRAINS

PHOTO BY JEFFREY HALVORSON

An aged, dusty bottle of lambic.

AMERICAN ALE • A standard yeast for pale ales and just about any style where you don't want a strong yeast character. Produces clean, crisp beers with low fruitiness.

PILSEN LAGER • Dry, crisp, and clean describe beers made with this type of yeast.

WHEAT BEER • This type of yeast is pretty much required for a good wheat beer. Beers may have flavors of tartness, clove, banana, esters, phenols, and are nearly dominated by the yeast.

Examples of U.S. wild ales.

AND THE VARIOUS FLAVORS THEY PRODUCE

BELGIAN ALE • Belgian beer often gets a substantial flavor impact from its yeast. This one may boast fruity aromas and flavors with a dry, tart finish. Ester levels vary. Alcohol tolerance can be high.

PHOTO BY PAUL MARKO

Culture of Brettanomyces.

BRETTANOMYCES LAMBICUS • Wild yeast found in lambic beers. Produces a cherry pie-like flavor and sourness along with distinct brett character (musty, horse blanket).