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JULY-AUGUST 2020, VOL.26, NO.4

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CHECK OUT LUTRA'S STORY AT [OMEGAYEAST.COM/LUTRA](https://omegayeast.com/lutra)



features

32 FOUR BEERS FROM ONE BREW DAY

A great way to produce multiple beers is by splitting one large batch into many different beers with the addition of malt extract, specialty grains, and other ingredients. Here's how to make four beers from a single brew day.

by Kevin Nanzer

40 2020 LABEL CONTEST WINNERS

Hundreds of homebrew labels were judged in our 25th annual label contest. It's time to announce the winners!

44 TRADITIONAL NORWEGIAN KVEIK BREWING

The process of brewing and fermenting beers with kveik yeast has been passed down for generations in parts of Norway. Chip Walton traveled to a picturesque farm in western Norway to experience the culture and brewing traditions first-hand.

by Chip Walton

52 NEW-AGE KVEIK

Kveik yeast strains impart unique flavors unlike any other yeast. Many of those flavors complement the hazy IPAs that are all the craze right now. Get tips for fermenting new-age kveik beers.

by John Holl

60 HEIRLOOM AND ALTERNATIVE GRAINS

If you are searching for a way to impart unique flavors that often showcase the regional *terroir* of where they are grown, heirloom and other alternative grains are a great source. Sure, they may require some extra effort, but the rewards are worth it.

by Ryan Coker

FROM BREW BUCKETS TO BREWHOUSES.



3.5 GAL
TO
60 BBL

304
STAINLESS
STEEL

BREWING
GEAR

ENGINEERING BETTER BEER



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departments

- 8 MAIL**
A new method of decorating bottle caps that allows white images to be overlaid on black caps is shared by the original author of the popular "DIY Bottle Cap Designs" article.
- 12 HOMEBREW NATION**
How do you store your hydrometer? Check out this reader-submitted project that keeps your hydrometer dry and safe. Also learn about phenolics found in beer and see the latest in homebrew products and news.
- 16 REPLICATOR**
One reader happened upon a one-off beer brewed by Asheville Pizza and Brewing and fell madly in love. The Replicator tracks down a recipe for this eccentric beast of a beer.
- 18 TIPS FROM THE PROS**
It's no surprise that American craft brewers immediately began using kveik to ferment IPAs when they got their hands on these fast-fermenting strains. However, as these two pros will attest, many other styles are good fits for kveik.
- 20 MR. WIZARD**
Creating a well-balanced, low-carbohydrate beer can be a challenge. The Wiz jumps down a rabbit hole to explore how some craft breweries and homebrewers may do just that. Also the topic of the value of the IBU rears its head again.
- 26 STYLE PROFILE**
Schwarzbier is a beer style that has recently risen to prominence after its popularity waned in its native region. Learn what makes this beer so unique, fun to brew, and great to drink.
- 82 TECHNIQUES**
How do you keep track of your brews? Denny and Drew have two different approaches to their record keeping. Learn some of the factors to consider when you record your recipes, brew day processes, fermentation, and beyond.
- 85 ADVANCED BREWING**
Wet hops are not the opposite of dry hops ... they're just hops that haven't been cured in an oast. Find some of the keys to building your own wet-hop beer recipe for this year's harvest.
- 88 PROJECTS**
Have you ever tried to clean up the exterior of your kegs and given up due to the effort required? One crafty homebrewer came up with his own Corny keg polisher utilizing a modified wood lathe that gives those old dingy kegs a new shine.
- 96 LAST CALL**
The 25th Annual Label Contest brought in hundreds of entries. One aspect that caught our attention when judging them was the volume of COVID-19 related labels. We knew we had to share them with you too.



where to find it

- 30** Beer Education Guide
91 Reader Service
92 Homebrew Supplier Directory

RECIPE INDEX

- Asheville Pizza and Brewing's
Norwegian Forest Cat clone . . . **17**
- Schwarzbier **27**
- American Gravøl **51**
- Drekker Brewing Co.'s
Hyper Scream clone **56**
- Jester King & Yazoo Brewing Co.'s
A Pale Green Horse clone **57**
- American-Style Lager **65**
- Wet Your Whistle **86**
- Buried Acorn Brewing Co.'s
Stoutland (**Web Exclusive**)
<http://byo.com/recipe/buried-acorn-brewing-co-s-stoutland-clone>



RECIPE STANDARDIZATION

EXTRACT EFFICIENCY: 65%
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one US gallon of water, would yield a wort of 1.024.)

EXTRACT VALUES FOR MALT EXTRACT:
liquid malt extract
(LME) = 1.033–1.037
dried malt extract (DME) = 1.045

POTENTIAL EXTRACT FOR GRAINS:
2-row base malts = 1.037–1.038
wheat malt = 1.037
6-row base malts = 1.035
Munich malt = 1.035
Vienna malt = 1.035
crystal malts = 1.033–1.035
chocolate malts = 1.034
dark roasted grains = 1.024–1.026
flaked maize and rice = 1.037–1.038

HOPS:
We calculate IBUs based on 25% hop utilization for a one-hour boil of hop pellets at specific gravities less than 1.050. For post-boil hop stands, we calculate IBUs based on 10% hop utilization for 30-minute hop stands at specific gravities less than 1.050. Increase hop dosage 10% if using whole leaf hops.

Gallons:
We use US gallons whenever gallons are mentioned.

26

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Q

Do you have a favorite style to brew and/or a least favorite style to brew?

* My favorite "style" to brew would be anything with Rauch malt in it. Come on, who doesn't like bacon? I'm fortunate that the palate desensitizing aspect of smoky phenols doesn't affect me. In the spring, I'm brewing a smoked helles or Maibock; in the summer, it's a Lichtenhainer, and for the colder temperatures, I usually gravitate towards a smoked doppelbock.

* Favorite style to brew? A saison! (Shocker, I know!) I love the wide boundaries of the style, the different flavors you can bring to bear, and the fact that no one can tell you you're wrong! My least favorite — porter — not because of the flavor or the technique but because, for whatever reason, I can't formulate a working recipe to save my life. To get around this blind spot, I borrow a friend's recipe and that annoys me every time.

* My favorite style to brew, that is the one I brew most often, is a good old premium English bitter ale. Nicely bitter with modest but definite hop character and very clear. My least favorite, that is that I never brew, is anything sour. Unless I made something else and it turned out sour, in which case I would throw it away. What can I say, I like to brew what I like to drink.

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suggested pairings at
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Brew U: Getting A Serious Brewing Education

Just like any other creative passion, homebrewing takes a certain amount of knowledge and ability to brew a beer that people can appreciate. Thanks to the demand by those who thirst for more than just their next beer, we have options when it comes to a brewing education. <https://byo.com/article/brew-u-getting-a-serious-brewing-education/>

MEMBERS ONLY



Introduction to Parti-Gyle Brewing

Why get only one beer per brew session when you can get two? Parti-gyle is a historic technique that is rarely utilized these days by professional brewers, but one that homebrewers can easily add to their brewing quiver. <https://byo.com/article/introduction-to-parti-gyle-brewing/>



Raw Ale

As every brewer knows, you have to boil the wort. Except that's not true at all. In much of northern Europe, farmhouse brewers never boiled their wort, and many of them still don't. And, no, they don't make sour beer. Learn the art of making a raw ale. <https://byo.com/article/raw-ale/>

MEMBERS ONLY



Making Dark Versions of Pale Beers

Pushing style boundaries has always been at the heart of homebrewers and craft breweries. Making dark or black versions of pale colored beers — the most well-known examples being America's black IPA and Germany's schwarzbier — is just one example of this. One homebrewer took on the challenge of other styles and dug into the best ingredients and techniques to get there. <https://byo.com/article/brew-the-schwarz/>

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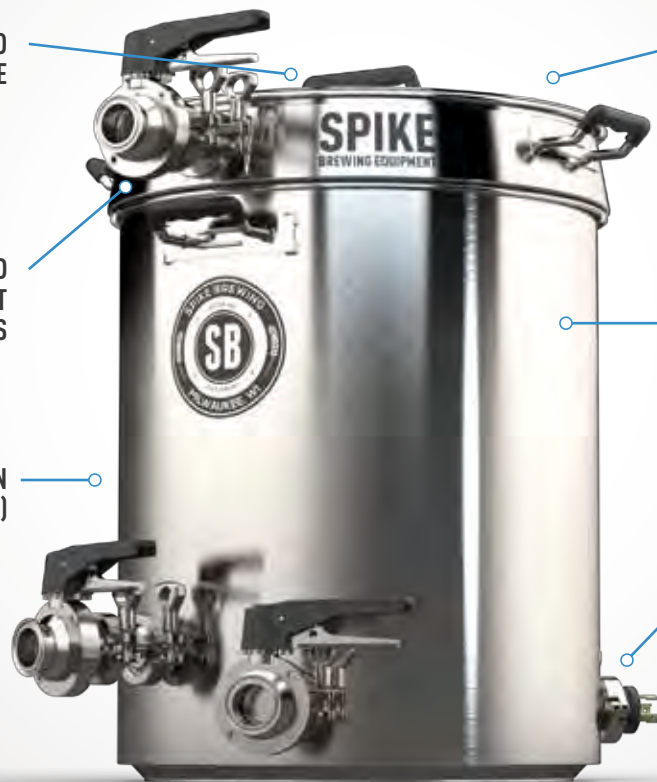
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PURSUE WHAT'S POSSIBLE



CUSTOM BOTTLE CAPS

I am writing to ask for further details regarding the “DIY Bottle Cap Designs” article (online at <https://byo.com/project/diy-bottle-cap-designs>). I have recently tried a printing service for custom bottle caps, which was below my expectations. For example, their printing has a matte finish of the image printed on top of the base paint of the cap, which is a bit different in look from the traditional lacquered cap. In addition to that, the resulting image is slightly raised. Searching for alternatives is how I got to your article. Since I want to use black as the base color for my caps, I am concerned about the method you describe because white color cannot be transferred, and I use white for some of my designs. I wonder if you know an alternative method that I could use to achieve a lacquered finish, or if it would be fine to use white caps and then black spray paint between steps 3 and 4? In other words, painting the caps before revealing the design. Would spraying black paint affect the image transfer if applied once the fluid medium has dried?

Christian D’Orazio • via email

We’re glad you found your way to this article while searching for a way to create designed bottle caps. We reached out to Jeremy Sartain, the author who came up with the design techniques in the original story to see if he had any insight. And, to our benefit, he does! Take it away, Jeremy:

“In the years since I wrote the article about my approach to bottle cap design, I have learned about a product that achieves near factory-like quality graphics on almost any non-porous surface. It is used in the process of professional guitar restoration, model airplanes and cars, as well as glazed ceramics. The product is known as ‘waterslide decal paper.’ It typically comes in clear or opaque white sheets suited to inkjet or laser printers. I have produced great results applying colorful or white images on black bottle caps with the following process:

- 1. Design and lay out your images on your computer in just the same way as described in the original article, except you do not mirror image the designs. The printed decals are not flipped over in this new process.*
- 2. Using opaque white waterslide decal paper, print according to the instructions by the manufacturer. Mine required printing on the*



Chip Walton is a beer writer and producer/host of *Chop & Brew*, a webshow about homebrewing, craft beer, and cooking. Before his current job at American Public Media as digital producer for *The Splendid Table* radio show and podcast, he was the social media and video projects producer for Summit Brewing Company. He also worked at Northern Brewer Homebrew Supply where he co-created and produced the popular *Brewing TV* video series. A former member of the American Homebrewers Association Governing Committee and Beer Judge Certification Program Certified judge, over the past couple of years he’s been obsessed with all things kveik. This has led him to brewing with many different indigenous kveik he’s received from Norway, and taking a trip to the Voss area of the country to visit and brew with traditional farmhouse brewers. Read about his journey and get a recipe inspired by his travels, beginning on page 44.



John Holl is the host of the *BYO Nano Podcast*. He is an award-winning journalist who has been writing about beer since 2003 and is the author of several books including *The American Craft Beer Cookbook*. He’s on Twitter @John_Holl and can also be heard weekly on both *Steal This Beer* and the *Drink Beer, Think Beer Podcast*. John has lectured on the culture and history of beer and judged beer competitions around the world. He’s quickly becoming a fan of kveik IPAs.

John makes his *BYO* writing debut beginning on page 52 of this issue, exploring the ways American craft brewers are using kveik to create entirely new flavors . . . mostly for hazy IPAs.



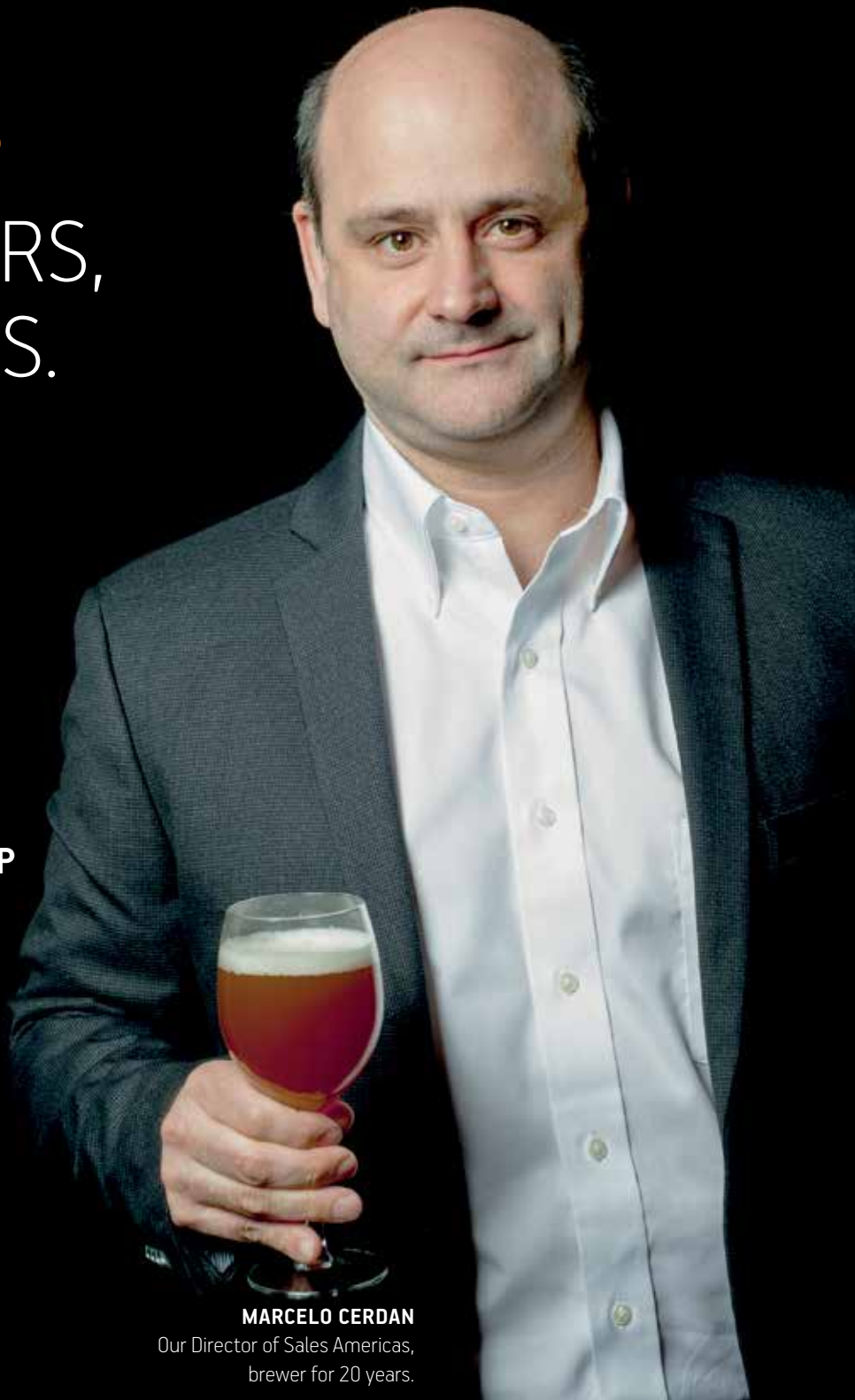
Ryan Coker is a Certified Cicerone and the Owner/Head Brewer of Revelry Brewing Company in Charleston, South Carolina, which opened in 2014. The brewery specializes in both clean ale and lager production as well as mixed fermentation styles. In five short years, the brewery has won four (3 gold, 1 silver) medals at the Great American Beer Festival and one gold medal at the World Beer Cup. Some of Ryan’s favorite ingredients to incorporate into brews are heirloom grains, and he has worked with industry leaders to make sure that these grains don’t fade into obscurity. “We feel strongly that our sense of place is what roots us to our products at Revelry and no cereal mash is too difficult for us in order to coax those flavors of yesterday into our brews.”

Ryan shares his passion for brewing with heirloom grains with a story on the subject beginning on page 60.

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MAIL

shiny side of the paper.

3. In order to achieve a high-sheen look matching the paint on most bottle caps, spray an even coat of clear gloss acrylic on the printed sheet and let dry overnight.
4. Punch out designs with a 1-inch (2.5-cm) circle punch like in the original process
5. Working one cap at a time, submerge a circle of decal paper in a bowl of lukewarm water until the design begins to lift off the paper backing (15 to 30 seconds).
6. Submerge the cap in the water and gently slide the decal onto the top of the cap. Holding the decal on the cap, remove the cap and re-position as needed to center and flatten the design.
7. Blot excess water off the cap and design with a paper towel and ensure no bubbles of air or water are trapped under the decal by pressing them out toward the edges if necessary.
8. Allow to air dry, followed by an application of heat with a hair dryer for strongest hold.


"I believe the result of this process will provide the low-profile, glossy, crisp image look you are after. However, it is neither as quick nor inexpensive as the original image transfer process. If the gloss acrylic applied after printing is not allowed to dry to a perfectly hard finish, I have found the decal will stick to itself too easily once immersed in water and is nearly impossible to salvage. Also, at the time of this response, each sheet of waterslide decal paper

purchased online averages about \$1 as opposed to the pennies per sheet of standard copy paper. For small runs, it may well be worth the extra time and effort to get exactly the result you've always dreamed of for your brew. I bought my waterslide decal paper from Amazon.com, but your local hobby and art supply shops may carry it for model making."

COLOR CALCULATIONS

I have a question on estimating color. If I have 10 grains in my grist bill and each grain has an MCU (Malt Color Units) of 5 then the total MCU is 50. Then, if I apply the formula, SRM (Standard Research Method) = $1.49 \times \text{MCU} / 0.69$ I get a SRM value of 22.155. However, if I calculate the SRM for each grain I get 4.523. Then when I sum all 10 I come up with an SRM of 45.23. My question therefore is do I calculate SRM based on the MCU total or do I calculate SRM for each grain individually and total that value.

Dennis Sopcich • via email

BYO's Recipe Editor Dave Green responds: "This is one that several homebrew calculators do improperly. Your first way is the correct way, you want to sum up the MCU from each individual grain and then enter the total MCU into the Morey equation. Love the fact that you're taking the time to actually do the calculations yourself!" 



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BEGINNER'S BLOCK

BY DAVE GREEN

THE PHENOLIC PHAMILY

The word “phenol” often comes up in the beer world, but its use can vary widely. It can be used to describe the clove-like aroma that can be produced from certain brewer’s yeasts. Strains like saison, Belgian, and German hefeweizen are often cited as producers of phenolic compounds. It can be used to describe the off-putting medicinal aromas from ill-wanted microorganisms that can infect a beer. It can be used when talking about astringency, a sensation in your mouth, which can have several sources. It can be used when folks talk about the haze caused when a beer gets heavily dry hopped. It can be used when describing the smoke-flavors of peated malts. So what are phenols?

Hundreds of phenolic compounds have been found to exist in beer. Starting with a basic building block of an aromatic ring of carbon molecules with a hydroxyl group attached to it, phenolic compounds can grow in a multitude of ways or become long chains (polyphenols) — like how sugar chains becomes starch. Many can be bitter, but some can contribute smoky, sour, or harsh flavors as well.

Chemically speaking, phenols are closely related to alcohols. In strong enough levels, both can be used as an antiseptic. In fact the mouthwash Listerine is named after Joseph Lister who started using phenol (long known as carbolic acid) as an antiseptic during surgical amputations and brought the mortality rate from 45% down to 15%. You probably already are familiar with a bunch of phenolic compounds: Aspirin (salicylic acid), vanillin, phenolphthalein (pH indicator), and tannins. Phenolic compounds provide the color to flowers and fruits, for example hydrangea blossoms, red grapes, and blueberries. There are lots more that lie just below the surface of

many products we use daily or that are found in plants. If you’ve ever heard of flavonoid compounds, they are contained within the phenol family. Many phenolic compounds have antioxidant characteristics as well, although some can be carcinogenic as well.

So now that we have an idea of the greater world of phenols, let’s focus in on how they relate to our beer.

MALTS AND PHENOLS

Let’s begin with malts and phenols because this is really where it all starts. Studies have shown that approximately 75% of the phenols found in beer will come from the malt (hops being the other typical source). Astringent polyphenolic chains, like lignin and tannins, are found in the husks and endosperm of grains. When a brewer mashes in, some of these phenolic chains will begin to disperse into the wort. Brewers will keep the pH of the wort acidic enough so these polyphenolic compounds in the grains have a hard time dispersing. Certain smoked malts can also introduce phenolic compounds into the wort, providing distinctive smoky, bacon, or even peaty-Scotch aromas, depending on which kind of smoked malt you use.

HOPS AND PHENOLS

Hops have as much as 50x more phenols per weight compared to malts. This is why when large amounts of hops are used in a beer; the phenolic concentration in a beer can jump quickly. Phenols are often bitter in quality, one of the main reasons plants produce them — they deter herbivory. So adding dry hops will also add some bitterness to the beer. The added polyphenols from dry hopping can also interact with the proteins found in the beer, creating the colloidal haze that typifies the modern hazy IPA. Having

the right protein and polyphenol mix and concentration is one key (along with proper yeast selection) to this interaction when planning to brew this style of beer. This protein-polyphenol colloidal haze has been cited to elevate the hop oil aroma and flavor in these beers as well.

WATER AND PHENOLS

The biggest concern when it comes to phenolic compounds and water relates to chlorine and the formation of chlorophenols. Elevated levels of chlorinated phenols are one of the worst things that can happen to beer. The chlorine most often comes from municipal water systems in the form of chloramine or chlorine. Steps are often taken by brewers — such as with potassium metabisulfite, carbon block filtration, or reverse osmosis filtering — to remove the chlorine from the water. Brewers are often advised not to use bleach as a sanitizer for this reason as well. Chlorophenols are often noted to have a medicinal, mouthwash, or Band-Aid aroma to them.

YEAST AND PHENOLS

The term biotransformation in beer is often applied to yeast and their interactions with certain hop compounds during active fermentation. But those interactions are not the only time this term can be applied to yeast’s secondary effects during fermentation. Yeast can biotransform certain phenolic compounds as well, changing one phenolic compound into something else. One such well-studied example is the case with POF+ (phenolic off-flavor positive) yeast strains like your typical German hefeweizen yeast. They can change ferulic acid (a common phenol found in wort) into the clove-like 4-vinyl guaiacol. Unwanted organisms in your beer can create chlorophenols as well.

BYO READER PROJECT

HYDROMETER HOLDER

MARK CAST • NEW BALTIMORE, MICHIGAN

I was quarantine-bored and checking the standard gravity on a batch ... again (third time today?). While drying the hydrometer, the towel snagged it and the hydrometer cracked in half. A few days later while checking out my newly arrived replacement, I came up with this idea. It's made out of very inexpensive 3/4-in. PVC tubing – readily available at home centers and hardware stores. Also, don't forget an end cap.

I started with 10.5 in. (27 cm) in total length of the PVC, which was a good length for my hydrometer. You can use either a small scroll saw or jigsaw to make the lengthwise cut. I left 1.5 in. (4 cm) of uncut pipe at both ends. Next I smoothed over the cut marks using a file and sandpaper. Then I drilled small holes in the bottom end cap (for

drainage) as well as in the tube for the mounting screws. Finally I glued on the mounting cap and used #4 screws to mount on my equipment shelving.

Tip the top of the hydrometer in then slide the bottom into the capped end. Mine is mounted over the sink where it air-dries safely (not in my hands). You could mount it anywhere you want, only a few drops of water come out. In fact I store the hydrometer in the holder.



Photos by Mark Cast

ANVIL

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In collaboration with the University of the Sciences (Philadelphia, Pennsylvania), Lallemand Brewing is proud to introduce its first non-*Saccharomyces* yeast in dry form. Isolated from nature by Dr. Matthew Farber and his research team, this yeast is able to produce both lactic acid and ethanol during primary fermentation. Determined to be of the genus *Lachancea*, the species is defined as new and the use of the product in sour beer production is patent pending. It will produce sour beer

in 7–10 days at 77 °F (25 °C). The acidity produced is described as subtle and smooth with flavor notes of red apple, peach, and honeydew melon. Philly sour is recommended at a pitch rate of 50–100 g per hL (2–4 g per gallon) of wort, which is sufficient to achieve a minimum of 2.5–5 million viable cells/mL and is available in 500-g and 11-g sachets. Learn more at lallemandbrewing.com

Photo courtesy of Caledonia Spirits

WORKING TOGETHER FOR EVERYONE

The current COVID-19 crisis can seem overwhelming at times. But despite all the pain and hardships that folks are going through, there are some bright spots that are sometimes not always reported. One such bright spot is the number of breweries, wineries, and distilleries that are mobilizing to craft sanitizer solution and hand sanitizers in order to help meet the growing demands for these products. Across the country, winemakers and brewers are creating the “wash” that the distillers can then concentrate through the distillation process to create an ethanol solution strong enough to kill the virus (The Centers for Disease Control and Prevention recommends at least 60% ethanol for disinfection from SARS-CoV-2 virus). It's heart-warming to know that our friends in the alcohol industry are giving back in the best way they can in these challenging times. We at *BYO* magazine salute all those that are devoting their time and valuable resources towards this magnanimous effort.

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DEAR REPLICATOR, Late last summer, my husband and I traveled with friends to Asheville, North Carolina for the brewery scene and other attractions. Early in our stay, we went to Asheville Pizza and Brewing Co. I ordered the Norwegian Forest Cat and was AMAZED at how good it was. The complexities of the beer with the subtle notes of the barrel were delightful. Sadly it was a limited release so I wasn't able to get a growler to go. I sampled beers around Asheville but never found one I enjoyed as much as the Norwegian Forest Cat. As the end of our trip neared, we still had several breweries on the list to visit but I was able to convince my husband and our good friends to return to Asheville Pizza and Brewing Co. so that I could get one more glass of that Norwegian Forest Cat. And a very special glass as it was — I had the last glass from the last keg and I was ever so grateful!



Patricia Taylor

Brick Township, New Jersey

Asheville. The name itself conjures the notion of a beer mecca in the southeast United States that draws many a craft beer drinker. Ask any beer aficionado to name a brewery located there and you'll probably get at least three different options. My guess is that Asheville Pizza and Brewing wouldn't be among the three. Maybe it should.

Asheville Brewing opened their doors in 1998 as just the third brewery in Asheville (right behind Highland Brewing Co. and Green Man Brewery). At that time, they were called Two Moons Brew-N-View with inspiration drawn from the conceptualization of a pizza shop melded with a second-run movie theater. This crazy (in a good way) venture came from the mind of Mike Rangel, who brought on Doug Riley, a brewer that had already cut his chops brewing in Portland, Oregon. The initial lineup of brews for Two Moons was hop-forward with the traditional West Coast edginess although they had other offerings like their American Porter called Ninja Porter [World Beer Cup Gold (2014) and Bronze (2018)].

Two Moons was founded on the premise that families are more than welcome, and Asheville Brewing continues that theme . . . they keep their offerings approachable. Combined eclectic decorations, a relaxing atmosphere, and award-winning pizza, kids and the kids-at-heart could come grab a pint and/or food and de-stress during the week. Even dogs are welcome in their outdoor area in Asheville's hip South Slope; this second location opened in 2006.

Since 1998, Asheville Pizza and

Brewing has continued to grow at a sustainable pace. Because they were one of the first names in town, they've had the benefit of watching the town and the brewery scene mature around them. That's also allowed them to stay true to themselves; they don't need to chase fads but rather simply provide quality sustenance in a pleasing atmosphere. The whole operation now employs 180 staff across three locations, two pubs (South Slope/Downtown and South Asheville) and the movie theater (North Asheville). But the soul of the business comes from the movie theater, where you're likely to see something starring David Bowie, Bill Murray, and occasionally select hit movies.

The brewery started out as a seven-barrel brewhouse at the North Asheville location. Four seven-barrel fermenters provided ample fermentation space in the beginning but that didn't last. They had to add another two fermenters, each at fifteen barrels to accommodate the different batches. Eventually, wort production couldn't keep pace so the brewhouse was upgraded to a complete fifteen-barrel operation. Fast-forward to today and all brewing operations are conducted on the South Slope. It contains the fifteen-barrel brewhouse and thirteen thirty-barrel fermenters for their flagships such as Shiva IPA, Ninja Porter, and locally distributed cans.

That original seven-barrel system is what they use for all of their experimental batches, which they shoot to make fifty of each year. When Pete Langheinrich joined the ranks thirteen

years ago, he brought with him a crafty, experimental attitude that has stuck. One of those one-off brews is Norwegian Forest Cat (thanks to Mike Rangel who coined the name based on where the yeast originated).

Norwegian Forest Cat is a one-of-a-kind brew. Literally. Asheville Brewing made seven barrels of the base beer but only one, singular barrel was truly barrel-aged producing the title beverage. The initial concept was to use new-to-the-market yeast, Hornindal Kveik, to produce pineapple and other tropical fruit flavors through fermentation and marry that with a low-IBU beer featuring late additions of Vic Secret and Motueka, both of which have similar flavor profiles. But the fermentation was too clean despite reaching temperatures well into the 90s °F (mid-30s °C). So, Pete decided to use a Sauvignon Blanc barrel that he had lying around the brewery and as luck would have it, produced an amazing beer according to our requestor and her husband.

The end result that you're shooting for is a low-IBU beer with a medium amount of base malt complexity (wheat, toast, lightly caramelized oats) and moderate tropical fruit (pineapple, papaya, melon, lime) that is fully supported by light oak, vanilla, and white grape. Also, the barrel that was used contained no *Brett* character and no secondary fermentation was noted during the six months it aged. You may also want to play with pitch rate and fermentation temperature (free rise versus starting it warm) to encourage more tropical fruit nature. Good luck!

ASHEVILLE PIZZA & BREWING'S NORWEGIAN FOREST CAT CLONE



(5 gallons/19 L, all-grain)
OG = 1.070 FG = 1.012
IBU = 10 SRM = 9 ABV = 7.6%

INGREDIENTS

9 lbs. (4.1 kg) pale malt
3 lbs. (1.36 kg) Simpsons Golden Naked Oats™ malt
1.5 lbs. (0.68 kg) Munich malt
1.5 lbs. (0.68 kg) flaked wheat
7.5 AAU Vic Secret hops (10 min.)
(0.5 oz./14 g at 15% alpha acids)
22.5 AAU Vic Secret hops
(hopstand) (1.5 oz./42 g at 15% alpha acids)
11.25 AAU Motueka hops
(hopstand) (1.5 oz./42 g at 7.5% alpha acids)
0.75 oz. (21 g) Vic Secret hops
(dry hop)
0.75 oz. (21 g) Motueka (dry hop)
White Labs WLP521 (Hornindal Kveik Ale), or Imperial Yeast A46 (Bartleby), or Omega Yeast OYL-091 (Hornindal Kveik) yeast
2/3 cup corn sugar (if priming)

STEP BY STEP

Mill the grains, then mix with 4.7 gallons (17.7 L) of 167 °F (75 °C) strike water to achieve a single infusion rest temperature of 152 °F (67 °C). Hold the mash at this temperature for 60 minutes. Adjust mash pH to 5.2 to 5.4 using phosphoric or lactic acid if your pH is too high. Mashout to 170 °F (77 °C) if desired.

Vorlauf until your runnings are clear before directing them to your boil kettle. Batch- or fly-sparge the mash to obtain 6.5 gallons (25 L) of wort. Boil the wort for 60 minutes. At 10 minutes left in the boil, add the Vic Secret hops along with Whirlfloc or Irish moss.

After the boil, cool the wort to approximately 190 °F (88 °C), and add the hopstand hops. Whirlpool for 15 minutes before further chilling the wort to 76 °F (24 °C). Pitch yeast. Allow the fermentation to free rise even up to 94 °F (34 °C)

by the end of primary for this beer.

Once primary fermentation is complete, you have a decision to make centered around the barrel-aging character of this beer. See 'Tips for Success' for more information. Eventually, carbonate the aged beer to approximately 2.3–2.4 volumes.

ASHEVILLE PIZZA & BREWING'S NORWEGIAN FOREST CAT CLONE



(5 gallons/19 L, partial mash)
OG = 1.070 FG = 1.012
IBU = 10 SRM = 9 ABV = 7.6%

INGREDIENTS

5.25 lbs. (2.42 kg) extra light dried malt extract
2 lbs. (0.91 kg) Simpsons Golden Naked Oats™ malt
1.5 lbs. (0.68 kg) Munich malt
1.5 lbs. (0.68 kg) flaked wheat
7.5 AAU Vic Secret hops (10 min.)
(0.5 oz./14 g at 15% alpha acids)
22.5 AAU Vic Secret hops
(hopstand) (1.5 oz./42 g at 15% alpha acids)
11.25 AAU Motueka hops
(hopstand) (1.5 oz./42 g at 7.5% alpha acids)
0.75 oz. (21 g) Vic Secret hops
(dry hop)
0.75 oz. (21 g) Motueka (dry hop)
White Labs WLP521 (Hornindal Kveik Ale), or Imperial Yeast A46 (Bartleby), or Omega Yeast OYL-091 (Hornindal Kveik) yeast
2/3 cup corn sugar (if priming)

STEP BY STEP


Bring 6.5 qts. (5.9 L) of water to roughly 167 °F (75 °C). Place the crushed grains in a muslin bag and steep the three grains for 45 minutes before removing and rinsing with 1 gallon (4 L) of hot water. Add water to make 5.5 gallons (21 L) of wort, then mix in the dried malt extract, with stirring, before heating to a boil. Boil for 30 minutes. At 10 minutes left in the boil, add the Vic Secret hops along with Whirlfloc or Irish moss.

After the boil, cool the wort to approximately 190 °F (88 °C), and add the hopstand hops. Whirlpool

for 15 minutes before further chilling the wort to 76 °F (24 °C). Pitch yeast. Allow the fermentation to free rise even up to 94 °F (34 °C) by the end of primary fermentation for this beer.

Once primary fermentation is complete, you have a decision to make centered around the barrel aging character of this beer. See "Tips for Success" for more information. Eventually, carbonate the aged beer to approximately 2.3–2.4 volumes.

TIPS FOR SUCCESS:

These tips are in chronological order regarding your batch of brew. First off, unless you have a low amount of residual alkalinity in your brewing liquor, you'll probably have to adjust your mash pH downward. For this beer, I'd recommend using phosphoric acid or lactic acid to achieve a mash pH between 5.2 and 5.4. Next, as mentioned in the recipes, you'll have to decide how you want to achieve the barrel-aged character in the beer. If you happen to have a clean Sauvignon Blanc barrel laying around your place or access to one, now is the time to use it. For the 99.99% of us that don't (hint: Sauvignon Blanc is almost never barrel-aged so good luck trying to find one if you go trying to track one down), you can mimic the effect by soaking a few medium-toasted French oak cubes in your favorite bottle of Sauvignon Blanc for several days before adding to the beer. Be careful though as a Sauvignon Blanc would be aged in a fairly neutral barrel, so don't go overboard with the duration of the beer on the cubes. 



Asheville Pizza & Brewing's Head Brewer Pete Langheinrich (left) and Owner Doug Riley (right).

TIPS FROM THE PROS

BY DAWSON RASPUZZI

GET YOUR KVEIK ON

Sours, English ales, German hybrids, & more

It shouldn't be a surprise to anyone that when American craft brewers got their hands on the fast-fermenting kveik strains from Norway they immediately started using them to quickly turn around IPAs with characteristics never seen before. However, IPAs (and the traditional Old World styles from their home countries) aren't all these unique yeasts do well. Allow these two pros to share just how diverse kveik strains really are.

In my experience, the profiles, although unique, are nearly identical fermented at 59 or 108 °F (15 or 42 °C) regardless of pitching rate.



Tim Shore is the Owner, Brewer, and Funk Whisperer of Buried Acorn Brewing Co. in Syracuse, New York. Tim's style is heavily influenced by his decade of experience experimenting with mixed cultures and his fascination with new and unique yeast-driven flavor combinations. While he retains his identity as a "forever homebrewer," Tim cut his pro-brewing teeth working for Burnt City Brewing in Chicago. He opened Buried Acorn in his hometown in the summer of 2018.

The most attractive attribute about kveik strains are their ability to create ester combinations not attainable through other commercially-available yeasts. We use kveik for almost all of our beers, with some exceptions. Kveik doesn't work for any style of beer that would require phenols to be present because they are not POF+, so we don't use it for our saison.

I'm not sure kveik is for every brewery, but we are extremely interested in creating new flavor and aroma combinations that don't necessarily fit into classic style categories. Some kveik strains like Skare, Laerdal, and Oslo are quite clean and can be used like Chico, or you could have fun and experiment using one of them in a hybrid like an altbier or Kölsch. On the flipside, Arset, Voss, and Ebbegarden are on the very fruity side and can be used to accentuate any beer style where you are looking for an ester-forward presentation.

Flavor profiles are very strain-dependent and it's difficult to modify expression of a single strain with traditional cellaring techniques. In my experience, the profiles, although unique, are nearly identical fermented at 59 °F or 108 °F (15 °C or 42 °C) regardless of pitching rate. So, to get different profiles in different brands we do use different strains. Omega Yeast, Mainiacal Yeast, Escarpment Labs, and Bootleg Biology have some wonderful isolated strains that we swap in and out depending on the brand. My favorite one came from DeWayne Schaaf at Ebb and Flow Fermentations some time ago. It's an original mixed culture from Voss and I have kept it alive and working in my brewery for years.

I have three mixed cultures that I

use in producing a broad array of flavors to blend in our barrel program. I have the Voss mixed culture, I have my house mixed culture, and a saison mixed culture. I ferment these strains open in our brewery and let the local microflora get mixed in. Voss creates a Grand Marnier kind of candied orange peel flavor that blends well with *Brett* barrels that are pineapple-forward. The Voss culture I kick out into the open fermenter at 104 °F (40 °C) and let it ride – it's usually done fermenting and ready to transfer to barrels by the morning. This quick reduction of simple sugars keeps *Lactobacillus* from souring and leaves any acid to be produced by *Pediococcus*. Like most all yeast, kveik is not expressive in an already acidic environment. The saison mixed culture is done the same way but it starts at 77 °F (25 °C) and will generally produce acid during primary fermentation depending on my hopping rate. My house mixed culture is a collection of *Brett* and bacteria cultures that have been in my life for over a decade. There is no technology attached to my open fermentation tanks so we try to time the brews so that the environmental conditions are ideal for the specific culture to function depending on what we are looking to achieve.

One of my favorite recipes with kveik is called Stoutland, which is a stout that tiptoes the line between what is acceptable as a stout and an entirely new (to me) combination of flavors. The tangy kveik esters bouncing off of all the chocolate and my pretty robust hopping rate make for a very angular and unique stout. You can find the homebrew recipe for Stoutland at <http://byo.com/recipe/buried-acorn-brewing-co-s-stoutland-clone>.




DeWayne Schaaf is the Owner/Brewer of Ebb and Flow Fermentations in Cape Girardeau, Missouri. DeWayne was introduced to kveik more than three years ago as a homebrewer and immediately started documenting what he learned about it on his Kveik World Order blog and the Milk the Funk blog.

Kveik is fast and clean, but I'll be the one to say that IPAs are likely my least favorite thing to ferment with them. Depending on which culture you use there is the ability to replicate traditional English and German style ales.

We have brewed everything but POF+ styles with them, and even that is possible if you use the Muri culture, which is believed to now actually be in the kveik family tree. Kveik work well co-pitched with saison or Lithuanian yeasts that are POF+ and both love warmer temperatures. *Brett* and bacteria both play well with kveik for mixed fermentation styles. Honestly, I'm at a loss when it comes to much that they aren't good at if you let the concept of "proper" go.

We are even brewing some kveik-fermented "faux lagers." Original cultures like Ebbegarden and Skare, or commercial cultures like Oslo from Bootleg Biology, ferment very clean and have marked lager-like profiles. We have played around with a number of

fermentation temperatures and have mostly kept it in the high-90s °F (mid-30s °C) to finish quickly then cold condition long to knock out any esters that may have formed. It is our experience that the exaggerated fruity ester profiles that kveik is known for are diminished greatly over cold conditioning.

For homebrewers looking to try a kveik brew, don't start with an IPA. Brew a mild or bitter, or perhaps a Kölsch. The temperatures are going to be hot soon, so this is the perfect time to not care about your chiller not getting your wort down to 62 °F (17 °C) or your closet not holding at 65 °F (18 °C). Don't be afraid to pitch it at 90–100 °F (32–38 °C) and keep it at that temperature until it is ready. These styles are less expensive to take the "risk" with and are better at helping you learn about the ester profiles that each kveik has to offer. A simple grist bill of Pilsner and pale malt (50/50) with 20 IBUs at 60 minutes will teach you a lot more about the capabilities of these yeasts than loading it up with hops. Save that for round two! 

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HELP ME, MR. WIZARD

BY ASHTON LEWIS

TASTES GREAT, LESS FILLING?

Also measuring IBUs: Part science, practice, and opinion

Q MY WIFE AND I HAVE BEEN DOING A LOW-CARBOHYDRATE DIET (KETO) FOR MOST OF THE YEAR AND IT HAS BEEN VERY SUCCESSFUL. WE'VE BEEN BUYING MICHELOB ULTRA AND SLEEMAN CLEAR FOR THE OCCASIONAL BEER BECAUSE OF THE LOW CARB FACTOR. I'VE ALSO BEEN BREWING SOME BRUT-ISH BEERS USING WHITE LABS ULTRA-FERM TO DRY THE BEERS OUT WITH SOME SUCCESS. I HAD ONE BEER SENT TO OREGON BREW LABS TO DETERMINE THE CARB COUNT AND IT CAME OUT AT 3.7% AND 3 GRAMS OF CARBS.

I'VE SINCE DISCOVERED A BEER BY BRIDGE BREWING COMPANY IN NORTH VANCOUVER, BRITISH COLUMBIA THAT CLAIMS 1.5 GRAMS CARBS AND 5.0% ABV, AND IT ACTUALLY TASTES LIKE A CRAFT BEER. THEY ALSO HAVE AN IPA VERSION IN THE TAPROOM WITH SIMILAR NUMBERS ([HTTPS://WWW.BRIDGEBREWING.COM/PRIME-TIME](https://www.bridgebrewing.com/prime-time)). HOW DO THEY GET THE CARBS SO LOW? I ASSUME THEY MUST BE DOING A HIGH GRAVITY BREW AND DILUTING WITH WATER.

IAN MACOOMB
OTTAWA, ONTARIO

The two types of starch found in cereal grains are amylose and amylopectin.

A The keys to clearly understanding this topic are knowing about the types of starch present in a brewery mash and how malt enzymes act upon these large carbohydrates, appreciating how exogenous enzymes can be used to step beyond the boundaries of malt enzymes alone, and considering alternative ingredients that leave little to no residual carbohydrates in beer after fermentation. Sounds like you have been pretty successful in your brews. I am going to provide a bit of a background for readers who may not be as advanced in their pursuits of low-carb beers as you are, so bear with me for a bit.

There are generally two sources of fermentables sugars available to beer brewers: 1) Starch-derived sugars from cereal grains and 2) simple sugars, such as sucrose (cane and beet sugar), fructose (fruit sugar), and glucose/dextrose (corn sugar). Simple sugars can be completely fermented by yeast to yield

ethanol and carbon dioxide, although complete fermentation is rarely a reality and some sugar is usually present following beer fermentation, but the mixture of carbohydrates produced from cereal grains in a brewer's mash contains fermentable and unfermentable carbohydrates. It's the unfermentable sugars that contribute to carbohydrate calories in beer.

The two types of starch found in cereal grains are amylose and amylopectin. Amylose is a straight-chain carbohydrate and amylopectin is a branched molecule. Amylose is almost entirely converted into fermentable sugars (glucose, maltose, and maltotriose) by beta amylase during mashing. Amylopectin is converted, through the joint actions of beta amylase (Pac Man enzyme that starts at a free end of amylose or amylopectin and produces maltose with each chop) and alpha amylase (random chopper that whacks up starch into smaller chunks by cleaving bonds with-

Photo courtesy of White Labs



Adding dextrin-chomping enzymes to your wort or beer are one way to cut down the calories and residual sugar chains found in beer. But it can be a challenge to find balance in these dry beers.

Table 1: Rundown of some common lower-calorie beer malt beverages

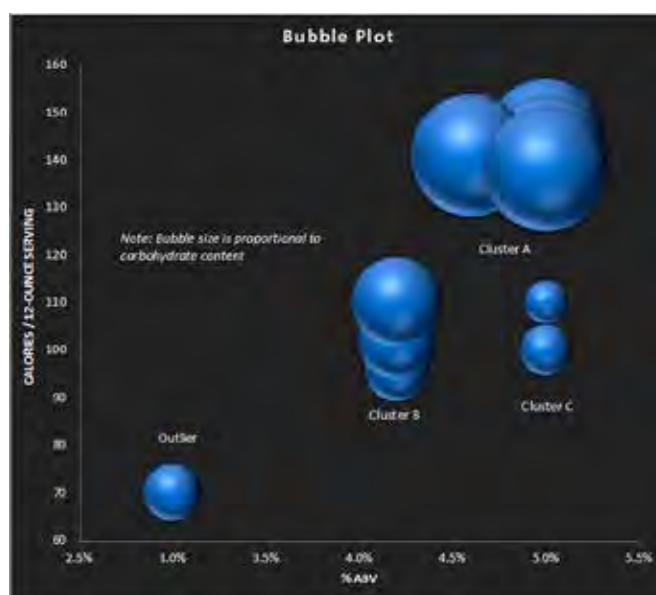
Brand	Carbohydrates (per 12-oz./355-mL serving)	% ABV	Calories (per 12-oz./355-mL serving)
Molson 67	2.6 g	3.0%	70 kcal
Miller Lite	3.2 g	4.2%	96 kcal
Coors Light	5.0 g	4.2%	102 kcal
Bud Light	6.6 g	4.2%	110 kcal
Miller High Life	12.2 g	4.6%	141 kcal
White Claw Seltzer	2.0 g	5.0%	110 kcal
Bridge Prime Time	1.5 g	5.0%	110 kcal
Coors Banquet	11.7 g	5.0%	141 kcal
Molson Canadian	10.3 g	5.0%	143 kcal
Budweiser	10.6 g	5.0%	145 kcal
Sierraveza	12.8 g	5.0%	138 kcal

in the starch molecule), into a mixture of fermentable sugars and left over bits called beta-limit dextrins. The takeaway point is that all cereal starches in a brewery mash contain beta-limit dextrins because neither beta- nor alpha-amylase can cleave the branch points in amylopectin. Beta-limit dextrins can be metabolized in our bodies and represent the majority of carbohydrates in beer.

Low-carbohydrate beers can be made through several routes. One way to reduce the carb and alcohol concentration of beer is to dilute with water, but the end result is simply watery beer and not what you seek. Another approach is to substitute cereal starch, and the hydrolytic products that follow mashing, with simple sugars such as sucrose, dextrose, and/or fructose. I personally like this method for home use because it comes with minimal risk of disappointment while being simple and predictable. But for brewers really seeking the ultimate in low-carb brewing, you need to look outside of the malt kernel for an enzyme capable of breaking alpha 1-6 bonds. The stalwart tool favored by commercial breweries is amyloglucosidase (AMG), sometimes called alpha-glucosidase. AMG is secreted by fungal *Aspergillus* species and commercial suppliers sell purified preparations, such as White Labs Ultra-Ferm, to brewers and to companies that produce liquid brewing adjuncts.

Although Miller Lite was the first nationally available light beer, the history of the style began with Dr. Joseph Owades' work with Gablinger's Diet Beer at Rheingold Breweries (Brooklyn, New York in 1967). In spite of being a commercial flop, Owades passed on the science behind the formulation to the Peter Hand Brewery in Chicago, famous for their Meister Bräu brand. Meister Bräu Lite was a success in the local Chicago market, but the brewery declared bankruptcy and Miller Brewing purchased its brands, including Meister Bräu Lite, in 1972. With some recipe tweaks to increase beeriness, Miller Lite was born and the rest is history.

Plotting information about carbohydrates, calories, and alcohol from light beers, regular beers, seltzers, and Bridge's Prime Time you cite in your question provides insights into these beverages. The data shown in Table 1 was collected from information posted by these breweries on their websites



Cluster A represents non-light beers, generally considered to fall in the American-adjunct lagers class of beer. Cluster B represents several light beers found in the marketplace with lower alcohol and lower calories. Cluster C has the alcoholic strength of Cluster A, but caloric count of Cluster B. The outlier represents the more heavily watered down Molson 67.

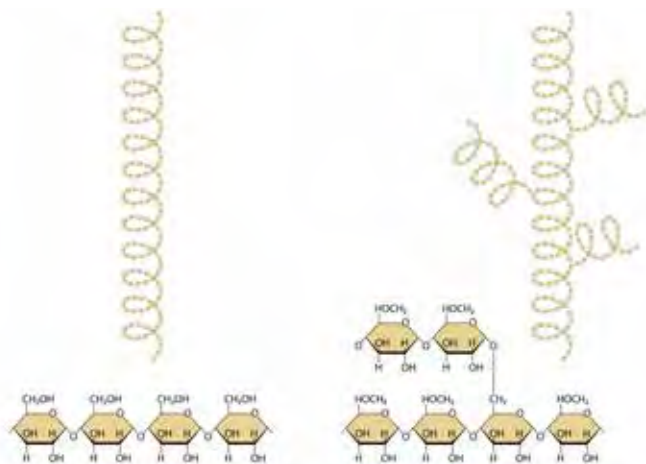
and graphically displayed using a bubble plot to help show clusters within the selection of beers.

The beers making up Cluster A in the bubble plot are Budweiser, Molson Canadian, Coors Banquet, Miller High Life, and Sierraveza. All of these beers, except for the all-malt Sierraveza, are brewed from malted barley and rice or liquid adjunct. And all beers in Cluster A have similar carbohydrate, % ABV, and caloric contents. It's important to note that liquid adjuncts have varying compositions and fermentabilities that are tailored for different applications. The types of liquid adjuncts used for full-strength lagers often mimic the fermentability of "normal" wort and explains how the adjunct-containing beers in Cluster A are similar to the all-malt Sierraveza.

Cluster B includes Miller Lite, Coors Light, and Bud Light; the beers come to mind when American beer drinkers think of light beer. These beers have 84% of the alcohol, about 75% of the calories, and between 26–62% of the carbohydrates

HELP ME, MR. WIZARD

Photo courtesy of Shutterstock.com



The different structural forms of amylose vs. amylopectin is best seen visually. The amylose enzymes found in malted grains can fully chop up amylose into sugars that yeast can ferment, while amylopectins will be reduced to both sugars and dextrins because amylase enzymes can't get to the branches.

as their full-strength siblings. The low carbohydrate level of these beers is achieved using a combination of brewing technique, ingredient selection, and the use of exogenous enzymes from fungal sources. I would say your homebrewed light beer, with 3.3 grams of carbs and 3.7% ABV, falls nicely into the light-beer category represented by Cluster B on our graph. Molson 67 falls outside of any cluster, labeled "Outlier" on the bubble plot, and is made by producing a light beer similar to Miller Lite but with more dilution with water following the fermentation.

Bridge Prime Time and White Claw hard seltzer make up Cluster C. These products have the alcoholic strength of the beers in Cluster A, the same caloric content as Bud Light, and fewer carbs than any of the beers in Clusters A and B. It's easy to explain why a seltzer would fall outside of beer clusters, but seeing where Prime Time falls in the bubble plot space is a surprise because it is beer, not a seltzer. And it is clearly different from other light beers in that it has lower carbs, more alcohol, and the same calorie-count as Bud Light.

According to the Prime Time label, it contains water, barley, flaked corn, hops, and yeast. Based on the carb count and % ABV, I expected to see sucrose in the ingredient mix. The word "malt" does appear on other Bridge Brewing labels so it's reasonable to conclude that Prime Time does not contain malted

barley and that all of the starch conversion was accomplished using exogenous enzymes. Enzymes were definitely added to the mash and it's likely that AMG was added to the fermenter where it has the longest time to break down dextrins into fermentable sugars. Prime Time is also hopped with Citra® and El Dorado® and that probably is the main differentiator in its flavor profile. Based on what I can see on the Bridge website, some sort of colored ingredient is also used and this may bring with it some added flavor without bringing carbs.

You asked how low-carb beers are brewed and the answer thus far generally addresses your question. Here are a few thoughts about brewing these types of beer at home:

- Low-carb, low-alcohol, and low-cal beers usually have a thin mouthfeel and a generally "watered-down" sensory profile because the numerical targets require the reduction of the compounds that add to the fullness of beer. Homebrewers may want to liven the party with hop flavor, a kiss of specialty malt, and even aromatic fruit flavors.
- The easiest way to brew low-carb, light beers at home is by adding simple sugars to normal wort and shooting for a lower original gravity.
- If you want to brew a beer like Prime Time, consider simple sugars and AMG added to the fermenter.
- Hop bitterness is amplified in lighter beers. Borrowing hopping techniques from hazy IPAs is something to consider with very low bittering hops added.
- The important thing to consider when consuming foods of all types is the total amount of food compounds consumed, not the concentration of the compounds of interest. One way to consume fewer carbs from beer is to simply consume less beer.

When I look at the numbers from Molson 67, I cannot help but ponder two competing thoughts: 1) Molson 67 looks like the sort of beer that is consumed by the liter, and 2) it would be more cost effective to pour two bottles of Miller Lite in a liter mug and top up with water than buying three bottles of Molson 67. Oops! Did I just write that?

Q IN THE MARCH-APRIL 2020 ISSUE, THE REPLICATOR'S REVIEW OF KNOTTED ROOT BREWING COMPANY'S PERPETUALLY UNIMPRESSED CLONE STATES THAT HOPS ADDED AFTER FLAMEOUT ARE NOT INCLUDED IN THE IBU CALCULATION, YET THIS BEER IS RATED AT 80 IBU. WITH THE ADVENT OF HAZY IPAS HOW ARE THE AFTER-BOIL HOP ADDITIONS BEING ACCOUNTED FOR IN THE IBU CALCULATION?

CHRIS PATTERSON
DOWNERS GROVE, ILLINOIS

A My view about how international bittering units or IBUs are used by the modern brewer is a blend of science, practice, and opinion. The science behind the IBU is something I have covered many times in past columns, so I will be brief. The original IBU method,

and one that is still used by many breweries, begins by extracting hop compounds in beer using iso-octane (an organic solvent), measuring the absorbance of 275 nm light by this mixture of compounds, and multiplying the absorbance by 50. This method was originally developed

as a rapid way to quantify the compounds in normal beer that relate to bitterness and the unit of measurement was standardized against 1 mg of iso-alpha-acids (IAAs) per liter of beer. This is why we assume that 1 IBU is the same as 1 ppm of iso-alpha-acids. The problem with the method is that it is not specific to IAAs and other compounds, including hop polyphenols that are not bitter, absorb 275 nm light. The HPLC (high performance liquid chromatography) method for specifically measuring IAA fractions is becoming more common, especially as larger breweries have begun brewing a greater volume of beer styles with large, late, and dry hop additions.

Measurement methods aside, the key to calculating hop bitterness is knowing how alpha acid additions to wort or beer translate to IAAs in finished beer. In other words, we need to know our hop utilization. Boiling duration, wort gravity, wort pH, hop type (cone, pellet, or extract), yeast behavior, and clarification method are all variables that influence hop utilization. But the most important variables to control in the pursuit of consistency are total thermal exposure and knowing how much hop goodies are added to the kettle. This is why the practical brewer part of me is less concerned about the numerical value of utilization and more concerned about a consistent brewing process and actually knowing what is being added to the kettle. The latter is extremely challenging and explains why practical brewers tend to assess hop specifics from a treetop level. I will get back to the practical side of hopping in a moment.

What does opinion have to do with this topic? Well, my opinion is that the numerical value of the IBU has taken on a life of its own among both brewers and consumers. For some, a high IBU value imparts some sort of physical prowess to beer; high IBU beers are strong, masculine, formidable, superior, and regal. Three Floyds' Alpha King and the Alpha King Challenge are great examples of how highly hopped beers are personified by brewers and consumers. Recently, some consumers have recoiled

from high-IBU beers because not everyone likes bitter beers, and we now see beers marketed as "zero IBU IPAs." My opinion is that the IBU has been hijacked from the brewery lab and shoved into the lexicon of beer marketing terms, and as such cannot be trusted. Seriously, show me a beer with hops that registers zero.

So here is the skinny on the 80 IBU recipe for Knotted Root's Perpetually Unimpressed. If one assumes 12% al-

pha for the 6 ounces of Citra® hops in the recipe, 7.5% hop utilization for hop additions to 190 °F (88 °C) wort, and crunches the numbers the result is 80 IBU. But does this really make sense?

In order to dissect this information, the first question that comes to mind is what is meant by 80 IBUs; are we talking the iso-octane method or HPLC method that quantifies IAAs? Method aside, is it even reasonable to assume any isomerization at 190 °F



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(88 °C)? The answer to that question is a resounding “Yes!” (Mark Malowicki, 2004, Hop Bitter Acid Isomerization and Degradation Kinetics in a Model Wort-Boiling System). Is it reasonable to assume 7.5% utilization and 80 IBUs from a late hop addition to 190 °F (88 °C) wort? If I were a


some bitterness, sometimes a little sometimes a lot, was coming from these additions, so they began backing off on hop additions during the boil.

You ask how brewers are performing bitterness calculations for this style and the answer is all of the above. The

“ Well, my opinion is that the numerical value of the IBU has taken on a life of its own among both brewers and consumers. ”

gambler, I would probably bet against this if we are talking IAAs measured by HPLC, but wouldn't be surprised by a high value from the iso-octane method.

At the end of the day, many practical brewers don't fret too much about the semantics because the IBU is just one way to gauge hop bitterness in beer. Many simply want to know what the beer tastes like because flavor rules for this beer style and the numbers follow. If brewers developed recipes only by calculating a brew, New England IPA probably would not exist as a style because conventional rules about brewing calculations don't work with this style. This is a style that came out of throwing calculations out the window and lots of hops into the kettle, especially late in the boil. It didn't take long for brewers to figure out that

corollary is how they are controlling aroma additions. The truth is that many brewers are not calculating either, unless we include IBU calculations with wild guesses about hop utilization. Brewers have become bilingual when it comes to hop talk. If this conversation is about old school styles, it's IBUs, multiple kettle additions, balance, and maybe some dry hops. Start talking hazies and the language shifts to “pounds-per-barrel,” biotransformation additions, and the minimum addition rate to provide a stable haze. Although not specifically discussed, many brewers have figured out that the best way to be relatively consistent with this style is to crank the volume control up to 120% because once the music is really, really loud, small adjustments in volume are imperceptible because the senses are maxed out. 

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STYLE PROFILE

BY GORDON STRONG

SCHWARZBIER

Germany's darkest beer

Despite its name, the beer itself is not actually black. It's usually a very dark reddish brown that can look a bit black if viewed in a wide enough glass.

SCHWARZBIER BY THE NUMBERS

OG:	1.046–1.052
FG:	1.010–1.016
SRM:	17–30
IBU:	20–30
ABV:	4.4–5.4%



Photo by Charles A. Parker/Imagines Plus

Germany is well-known for its wide range of pale beers, such as Pilsner, weizen, helles, Kölsch, and Gose, but it does make darker amber-to-brown beers, such as altbier, Munich dunkel, and bock. However, none of these approach black in color. There really isn't a German tradition of making porters and stouts, unless you count the rare Baltic porter. For their darkest beer, you have to only look at its name – schwarzbier – which literally means black beer.

Despite its name, the beer itself is not actually black. It's usually a very dark reddish brown that can look a bit black if viewed in a wide enough glass. However, it's darker than other German beers, even if it doesn't really approach the light-swallowing opacity of some stouts. This difference does provide some clues about the types of malt used, as well as the flavor of this beer style.

This was not a widely known style before the fall of the Iron Curtain in 1990. Michael Jackson's *World Guide to Beer* gives it just a passing mention; not even a full paragraph. In his *Beer Companion* book, written after German reunification, the beer has a much fuller description and discussion within its own section. The fall of communism in Eastern Europe lifted the veil from this style and allowed it to be more widely appreciated.

The Beer Judge Certification Program (BJCP) includes schwarzbier as style 8B within Category 8, European Dark Lager. The other style within this category is Munich dunkel. Amber beers and stronger beers are categorized elsewhere.

HISTORY

When Jackson first mentions the beer by name, he characterizes it as a low-alcohol, sweet beer used for blending in bars, seemingly only

thinking it is defined by the beer of Bad Köstritz in Thuringia (then in East Germany). He does describe black lagers in Japan, and says they were inspired by dark lagers of Kulmbach. Japanese brewers first visited Germany in the late 1800s, and took inspiration for several of their modern styles from them.

After German reunification in 1990, the large German brewery Bitburger purchased the Köstritzer brewery in Bad Köstritz in 1991 with the goal of more widely producing and exporting the beer. They reformulated the beer, changing it from the beer Jackson first described to a standard-strength beer or *Vollbier*.

But Köstritzer is not the only producer of this beer. Modern examples also include Kulmbacher's Mönchshof Schwarzbier from Kulmbach in Franconia (Northern Bavaria) and Einbecker Schwarzbier from Einbeck in Lower Saxony. If you draw a triangle between Einbeck, Kulmbach, and Gera (near Bad Köstritz), you can find a region where this style has flourished. Similar to the triangle of Munich, Prague, and Vienna where lager brewing developed, you find a region where darker beers had more of a local following.

If you recall my recent article on rauchbier, you probably remember that this area is where the Frankish people settled in the Middle Ages. I'm not saying there is a strong link here, just that it seems that people that enjoyed smoky beers also would enjoy the more roasted darker beers as well. Even if the technology that produces modern dark malts hadn't been invented yet. Some articles cite that charred barley bread used for brewing dated to 800 BCE was found near Kulmbach as evidence of Germany's first brewing tradition. Could it be possible this is related? Seems a bit sketchy to me, except to point to perhaps a common



preference for these flavors.

The one thing I don't want to imply is that there is somehow an unbroken link for thousands of years to this style; there isn't. Even when breweries that currently produce the beer talk about their heritage, that shouldn't imply that all of their products were brewed continuously through this time. No, we can only point to what we know; that the beers were influenced through this regional preference and that they grew after 1990.

The way that the Japanese are characterized in Michael Jackson's *Beer Companion* doesn't lead one to believe that schwarzbier as brewed in Bad Köstritz was the influence for modern Japanese versions. Japanese brewers cited Bavaria's dark beers as the influence, although this information serves as anecdotal evidence at best. They are popular in Japan, even if the history is murky.

I tend to look at this style as more modern in character, and reflecting the regional preferences in Germany. It can be found in many places in the world as craft beer brewers explore once obscure regional styles. The export of decent German commercial examples to the United States and elsewhere has no doubt furthered this trend. I personally think this style helped influence the development of the once popular black IPA.

Several good modern craft examples are available here in the US. Sam Adams Black Lager is on the low end of the bitterness range, but very approachable. Devil's Backbone Schwartz Bier, pFriem Schwarzbier, and Chuckanut Schwarz Lager are all fine examples of this style. With the rise of many craft German-type lager specialists, I would seek them out for any seasonals or special releases; this style is in their wheelhouse.

SENSORY PROFILE

The first things you should know about this style is that it's a dark German lager, so it should have all the familiar lager characteristics like a clean fermentation profile and a smooth texture. The dark color is often less than black, but darker than any other

SCHWARZBIER

(5 gallons/19 L, all-grain)
OG = 1.048 FG = 1.012
IBU = 30 SRM = 31
ABV = 4.7%



INGREDIENTS

6 lbs. (2.7 kg) Pilsner malt
3 lbs. (1.4 kg) dark Munich malt
12 oz. (340 g) Weyermann Carafa® Special I malt
4 oz. (113 g) Weyermann Carafa® Special III malt
1.75 AAU Hallertauer hops (first wort hop) (0.5 oz./14 g at 3.55% alpha acids)
5.5 AAU Magnum hops (60 min.) (0.5 oz./14 g at 11.0% alpha acids)
0.5 oz. (14 g) Hallertauer hops (5 min.)
Wyeast 2124 (Bohemian Lager), White Labs WLP830 (German Lager), or SafLager W-34/70 yeast
¾ cup corn sugar (for priming)

STEP BY STEP

This recipe uses reverse osmosis (RO) water. Adjust all brewing water to a pH of 5.5 using phosphoric acid. Add 1 teaspoon of calcium chloride to the mash.

This recipe uses a step mash. Mash in the Pilsner and dark Munich at 144 °F (62 °C) in 14 qts. (13 L) water. Hold for 60 minutes. Raise the temperature to 158 °F (70 °C) and hold for 15 minutes. Add the Carafa® malts. Begin recirculating and raise temperature to 168 °F (76 °C) and recirculate for 15 minutes.

Put the first wort hops in the boil kettle, then sparge slowly and collect 6.5 gallons (24.5 L) of wort.

Boil the wort for 90 minutes, adding hops at the times indicated in the recipe.

Chill the wort to 50 °F (10 °C), pitch the yeast, and ferment until complete. Rack to secondary and lager for three months at 32 °F (0 °C).

Rack the beer, prime and bottle condition, or keg and force carbonate.

SCHWARZBIER

(5 gallons/19 L, extract with grains)
OG = 1.048 FG = 1.012
IBU = 30 SRM = 31
ABV = 4.7%



INGREDIENTS

4 lbs. (1.8 kg) pale liquid malt extract
2 lbs. (907 g) Munich liquid malt extract
12 oz. (340 g) Weyermann Carafa® Special I malt
4 oz. (113 g) Weyermann Carafa® Special III malt
1.75 AAU Hallertauer hops (first wort hop) (0.5 oz./14 g at 3.55% alpha acids)
5.5 AAU Magnum hops (60 min.) (0.5 oz./14 g at 11.0% alpha acids)
0.5 oz. (14 g) Hallertauer hops (5 min.)
Wyeast 2124 (Bohemian Lager), White Labs WLP830 (German Lager), or SafLager W-34/70 yeast
¾ cup corn sugar (for priming)

STEP BY STEP

Start with 6 gallons (23 L) of soft or reverse osmosis (RO) water in the brew kettle. Heat the water to 158 °F (70 °C).

Turn off the heat. Add the finely crushed Carafa® malts in a mesh bag and allow the grains to steep for 30 minutes. Remove the bag and rinse grains gently.

With the heat turned off, add the malt extracts and stir thoroughly to dissolve completely. You do not want to feel extract on the bottom of the kettle. Turn the heat back on then add the first wort hops and bring to a boil.

Boil the wort for 60 minutes, adding hops at the times indicated.

Chill the wort to 50 °F (10 °C), pitch the yeast, and ferment until complete. Rack to secondary and lager for three months at 32 °F (0 °C).

Rack the beer, prime and bottle condition, or keg and force carbonate.



STYLE PROFILE

German beer. Holding the beer to a light shows that it is clear and often has ruby highlights. It is topped with a tan-colored, persistent head.

The ingredients that produce the dark color also affect the aroma and flavor. The roast character is smooth and clean, not harsh and burnt. It shouldn't have an acrid bite. The roast often has a dark or bitter chocolate aspect, but is backed by a well-toasted bready malt backbone. In no way should this beer taste like a porter or stout, however.

The balance of bitterness needs a little explanation. Since the beer can have a variable sweetness level, expressing bitterness in IBUs is a little misleading. Sweeter and richer beers can take more IBUs while maintaining the same balance. The sensory impression is a roughly medium-bittered beer. The finish and balance can be dry to

too malty and heavy, and a range between 40 and 80% is reasonable. Pilsner, Munich, and roast malts should be the "holy trinity" of this style, but there are clearly many reasonable choices for each. Dark Munich malts have a wide range with different flavor profiles, so the brewer's selection of maltster will influence the finished product greatly. Regular Munich malt also works but with less contribution of deep toast flavors.

For roasted malts, huskless versions will give the best results since they lack the harsh, sometimes acrid, quality of dark-roasted husked products. Since they also have less flavor impact, using a higher percentage in the grist is often needed. I think there is an interplay between the roast and the Munich malts, so if you reduce the percentage or color of the Munich malts, you may need to increase the roast

“When the beer has a bit of sweetness, it often has more of a residual maltiness than a caramel-type malt flavor.”

somewhat sweet, and the bitterness can be detected in the aftertaste. But this also isn't a black IPA, so it shouldn't have huge levels of hops, alcohol, and bitterness.

When the beer has a bit of sweetness, it often has more of a residual maltiness than a caramel-type malt flavor. Sometimes a little sweetness helps soften the finish of the beer. So focus more on the sensory aspects rather than the specific numbers.

As an average-strength beer, expect an alcohol strength slightly under 5% ABV. The body isn't heavy, medium at most and often in the medium-low range. The smooth roasted character, light dryness, lack of full body and alcohol, and balanced bitterness combine to make this a very drinkable beer. It is not a fireside sipper.

The Kulmbacher commercial example is nicknamed, "The Black Pils" – more of a measure of the hopping level than the finished beer profile since there is clearly much more malt flavor in a schwarzbier than in a Pilsner. But it gives a hint that a firm bitterness and a noticeable late noble hop character is welcome. Fresher versions tend to have more of a late hop character, so don't fret if imported commercial examples don't show this aspect.

BREWING INGREDIENTS AND METHODS

Both Michael Jackson and Roger Protz provide grist information for Köstritzer: 50% pale malt, 43% Munich malt, and 7% roasted malt. Looking at the range of colors they mention for the malt, I can deduce that the Munich-type malt is dark Munich and that the roasted malt is Carafa® Special I. They put IBUs at 35 (hmm, maybe those BJCP guidelines need to be adjusted up a touch . . .) and mention Hallertauer as the late hop. Yet that's a clone recipe not guidance for a style with multiple examples.

As this is a German-style beer, I would interpret the pale malt as Pilsner malt, the base of most beers from Germany. I think Pilsner malt is needed to keep the beer from being

malt presence. It's a variable up to the brewer's discretion, but I would think somewhere between 5% and 15% roasted malt would fit this style.

Since the beer has a lighter body and seeks a moderately dry finish, I would use the common German practice of step mashing to encourage attenuation. Dark Munich malt can make a heavy beer if you aren't careful; you don't want this beer to taste like a doppelbock after all. So respect German tradition, and do what they do. Use a mash program that has rests in the optimal temperatures for both beta amylase (144–146 °F/62–63 °C) and alpha amylase (158–162 °F/70–72 °C). A decoction mash isn't a common practice for this style. If you use a single infusion mash, shoot for the lower end of the typical range, something around 149–151 °F (65–66 °C) to help the yeast finish with low residual sugars.

There is a bit of late hop character, so follow the typical



Köstritzer brewery in Bad Köstritz brewed a relatively unknown vollbier (standard-strength beer) described by Michael Jackson. It is considered to be one of the forerunners of the modern schwarzbier style of beer that has since gained global attention in the modern craft beer movement.

Photo courtesy of Wikimedia Commons

German tradition of using your best aroma and flavor hops at the end. Hallertauer is the classic, but Tettnanger is often a good second choice. Bittering hops can be any German hop; I like Magnum for its clean character and efficient bittering, but you could also use lower alpha hops.

A clean German lager yeast is obvious, like the Weihenstephaner 34/70 strain (Wyeast 2124, White Labs WLP830, or SafLager W-34/70). Follow normal fermentation practices, pitching the yeast and fermenting around 50 °F (10 °C). Lager for two to three months near freezing to allow the yeast to condition the beer.


HOMEBREW EXAMPLE

My recipe is fairly simple: 60% Pilsner malt, 30% dark Munich malt, and 10% roasted malt. I'm using mostly Carafa® Special I, with a little Carafa® Special III to adjust the color darker. I typically can get Weyermann Munich II, which is a lighter color than the 40 EBC malt Jackson said Köstritzer uses.

I'm targeting 30 IBUs, at the upper end of the range since I find that the Munich malts benefit from the support. Hallertauer is the classic finishing hop, and I'll use it for aroma and flavor. First wort hopping is my choice for introducing hop flavor, and Magnum is my bittering hop; both encourage a smooth bitterness.

A classic German step mash program encourages attenuation, which is what I want when using the dark Munich malt. I'm not doing anything unusual in yeast choice or fermentation. The mash and fermentation regime are what I'd call my go-to German scheme for most styles.

This beer is brewed at the 12 °P (1.048 SG) strength, which is typical of standard-strength German beers. For me, the most important parts of this style for the brewer is to use the debittered dark malts, and to properly attenuate the beer so that it isn't too heavy. The rest is what you'd expect from German beers: Use good technique, use fresh ingredients, and take your time with lagering.

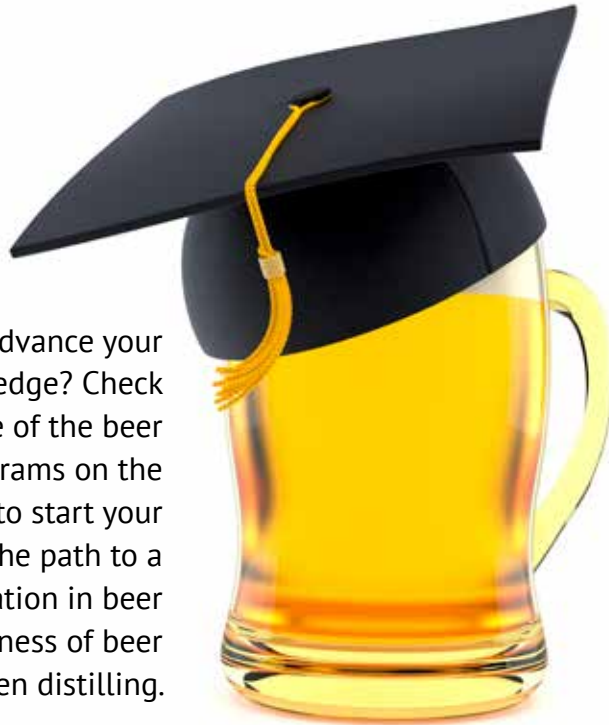
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4 BEERS FROM 1 BREW DAY

A new approach to split batch brewing
by Kevin Nanzer

Over the years the amount of time I can dedicate to brewing has drastically decreased. When I started homebrewing in college, I had nothing but free time. Then, becoming a single young professional, I still had a lot of time and now more expendable income as well — the perfect recipe for a homebrewer, pardon the pun. Over time though, I got a girlfriend, who turned into a wife, then came a house, then kids. Each step along the way my pool of free time got smaller and smaller. However, the passion for brewing went in the opposite direction. As you know if you are reading this magazine, the more you learn about brewing, the more you want to try.

Over the years I developed a way to get the most out of my brew days. Since I now only have the time to brew once every couple months, I have to brew bigger batches. I quickly found out that 25 gallons (95 L) of a single beer got old really quickly. So, I started experimenting with splitting a batch into multiple fermenters and pitching different yeasts, or adding different secondary ingredients like dry hops and fruit additions. After doing this for a few batches, I noticed that the beers just never turned out different enough from one another to make it worth the effort of cleaning and sanitizing the extra fermentation vessels. That's when I started experimenting with adding dried malt extract (DME) or sugar and steeping darker grains in the kettle to get very different beers from one brew day. After a lot of trial and error, I came up with a process that results in four distinct beers out of a single brewing session.





Photo by Charles A. Parker/Images Plus



A sugar solution (cane sugar dissolved in boiling water and then cooled) can be added to the fermenter to boost the gravity of a beer. Add the solution and then the cooled wort, and mix.

With the goal of getting four very different beers from one kettle of wort, you have to think about what really makes one beer different from another. For me, it really comes down to a few main things: Yeast expression, starting gravity, color, adjuncts, water chemistry, and wood aging.

Yeast is obviously the easiest one to deal with. You simply need multiple fermenters and a large enough kettle to fill all of them with one batch. However, like I mentioned in the opening, with a few exceptions (mostly sour-related), different yeasts in the same wort just doesn't differentiate each beer from one another to the level I am looking for.

Next is the **starting gravity**. This can be done a few different ways. For Belgian styles and a few other styles of beer you can add a sugar solution (cane sugar and water) directly to the fermenter to boost gravity and dry-

ness. Another method is to add dried malt extract (DME). The best way I found to add this is during the whirlpool. This is much easier if you use a counterflow or plate chiller, or use the no-chill method. The reason for this is you will want to run off some of the lower gravity wort to a fermenter prior to adding the DME to boost the gravity for the next fermenter. Keeping the kettle of wort hot here and chilling on the way to the fermenter allows you to both dissolve the DME easily and make sure it is sanitized by the hot wort. It can be done without a counterflow/plate chiller if you wanted to dissolve/sanitize the DME in a small amount of water on your stove separately and make a very high gravity solution to add directly to the fermenter, but the counterflow/plate chiller makes this a much simpler method.

For **color** you can use a very similar

method as for boosting starting gravity, but instead of adding DME to the hot wort, you can steep dark and caramel grains with a mesh bag or some other heat-safe strainer to add color and/or sweetness and body to the wort to follow. Other options here are products like SINIMAR® or Belgian candi sugar.

The addition of **adjuncts** is another way to significantly differentiate a beer. Normally I use things like fruit or spices, but this can literally be anything edible.

Water chemistry can drastically change the beer's expression. Starting with a neutral profile and adding gypsum or calcium chloride to the fermenter can really set the different style apart.

The final method to create a different beer is to **age it on wood** (oak or other) — whether you have a small barrel, or use barrel alternatives such as chips, cubes, spheres, etc.

PLANNING OUT FOUR BEERS

The first step is to think through and plan your brew day. Keep in mind it will be longer than a normal brew day and require much more planning, so you will want to start thinking about it well in advance. There are endless possibilities on the combinations of beers you can make with these methods, so it really depends on what beers you want to drink and how involved you want to make your brew day. My general rule is to design the brewing process to go from light to dark, low to high gravity, and low to high bitterness/hoppiness. Here are my tips for designing the brew day:

1. Think about what beers you like that have similar base grain bills. For example, a saison and a hefeweizen are basically the same grain bill with 50/50 or 60/40 Pilsner malt-to-wheat.

2. Think about beers that don't have grains as the star. For example, an IPA could be many combinations of base grains because the hops are really what you are trying to showcase.

3. Create the base recipe. This is ba-



Adding dried malt extract (DME) is another method to increase the original gravity for a batch. I add it during the whirlpool after draining off the wort for the lower gravity batches.

sically the recipe for the first beer you will run out of the kettle. You just scale it up to the full volume of your system. In my case this is 30 gallons (114 L). So, if my lightest, lowest ABV, lowest hopped beer is a helles, then I would enter my ingredients for that into my brewing software as if I were making 30 gallons (114 L) of it.

4. Clone that recipe and then scale the batch size down to a volume that equals the full batch minus the batch size of your first beer. For example, my full batch is 30 gallons (114 L), and I want 10 gallons (38 L) of helles. Then I would clone that full recipe and then scale that clone down to a 20-gallon (76-L) batch size. This is my new base recipe for the remaining three beers.

5. Add additional ingredients to the scaled down recipe to make the second beer on your list. If my sec-

ond beer were a saison, I personally wouldn't add anything to adjust the gravity in the kettle. I would just boil some cane sugar and water in a saucepan on my stove and add that to the second fermenter before running more of the original wort into it. That would boost the gravity and help dry out the second beer. But I would add some hops to the kettle to increase the bitterness to get the bite I want in a saison. You add those hop additions to that cloned recipe, which now increases the base bitterness for your next two beers as well.

6. Now clone the recipe again and do the same thing as before. I want 5 gallons (19 L) of saison, so I take 20 gallons (76 L) from the previous recipe clone and subtract 5 gallons (19 L), resulting in 15 gallons (57 L) remaining. Now I scale the new clone down to a 15-gallon (57-L) batch size and work

from there. My next beer is going to be an old school IPA, so get ready for some crystal malt. I add a pound (0.45 kg) or so of crystal 40, and enough DME to the recipe to bring my gravity up to around 1.065. Then I add my hops to get the flavor profile I'm looking for and increase the bitterness.

7. Clone the recipe for the last time and scale it down again. I want 10 gallons (38 L) of the IPA, so I subtract 10 gallons (38 L) from the 15 gallons (57 L) of the previous recipe and scale it down to 5 gallons (19 L). For the last beer I want an imperial stout. So, I add a mix of dark grains and more crystal malt to the final recipe, as well as some more DME. I might even use a Munich DME or something like that to boost the malt backbone on this one. I don't have to add any hops because the ones I added for the IPA are enough.

WRITE IT ALL DOWN

Now I have a recipe. But since this is a much more complex brew day than most, I like to make a list of steps to follow. It's not just that there are more steps than a normal brew day, but there is also more cleaning due to the multiple fermenters. I write down every step of the day so I can just go down the list after each thing I do and see what comes next. I didn't do this when I first started this method, and there were many more mistakes than I care to admit. The list may not rid you of mistakes completely — with so much happening in one brewing session, mistakes will sometimes happen — but it will reduce that number. Here is a sample brew day list:

MASH

1. Heat 16 gallons (61 L) of carbon-filtered water to 166 °F (74 °C) in mash tun.

- Add crushed Campden tablet.
- Add 20 mL lactic acid (88%).
- Add 20 g calcium chloride.
- Add 12 g calcium sulfate (gypsum).

2. Heat full hot liquor tank (HLT) for sparge water.

- Add Campden tablet.

3. Mill grains into buckets.



Yeast is a big factor in hitting style characteristics, so make sure to plan ahead and get the yeast needed for each batch ahead of time (and multiple packets, or yeast starters if needed for certain batches).

4. Add grains to water in mash tun, mix and recirculate.
5. Check pH and adjust if needed.
6. Clean fermenters.
7. Check temperature after 30 minutes and heat if needed.

SPARGE and BOIL

1. Vorlauf mash then transfer full liquid contents from mash tun to boil kettle (start heating boil kettle).
2. Add half of HLT water to mash tun, mix, and recirculate until clear.
3. Transfer full liquid contents from mash tun to boil kettle.
4. Repeat until boil kettle is full.
5. Bring to boil for 30 minutes.
6. Sanitize fermenters.
7. Add 1.5 oz. (42 g) Magnum hops.
8. Add yeast nutrient.
9. Recirculate wort through chiller and hoses for last 5 minutes of boil to sanitize.

COOL and TRANSFER

1. Turn off burner.
2. Recirculate the wort for about 10

minutes (whirlpool).

3. Make sugar solution for saison on stove in kitchen (1 lb./0.45 table sugar in ~4 oz./118 mL water).
4. Turn off pump and let stand for two minutes for whirlpool to settle before running off.
5. Runoff 10 gallons (38 L) of wort to the helles fermenter (Speidel #1), chilling during transfer.
6. Add table sugar solution to saison fermenter (carboy).
7. Add saison hop addition, 15 g gypsum, and whirlpool for 10 minutes.
8. Run 5 gallons (19 L) of wort to saison carboy.
9. Add IPA hops, 6 lbs. (2.7 kg) DME, and 1.5 lbs. (0.68 kg) of crushed crystal 40 in a grain sack to kettle and recirculate for 15 minutes.
10. Runoff 10 gallons (38 L) of wort and transfer to fermenter (Speidel #2).
11. Steep the remaining dark/crystal grains in last 5 gallons (19 L) of hot wort for 10 minutes.
12. Add 3 lbs. (1.4 kg) of DME.

13. Chill and runoff to last fermenter (FastFerment).

14. Pitch yeast in IPA and saison fermenters.

15. Move helles and stout to fermentation fridge to cool to pitching temperature, then pitch yeast.

When you get really good at running your brew days like this, you can even throw in the cleaning/sanitizing of kegs and the transferring of last week's batches out of their fermenters, in prep for this week's brews. I like to reuse my yeast from the previous week's batches. If you do this, you might want to plan both brew days at the same time so you can maximize your variety and utilize the large amount of yeast you will have for the second brew day. Maybe do some strong lagers that normally take an obscene amount of yeast to do them right.

TIPS FOR SUCCESS

When planning a four-batch brew day

like this there are a few tips that will help you be successful.

- 1.** Don't drink, at least until you are running off into the fermenters. This is by far the biggest factor in the resulting beers. I often fail at this, so trust me, I know from experience.
- 2.** Make sure to have all ingredients on hand, and have some extra DME around in case you don't hit your gravity or your recipe calculations were off (this is good practice for any brew day, but especially important for a complicated one like this).
- 3.** Normally I will keep the mash water profile very neutral so I can add gypsum or calcium chloride to the fermenter to adjust for the specific style. This can make a big difference in flavor and mouthfeel for the different styles.
- 4.** Be prepared to improvise. Things will sometimes go wrong — don't panic, just work through it and everything will be fine.

5. Typically, I don't use this method if I am brewing for competition. You will need to cut corners on some styles, so even though this practice produces great beers to drink, it might not result in beers that perfectly align with style definitions.

6. If you do want to enter them in competitions, choose one or two of the beers and really try to hit those recipes to style.

STYLE SUGGESTIONS

There are many combinations of styles that you can brew in this manner, where each style builds off of the ingredients from the previous. To help get the ideas flowing, here are some of my favorite 4-in-1 examples from past brew days:

Lagers and Ales

1. Light Lager – 85% Pilsner malt, 10% Vienna malt, 5% flaked corn, German Magnum hops (10 IBU).

2. Amber Mexican Lager – Add Mu-



Photo by Kevin Nanzer

Color and flavor adjustments can be made to batches by steeping specialty grains in the kettle.

nich DME to desired gravity and whirlpool a little more Magnum hops, (to get 5–10 more IBU).

3. Belgian Dubbel – Add dark Belgian candi syrup to the fermenter.

4. Barleywine – Add a bunch of Maris Otter DME and more American hops (Chinook/Cascade). Also add gypsum to the fermenter.

Notes: This set is relatively straightforward. Distinguishing flavors of the different beers relies heavily on the yeast and DME additions.

Hop Heads

1. Session IPA – 50/50 Pilsner/pale malt, 30 IBUs of whatever hops you like (including some in the whirlpool). Add gypsum to fermenter.

2. Pale Ale – Add some pale DME and gypsum to fermenter.

3. New England IPA – Add some wheat DME to boost gravity, add calcium chloride to fermenter, and multiple dry hop additions (some during active fermentation).

4. West Coast DIPA – Add more pale DME, maybe a touch of crystal or Munich DME, bring back to boil if you want more bitterness out of the whirlpool hops you already have in there. Add gypsum to the fermenter.

Notes: Each of these four beers will be dry hopped differently in their fermenters and playing with different yeast strains can help set them apart as well. I don't recommend this 4-pack on this large of a scale if the beers won't be consumed rather quickly. It's not easy to finish that much hoppy beer without a lot of help before it starts to go downhill. I generally limit it to one or two hoppy beers per wort. However, if you've got a lot of hop-loving friends this may not be a problem.



The larger your equipment, the easier it is to make multiple batches of a good size from a single brew day. Maximizing the space you have is also important.

All Pilsner Malt

- 1. Light Lager** – 100% Pilsner malt, 10 IBU noble hops.
- 2. German Pilsner** – Add some Pilsner DME and more noble hops to boost IBU and aroma.
- 3. Saison** – Add sugar to kettle to boost gravity and dry out the beer. Also add gypsum to the kettle (see notes, below).
- 4. Belgian Tripel** – Add more Pilsner DME.

Notes: Most of my favorite beer styles start with a 90–100% Pilsner malt base. Boosting the Pilsner's gravity with the Pilsner DME will give it a similar character as if you used a pinch of melanoidin malt in your grist. You can move that gypsum addition around depending on

how crisp you like your Pilsner. I would leave it out of the light lager, but you can add it to the kettle after that, or after the saison, or just pick and choose by adding it directly to the fermenters where you want the hops to pop a bit.

If four beers sounds too ambitious or your maximum batch size makes three beers from one brew more reasonable then you can do that too. Here are a couple of suggestions for brewing three beers from one wort:

Wheat and Pilsner

- 1. Hefeweizen** – 50/50 Pilsner/wheat malt, 10–15 IBUs of German hops.
- 2. Saison** – Add sugar solution and gypsum to fermenter.
- 3. New England IPA** – Add some Pilsner or wheat DME and a bunch

of juicy, citrusy hops in the whirlpool and to the fermenter to your liking. Also add calcium chloride to the kettle.


Notes: I like my saisons to be nice and crisp, so I add a little gypsum to that fermenter. The 50/50 Pilsner/wheat base works great for a New England IPA. It gives a nice neutral, slightly sweet backbone for the hops to shine. I like to add a small amount of dry hops to the New England IPA fermenter at yeast-pitching. I think it adds a nice layer of hop flavor and prevents hop creep by introducing the enzymes during fermentation.

Classic American

- 1. Pale Ale** – 90% Pale malt, 10% light crystal, 30 IBU Cascade hops spread throughout boil.
- 2. West Coast IPA** – Add some pale DME and sugar to boost gravity and dryness. Add more American hops of your choice. Depending on how bitter you like it, you can bring the wort back to a boil.
- 3. Barleywine (or Imperial Stout)** – Add pale DME, steep dark grains like Carafa® and chocolate malt if you are going with the stout.

Notes: Here are three really classic American beers that I can never get enough of. All three of these beers are great to have on tap whenever you can. They are crowd pleasers and easy to crank out. Probably the easiest of the brew days on the list.

SUMMARY

There are countless ways that you can utilize the methods outlined in this article. Even if you don't have a large system the ideas can be scaled down for small batches. The number of beers you make can vary from two to infinity depending on your scale and imagination. The point is, variety is important, but so are the other things in life. So, we need to think creatively on how we can accomplish both without too much compromise. Especially in the times we live in now, where 9 out of 10 beers on every menu are some form of IPA. 



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Maybe it was because people had been cooped up at home due to the coronavirus pandemic. Maybe the word got out and spread further than in some previous years. Maybe it was the quarter-century anniversary . . . but whatever it was, this year's label contest drew more high-quality entries from homebrewers than we may have ever received before. And they weren't just from here in the States either. It's fair to say, the BYO Label Contest has truly gone international in its 25th year. The top three winners were international entries — and of the 19 winning labels published over the next few pages, seven countries are represented. That is definitely a first.

We'd like to thank our generous sponsors for the donated prizes, and we hope even if you didn't win you enjoy seeing the creative homebrew labels sent in from around the world. And remember, next year's label contest is only a year away!



ARTUR SZUDROWICZ
 OPOLE, POLAND

Coming all the way from Poland, this label of a pig who made some questionable choices captured the imagination and hearts of the judges. From Browar Swinski Ryjek (Pigface Homebrewery), this passion fruit sour ale is labeled in style! Artur says this original artwork of the kwasi knur (sour boar) was first roughly sketched on paper, then redrawn by hand and colored on a computer.

Prizes: 10-lbs. Rahr 2-row malt, 8-oz. Centennial hops, 1-lb., Dingeman's DeBittered Black Malt, 1-lb. Dingeman's Biscuit malt, and 1-lb. Weyermann® German Pilsner malt from **BSG HandCraft**; Selection of six yeast strains from **Fermentis by Lesaffre**; Gift card from **GrogTag**; Brewer's Best® 16-Gallon Basic Brewing Kettle with Ports from **LD Carlson Company**





MATHIEU TREMBLAY

ST-HONORE, QUEBEC

Sometimes the name says it all. Aircraft Mechanic was brewed by two friends, homebrewers and, you guessed it – aircraft mechanics. “Aviation and homebrew are passions for us and that is the reason and inspiration for our beer label,” says Mathieu. The design was created by Matt’s wife, who deserves a beer for her work!

Prizes: BrewSSSiphon® basic kit from **BrewSensible**; 10-lbs. Rahr 2-row malt, and 8-oz. Centennial hops from **BSG HandCraft**; Selection of six yeast strains from **Fermentis by Lesaffre**; Gift card from **GrogTag**; Draft Brewer® Taproom Maintenance Toolkit from **Northern Brewer**



ESPEN WESTUM

DAL, NORWAY



This isn’t the first time Espen’s label has gotten attention. This label is a custom-drawn picture from French artist David Thiérée that Espen bought. He brought a case of the canned beers to share at the Beer Zombies Festival this year in Las Vegas, where it was a hit. “Just the label itself created a hype to get it,” he says. Yeah, that checks out.

Prizes: UNI-STAT IIa temperature controller from **BH Enterprises**; 10-lbs. Rahr 2-row malt, and 8-oz. Centennial hops from **BSG HandCraft**; Selection of six yeast strains from **Fermentis by Lesaffre**; Gift card from **GrogTag**



WILLIAM GARDNER

HOOSICK FALLS, NEW YORK

The bronze-winning label is for a New England IPA that is out of this world! “Ascension was brewed in tribute to the stars. It’s a reflection of when we ascend into an alternative state of consciousness,” says William Gardner. Brewed with Ekuantot®, Citra®, and Galaxy™ hops, Ascension is fermented with a couple of kveik strains – Voss and Hornindal.

Prizes: Gift certificate from **Bader Beer & Wine Supply**; Two 500-mL amber E.Z. Cap bottles, bottle brushes, and carrying handles from **E.Z. Cap**; Gift card from **GrogTag**; Yeastman Special Delivery Package from **White Labs**





KELSEY BLACK

CLEVELAND, OHIO

READER'S CHOICE

One of the great things about this hobby (beyond the resulting beer) is how it can bring people closer. That's how Kelsey started making beer, and then labels. "My father, Jerry Hensley, and I started homebrewing in 2014 as a bonding activity and it has since become our favorite hobby. Our brand, HenHouse Home Brewing (Not to be confused with HenHouse Brewing Co. in California), is based on our last name, Hensley, and each beer pays homage to farm life and animals." This label for a hazy IPA with spruce tips received the most votes in our Reader's Choice contest on Facebook. Congrats!

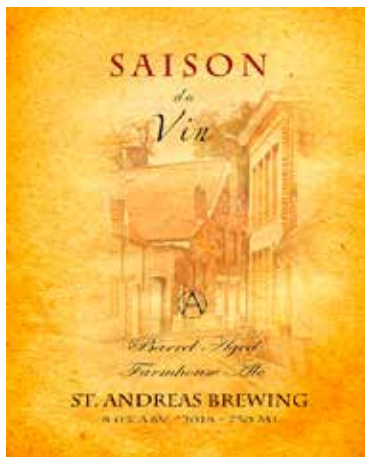
Prizes: Gift certificate from **Bader Beer & Wine Supply**; 10-lbs. Rahr 2-row malt, and 8-oz. Centennial hops from **BSG HandCraft**; Gift card from **GrogTag**; Yeastman Special Delivery Package from **White Labs**

HONORABLE MENTION

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ANDREW SCHMITT
ORANGEVILLE, ONTARIO



DALE HORCHNER
LOGAN, UTAH



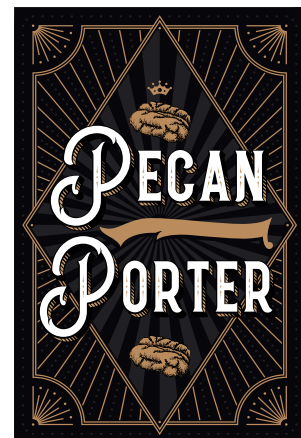
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Traditional
NORWEGIAN
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BREWING



Farmhouse brewers continue age-old methods with their indigenous yeast

Story and Photos
by Chip Walton

To be honest with you, at first I didn't have much interest in kveik, the strains of indigenous symbiotic yeast culture from Norway that seem to ferment at warp speed and at unusually high temperatures. From what little bit I'd heard about it, it seemed gimmicky, like a trend or fad that wouldn't last long here in the U.S. Beyond the quick fermenting power of kveik — with its ability to turn around a beer from grain to glass in just a matter of days — I didn't see what the hype was about. That was before I met Ivar A. Geithung. Ivar is a Norwegian homebrewer and family man who lives on a picturesque farmstead in Vossetrand, about 30 kilometers west of Voss, with his wife and four kids. He is passionately determined to keep alive a very old and traditional way of Norwegian farmhouse brewing, a way of brewing — and life — that he invited me to come from my home in Minnesota to see myself. What I learned during my week in Norway is that this method is about more than just kveik; it's a generations-old story of a special wort made over the course of a very long brew day with culturally important local ingredients. The resulting beer is quite a treasure to behold.

TRANSATLANTIC KVEIK CONNECTION

Before I take you to Ivar's brew cellar in Norway, let me tell you a bit about our transatlantic friendship prior to the trip, and how he and kveik won me over. As a fan and follower of my *Chop & Brew* homebrew web series and social media accounts, Ivar had direct access to my inbox. He first messaged me in the spring of 2017 via Facebook Messenger asking if I'd ever brewed with *real* kveik. I explained to him that I had not brewed with *any* kveik, let alone that which might not be whatever *real* meant to him. He was asking about native Norwegian kveik, true cultures of yeast — not the single, isolated strains made available by most North American yeast labs.

In countless messages and conversations Ivar taught me about the many indigenous kveik strains in Norway, how they differ from one another, that each strain has a specific type of wort it prefers to ferment and a set of conditions it operates best under. He spoke with intensity, knowledge, joy, and nostalgia about kveik and the farmhouse traditions of his region of Norway. He graciously sent me dried flakes of kveik inside loose plastic wrap along with suggested recipes for making a wort that the yeast would go well with. Twice he sent me boxes containing multiple two-liter soda bottles filled with different versions of his homebrews, or *haimabrygg*, the ancient brew of Norway. They shared common characteristics in that they were rich-bodied with bold malt sweetness, a medium-to-high level of smoke, and a wonderful citrus flavor from the kveik that is complemented by a woody, piney taste from the use of juniper and alderwood. They were unlike any beer I'd ever had before, and I was immediately drawn to them.

His beers are fermented with a kveik strain originally given to him by Sigmund Gjernes, who also lives in the Voss area, and Ivar has kept going for years by both drying to store and pitching directly in liquid form from previous brews. His brews are made in what he and other brewers from the area call "the old style." Per tra-

dition, these beers are mashed high and for a long time in a wooden vessel called a *gil*, then boiled for many hours in a copper kettle over an open fire, and then brought back to the wooden *gil* where it is fermented at high temperatures. The first servings are drunk directly from the fermenter on the third day of fermentation in a social event called *oppskåke*. So many things about this process seemed unreal and mystical. Check your modern homebrew assumptions at the door.

After nearly two years of communicating with Ivar online, watching short video clips he'd send at all hours of the day, following every link he sent me about the science, mystery, and magic of kveik, I finally took him up on the invitation to come to his home and experience the old way of brewing firsthand, to participate in two daylong brews, and visit with local brewers and historians. More than anything, he wanted me to learn about and document for others the importance of kveik to his area, to see that it's not just a quick-fermenting culture of yeasts to be pitched into just any random style of beer, but that kveik is life itself. Ivar tells me that in the Voss region of Norway the word kveik means to bring life to, or to give life.

"When you spark the fire under your brew kettle or on your kitchen stove," he explains to me, "they say you kveik it. When a child is born, you say it is kveik'd into the world."

It was clear that this trip was going to be about much more than just a faster method of fermentation.

ON SELLAND FARM, IN THE MOTHERLAND OF KVEIK

Before I tell you about the experience of brewing with Ivar at his home, I want to set the scene and describe some of the unique pieces of equipment used for brewing. My wife and I stayed with Ivar for a week on his farmstead called Selland, the name of his wife's family who has lived there for many generations. Selland farm sits near the base of a forested mountain slope; below the farm there's a beautiful lake called Opphemsvatnet surrounded by mountains. Around

Ivar's house are other previously functional sheds, barns, and other farm buildings, some housing agricultural and brewing artifacts. His wife's uncle, a brewer himself in his earlier days, lives in another house on the farm.

Historically on the farm, as far back as the 1600s, brewing was done in a smaller farm building called an *eldhus*. This is where beer was brewed, flatbreads baked, meats and fish cured, dried, and smoked; it was a multifunctional space for producing food and beer. Beer brewing was central to Norway's agricultural community. Each farm produced beer for the family, workers, and neighbors using ingredients grown on the farm: Barley and other grains, hops, and a special house kveik. Beer was brewed to celebrate holidays or changing of seasons, weddings and births, and was essential at funerals to properly honor the recently departed. (See the American Gravøl recipe on page 51 for more on this).

"This kind of brewing is the strong pillar of the Norwegian peasant society," says Ivar. "Everything was related to brew. If you made an important agreement or contract, that would be signed with brew. Then, over time, it was erased. Small, remote places took care of it. When the new Pilsner style of brewing came people just chose that instead. Even people who had copper kettles went for the modern way."

Selland does have a dilapidated *eldhus* that will one day be used for brewing activities again. Until then, however, Ivar has a unique brew space in the basement of his house.

BREWING THE OLD WAY

Walking into Ivar's brew cellar is like taking a trip back in time. Your attention is immediately drawn to the large deep-set hearth blackened by hundreds of years of fire and smoke. Inside of it a massive kettle is suspended by two thick chains that hang down from inside the chimney. It looks like a giant witch's cauldron or something out of a fairy tale. The kettle is copper, rolled in one piece and nailed down one side. It holds about



Left: Juniper branches and alderwood are added to the brewing water and heated in a massive kettle that hangs from chains over an open fire. **Right:** The correct mash consistency is reached when the stir stick stands upright without falling over. After holding that mash for about 10 minutes, it is transferred one *kjenge* at a time from the small kettle to the larger *gil* behind it.



48 gallons (180 L) of wort. I'm amazed when Ivar says that older kettles were even larger, built and nailed together from three separate pieces.

Near the door, atop a sturdy and well-supported bench, there is a large round wooden vessel, sort of like a barrel but straight-sided and much larger; it is equally as impressive as the kettle. This is the *gil*, the traditional dual-purpose mash tun and fermenter. The room smells of past fermentations, like mushrooms and smoky bread dough. With our senses fully captivated, we are ready to brew.

The first thing I need to say about brewing the old way is that it takes time. A *lot* of time. But that is part of the principle and philosophy of the brew, and Ivar says that out of respect of the tradition you cannot rush it.

"Like the old brewers will tell you," he says, "the best thing for your brew is patience. You have to do everything slow and wait for everything." The brew day I'm about to describe took us about 13 hours from start to finish. It was intense, exhausting, and enlightening. It was also quite a social affair. People from the community see smoke coming from the chimney and they know Ivar's brewing. Throughout the day friends and fam-

ily come by to see what's going on in the brew cellar, taste mash, smell the farm hops, and lend a hand. During the day, they bring food and coffee. In the late night and early morning hours they bring beer and laughter. They want to be a part of this old way of brewing.

The aforementioned kettle and *gil* are two larger pieces of equipment used for brewing. There is also a much smaller cast-iron kettle that will be used during mashing. Possibly the most important and symbolic item used during the brew is the *kjenge*, a traditional hard-carved wooden bowl with a handle. *Kjenge* come in all shapes and sizes and with different adornments; Ivar's holds about two quarts (2 L) of liquid. Symbolically it is used for scooping, serving, and drinking from. But functionally, in the brew cellar it is also the scoop used to move water and/or grain and mash throughout almost every part of the daylong process. No pumps, hoses, or gravity systems here. This is a labor of love, moving hundreds of quarts/liters of mash and wort multiple times across the brew cellar one *kjenge* at a time. *All. Day. Long.*

Ingredients that are unique to this process and to the flavor of the brew include alderwood, juniper, and kveik.

On this trinity of ingredients Ivar tells me, "If you ask one of the old brewers how long these things have been being used, they say 'forever.'" Ivar says that juniper is considered a holy wood among Norwegians. You find it in cooking, in smoked and cured meats, soaps, in cleaning and sanitizing. Before hops, brewers used juniper as a means of bittering, flavoring, and preserving beer.

The brew begins early in the day or even the night before by preparing the first *sprakalog*, or juniper-infused water, for mashing. The larger copper kettle is filled with water and many branches of juniper — the branch, green, and berries. Freshly chopped chunks of alderwood are also added to this first round of steeping water. Juniper provides a piney, herbal character to the water and resulting brew. The alderwood not only provides earthy, woody notes but also adds color as the wood oxidizes upon being cut and coming in contact with the water, lending a reddish-orange color to the water. Over the course of a few hours, this is brought to a near-boil and then allowed to cool a bit.

While this is happening, Ivar cleans the *gil* and constructs a layered filter in preparation for mashing. The wooden *gil* is cleaned using ash



Top: Ivar scoops the mash one *kjenge* at a time from the small kettle to the wooden *gil*.

Bottom: When filled, the *gil* will be covered with a large wooden lid and left for an hour or two to mash at temperatures that begin as high as 160 °F (70 °C).

from the prior brew's fire combined with the dried herb meadowsweet and some of the hot juniper-infused water; this ashy paste is brushed throughout the interior of the large wooden vessel and then rinsed. Once cleaned in this fashion, a filter bed is built from *rostatre*, pieces of jagged, slotted wood sanitized in the kettle; these are fitted into one another almost like a puzzle on the bottom of the *gil* in a way that leaves space for liquid to escape through the bottom spigot or pour valve. On top of these wood pieces a layer of the steeped alderwood chunks is placed around the pour valve, with handfuls of fine hay

on top of that, and all capped with the thick layer of boiled juniper branches. This creates a wonderfully efficient natural strainer for the wort.

Here I should note that Ivar generally doesn't take measurements with modern tools like thermometers, hydrometers, etc. He gauges things with a much more folk-based understanding, using his fingers, hand, and elbow to measure heat; tasting water, juniper, grains, mash, and wort to know that things are moving along accordingly. He humored me a few times when I insisted on taking measurements, but eventually I gave up, put down the refractometer, and

let the ancestral method do what it's done best for hundreds of years. Ivar tells me the mash is ready to begin when the temperature of the *sprakalog* "is so high that your mind should say 'no' to putting your finger in but you should manage to do it, convince yourself to do it. That's when we start mashing."

The mash process happens in small batches in a cast-iron kettle that is set on the ground. The grist is mainly malted barley (pale ale) with a small percentage of flaked oats, a nod to the type and ratio of crops previously grown on Selland farm. For this particular brew, Ivar was aiming for a bigger beer than his typical 6-8% ABV brews; we were aiming more for a barleywine strength beer. The total grist was about 198 lbs. (90 kg): 176 lbs. (80 kg) pale malt (11 lbs./5 kg of which was dried/cooked in the old-style near the fire in a small cast-iron pot) and 22 lbs. (10 kg) oats — for a brew that ultimately yielded about 37 gallons (140 L) at approximately 13% ABV! (Okay, so I snuck in a few gravity readings along the way.) A portion of the grist is poured into the smaller cast iron kettle. Hot mash water is added to this grist, and the mash is stirred, adding more water until the mash reaches an oatmeal-y consistency that allows for the stir stick placed upright in the middle of the mash to stand straight and not fall over.

After holding that mash for about 10 minutes, it is transferred one *kjenge* at a time from the small kettle to the larger *gil*, filling it in a pattern as to not disrupt or destroy the filter system. After many rounds of this lengthy process of mixing, mashing, and moving mashed grain to the *gil* is complete, the rest of the water is carried from the boil kettle to the *gil* — nearly full by the end — and topped with a large wooden lid. It is left to rest for an hour or two or more. Ivar aims for a mash temperature as high as 160 °F (70 °C) at the start.

"Most of this brewing is thought like it's a part of things that happens in life. Sometimes a thing is quite personalized towards the *gil*. They think that it's a person doing stuff

here. You give the *gil* porridge,” Ivar laughs at the analogy, “and the porridge should be thick and sweet in the stomach of the *gil*. When we say *meske*, you call it mashing, it actually means digesting. The *gil* digests the food you give her.”

Another fire is lit under the boil kettle to make another full batch of juniper-infused water that will be used for sparging wort and also for cleaning and sanitizing the dairy cans that will be used for cooling wort before fermentation.

After an hour or two of mashing, Ivar begins running off the wort very slowly into the small cast-iron kettle below the spigot. It is moved from there one *kjenge* at a time back to the large copper kettle. (You can see why Ivar says time and patience are key.) Hops are added to the kettle now, basically a first wort hop. In most brews, Ivar uses a low-alpha acid hop, not so much for bitterness as for a bit of spice and primarily for preservation. He doesn't want hops that will overpower or interfere with the flavors of his long-boiled wort and fermentation of the kveik. He generally uses about 17.6 oz. (500 g) of Hersbrucker pellets. In our brew, Ivar also added about 7 oz. (200 g) of his own farm-grown hops during one of the rounds of run-off to make it extra special.

And then the long wait begins, first to bring nearly 53 gallons (200 L) of wort to a boil, then for the four-to-five hour boil to achieve the deep, richly sweet wort that Ivar describes as “hard-boiled.” This obviously gives the brewer plenty of time to scoop out the mash from the *gil* and get the vessel ready for fermentation. Also, by this time in the evening a group of friends has filled the brew cellar and are telling stories, sharing jokes, and razzing each other as they enjoy cups and *kjenge* of *haimabrygg*. Over the hours, they depart one by one, leaving just Ivar and me there to tend to the brew kettle. I'm exhausted from the daylong brew session on the heels of an international flight, but Ivar's dedication and enthusiasm for the brew keep me awake and grounded.

Around 1 a.m., when the boil is

Commercial Kveik vs. Traditional Norwegian Kveik

The kveik strains that are commercially available in the U.S. are not the same as the indigenous strains you'd find in Norway or other Scandinavian and European countries. Why not? Think of kveik similar to how you think of a SCOBY used to ferment kombucha. SCOBY actually stands for Symbiotic Culture of Bacteria and Yeast, which is to say it is a group or colony of different yeast and bacteria that work together to ferment in a special way to create a unique end-result. Kveiks are basically SCOBY or mixed cultures for fermentation.

There are currently 62 different kveik strains registered in Europe, a number that grows each year with lab testing and confirmation. They are generally named for the family or farm from which they were harvested. Almost like a family sourdough starter that is built up over many years and is kept alive by brewing with it. Depending on the kveik, the colony might include up to 10 different strains of yeast and/or bacteria. They also might be considered top-fermenting or bottom-fermenting. They might be better suited for raw (unboiled) wort or boiled (sometimes for hours on end) wort. These kveik can live and be reused for hundreds of years.

The kveik strains available to most homebrewers in North America, however, are light years apart from their traditional Norway ancestor. Why? Because what most yeast labs do in producing their commercially-available kveik is dissect the collection of yeast and bacteria, then propagate only the cleanest, most reliable, replicable, and flavorful single strain. “If you don't isolate, and you try to grow a mixed culture, you're provid-

ing people with snowflakes,” says Owen Lingley, owner of Imperial Yeast. “From our standpoint, to make sure that we can keep things diastatic-free and provide repeatable results to people, we have to isolate, and that means cleaning it up.”

Imperial Yeast offers several single-kveik strains as well as a three-kveik blend called Kveiking. Lingley says it's exciting to help brewers understand how these strains work and the flavor profiles that can be achieved with proper management and fermentation. “A lot of those flavor profiles are completely different from, yet complementary to, the beer styles that are coming out now. They mimic different hop flavors and produce unique esters that are not available in other yeast strains. I think you've seen kveik strains continue to grow in popularity because they push the envelope on flavor and provide consumers with something different.”

The traditional farmhouse brewers I met in Norway are not upset that a cleaned up version of kveik is being embraced by American brewers. In fact, they are excited that the world is taking notice and interest in kveik. They do, however, want to make sure we all know of the long tradition of brewing very special beers with indigenous kveik, a tradition tied to family, community, the seasons of the year, and important events: Births, marriages, harvest times, and deaths.

Learn more about kveik strains and their yeast/bacteria make-up at the Farmhouse Kveik Registry maintained by Lars Marius Garshol at: <http://www.garshol.priv.no/download/farmhouse/kveik.html>

complete, he slowly puts out the fire. Using the *kjenge* we scoop about half of the hot wort into a set of large metal dairy canisters, which are then placed in tubs of cold water and pre-cooled by a chilly early-autumn Norwegian night to cool down to closer to the range of kveik pitching temperature, in the lower 100s °F (lower 40s

°C). The cooled wort in dairy canisters is then poured into and blended with still-warm wort from the kettle in the *gil* to achieve our pitch temperature. Ivar pitches dried flakes and for good measure a bit of kveik slurry from a previous brew. We top the *gil* with a loose-fitting wooden lid and leave it to do its thing. It's 3:30 a.m. and the



Top: After fermentation is complete, some of the kveik slurry is dried for easy storage until it will be pitched in future batches.

Bottom: Two samples of Ivar's beers brewed in his Vossestrand farmstead in northwestern Norway.

brew day is over.


Fermentation takes off within hours of pitching the kveik. The brew cellar smells of baked bread, oranges, cinnamon, and smoke. Every day we crack the lid slightly to check on the active fermentation. The brew is topped with an undulating kräusen — Ivar calls it a sticky lid — of proteins, hop matter, and kveik yeast. Our hope is that it will be ready for *oppskåke* on the third day. Ivar's method for determining when the beer is ready for *oppskåke* is to drag a stick through the surface of the fermentation, cutting a line through the kräusen. If this layer immediately comes back together in

the wake of the stick passing through, it is not ready. However, if the kräusen remains separated with a channel down the middle, it is now time for *oppskåke*. Ivar uses the *kjenge* to make a wider part in the foamy top and fills the scoop with the freshest beer you can imagine drinking. This is a tradition that has been happening inside this cellar for many, many years. I can feel the spirits of past brewers in the room as we toast. "Skol!" I say to Ivar. "Got ol!" he says to me. It means, "good ale." The beer fermented from 1.120 to 1.020 in just three days and was still holding a temperature in the lower 90s °F (lower 30s °C). (I checked.

Wink wink.)

Back in the old farm days, the *oppskåke* would carry on for many hours with music, singing, dancing, and beer enjoyed by people from all around the farm community. As you can imagine that kind of a crowd would've helped put a nice dent in 37 gallons (140 L) of beer. However, these days, after a much smaller but still ruckus and wild *oppskåke*, Ivar kegs some of the beer, and shares a large portion of it in big soda bottles. A portion of the beer also holds well as the kveik continues to condition in some large plastic storage totes, the bottoms of which hold many liters of healthy kveik slurry for future brews.

Brewing with Ivar taught me that there is much more to kveik than a unique yeast that can just be added to any modern style of beer for the sake of a quick ferment. The true beauty in the way that Ivar brews is in the tradition and the dedication to producing a time-honored and unique wort through the use of local, largely symbolic ingredients. It is a wort unlike anything I've ever seen brewed, a recipe that over the course of hundreds or thousands of years has been passed down on the farms to be perfectly suited for kveik from the area. The resulting beer is like a smoked barleywine with the malt body of an epic Scottish ale with rich juniper notes and a fragrant citrus fruitiness.

During our week in Norway we not only brewed with Ivar, we also visited with Rune Midttun. Rune is a professional brewer brewing more modern styles at Voss Fellesbryggeri in Voss, but he also brews in the old way with the help of some modern medium-scale equipment at an *eldhus* at the end of the lake, not far from Ivar's home. We talked with him about his family history and his project to bring *haimabrygg* techniques into his professional brewery. We also visited with an older gentlemen named Ivar Husdal, a homebrewer and historian who shared a lot of wonderful stories and information on the cultural importance of kveik and farmhouse brewing in the area of Vossestrand. A series of videos from our trip can be found at youtube.com/chopandbrew. 

Norwegian Kveik Recipe

AMERICAN GRAVØL

(5 gallons/19 L, all-grain)
OG = 1.080 FG = 1.018
IBU = 15 SRM = 7 ABV = 8.2%



This recipe is brewed in a way that I feel pays homage to the ingredients and processes I saw being used in Norway. That's not to say it doesn't involve a lot of improvisation. I used kveik given to me by Ivar (which he got from Sigmund Gjernes), but commercially-available kveik (some of which come from Gjernes' homestead) will result in a tasty beer too. The resulting beer was a highly aromatic and malty beer, dark orange-amber in color. It had very strong notes of smoke, pine, berries, citrus peel, and a rich malt sweetness.

INGREDIENTS

12 lbs. (5.4 kg) Simpsons Best pale ale malt
2.25 lbs. (1 kg) applewood smoked malt
2.25 lbs. (1 kg) cherrywood smoked malt
3.5 AAU Hallertau Mittelrüh hops
(1 oz./28 g at 3.5% alpha acids)
(first wort hop)
6–7 small branches of juniper
(see Tips for Success)
1 lb. (0.45 kg) apple wood chips
Imperial A44 (Kveiking) or Omega
OYL-061 (Voss Kveik) or The Yeast
Bay WLP4045 (Sigmund's Voss Kveik)
or LalBrew Voss Kveik yeast
½ cup corn sugar (if priming)

STEP BY STEP

Prepare mash water by steeping juniper branches and apple wood chips in 7 gallons (26.5 L) of 160 °F (71 °C) water. Let steep for at least one hour to infuse flavor and color, stirring and punching down the cap frequently. If your steeping vessel doesn't have a false bottom or other means of straining, remove juniper and apple wood chips with long-handled scoop or colander, and set aside.

Heat water to 170 °F (77 °C) for a mash temperature of 160 °F (71 °C). Mash grains for at least two hours at 160 °F (71 °C). (You could mash even longer if you'd like.)

During the long mash, bring sparge water to holding temperature and add

back juniper and apple wood chips. Let steep to infuse flavor and color. After mash rest, remove the juniper and wood chips from the sparge water and sparge mash to collect at least 6 gallons (23 L) of wort in boil kettle. Add the first wort hops. Also collect 1–2 cups (240–480 mL) of this wort in a sanitized jar and add kveik flakes; stir several times to reconstitute into a pitchable slurry. Keep this at room temperature, if not warmer.

Boil collected wort for two hours then use a wort chiller (or cool naturally) to 103 °F (39 °C). Pitch rehydrated kveik slurry. Fermentation should start very quickly after (if not almost immediately upon) pitching this mini-starter of kveik slurry.

Allow temperature to drop to 90–95 °F (32–35 °C) and maintain that temperature. Check gravity and temperature every day. My beer fermented to 1.018 in three days with the yeast I used. Condition for one week at least. For packaging, go with a low carbonation level at around 1.5 volumes.

TIPS FOR SUCCESS

Gravøl is what Norwegians call a beer brewed for a funeral. Of course the passing of a loved one is a sad occasion to brew, however, the intense fermentation power of kveik makes it possible to make a beer quickly so that the deceased can be honored with a living brew. I brewed this beer for a dear friend whose father passed in October 2019. I drank and shared about a half-

gallon (2 L) of the live beer straight from the fermenter to celebrate the traditional *oppskåke* I'd learned about in Norway. I bottled two gallons (8 L) of the very young beer between plastic PET bottles and flip-tops, and kegged the remaining beer.

Since I wouldn't be brewing over an open fire, which would over the long boil impart a smokiness to the wort, I decided to use some apple and cherry wood smoked malt. Instead of the alderwood that is used traditionally in western Norway for steeping in the mash and sparge water, I used applewood chips (yep, the kind that you might use for grilling). I used about one pound (0.45 kg) of chips for the full 5-gallon (19-L) batch, but you could go with more if you're not seeing a big color difference in your mash or sparge water. I was lucky enough to find a type of juniper tree in a local Minneapolis park that a forest guide friend uses for making wilderness teas so I felt safe using its branches and berries. Note that not all juniper and its relative family of cedar trees are safe to consume. Please take caution with both the juniper and wood chips. For the hops, go with a low-alpha acid variety; hops are not really for flavor here, more for some balance and preservation. We want to highlight the flavors of the kveik, juniper, and wood chips.

Check out this video for more discussion of process and tasting notes from *Chop & Brew*: <https://bit.ly/americangravol>



NEW AGE WEEK



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How American brewers are changing the game with kveik

by John Holl

When they started talking about a collaboration beer, the initial assumption was that it would be spontaneous. That made sense given that the two breweries were Austin, Texas-based Jester King and Embrace the Funk, part of Yazoo Brewing Co., of Nashville, Tennessee. Both breweries are known for coolship ales, beers that spend long times in barrels, and an embrace of truly wild microbes.

However, as time ticked away and the limited window to brew together approached they realized that the calendar was not on their side. So, Brandon Jones, the head of Yazoo's sour and barrel aging program, proposed something radical to Jester King Owner Jeffrey Stuffings: An IPA fermented with kveik yeast that, if the strain used did as promised, would result in a ready-to-drink ale in a matter of days.

"It's crazy, it's one of those things that you hear about and it makes you spit your beer out (in surprise), like you pitch at 95 °F (35 °C) and it's ready in just days," said Jones. "And you get no fusel or off character. It's pretty incredible."

The beer, brewed in 2016, was called Pale Green Horse and is a kveik IPA. The duo brewed it with Texas Hill Country well water from Jester King's farm, the grist was made up of local pale ale malt from Blacklands Malt plus raw oats and wheat from Barton Springs Mill. The beer was hopped with Citra®, Galaxy™, and Mosaic® on brew day, and later dry hopped with Citra®, Galaxy™, Mosaic®, and Strata®. Omega Yeast Labs' Hornindal Kveik strain was used. It was only the second cultivated yeast beer that Jester King had made up to that point.

"Hornindal will add a bit of citrus and candied fruity peach ring character, some Grand Marnier character to a beer, so using it for a citrus IPA makes sense," Jones said.



Original cultures of different kveik strain blends streaked out and stained on growth plates. The different kveik strains present can be distinguished via color stain intensity and colony shape.

THE REVIVAL OF KVEIK

Some traditions fade away over time, but thankfully the light was never fully extinguished on farmhouse beers fermented with kveik. Kveik, pronounced “kviike” or “kwike,” means “yeast” in the Nordic regions where it is found. Thanks to Lars Marius Garshol, the world was introduced to this yeast and it became a world-wide sensation.

Garshol, a researcher and beer enthusiast, started blogging about kveik in 2013 and quickly caught the attention of pro brewers and homebrewers around the world.

It was on a trip to Lithuania that Garshol began to learn about traditional farmhouse brewing that was being done in homes on a very small scale and remembered hearing that similar brewing was still being done in western Norway. When he visited and began talking with people, he discovered that the tradition of local brewing was still strong among some, and that the results they were getting from local yeast was unlike anything else happening in the world.

Brewers in the region would pitch the yeast into warm or hot wort, and then would collect the kveik after each batch to use again, even weeks later, showing its robustness. Many would store the dried yeast on wooden rings that would then be added to the next batch. Garshol has talked of some brewers that have used the same yeast for decades.

By highlighting the attributes of the yeast, what at first seemed unlike-

ly (the high fermentation temperatures chief among them) quickly became a go-to strain for fermentation enthusiasts. Groups like the online Milk the Funk became obsessed with kveik and everyone who was interested wanted to learn more.

Collected from various farmhouses throughout Norway, there are a number of strains that have become popular and cultivators continue to scour the countryside to find new ones that bring not only a rustic and fruit essence to a beer, but also the robustness that brewers love. Among the more recognizable strains are the earlier mentioned Hornindal, Voss, Hardanger, and HotHead®, an exclusive from Omega Yeast Labs.

In fact, most of the yeast labs in the United States have laid claim to their own kveik and are quick to highlight its attributes to entice brewers.

In the rush to replicate and forge new ground on a historic organism, there’s also some worry of its heritage being lost.

“The people of West Norway, while happy that others are enjoying the flavors that come with beers made from their unique yeasts, are worried that their cultural heritage is still in danger,” wrote beer historian Martyn Cornell recently to a group of writers following a trip to the country.

“To try to safeguard that heritage in the face of the commercialization of kveik, the West Norway Cultural Academy has launched a project to apply for traditional brewing with

kveik in western Norway to be listed by UNESCO, the United Nations Educational, Scientific and Cultural Organization, under the Convention for the Safeguarding of the Intangible Cultural Heritage.”

Cornell points out that if the yeast gets the designation, it would join the ranks of “reggae in Jamaica, Neapolitan pizzaiuolo, Kabuki theatre in Japan, and windmill operating in the Netherlands.”

Atle Ove Martinussen, the chief executive of the West Norway Cultural Academy, said in a press release that the designation would be welcomed because “it’s very important to stress that this is an unbroken living tradition, even if fewer and fewer people are doing this traditional brewing.”

However, as Cornell points out, this is still several years away from happening, if it does at all.

The groups needs to “gather all the evidence for the application, investigating the history of farmhouse brewing in western Norway, trying to produce a ‘molecular clock’ to show when kveik as a family of yeasts broke away from ‘mainstream’ brewing yeasts, talking to surviving farm brewers about their techniques and methods, and the importance of homebrewing to their lives and the lives of people in their communities. Then a case will be put together to go to the Norwegian government, and the government can, if it approves, put in the application for recognition of farmhouse brewing as an ‘intangible cultural heritage’ to UNESCO.”

In just six years kveik has gone from being obscure outside of its region to a global brewing focus. It should not be a surprise to anyone that, especially here in America, the yeast found its way into IPAs — by far the most popular category in the craft segment and the style that fueled the beer revolution.

“I don’t think that some of these Norwegian brewers, these small farmhouse brewers that were making beers with juniper, and herbs, and berries ever thought folks would be turning out juicy, hazy IPAs with these microbes, but here we are,” says Jones.

WHY BREWERS LOVE IT

Regardless of size, brewers in the United States have been experimenting with kveik, with many putting commercial examples into the world either on draft or in packages. While some have tried to replicate traditional Norwegian farmhouse ales, IPA is the most popular style American brewers are using kveik for.

Ryan Pappé, Head Brewer at Portland Brewing and Pyramid Brewing, said they first started to play with kveik last year in advance of the Oregon Brewers Festival.

“One of our brewers is a Norwegian-American who lived in Norway and we had a connection to the culture we wanted to play with, and so we did something fairly typical — we took a beer that we had already made and, splitting off the wort for fermentation with kveik, what we ended up with was basically a pale ale.”

The wort they used was for the Pyramid Hefeweizen, which has 60% malted wheat. But it wasn't as easy as just pitching and letting it go. In fact most brewers interviewed for this story said they have had to make special considerations for their fermenters to let the kveik do its thing.

For Pyramid it meant having a technician come in and change the settings on their glycol chiller to set the tanks to 100 °F (38 °C).

“But, man once it was going it was exciting to see it in action. It finished in two days and we started dry hopping right away. Using it really does add some complexity and fruitiness to the beer. It's melon and tropical and not the usual citrus that you get from a lot of newer American craft hops. It's a lot of fun to use.”

Although not new, there is a novelty to using the yeast and pro brewers — many that have been turning out hazy IPAs for less time than kveik has been “re-discovered” — said they had fallen into the same old, same old hazy IPA that customers love — heavily hopped with Citra® and Mosaic® and fermented with Wyeast 1318 (London Ale III) or the Chico yeast.

In North Dakota, the viking-themed Drekker Brewing Co. started experimenting with kveik in 2017 af-



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KVEIK IPA CLONE RECIPES

DREKKER BREWING CO.'S HYPER SCREAM CLONE

(5 gallons/19 L, all-grain)
OG = 1.076 FG = 1.013
IBU = 25 SRM = 6 ABV = 8.4%

This imperial New England-style IPA has a silky mouthfeel from generous oat and spelt additions, and a massive hop aroma due to massive late-hop additions and kveik yeast.

INGREDIENTS

9 lbs. (4.1 kg) Rahr 2-row barley malt
3.25 lbs. (1.5 kg) Crisp naked oat malt
2.25 lbs. (1 kg) Weyermann Carafoam® malt
1.25 lbs. (0.57 kg) Weyermann spelt (dinkel) malt
0.25 lb. (113 g) Simpsons Golden Naked Oats™ malt
3 AAU Magnum hops (60 min.) (0.25 oz./7 g at 12% alpha acids)
12 AAU Vic Secret hops (0 min.) (0.75 oz./21 g at 16% alpha acids)
9 AAU Citra® hops (0 min.) (0.75 oz./21 g at 12% alpha acids)
1.5 oz. (42 g) Vic Secret hops (hopstand)
1.5 oz. (42 g) Citra® hops (hopstand)
3.75 oz. (106 g) Vic Secret hops (1st dry hop)
3.75 oz. (106 g) Citra® hops (1st dry hop)
1.75 oz. (50 g) Vic Secret hops (2nd dry hop)
1.75 oz. (50 g) Citra® hops (2nd dry hop)
Omega Yeast OYL061 (Voss Kveik), Imperial Yeast A43 (Loki), or LalBrew Voss Kveik
¾ cups corn sugar (if priming)

STEP BY STEP

This is a single step infusion mash at 152 °F (67 °C) for 60 minutes. Vorlauf and sparge as usual to collect 6.5 gallons (24.6 L) of wort. Boil for 60 minutes, adding the first hop addition as the wort comes to a boil. Add the flameout hops at the end of the boil. Create a whirlpool and let settle for 10 minutes. Then cool the wort to 175 °F (79 °C) and add the hopstand addition and whirlpool for 10 minutes before cooling down to 80 °F (27 °C).



Aerate, pitch yeast, and let temperature free rise to 100 °F (38 °C) during fermentation. The first dry hop additions should be added at about 24 hours at peak of fermentation. The second dry hop additions should be added on day five. Keep the beer on the hops for three more days then package as normal. Kegging is preferred.

DREKKER BREWING CO.'S HYPER SCREAM CLONE

(5 gallons/19 L, partial mash)
OG = 1.076 FG = 1.013
IBU = 25 SRM = 6 ABV = 8.4%

INGREDIENTS

5 lbs. (2.27 kg) extra light dried malt extract
3.25 lbs. (1.5 kg) Crisp naked oat malt
2 lbs. (0.9 kg) Weyermann Carafoam® malt
1.25 lbs. (0.57 kg) Weyermann spelt (dinkel) malt
0.25 lb. (113 g) Simpsons Golden Naked Oats™ malt
3 AAU Magnum hops (60 min.) (0.25 oz./7 g at 12% alpha acids)
12 AAU Vic Secret hops (0 min.) (0.75 oz./21 g at 16% alpha acids)
9 AAU Citra® hops (0 min.) (0.75 oz./21 g at 12% alpha acids)
1.5 oz. (42 g) Vic Secret hops (hopstand)
1.5 oz. (42 g) Citra® hops (hopstand)



3.75 oz. (106 g) Vic Secret hops (1st dry hop)
3.75 oz. (106 g) Citra® hops (1st dry hop)
1.75 oz. (50 g) Vic Secret hops (2nd dry hop)
1.75 oz. (50 g) Citra® hops (2nd dry hop)
Omega Yeast OYL061 (Voss Kveik), Imperial Yeast A43 (Loki), or LalBrew Voss Kveik
¾ cups corn sugar (if priming)

STEP BY STEP

Place all the crushed grains in a large grain bag. Heat 9.5 qts. (9 L) of water to 167 °F (75 °C) then submerge the grains into the water. Mix well and the mash should settle at 152 °F (67 °C). Try to maintain this temperature for 60 minutes. Remove the grain bag and rinse the grains with 2 gallons (7.6 L) of hot water. Top off the kettle to 6 gallons (23 L) then stir in the dried malt extract. Once all the extract is dissolved, bring wort up to a boil. Boil for 60 minutes, adding the first hop addition as the wort comes to a boil. Add the flameout hops at the end of the boil. Create a whirlpool and let settle for 10 minutes. Then cool the wort to 175 °F (79 °C) and add the hopstand addition and whirlpool for 10 minutes before continuing to cool down to 80 °F (27 °C).

Follow the remainder of the all-grain recipe instructions.



KVEIK IPA CLONE RECIPES



JESTER KING & YAZOO BREWING CO.'S A PALE GREEN HORSE CLONE

(5 gallons/19 L, all-grain)
OG = 1.063 FG = 1.011
IBU = 68 SRM = 5 ABV = 6.7%

INGREDIENTS

9.5 lbs. (4.3 kg) Blacklands Pale Moon pale ale malt
1.25 lbs. (0.57 kg) flaked oats
1.25 lbs. (0.57 kg) hard red wheat
0.66 lb. (300 g) oat groats (hulled, unmalted oats)
5 oz. (113 g) dextrine malt
5 oz. (113 g) Munich malt (20 °L)
8.4 AAU Mosaic® hops (first wort hop) (0.7 oz./20 g at 12% alpha acids)
4.9 AAU Galaxy™ hops (first wort hop) (0.35 oz./10 g at 14% alpha acids)
10.8 AAU Citra® hops (0 min.) (0.9 oz./21 g at 12% alpha acids)
15.4 AAU Galaxy™ hops (0 min.) (1.1 oz./31 g at 14% alpha acids)
13.2 AAU Mosaic® hops (0 min.) (1.1 oz./31 g at 12% alpha acids)
0.7 oz. (20 g) Citra® hops (hopstand)
0.7 oz. (20 g) Galaxy™ hops (hopstand)
0.7 oz. (20 g) Mosaic® hops (hopstand)
0.7 oz. (20 g) Strata® hops (1st dry hop)
0.9 oz. (26 g) Citra® hops (1st dry hop)
0.7 oz. (20 g) Galaxy™ hops (1st dry hop)
0.25 oz. (7 g) Mosaic® hops (1st dry hop)
0.9 oz. (26 g) Strata® hops (2nd dry hop)
0.7 oz. (20 g) Citra® hops (2nd dry hop)
0.5 oz. (14 g) Galaxy™ hops

(2nd dry hop)
0.5 oz. (14 g) Mosaic® hops (2nd dry hop)
0.9 oz. (26 g) Strata® hops (3rd dry hop)
0.7 oz. (20 g) Citra® hops (3rd dry hop)
0.5 oz. (14 g) Galaxy™ hops (3rd dry hop)
0.6 oz. (17 g) Mosaic® hops (3rd dry hop)
Omega Yeast OYL091 (Hornindal Kveik), Imperial Yeast A46 (Bartleby), or White Labs WLP521 (Hornindal Kveik Ale)
³/₄ cups corn sugar (if priming)

STEP BY STEP

This is a single step infusion mash at 154 °F (68 °C) for 60 minutes. Vorlauf and sparge as usual to collect 6.5 gallons (24.6 L) of wort. Add the hops to the kettle during the sparge phase. Boil for 60 minutes. Add the flameout hops at the end of the boil. Create a whirlpool and let settle for 20 minutes. Then cool the wort to 175 °F (79 °C) and add the hopstand addition and whirlpool for 20 minutes before continuing to cool down to 80 °F (27 °C). Aerate, pitch yeast, and let temperature free rise to 100 °F (38 °C) during fermentation. The first dry hop additions should be added on day three of fermentation. The second dry hop addition should be added on day seven. The final dry hop addition should be added on day 10. Keep the beer on the hops for three more days then package as normal. Kegging is preferred.

JESTER KING & YAZOO BREWING CO.'S A PALE GREEN HORSE CLONE

(5 gallons/19 L, partial mash)
OG = 1.063 FG = 1.011
IBU = 68 SRM = 5 ABV = 6.7%

INGREDIENTS

4.4 lbs. (2 kg) extra light dried malt extract
1.5 lbs. (0.68 kg) 2-row pale malt
1.25 lbs. (0.57 kg) flaked oats
1.25 lbs. (0.57 kg) hard red wheat
0.66 lb. (300 g) oat groats (hulled,

unmalted oats)
5 oz. (113 g) dextrine malt
5 oz. (113 g) Munich malt (20 °L)
8.4 AAU Mosaic® hops (first wort hop) (0.7 oz./20 g at 12% alpha acids)
4.9 AAU Galaxy™ hops (first wort hop) (0.35 oz./10 g at 14% alpha acids)
10.8 AAU Citra® hops (0 min.) (0.9 oz./21 g at 12% alpha acids)
15.4 AAU Galaxy™ hops (0 min.) (1.1 oz./31 g at 14% alpha acids)
13.2 AAU Mosaic® hops (0 min.) (1.1 oz./31 g at 12% alpha acids)
0.7 oz. (20 g) Citra® hops (hopstand)
0.7 oz. (20 g) Galaxy™ hops (hopstand)
0.7 oz. (20 g) Mosaic® hops (hopstand)
0.7 oz. (20 g) Strata® hops (1st dry hop)
0.9 oz. (26 g) Citra® hops (1st dry hop)
0.7 oz. (20 g) Galaxy™ hops (1st dry hop)
0.25 oz. (7 g) Mosaic® hops (1st dry hop)
0.9 oz. (26 g) Strata® hops (2nd dry hop)
0.7 oz. (20 g) Citra® hops (2nd dry hop)
0.5 oz. (14 g) Galaxy™ hops (2nd dry hop)
0.5 oz. (14 g) Mosaic® hops (2nd dry hop)
0.9 oz. (26 g) Strata® hops (3rd dry hop)
0.7 oz. (20 g) Citra® hops (3rd dry hop)
0.5 oz. (14 g) Galaxy™ hops (3rd dry hop)
0.6 oz. (17 g) Mosaic® hops (3rd dry hop)
Omega Yeast OYL091 (Hornindal Kveik), Imperial Yeast A46 (Bartleby), or White Labs WLP521 (Hornindal Kveik Ale)
³/₄ cups corn sugar (if priming)

STEP BY STEP

Place all the crushed grains in a large grain bag. Heat 8 qts. (7.6 L) of water to 169 °F (76 °C) then submerge the grains into the water. Mix well and the mash should settle at 154 °F (68 °C). Try to maintain this temperature for 60 minutes. Remove the grain bag and rinse the grains with 8 qts. (7.6 L) of hot water. Top off the kettle to 6 gallons (23 L) then stir in the dried malt extract. Once all the extract is dissolved, add the first wort hops and bring wort up to a boil. Boil for 60 minutes.

Follow the remainder of the all-grain recipe instructions.

ter brewery President and Co-Founder Mark Bjornstad read about it online. The first beer they made with it was Whisper Scream, an IPA.

“We are obviously drawn to the cultural aspects of Norway and it resonates with a lot of the stuff we are doing and we felt a connection to it,” he said.

They approached the recipe in the same way they usually do. They envisioned an IPA in the 6–7% ABV range that would be hazy and aggressively dry hopped. “And just hoped that the yeast strain could do some fun modulation with the higher (fermentation) temperatures. It did, and the next time the brewers followed up with a double IPA named Hyper Scream.”

These are released under the Nordic IPA moniker and there is no hiding the giddiness in Bjornstad’s voice as he talks about what kveik does to the beers.

“It’s like the honey badger of yeast. It just wants to work and it annihilates anything in its way. It loves to be under-pitched and can handle anything. High gravity, weird sugars, it doesn’t matter. Stuff that would be toxic to other yeasts it just crushes it. It’s amazing.”

Drekker is currently working on a triple IPA version of the recipe with kveik. “We’re just in love with what it does to our IPAs,” he says, noting that Voss is the preferred strain for the brewery when using kveik. Otherwise it’s London Ale III for the IPAs.

For the Nordic IPAs, Drekker knocks out and pitches at 85 °F (29 °C) and lets the temperature free rise to 100 °F (38 °C), which is where they set the tank controls. It usually hits that after about six to eight hours and if they’ve timed it out right it plateaus itself at 100 °F (38 °C).

“It really doesn’t call for too much tank control,” Bjornstad said. “This is a great yeast for a brewery that wants to do an IPA but doesn’t have temperature control, to just let it go totally unrestrained.”

Dry hopping usually happens about 24 hours later, sometimes less. Double dry hopping can happen between 36 and 48 hours and on day four or five the beer is ready to be pushed

out of the fermenter.

“It’s a crazy turnaround,” Bjornstad said. “When you’re fermenting with Voss you’re getting these essential orange oil smells coming out of the fermenter. If we don’t do anything else it comes out finished with a nice oily orange zest character. Dry hopping gets rid of the orange but we get more of the tropical pineapple flavors from the hops.”

He says that Voss doesn’t do anything that overpowers or competes with hop character but rather “assists, changes, and elevates it.”

That is one of the reasons it is popular with brewers and why drinkers have been flocking to the beers made with it, even if they don’t necessarily realize it.

While Drekker lists all of their ingredients on their packaging, some other brewers are not necessarily highlighting their use of kveik, even as it is chiefly responsible for turning tanks around faster with finished beer.

Some cited the additional time it would take to talk about the yeast and what it does (in addition to teaching folks how to properly pronounce it) while others said that it is really only the hops (and how many pounds per barrel used) that customers were interested in knowing.

Still, when asked, most brewers are eager to engage about the yeast or talk about how they have put it into use.

“I think it might be the next wave in beer geek culture where people will be able to identify yeast strains like this, especially in hazies,” said Pappe.

Charles Porter, the Founder and Brewmaster at Little Beast Brewing in Portland, Oregon prides himself on making farmhouse beers and has been using kveik on some non-traditional recipes, including a dark ale that lets the yeast shine without too much roast present. For his hazy IPA he likes the Loki strain.

“It ferments quickly, it’s more sustainable. You don’t need glycol, you don’t need to control it as much, it has good viability. You can re-pitch it a bunch and it’s still really good. I like how clean it is and the clean hop profile it leaves in the beer. It’s what is going to save the world,” says Porter.

Expect it to be used in IPAs on a larger scale, but brewers are already looking to other styles of beer where kveik could be used, from English ales, to robust stouts, and even lagers (refer to “Tips from the Pros on page 18 for advice from two pros fermenting other styles with kveik strains).

“You can use it for just about anything,” says Porter.


SECURING AND USING KVEIK

Following the curiosity and online popularity of kveik, Jasper Akerboom, the Lab/QC Manager at Jasper Yeast in Sterling, Virginia saw a rise in the number of professional orders coming into the company. The anecdotal information he has received from brewers tends to have them falling into two buckets. The first are breweries that wanted to try it out of curiosity or even disbelief that a yeast could behave in the described manners, and after a batch (or a few) went back to their tried and true strains. The other group is the one that has gone “all-in” on kveik and is regularly ordering it and using it, typically for quick-turn-around IPAs.

Brewers that tend towards the experimental are likely getting the most out of the various kveik strains, Akerboom, says.

“It’s a tool (that is useful in the brewhouse) for people trying to push the envelope. It loves high temperatures, high alcohol, high gravity, and it just lends itself to more stressful situations in general. So, I think you’ll start to see people do bigger stouts with it because it really can perform incredibly well.”

For the homebrewers who are looking to use the yeast for the first time, Akerboom urges them to follow the lab instructions. He knows that it can seem odd to ferment in the 95–105 °F (35–41 °C) range, but that really is where the strains thrive.

“Fortunately, there is a lot of reading material out there, the Norwegian brewers were very open in sharing their information and what they’ve learned and it’s an excellent resource but after that it is really just about trying your own recipes and seeing what can develop.” 




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Heirloom *and* Alternative Grains

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Story and Photos
by Ryan Coker



The Industrial Revolution brought about a new era in manufacturing and technological improvements in food processing. Unfortunately, parallel to those advancements began the whitewashing of flavor from our cookbooks, family recipes, and geographical provenance. Grain was re-engineered to be drought-tolerant, bug-resistant, and more robust, sometimes even genetically modified to increase gluten content. These agronomic improvements resulted in fewer varieties of grains being planted and consumed, ultimately leaving us with a far simpler palate of flavor to explore through food and drink.

Enter the current renaissance of hyper-localism and “new” examples of *terroir* showing up in cities everywhere. Grains once lost to the handed down index cards from our past are finding their way back into farms, universities, and our food and drink. Not since the Belgian farmhouse brewers of Wallonia have we seen such a prolific use of heirloom grains in brewing, and now more than ever it’s easier to incorporate these grains in your brewing at home.



A representative picture of Amber Waves, an heirloom malt liquor brewed in collaboration between chef Sean Brock and Revelry Brewing Co. in Charleston, South Carolina. From bottom to top, Carolina Gold Rice, Jimmy Red Corn, rice hulls, Virginia Thoroughbred Barley, and Seashore Black Rye.

THE UNUSUAL SUSPECTS

The most accessible grains to most people are corn and rice, but when you don't stop at "garden variety" and you dig in, brewing grains begin to show in technicolor. Brewing corn no longer comes in just "yellow," there's Indigo Blue, Bloody Butcher, Mosaic, Jimmy Red, and the list goes on. The same applies to rice, ranging from China Black to Carolina Gold, each having its own unique flavor and extract attributes.

Moving on to the more obscure, many maltsters have begun malting "alternative" grains such as buckwheat, millet, oats, spelt, and rye. Known as a pseudo grain, buckwheat is technically a grass, but has the same potential to be malted for brewing purposes and is gluten-free to boot. Millet fits the same gluten-free bill and both of these grains can be toasted, roasted, or stewed to provide the same range of Maillard reaction and color that we've come to expect from our more traditional brewing grains.

With malt houses all over North America exploring these

heirloom grains, you should be able to leverage your local homebrew club, brewery, or homebrew shop to get your hands on some of these options; even better in this case because the grain comes to you already modified for conversion. Other options for incorporation into your brewing include sorghum, farro, rye varieties and more; the sky really is the limit!

SOURCING GRAIN IN YOUR BACKYARD

There are boundless options for the type and variety of grains you can incorporate, but geography may be the biggest limiting factor. The more access you have to farmers, bakers, universities, and food markets, the more diverse the options you can keep in your brew cupboard.

The easiest place to find raw grain to incorporate into your beer is your nearest grocery store, and depending on their specialty selections, the options will vary; pre-milled grits, steel cut oats, and varieties of rice will be the lion's share of what's available. While grocery stores may be your most direct access point, it's also likely to be the least diverse and ingredients may be over- or under-processed for ideal brewing applications; grains that lack uniformity or that are over- or under-milled or polished can create inconsistencies from batch-to-batch.

If you really want to explore your local *terroir*, take your search slightly off the beaten path. Speak with local farmers about what they're growing and where they're selling it. Going to the source allows you to cut off the supply chain and usually equates to cost savings; raw grain costs less than malted grain because of the diminished amount of labor applied to processing. Oftentimes, the byproduct from milling grain is best suited for cereal mashing and comes at little to no cost. I've been regularly using dent corn and rice middlins at Revelry Brewing Co. in Charleston, South Carolina, from our local mill, and the flavor impact has been undeniable in the resultant beers. Coincidentally, when corn is milled into grits, a portion of the bran (outer hull) is left behind and acts as a wonderful filter bed in the same way that rice hulls are used in conjunction with oats or other grains without a hull. Furthermore, these byproducts that aren't acceptable for sale as food (because it isn't particularly "pretty"), are mostly considered waste and often tossed or used as animal feed, so farmers/millers are generally eager to find an end user!

Another avenue to consider includes a visit to your local bakeries to see what access they have; baking-quality seed is usually of the utmost quality, having uniform shape and cleanliness, but price tends to mirror the quality. Additionally, bakers and chefs tend to dabble in the obscure when it comes to their self expressions and will often be the gate keeper to some of the more romantic grain options. I've used Seashore Black Rye and farro, an ancient wheat, from our local bakery to make some excellent beers.

Finally, reach out to any local colleges and universities, especially those that have an agricultural emphasis throughout their curriculum. Universities across North America are constantly performing research and have ac-

cess to heirloom seed banks and experimental varieties and are often excited to spread the knowledge of what they do.

OK, so you've gone explored these avenues and acquired some great grains. Now what?

THE INFAMOUS CEREAL MASH

Most brewers with some experience under their belts are at least familiar with the concept of a cereal mash . . . and avoid it like the plague. Admittedly, the task seems Herculean considering that you're about to facilitate the process of access to starch in lieu of a skilled maltster stepping in. That said, this step can be executed with intermediate skill and equipment and can add flavor, nuance, and a sense of place to all of your brews. Aside from the aforementioned, reasons to do a cereal mash also include an effort toward sustainability in areas with selective growing environments, potential cost reductions, making gluten-free/reduced beers, or simply wanting to make things hard on yourself (I kid, it really isn't that hard, please read on.)

"What is a cereal mash?" you ask. Simply put, we're charged with the task of hydrolyzing starch in order for amylase enzyme activity to occur. All grains (and some grasses; I'm looking at you buckwheat) require that starch goes through a gelatinization step before we access the potential of that grain in the form of extract. Cereal mashing is akin to decoction mashing in that the cereal mash is boiled and later used to heat the "rest mash;" this boiling process also helps soften the endosperm and allows enzymes from the rest mash to convert the newly accessible starch. Malting is the traditional pathway for providing access to starch for conversion, but in the case of the obscure, malting is inaccessible or quite cost prohibitive. Employing a cereal mash in your beers is analogous to discovering a hidden pantry in your kitchen that you never knew you had; instead of just the basic, widely available ingredients, you also have "spices" to add to your recipe!

Try These Grains

There are many heirloom grains that I'd recommend experimenting with in your homebrewing. Here are descriptions of some of my personal favorites, many of which should be easily accessible for readers.

Farro/Spelt – An ancient wheat that originated in the Fertile Crescent. Known for its savory, earthy nuttiness, with an underlying tangy acidity. Look for pearled or semi-pearled varieties at retail for easier access to starch, as the bran material is removed or diminished through this process. Use farro as a replacement grain for your standard brewer's wheat for a bit more of a rustic flavor.

Clemson Graham Oats – Clemson University's Public Service and Agriculture program rolled out this new variety of oat in 2012 and makes it available to growers, researchers, and end users by request. Recently, Epiphany Craft Malt (Durham, North Carolina) malted these oats to great brewing success. Reach out to your local universities to see if public programs like this exist near you. Look for a mostly neutral flavor profile with a slight minerality and fresh field flavors and, depending on kilning, a deep nuttiness and subtle sweetness.

Carolina Gold Rice (middlins) – Produced by Anson Mills and sold at retail online and in stores, this historical rice presents with a grassy overtone with slight floral undertones and is best used in lagers to help cut overall protein content while still adding a neutral fermentable sugar.

Jimmy/Bloody Butcher Red Corn – Originally designated for Bourbon mash production, these heirloom corn varieties can provide notes of cardamom and cinnamon along with honey-nut undertones. These varieties can be found in grocery stores packaged as grits, in a ready-to-mash form. If you'd like to forego a cereal mash, Riverbend Malt House (Asheville, North Carolina) recently added a malted Bloody Butcher to their offerings.

Indigo Blue Corn – Used mostly for popping corn, the blue varieties are known to have a much sweeter, more mellow flavor profile than most other corns used in cooking. This corn has proven very useful in hybrid styles like cream ales with its unique flavor and ability to thin out overall protein content for better clarity.

African White Sorghum – Sorghum is one of the largest cash crops grown in the Southern United States. It is available in grain or syrup form and can be used as a gluten-free alternative to other grains. Sorghum has a cashew-like flavor profile that evokes memories of Belgian waffle cones. Grain sorghum tends to carry more flavor through than the syrup version, which mostly provides a neutral sugar source.

Buckwheat – Technically a grass (like millet), buckwheat has a distinct flavor reminiscent of a fresh cut field, hay, and subtle earthy mushroom. This grain makes its way into a farmhouse-style brew seamlessly and also fits the gluten-free option. Epiphany Craft Malt also has a malted version of buckwheat available.

Millet – One of the world's oldest cultivated crops, millet is considered a low maintenance and drought-resistant annual grass. Colorado is responsible for 50% of the millet produced in the US, with surrounding states comprising the rest. Grouse Malt House (Wellington, Colorado) is a great resource for locating millet for brewing. Look for a slightly nutty flavor profile with a mild sweetness; millet can also be roasted or stewed to increase its depth of flavor through Maillard reactions.

Quinoa – Native to South America, but now considered an American household staple; quinoa comes in many varieties and with differing flavors. It is a ready substitute in any beer that otherwise calls for rice in the grain bill. Look for an earthy sweetness to this grain and explore the nuances of all the available options.



A cereal mash underway at a collaboration between Revelry Brewing and Leaven Brewing in Riverview, Florida, using Indigo Blue Corn in a cream ale recipe.

CEREAL MASH PROCESS

This is where the rubber meets the road. You're going to need some equipment, but it's all either already in your repertoire or easily commandeered. In the simplest of setups, a mesh bag and the largest pot in your kitchen will do. Start by doing a cursory search of the gelatinization temperature range of the grains you intend to use. For instance, corn and rice have different optimum gelatinization temperatures, although the ranges overlap. In our example, let's use rice, which gelatinizes between 131–174 °F (55–79 °C).

Now that you know your gelatinization temperature of the raw grain, choose a temperature somewhere in the middle of that range and calculate what the strike temperature of your brewing liquor (water) should be at a 4:1 water-to-grist ratio. There is no hard and fast rule with your brewing liquor ratio, but try to stay between 3:1 and 4:1 for best results, creating a proper viscosity.

Bring your pot of brewing liquor up to strike temperature, fill a mesh bag with your milled grain du jour and add it to the pot. If you're using a flame to heat the pot, try keeping the bag(s) of grain suspended in the pot to avoid scorching; I use clothespins or other comparable clips at the top of the kettle to achieve this when dealing with

homebrew-size cereal mashes (for bigger cereal mashes, we've used bar clamps, as pictured to the left). The pot needs to remain within the gelatinization temperature range for 15–30 minutes to achieve full hydrolysis of the starch granules.

While not absolutely necessary, especially if extract isn't your number one priority, there are a couple of options you can utilize in your cereal mash to hedge your bets for greater starch conversion. Malted barley contains alpha and beta amylase enzymes in a readily accessible format, due to the modifications undergone through the malting process; sprinkling in a small percentage (10%) of crushed barley in the cereal mash will assist with starch conversion.

Side Note: While another topic of exploration, if you're trying to make a gluten-free product, you'll have to forego the addition of crushed barley by adding exogenous enzymes in the form of amyloglucosidase to your cereal mash. Sold under the name Ultra-Ferm from White Labs, you can pick up a homebrew-sized amount and use it during the cereal mash to promote total hydrolysis of the starch; but there is a caveat, the enzyme is quickly denatured at temperatures higher than 160 °F (71 °C), which bleeds into the gelatinization temperature of certain cereal grains.

After your initial rest, you can begin to raise the temperature to boiling and hold it there for at least 30 minutes. Depending on your grain of choice, you may decide to cook it longer, but probably no more than an hour should be necessary. Of course, the longer you cook the grain, the more opportunity for Maillard reaction and grain texture to change things, for better or worse. During this phase of the cereal mash, I like to go ahead and get my brewing grains mashed in at the top end of dough-in temperatures, and the bottom end of protein rest temperatures, somewhere around 130 °F (54 °C), with a goal to time up the end of the cereal mash with the end of this rest, which should be about 15 minutes long.

Doing a bit of a step mash in this way has advantages of breaking down potentially problem-causing beta glucans that can contribute haze as well as creating a more stable sparging scenario. Furthermore, enzymes at these lower temperatures offer the ability to break down larger proteins that help reduce haze and provide stability to head and body. Once the cereal mash is completed, carefully add it to your other mash with the intention of bringing the temperature of the new mixture up to saccharification temperatures (140–158 °F/60–70 °C); if the addition doesn't quite get the temperature of the mixture to your desired saccharification rest, depending on your setup, you can heat it from there or add more hot brewing liquor to the mash if you wish, if not, proceed to vorlauf/lauter to the kettle.

That's it; you've done it! From here on out it's business as usual with your process. While the time and equipment requirements are increased, the potential to differentiate your product is astounding and should not be overlooked; there is grain everywhere if you know where to look.

ALTERNATIVE METHODS

There are other options for ways to use these alternative grains that do not require a cereal mash. For instance, you can always incorporate only the flavor and color of these wonderful grains through a cold steep — although this can have its own pitfalls with respect to quality and stability. When substantial amounts of unconverted starch makes its way through to the kettle/fermenter, hazes and other undesirable effects begin to occur. I'd recommend using cold steeping in moderation to avoid problems down the road.

Another less explored method of incorporating raw, heirloom grains in brewing is modification through koji fermentation. I should preface that taking this step is definitely moving into uncharted waters with a myriad of flavor potential, growing substrates, and varieties of koji to work with. Koji, *Aspergillus oryzae*, is the mold responsible for turning rice into sake and can be grown on almost all grains that are partially or fully cooked. As the mold grows on the substrate over approximately 48–72 hours, enzymes convert the starch into fermentable sugar.

Taking a page out of the *Noma Guide to Fermentation* by René Redzepi and David Zilber, consider building a fer-

mentation chamber to grow the koji; this can be a simple Styrofoam cooler or an elaborate cedar-lined traditional Japanese *muro*, depending on your skills and what you want to spend. The most important adherences in this process are with respect to temperature, humidity, and sanitation. Ideally, you'll keep your fermentation chamber at 86 °F (30 °C) and 75% humidity and make sure that it is well sanitized throughout before inoculating the grains with your koji.

After the chamber is built, simply steam your grain of choice, spread them out on a pan or tray and allow to cool to room temperature, then sprinkle with store-bought koji spores; a little goes a long way. After 24 hours in the chamber, with gloved/sanitized hands, rake and turn the koji, then allow another 24 hours prior to halting the process. Once finished, rinse the grain and it's ready for use! You'll notice based on the variety of koji that you use, that the flavor of the substrate has changed dramatically, and thus will likely carry on through to your beer in some respect; again, uncharted waters, but something worthy to explore.

There you have it, the world is your oyster and there's no grain that can elude your brewing at home if you're willing to put in the extra work!

AMERICAN-STYLE LAGER

(5 gallons/19 L, all-grain)

OG = 1.046 FG = 1.008

IBU = 15 SRM = 2–4 ABV = 4.9%



INGREDIENTS

7 lbs. (3.2 kg) 2-row pale malt

2.5 lbs. (1.1 kg) raw rice or corn

0.25 lb. (113 g) acidulated malt

12 AAU Mt. Hood hops (60 min.)

(2 oz./56 g at 6% alpha acids)

0.5 oz. (14 g) Mt. Hood hops (dry hop) (optional)

White Labs WLP080 (Cream Ale Yeast Blend) or a packet

each of SafAle S-04 and SafLager W-34/70 yeast

¾ cup corn sugar (if priming)

STEP BY STEP


Mill the 2-row malt and remove half a pound (0.23 kg) for use in the cereal mash process; set the rest aside for now. Crush the raw grain and add it plus the half pound (0.23 kg) of 2-row you set aside into a muslin or nylon mesh bag and secure the top.

Heat 1.25 gallons (5 L) of water (4:1 water-to-grist) in a large pot to the proper strike temperature for a 158 °F (70 °C) mash rest. Add the bag(s) of grain to the pot and rest at 158 °F (70 °C) for 15–30 minutes (this is also an opportunity to use White Labs Ultra-Ferm if you choose). It is important to make every effort to keep the grain off the bottom of the pot to avoid scorching. This can be achieved by suspending the bags with clips on the rim of the pot or good old-fashioned constant stirring.

After the initial rest, bring the pot up to boiling for no

less than 30 minutes. When the pot begins to boil, start your regular mash-in regimen with the remaining milled 2-row and acidulated malt in a separate pot at a 3:1 water-to-grist (approximately 3.5 gallons/13 L). Target an initial mash temperature around 130 °F (54 °C). As the cereal mash is done boiling, if you timed things up correctly, you are ready to raise the temperature of your larger mash to your desired saccharification temperature. Carefully add the boiled grain and liquid into your larger mash; add additional hot liquor or heat if necessary to raise the temperature to the desired temperature. From this point, vorlauf and sparge as you normally would.

Boil the wort for 60 minutes, adding hops at the beginning of the boil. Add kettle finings like Irish moss or Whirlfloc, if desired, with 15 minutes left in the boil. Chill wort to 50 °F (10 °C), aerate thoroughly, then pitch yeast. Ferment at 50 °F (10 °C) for ten days. On day ten, allow the temperature to rise for another 7 days until it reaches no higher than 62 °F (17 °C). At this point, rack the beer into another carboy and allow another 3 weeks at 45 °F (7 °C) before packaging. You may also add an optional dry hop during the transfer to secondary, but tread lightly so as to not conceal the grain's flavor.

An optional alternative approach to this or other similar recipes would substitute koji-fermented grain in for the raw grain and omit the cereal mash process. While brew day is made easier, the steps to produce the koji-fermented grains are meticulous, time-consuming, and require ample foresight. Also, be prepared for quite a different flavor profile if you choose this method, especially depending on your koji spore of choice; my favorite koji for brewing is any used in sake production. 

BYO NANO CON

San Diego, California
November 6 & 7, 2020

BIG IDEAS FOR SMALL-SCALE CRAFT BREWING

Sales & Marketing • Brewing Operations
Start-Ups • Business Operations

Save \$200 when you register by August 10 – space
is limited for this conference so don't wait to lock in
your spot and also save!

The landscape for small-scale breweries has radically changed. It is more important than ever to invest in better understanding the new brewing business landscape and how to best rebuild - or launch - your small brewery in this new reality. Join Nano Breweries (and Nanos in-planning) in San Diego for two days packed with over 30 timely seminars, workshops, and events geared just for you – the small-scale, taproom-focused commercial brewery.

Byo.com/NanoCon

Brought to you by

Brew
THE HOW-TO HOMEBREW BEER MAGAZINE
YOUR OWN

HIGHLIGHTS

San Diego, California • November 6 & 7, 2020

Brewing education has had to move online during the current pandemic. But nothing can really replace the experience of a live event where you can interact with fellow attendees, get your questions answered in person by speakers, and look over and touch brewing equipment and supplies from vendors. NanoCon will be a wonderful opportunity to again have a live and safe event that will benefit your small-scale brewing and business knowledge coming out of these very challenging times.

The landscape for small-scale breweries has radically changed in the last few months. It is more important than ever to invest in better understanding the new brewing business landscape and how to best rebuild - or launch - your small brewery in this new reality. As a result, don't miss this targeted conference for anyone running (or thinking about starting) a small-scale craft brewery. Learn the new business, marketing, and brewing strategies targeted for your sized needs. From strategies to safely building back tap-room sales to lessons learned from the necessities of to-go sales to more accurately managing cash flow during uncertain times, you'll learn invaluable and very timely strategies over two days from experts and Nano brewers. And please know your NanoCon registration is refundable so you can rest easy and sign up with no risk given the times we all now face.



30 BIG SEMINARS

Expert speakers will cover topics on brewing operations, sales and marketing, business operations, start-ups, and lots more to succeed in the new business landscape.

ROUNDTABLE DISCUSSIONS

Peer-to-peer learning bringing full audience discussions on variety of subjects so you can learn what is working – and what isn't – these days from others in the Nano Craft Beer segment.

TWO LUNCHES WITH KEYNOTE ADDRESSES

Learn during lunch with panel discussions on current Nano trends and lessons learned so far in 2020 with timely strategies on how to best succeed as a small-scale brewery.

NANO-FOCUSED VENDORS

Check out the latest in equipment, supplies, and ingredients from leading companies focused on your Nano market and your specific scale and needs.

OPENING & CLOSING SAN DIEGO CRAFT BEER RECEPTIONS

Wrap up your full day of learning with sampling some of San Diego's finest craft beers served by the breweries on the trade show floor.

OPTIONAL 2-DAY PRE-CONFERENCE START-UP BOOT CAMP

Spend two full days leading into NanoCon learning from Steve Parkes, Lead Instructor and Owner of the American Brewers Guild, about the keys to starting up a new craft brewery both on the business side as well as the brewery side. This popular class regularly sold out at our past events.

OPTIONAL 1-DAY PRE- CONFERENCE BOOT CAMPS

Spend an immersive full-day workshop just before NanoCon starts exploring one of the following key topics: Dr. Chris White and Kara Taylor on Yeast Lab Skills & Management for Nanos, Audra Gaiziunas on Brewery Financials, Ashton Lewis on Hands-On Nano Brewing Science, John Palmer on Brewing Water Adjustments, and Michael Tonsmeire on Sour Beer Techniques.

OPTIONAL PRE- AND POST-CONFERENCE SAN DIEGO CRAFT BREWERY TOURS

Here's your chance to easily check out San Diego's famed craft beer scene. We'll offer tours on both the day before and the day after NanoCon.

ONE-YEAR PRINT SUBSCRIPTION TO BREW YOUR OWN

Included with your NanoCon registration, a \$29.99 value. Features our regular Nano Brewing column.

NANO LEARNING TRACKS



BREWERY OPERATIONS

- Brewing Water Treatments
- Small-Scale Sour Brewing
- Brewing Techniques For Hot Styles
- Reusing Yeast Best Practices
- Equipment TLC: Regular Maintenance & Upkeep
- Maintaining & Troubleshooting Your Taproom Draught System
- Understanding & Using Biotransformation
- Nano Peer-to-Peer Table Topics

BUSINESS OPERATIONS

- How to Properly Price Your Beers
- Contract Brewing & Alternating Proprietorships
- Keys to Better Brewery Financial Forecasting
- Top 5 Legal Mistakes to Avoid As A Brewery
- The Financials Behind Packaging Decisions
- Brewery Insurance Claims Case Studies: Lessons Learned
- What Every Brewery Needs to Know About Trademarks
- Nano Peer-to-Peer Table Topics

SALES & MARKETING

- 10 Ways To Boost Taproom Sales
- Keys to Successful Brewery Branding
- Develop a Better Brewery Marketing Plan
- 11 Ways To Sell More Brewery Swag
- Keys to Training Taproom Staff
- Create A Month's Worth of Brewery Social Media Posts In 1 Day
- Events To Increase Taproom Business
- Nano Peer-to-Peer Table Topics

START-UPS

- Balancing Being Owner & Head Brewer
- Financing Options For Your Nano Launch
- Legal Checklist For Your Brewery Launch
- Planning Your Taproom Draught System
- Setting Up Commercial Accounts for Ingredients, Equipment & More
- 5 Ways to Reduce Brewery Risk
- Create a "Go To Market" Brewery Strategy
- Nano Peer-to-Peer Table Topics



PRE-CONFERENCE NANO BOOT CAMPS

- Starting Up A Commercial Brewery (2-day class, Nov. 4 & 5)
- Hands-On Nano Brewing Science (1-day class, Nov. 4)
- Brewing Water Adjustments (1-day class, Nov. 4)
- Yeast Lab Skills & Management for the Nano Brewery (1-day class, Nov. 5)
- Brewery Financials (1-day class, Nov. 5)
- Sour Beer Techniques (1-day class, Nov. 5)

PRE- AND POST-CONFERENCE CRAFT BREWERY TOURS

- San Diego Craft Breweries

COME EARLY OR STAY LATE: PRE- AND POST-NANOCON ACTIVITIES



**WEDNESDAY, NOVEMBER 4 &
THURSDAY, NOVEMBER 5**
**STARTING UP YOUR OWN
COMMERCIAL BREWERY BOOT CAMP**
10 a.m. – 5 p.m. both days
With Steve Parkes (\$450 for NanoCon attendees, \$525 for non-attendees)
Over Wednesday & Thursday you'll walk

through the steps, planning decisions, and keys you need to know on both the brewing and management sides to successfully open a commercial craft brewery with the Lead Instructor and Owner of the American Brewers Guild Steve Parkes, who has trained hundreds of professional brewers. Learn from Steve's decades of expertise and wide range of experience to help you better achieve your goals. Over two full days you'll be guided through all the various elements you'll have to know for the next big step toward starting a craft brewery. This two-day workshop is the perfect lead-in to the main NanoCon event if you already have a brewery in planning or are just starting to consider the possibility of opening one up yourself.



WEDNESDAY, NOVEMBER 4
HANDS-ON NANO BREWING SCIENCE
10 a.m. – 5 p.m.
With Ashton Lewis (\$225 for NanoCon attendees, \$275 for non-attendees)
Get hands-on with pH meters, slants and loops, stir plates, centrifuges, and other brewing science gear with professional brewer and BYO Technical Editor Ashton Lewis. Ashton

will walk you through what your Nano brewery should have in terms of scientific testing equipment and how to best use this gear to improve quality control over your beer. You'll have the chance to understand how to not only use and care for the equipment properly, but also how to use the results to boost the consistency and quality of your brewery's beer. This workshop will focus only on those pieces of equipment suitable – and affordable – for a small-scale Nano craft brewery.



WEDNESDAY, NOVEMBER 4
BREWING WATER ADJUSTMENTS
10 a.m. – 5 p.m.
With John Palmer (\$225 for NanoCon attendees, \$275 for non-attendees)
Water is a critical brewing ingredient and yet is one of the least understood. John Palmer, who wrote the definitive book on the subject, *Water: A Comprehensive Guide for Brewers*, will

take the mystery out of your approach to handling water in your brewery. You'll learn not only the chemistry, but also the tests you should be taking and the adjustments to make resulting in better beer. You'll leave with the practical how-to aspects of getting the most out of your brewery's water with the goal of brewing the best beer possible no matter the style.



THURSDAY, NOVEMBER 5
BREWERY FINANCIALS
10 a.m.- 5 p.m.
With Audra Gaiziunas (\$225 for NanoCon attendees, \$275 for non-attendees)
You'll start the day by gaining an understanding of the importance of finance and accounting in craft beer and learn the top

financial mistakes craft breweries make (and how to avoid them).

You'll then be introduced to the basics of the brewery balance sheet, income statement, and cash flow statements to understand how they all tie together for your brewery business. You'll also learn basic ratio analysis to better communicate with bankers and investors. Brewery cost accounting will be covered including beer recipe costing and overhead allocation. Plus during this full-day workshop budgeting, inventory management, and standard operating procedures you should have in place will be discussed. You'll leave this workshop armed with the tools and confidence to better understand and manage your Nano brewery's financial needs.

THURSDAY, NOVEMBER 5
**YEAST LAB SKILLS & MANAGEMENT
FOR THE NANO BREWERY**
10 a.m.- 5 p.m.
With Dr. Chris White and Kara Taylor (\$225 for NanoCon attendees, \$275 for non-attendees)
Join Dr. Chris White and Kara Taylor of



White Labs on how to master different yeast-related techniques for your Nano brewery. This full-day workshop will cover culture selection and explore preparing yeast for pitching, what to expect when re-pitching, working with multiple cultures, and how to troubleshoot fermentation issues related to poor yeast-handling practices. Plus you'll learn hands-on yeast lab skills including counting cells, using slants, harvesting yeast, washing and reusing yeast, streaking plates, calculating growth rates, and much more.

THURSDAY, NOVEMBER 5
SOUR BEER TECHNIQUES
10 a.m.- 5 p.m.
With Michael Tonsmeire (\$225 for NanoCon attendees, \$275 for non-attendees)
Learn hands-on traditional European as well as newer American methods to produce sour and funky beers from



Michael Tonsmeire, who literally wrote the book on the subject with *American Sour Beers*. Michael will demonstrate the unique skill set needed to create delicious sour beers at your brewery including wort production, growing alternative microbes, blending, aging on fruit, and sanitation. The focus will be on practical topics difficult to convey by words alone, so no biology or chemistry degree required. You'll leave with a clear understanding of the processes to reliably produce sour beers suited to your customers' palates in your desired time frame.

**THURSDAY, NOVEMBER 5 AND
SUNDAY, NOVEMBER 8**
SAN DIEGO CRAFT BREWERY TOURS
(\$125)

Thursday, November 5
Noon to 4 pm
5 pm to 9 pm
Sunday, November 8
11 am to 3 pm

This four-hour tour includes round-trip transportation from our NanoCon hotel, the Crowne Plaza, while tasting and visiting four different breweries in the greater San Diego area. Beer and a meal is included as you explore a variety of different craft breweries in the thriving San Diego craft beer scene.



DAY 1 • FRIDAY, NOVEMBER 6, 2020 | 9:30 – 10:30AM

MAINTAINING & TROUBLESHOOTING YOUR TAPROOM DRAUGHT SYSTEM BREWERY OPERATIONS

You work hard to produce great beer in your brewery. Shouldn't you work just as hard to be confident that beer makes it from keg to glass in great shape? Making sure your draught system is operating properly should be a priority when running a taproom. Learn what regular maintenance you should be doing so your draught system does the beer you brewed justice as well as how to avoid and fix common problems that can pop up with taproom draught set-ups. Michael Peacock, a draught system consultant and instructor, will teach you what you need to know so you can take better care of your draught beer back home at your brewery.

MICHAEL PEACOCK
FOUNDER, TAPCRAFT
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM

HOW TO PROPERLY PRICE YOUR BEERS BUSINESS OPERATIONS

Many breweries don't carefully track the costs of their individual beers they brew each batch and as a result often end up incorrectly pricing their beers on assumptions rather than numbers. Some beers cost more to produce thanks to ingredients or other aspects like barrel aging. The price of each beer has to reflect these realities so your profit margins are in line with your costs which in the end will result in a healthier business. Coronado Brewing CFO Kate Zittere handles these same pricing decisions every day with her job and she'll share the lessons she has learned with you on more accurately pricing your beers.

KATE ZITTERE
CHIEF FINANCIAL OFFICER, CORONADO BREWING CO.
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM

FINANCING OPTIONS FOR YOUR NANO LAUNCH START-UPS

You've got your great idea and even a business plan, but how are you going to pay for the equipment, location, and materials to get your brewery up and running? Brewery financial expert Audra Gaiziunas is very familiar with the broad range of financing your brewery dream – from friends and family to banks and everything in between. She'll run down the different options along with the pros and cons of each so you can better weigh how you work to raise money and how those decisions might impact your future business.

AUDRA GAIZIUNAS
OWNER, BREWED FOR HER LEDGER, LLC

10 WAYS TO BOOST TAPROOM SALES SALES & MARKETING

Join Andrew Coplon, the Founder of Secret Hopper, to learn how the little things can make a big difference in your tasting room. Merely suggesting a second beer? A 16 percent increase in that tab. How about handing a guest a physical menu? An impressive 35-percent increase in the average check versus those without. Encouraging a



to-go purchase? Nearly 50-percent of those guests asked will make the added purchase. This educational session will discuss these strategies and 7 more ways to boost taproom sales and create even more memorable experiences.

ANDREW COPLON
FOUNDER, SECRET HOPPER

9:30 –
10:30AM



COFFEE BREAK & EXHIBITS

NANO EXHIBITS

Grab a coffee and check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing's top vendors.

10:30 –
11:00AM

CONTRACT BREWING & ALTERNATING PROPRIETORSHIPS

BUSINESS OPERATIONS

Many Nano breweries are happy to stay put with their existing brewing system, but see opportunities to sell their beer well beyond their taprooms. Besides expanding your own physical brewery, there are several options to consider that other small craft breweries are using to increase their brewing volumes while not investing in a larger brewhouse. One avenue is contract brewing your recipes with a larger brewery that has existing capacity. The other is an alternating proprietorship so that you share the resources of a larger brewhouse with other craft brewers. The Craft Beer Attorney Candace Moon will walk you through how contract brewing and alternating proprietorship are set up as well as the pros and cons of each so that you can carefully consider your options as you look to cost-effectively expand your reach.

CANDACE L. MOON
THE CRAFT BEER ATTORNEY, APC
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM

11:00AM – 12:00PM



CREATE A MONTH'S WORTH OF BREWERY SOCIAL MEDIA POSTS IN 1 WORK DAY

SALES & MARKETING

Social media marketing should be a vital part of your marketing plan for your brewery, but it can be overwhelming, stressful, and time consuming. Julie Rhodes, owner of Not Your Hobby Marketing Solutions, a business consultant for the craft beer industry, will lead this track on how to plan, create, schedule, and post a month's worth of social media content for your brewery in just one regular work day. Learn how to take your social media marketing efforts to the next level, all while saving time and effort in creating content to promote your beer brand.

JULIE RHODES
OWNER, NOT YOUR HOBBY MARKETING SOLUTIONS



5 WAYS TO REDUCE BREWERY RISK

START-UPS

Starting a business is an exciting process, but it can be a little scary. You can now be liable for new risks you face as brewery owners and operators . . . which can be financially devastating. This seminar examines risks we face as an operator and owner, and gives you 5 practical, "take-home-and-use" ways to reduce the chance of incidents that can stop us before we even get started. These tips from Robin Campbell, who specializes in brewery-specific insurance, will help you understand risk as your business grows, and enables you to make smarter decisions as it relates to insurance products and services.

ROBIN CAMPBELL
RISK MANAGER, CEDARBREW INSURANCE





11:00AM –
12:00PM

SMALL-SCALE SOUR BEER BREWING BREWERY OPERATIONS

Understand how to produce sour and funky beers for your small brewery from a fellow craft brewer and author of the book *American Sour Beers*, Michael Tonsmeire. You'll cover wort production, growing alternative microbes, blending, aging on fruit, and of course, sanitation. The goal is that you'll leave with better knowledge to produce your own sour beers suited to the taste profile you want and the time frame you need as a business.

MICHAEL TONSMEIRE
AUTHOR, *AMERICAN SOUR BEERS*
CO-FOUNDER, SAPWOOD CELLARS



12:00 – 1:45 PM

LUNCH & NANO TRENDS ROUNDTABLE GROUP SESSION | NANO EXHIBITS

Listen and learn after you enjoy lunch as a range of craft beer industry veterans discuss COVID-related trends specific to the Nano segment from both the business as well as beer side. Nano exhibitors will also be available over lunch to visit.



2:00 – 3:00 PM

KEYS TO SUCCESSFUL BREWERY BRANDING SALES & MARKETING

You make great beer, but many Nanos forget that they also need to keep building a brand around their beer. Have you emphasized the right back story to tell and is that story and personality reinforced through design and all marketing materials? Plus does your marketing voice work with or against other efforts? Craft beverage branding expert Todd Colburn will help you identify how you can be most successful with your branding efforts at your brewery.

TODD COLBURN
FOUNDER AND CEO, HIGHER GRAVITY BRAND ADVOCATES



BALANCING BEING OWNER & HEAD BREWER START-UPS

Juggling all the various duties of being a small business owner is always challenging, but when one of those responsibilities is also brewing beer in addition to running a business your workday gets pretty complex. Doing everything as well as it needs to get done takes some careful planning and organization so key items don't fall through the cracks in the brewery or at your desk. Steve Parkes who wears both the Brewmaster and Business Owner hats at his Drop-In Brewing as well as running the American Brewers Guild will help you make better decisions on how best to divide your time and duties so things go smoothly.

STEVE PARKES
BREWMASTER & OWNER, DROP-IN BREWING COMPANY
OWNER & LEAD INSTRUCTOR, AMERICAN BREWERS GUILD

KEYS TO BETTER BREWERY FINANCIAL FORECASTING BUSINESS OPERATIONS

If your business projections and forecasted budgets are not as accurate as they should be they won't do you or your brewery much good. Building your financial projections on a firm foundation will help you better anticipate the future money needs of your brewery and help you run it more strategically. The brewery business is highly specialized with unique accounting needs for this industry. Brewery CFO Kate Zittere will help you understand how to create more accurate projections for your business and what you should include in your forecasts.

KATE ZITTERE
CHIEF FINANCIAL OFFICER, CORONADO BREWING CO.
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM

BREWING WATER TREATMENTS

BREWERY OPERATIONS

Water is the least understood ingredient when making great beer. John Palmer, who literally wrote the book on the subject, will help take the mystery out of water's role in brewing and how to make better beer as a result. You'll learn how to adjust your brewing water, understand water reports, and other vital skills any pro brewer needs to know. You'll leave with not only an understanding of the chemistry concepts, but also the practical how-to aspects of getting the most from this brewing ingredient.

JOHN PALMER

CO-AUTHOR, *WATER – A COMPREHENSIVE GUIDE FOR BREWERS*
PUBLICATIONS DIRECTOR, MASTER BREWERS ASSOCIATION OF THE AMERICAS

2:00 – 3:00PM



SAN DIEGO NANO BEER BREAK & EXHIBITS

NANO EXHIBITS

Sample some local Nano craft beer from the San Diego area as you check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing's top vendors.

3:00 – 3:45PM



WHAT EVERY BREWERY NEEDS TO KNOW ABOUT TRADEMARKS

BUSINESS OPERATIONS

With the sheer number of breweries now in business and all those beers being brewed the chances are greater than ever your naming ideas are going to overlap with another brewery. We've all read in social media the legal dust-ups that can take place complete with cease-and-desist letters and other impacts. Being in the brewery business, you need to know the basics about trademarks to protect your business from others copying you or you accidentally copying others. The Craft Beer Attorney Candace Moon will bring you up to speed so you can better understand and work through this increasing legal dynamic in the craft beer world.

CANDACE L. MOON

THE CRAFT BEER ATTORNEY, APC
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM

4:00 – 5:00PM



SETTING UP COMMERCIAL ACCOUNTS FOR INGREDIENTS, EQUIPMENT & MORE START-UPS

One area of change for homebrewers launching a commercial brewery is working for the first time directly with companies that sell their brewing ingredients and supplies instead of just purchasing the same items from a local or online retailer. And there is definitely more of a learning curve involved than you would think. You'll learn from a long-time pro brewer and now ingredients sales representative about the best ways to start off what will be an important business relationship for the success of your new Nano.

ASHTON LEWIS

SALES REPRESENTATIVE, BSG CRAFT BREWING
TECHNICAL EDITOR, *BREW YOUR OWN* MAGAZINE

REUSING YEAST BEST PRACTICES

BREWERY OPERATIONS

Reusing your healthy yeast can be one of your tools to a healthier fermentation as well as keeping costs down. Learn the various techniques you need to know including assessing yeast viability, yeast washing, storage, knowing when to start over with a fresh strain, and other skills from Kara Taylor of White Labs. She'll walk you through the best practices for small craft breweries to get the most out of your yeast again, and again, and again.

KARA TAYLOR

SENIOR LABORATORY MANAGER, WHITE LABS





4:00 – 5:00 PM

KEYS TO TRAINING TAPROOM STAFF SALES & MARKETING

Your taproom staff is the frontline of interacting with your end customers. They can easily help or hurt beer sales based on how well they interact with visitors. And ultimately they are a reflection of your brewery and will influence the enjoyment of your beer being served. Learn the best practices for training your taproom staff and how to make them more knowledgeable about your brewery's beers they are being asked to sell to your customers. A server or bartender more knowledgeable about your beer will translate to a better customer experience, which then translates to more sales. Learn from front-of-the-house taproom veteran Dave Adams how to make sure your staff maximizes the opportunity to turn a first-time visitor into a longtime customer with the right training.

DAVE ADAMS

VICE PRESIDENT OF HOSPITALITY, GREEN FLASH BREWING
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM



5:00 – 6:30 PM

SAN DIEGO CRAFT BEER OPENING RECEPTION NANO EXHIBITS

We've invited some of our favorite San Diego craft breweries to join us to pour samples of their beer for you as a fun way to wrap up your first full day of NanoCon. You'll have the chance to talk with attendees, brewers, and visit with our exhibitors before you head out on the town to check out the incredible local brewery and taproom scene in San Diego for the evening.



DAY 2 • SATURDAY, NOVEMBER 7, 2020 | 9:30 – 10:30 AM

LEGAL CHECKLIST FOR YOUR BREWERY LAUNCH START-UPS

Undertaking any entrepreneurial endeavor can be a daunting task. It can get very complicated when doing so in a highly regulated environment, such as the one that governs the manufacture, distribution, and sale of beer. And while every founding team will inevitably make some mistakes, Craft Brewery Lawyer Matthew McLaughlin will walk you through a legal checklist of steps to take before opening your brewery's doors in order to give your brewery the highest chance of success.

MATTHEW MCLAUGHLIN
FOUNDER, MCLAUGHLIN, PC



EQUIPMENT TLC: REGULAR MAINTENANCE & UPKEEP BREWERY OPERATIONS

You've already made the big investment in your brewhouse and fermenters and are using this equipment to brew great beer. But you really need to regularly maintain your brewing equipment for the sake of your beer quality and also the sake of your dollar investment. Learn what regular maintenance you need to be doing – and how often – to take care of your valuable equipment with John Blichmann, who designs and manufactures small-scale craft brewing equipment.

JOHN BLICHMANN
PRESIDENT, BLICHMANN ENGINEERING

EVENTS TO INCREASE TAPROOM BUSINESS SALES & MARKETING

Events in your taproom are a great way to bring old and new customers into your business to buy more of your beer. Learn about the variety of different events you can put into place to boost beer sales and build your customer base. From one-time events like beer releases to reoccurring public events to private events, there is a lot of opportunity and plenty to consider as you look at your taproom calendar and weigh your options. Andrew Coplon works with breweries to improve their taproom

experience so he's had a front row seat to the financial impact of different types of events for a brewery business.

ANDREW COPLON
FOUNDER, SECRET HOPPER

BREWERY INSURANCE CLAIMS CASE STUDIES: LESSONS LEARNED BUSINESS OPERATIONS

Wondering what could possibly happen to sabotage your brewery business? Thinking you are too small to worry about claims and lawsuits? Think again! Robin Campbell of CedarBrew Insurance will give you real-life claims examples — stuff she's handled from her smallest to largest brewery accounts. She's not just going to scare you — she'll provide practical solutions-driven responses to manage these risks before they become claims. Learn the difference between prevention and mitigation, both important tools for your management of risk at your brewery business as you grow.

ROBIN CAMPBELL
RISK MANAGER, CEDARBREW INSURANCE

NANO EXHIBITS & COFFEE BREAK NANO EXHIBITS

Refuel with a cup of coffee and check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing's top vendors.

NANO TABLE TALKS GROUP SESSION

Peer-to-peer learning from your fellow Nano industry people at its best. We'll have dozens of tables each assigned a different topic of interest to Nano Breweries spanning brewing, sales, business, and start-ups. For 30 minutes you will trade advice and tips with the other people at your table on that specific topic. Then you'll switch tables to another subject of interest to you. So you'll have the chance to gain knowledge on two different specific subjects you want to explore (and maybe make some new friends and contacts along the way!)

LUNCH & COVID-19 BREWERY STRATEGY PANEL GROUP SESSION NANO EXHIBITS

2020 changed everything including the way Nano Breweries operate and sell beer from their taprooms. We'll have an expert panel discuss lessons learned from the experience and best practices for success moving forward. Nano exhibits will also be open for you to explore during the lunch session.

UNDERSTANDING & USING BIOTRANSFORMATION BREWERY OPERATIONS

Hop biotransformation by yeast is the hot brewing science topic of the moment. Certain yeast strains can transform different hops high in geraniol such as Mosaic® and Citra® to result in boosted hoppy citrus and floral flavors. Other biotransformation of organic acids to esters will enhance beer flavors as well. Simply put, hops can never reach their full potential in your beers without the biotransformations provided by yeast. Lallemand's Brittany Berg will break down the science for you so you can leave with a better understanding of hop biotransformation by yeast and how that knowledge might help you brew better beer.

BRITTANY BERG
TECHNICAL SALES MANAGER, LALLEMAND

9:30 – 10:30AM



10:30 – 11:00AM



11:00AM – 12:00PM



12:00 – 1:45PM



2:00 – 3:00PM



2:00 – 3:00 PM

THE FINANCIALS BEHIND PACKAGING DECISIONS BUSINESS OPERATIONS

Kegs, Cans, Growlers, Crowlers, Bottles – there are plenty of packaging options for you to consider as a brewery business. Each packaging option comes with its own lists of pros and cons. But each option also comes with its own financials based on costs and other factors. Learn how to navigate through the financial details behind your packaging decisions so you can best run your brewery business with a better understanding thanks to brewery financial expert Audra Gaiziunas.

AUDRA GAIZIUNAS
OWNER, BREWED FOR HER LEDGER, LLC



DEVELOP A BETTER BREWERY MARKETING PLAN SALES & MARKETING

Working in a small brewery is a busy business with a lot of “To-Do” lists. If you don’t have a marketing plan in place opportunities for more sales and revenue can fall through the cracks easily. You need to organize your promotions, social media, events, and beer release strategies all in one place and organize efforts to maximize the sales impact to your bottom line. Laurie Delk will cover what you need to consider and include in your brewery’s marketing plan to help your business succeed.

LAURIE DELK
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM



CREATE A “GO TO MARKET” STRATEGY FOR YOUR BREWERY START-UPS

Ever-increasing competition in the craft beer space is a challenge that all of us face, but you can give yourself a competitive advantage before you even open your brewery doors in the form of a business plan called a “go to market” strategy. Your go to market strategy for your brand includes how you plan to promote, price, sell and distribute your beer – it gives you a clear vision of how you will grow your unique brand. Learn what components you need in your “go to market” strategy, step-by-step instructions on how to create your strategy, and how to execute those steps from Julie Rhodes, business consultant for the craft beer industry and owner of Not Your Hobby Marketing Solutions. Just like building a recipe for a beer, you need a clear outline of the ingredients, and the same goes for the business side of your brewing organization, so by the end of this track, you will have all the ingredients you need to build a solid launch plan for your craft brand.

JULIE RHODES
OWNER, NOT YOUR HOBBY MARKETING SOLUTIONS



3:00 – 3:45 PM

SAN DIEGO NANO BEER BREAK & EXHIBITS NANO EXHIBITS

We’ve invited a new group of local Nano Breweries from San Diego to pour samples and visit with as you check out the latest in Nano-sized equipment, gear, ingredients, and supplies from dozens of craft brewing’s top vendors.

4:00 – 5:00 PM

11 WAYS TO SELL MORE BREWERY SWAG SALES & MARKETING

Craft beer today is arguably just as much about branding as it is producing a high-quality product. Because of this, your brewery should aim to remain in your guests’ minds long after they take the last sip. This can be done via social media, mailing lists, and even encouraging your customers to proudly leave with a collection of bottles, cans, crowlers, and growlers. But don’t forget the merch. Join Andrew Co-

plon of Secret Hopper for 11 tips that can ultimately make a big difference in increasing your overall merchandise sales and help create an army of walking brand advocates.

ANDREW COPLON
FOUNDER, SECRET HOPPER

BREWING TECHNIQUES FOR HOT STYLES BREWERY OPERATIONS

Just because a new beer style is popular doesn't mean there shouldn't be careful brewing techniques and approaches to making it the best it can be for your thirsty customers. From hazy IPAs to kettle sours, there are best-selling styles customers love, but these styles are quickly evolving so there isn't a solid foundation of known brewing traditions with techniques. Ashton Lewis will give you the straight-forward how-to technical brewing tips to tackle the newer beer styles attracting customer attention and dollars.

ASHTON LEWIS
SALES REPRESENTATIVE, BSG CRAFT BREWING
TECHNICAL EDITOR, *BREW YOUR OWN* MAGAZINE

PLANNING YOUR TAPROOM DRAUGHT SYSTEM START-UPS

The heart of a taproom is its draught system delivering the beer you've carefully brewed to customers' pint glasses. But multi-tap systems need to be carefully thought through and planned to save you headaches and money down the line. It's also about protecting your beer so that it is served in the best possible condition translating to happier customers and repeat sales. Michael Peacock helps breweries design their taproom draught systems so he's the perfect speaker to give you insights on the host of details you need to consider.

MICHAEL PEACOCK
FOUNDER, TAPCRAFT
INSTRUCTOR, SAN DIEGO STATE UNIVERSITY BUSINESS OF CRAFT BEER PROGRAM

TOP 5 LEGAL MISTAKES TO AVOID AS A BREWERY BUSINESS OPERATIONS

From regulatory compliance to managing human capital, legal risk is present in every brewery every single day. And while your time is better served developing innovative beer recipes and brewing the highest quality beer, Craft Brewery Lawyer Matthew McLaughlin will provide you examples of the five greatest legal risks facing breweries and discuss strategies and best practices you can implement to mitigate that risk.

MATTHEW MCLAUGHLIN
FOUNDER, MCLAUGHLIN, PC

SAN DIEGO CRAFT BEER CLOSING RECEPTION NANO EXHIBITS

We've invited some more of our favorite craft breweries from San Diego to join us to pour samples of their beer for you as a fun way to wrap up NanoCon. You'll have this final chance to talk with attendees, speakers, local brewers, and visit with our exhibitors before you head out to explore San Diego's breweries and craft beer taprooms Saturday night.

4:00 – 5:00PM



5:00 – 6:30PM



As an attendee, you'll have the opportunity to check out the latest Nano-sized brewing equipment, products, supplies & services from leading craft brewery vendors Friday & Saturday in the Grand Hanalei Ballroom.

Thanks to our **BYO NANO CAN** Sponsors!



GREAT CONFERENCE HOTEL IN THE CRAFT BEER HOTBED OF SAN DIEGO!

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The 2020 NanoCon is being held at the San Diego Crowne Plaza. San Diego County is an international leader in the craft beer world with 150+ local breweries to discover. You not only have the chance to learn strategies to be more successful at your own brewery all day at the conference, but we've set up the schedule so you can also explore on your own this incredible local craft beer scene at night. The hotel and NanoCon will be following all recommended safety guidelines so you can focus on the learning and not the worrying.

San Diego Crowne Plaza
2270 Hotel Circle North
San Diego, California 92108

Airport: San Diego International Airport (SAN) is only 5 miles from the hotel.

Telephone Reservations: (619) 297-1101

Mention group name "NanoCon2020" to receive a special discounted rate.

Web Reservations:

byo.com/nanocon

Group Discounted Room Rate:

\$115 per night for a room with either one king bed or two queen beds.



Hotel Information: We have reserved a limited number of rooms at a special discounted rate for attendees. Contact the hotel directly for your room reservations. When making your reservations make sure to say you are attending the "NanoCon 2020" to receive the special discounted group rate for your room. Rooms are available on a first-come, first-served basis. The special discounted rate will be available until the conference group block of rooms is sold out (which it did the last two years), so reserve your room right after registering for the conference.

**Please make sure you have already successfully registered for the conference before making your hotel room reservations or any other travel plans.*

SCHEDULE AT-A-GLANCE



Pre-Conference NanoCon Boot Camps • Wednesday, November 4, 2020

10:00 AM – 5:00 PM	Starting Up a Commercial Craft Brewery Boot Camp (Day 1)
10:00 AM – 5:00 PM	Hands-On Nano Brewing Science Boot Camp
10:00 AM – 5:00 PM	Brewing Water Adjustments Boot Camp

Pre-Conference NanoCon Boot Camps & Brewery Tours • Thursday, November 5, 2020

10:00 AM – 5:00 PM	Starting Up a Commercial Craft Brewery Boot Camp (Day 2)
10:00 AM – 5:00 PM	Brewery Financials Boot Camp
10:00 AM – 5:00 PM	Yeast Lab Skills & Management for Nano Brewery Boot Camp
10:00 AM – 5:00 PM	Sour Beer Techniques Boot Camp
12:00 – 4:00 PM	San Diego Craft Brewery Tours
5:00 – 9:00 PM	San Diego Craft Brewery Tours

NanoCon Day #1 • Friday, November 6, 2020

8:00 – 9:00 AM	REGISTRATION			
9:00 – 9:15 AM	WELCOME & INTRODUCTION			
9:30 – 10:30 AM	Maintaining & Troubleshooting Your Taproom Draught System	How To Properly Price Your Beers	Financing Options For Your Nano Launch	10 Ways To Boost Taproom Sales
10:30 – 11:00 AM	COFFEE BREAK & NANO EXHIBITS			
11:00 AM – 12:00 PM	Contract Brewing & Alternating Proprietorships	Create A Month's Worth Of Brewery Social Media Posts In 1 Work Day	5 Ways To Reduce Brewery Risk	Small-Scale Sour Beer Brewing
12:00 – 1:45 PM	LUNCH & NANO TRENDS ROUNDTABLE			
2:00 – 3:00 PM	Keys To Successful Brewery Branding	Balancing Being Owner & Head Brewer	Keys To Better Brewery Financial Forecasting	Brewing Water Treatments
3:00 – 3:45 PM	SAN DIEGO NANO BEER BREAK & NANO EXHIBITS			
4:00 – 5:00 PM	What Every Brewery Needs To Know About Trademarks	Setting Up Commercial Accounts For Ingredients, Equipment & More	Reusing Yeast Best Practices	Keys to Training Taproom Staff
5:00 – 6:30 PM	SAN DIEGO CRAFT BEER OPENING RECEPTION			

NanoCon Day #2 • Saturday, November 7, 2020

9:30 – 10:30 AM	Legal Checklist For Your Brewery Launch	Equipment TLC: Regular Maintenance & Upkeep	Events To Increase Taproom Business	Brewery Insurance Claims Case Studies: Lessons Learned
10:30 – 11:00 AM	COFFEE BREAK & NANO EXHIBITS			
11:00 AM – 12:00 PM	NANO TABLE TALKS			
12:00 – 1:45 PM	LUNCH & COVID-19 BREWERY STRATEGY PANEL			
2:00 – 3:00 PM	Understanding & Using Biotransformation	The Financials Behind Packaging Decisions	Develop A Better Brewery Marketing Plan	Create A "Go To Market" Strategy For Your Brewery
3:00 – 3:45 PM	SAN DIEGO NANO BEER BREAK & NANO EXHIBITS			
4:00 – 5:00 PM	11 Ways To Sell More Brewery Swag	Brewing Techniques For Hot Styles	Planning Your Taproom Draught System	Top 5 Legal Mistakes To Avoid As A Brewery
5:00 – 6:30 PM	SAN DIEGO CRAFT BEER CLOSING RECEPTION			

Post-Conference NanoCon Brewery Tours • Sunday, November 8, 2020

11:00 AM – 3:00 PM	San Diego Craft Brewery Tours
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**San Diego, California
November 6 & 7, 2020
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NanoCon Attendees \$450/ Boot Camp Only \$525
- 1-Day Hands-On Nano Brewing Science Boot Camp (Nov. 4)
NanoCon Attendees \$225/Boot Camp Only \$275
- 1-Day Brewing Water Adjustments Boot Camp (Nov. 4)
NanoCon Attendees \$225/Boot Camp Only \$275
- 1-Day Brewery Financials Boot Camp (Nov. 5)
NanoCon Attendees \$225/Boot Camp Only \$275
- 1-Day Yeast Lab & Management Boot Camp (Nov. 5)
NanoCon Attendees \$225/Boot Camp Only \$275
- 1-Day Sour Beer Techniques Boot Camp (Nov. 5)
NanoCon Attendees \$225/Boot Camp Only \$275

PRE- & POST-NANOCON CRAFT BREWERY TOURS *Open to attendees and their guests

- Thursday, November 4, Noon – 4 PM San Diego Breweries \$125
- Thursday, November 4, 5 – 9 PM San Diego Breweries \$125
- Sunday, November 8, 11:00 AM – 3:00 PM San Diego Breweries \$125

Discounted hotel rooms need to be reserved directly with San Diego Crowne Plaza For details: byo.com/nanocon

4 WAYS to REGISTER

WEB PAGE:
BYO.COM/NANOCON

MAIL THIS FORM WITH PAYMENT TO:
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5515 MAIN STREET
MANCHESTER CENTER, VT 05255

PHONE:
802-362-3981 EXT. 106

FAX THIS FORM TO:
802-362-2377

» PLEASE NOTE A SEPARATE REGISTRATION FORM IS REQUIRED FOR EACH NANOCON ATTENDEE »

YOUR NANOCON REGISTRATION INCLUDES:

- » Admission to the conference's full two-day schedule of seminars
 - » Two Lunches with Program
 - » Nano Exhibits Admission
 - » Admission to Opening and Closing Craft Beer Receptions
 - » NanoCon Welcome Bag
 - » One Year (8 issues) Print Subscription/Renewal to *Brew Your Own Magazine*
- (Your discounted hotel room needs to be reserved directly with the San Diego Crowne Plaza, go to byo.com/nanocon.)*

PAYMENT METHOD

Check Enclosed (payable to BYO magazine)
 Credit Card Visa MasterCard AMEX

Card # _____ 3-Digit CCV# _____ Exp. Date _____
 Name on card: _____
 Signature: _____

By registering for the conference, I give permission for the free use of my name and photo in any media account of this event. I also certify that I am 21 years of age or older. Cancellation policy: During these uncertain times, please rest easy knowing you can receive a full refund by sending us written notice right up until October 1, 2020. Refund requests received after October 1, 2020 will be honored, minus a \$100 fee. In the case the event has to be cancelled, full refunds to attendees will be made available. Early Bird Discount registration must be received and paid for in full by August 10, 2020.



RECORD KEEPING

Become a homebrewing bookie

There's an old saying that goes "To get where you're going, it helps to know where you've been." OK, maybe that's not really an old saying, but Denny says it and he's old, so that's close enough. No matter what, keeping good records of your brewing is a great way to get a leg up on your next batch. After all, if something great happened, you want to be able to recreate it. If something terrible happened (hey, it happens to us, too . . . sometimes more than we're willing to admit) then you want to be sure it never happens again! There are multiple ways of documenting your brew sessions, so let's look at them so you can decide what works best for you.

And as Adam Savage, the hero to many scientifically minded, says, "Remember kids, the only difference between science and screwing around is writing it down."

WHAT TO TRACK

What you should track depends on what you want to know. Denny's theory has always been to track everything he can think of, because it's gonna be the one thing you don't write down that will turn out to be crucial to a future brew! Even though he uses software to create recipes, he keeps notes in a series of spiral notebooks. He's up to 11 of them now! His note taking has evolved over the years, but here's where it is today:

Each page starts with the brew number, the name, batch size, and date. Then he transcribes the recipe from the software to the notebook. Hard drive crashes have shown him that redundancy is a good thing. He lists the brand and amount of each ingredient in the recipe. If he's feeling particularly picky, he'll even list the colors of the malts and other fermentables. Next come the

hops: Variety, form (pellet or whole), the alpha acids (AA) and the time of the addition . . . boil time, whirlpool with temperature, and dry hops. Following that is the yeast for the recipe. He specifies if a starter was made and what the size of the starter was. He lists the date on the yeast pack. If he's using a slurry, he lists the batch number it came from and what generation the yeast was. Finally, things like water treatments (including water source), finings, and nutrients are listed. Some may call him meticulous in this regard.

The next section lists the temperature of the grain before mash in. This can be very important especially for outdoor brewers. Knowing the temperature of the grain allows you to make a decent guess at adjusting your strike liquor to account for the grain temperature. Most software will let you enter this information and calculate the strike temperature for you, but oftentimes you need to make further adjustments. For instance, if you look back at your notes and discover that the grains for your mash are 20 °F (11 °C) colder this time than the last time you brewed, you will want to heat your water 2 °F (1 °C) hotter than last time. A good brewing calculator, such as BeerSmith, can perform these calculations for you if you don't want to go through the process of obtaining grain's and water's specific heat capacity and then calculating temperature change using your water-to-grain ratios. Or, with good notes, you can figure these types of calculations out on your own.

Next comes strike water amount and temperature. The amount is listed both as the total amount and qts./lb. (this can obviously be in L/kg as well, which is the same ratio as weight of water to grains). For instance, something

What you should track depends on what you want to know.

Baltic Porter

Baltic Porter (12 C)

Type: All Grain
 Batch Size: 5.00 gal
 Boil Size: 9.5 gal
 Boil Time: 90 min
 End of Boil Vol: 9.10 gal
 Final Boiling Vol: 7.60 gal
 Fermentation: Ale, Two Stage
 Taste Notes:

Date: 27 Jan 2016
 Brewer:
 Assist Brewer:
 Equipment: Pot and Cooler (5 Gall/19 L) - All Grain
 Efficiency: 82.00 %
 Est Mash Efficiency: 89.7 %
 Taste Rating: 90.0

Ingredients

amt	name	Type	#	h4BU
6 lbs	Marisch Malt - 10L (110.0 SRM)	Grain	1	311.2 %
3 lbs	Pilsner (2 Row) (6.0 SRM)	Grain	2	26.0 %
3 lbs	Biscuit Malt (23.0 SRM)	Grain	3	18.6 %
3 lbs	Pilsner (2 Row) (6.0 SRM)	Grain	4	15.9 %
1 lb 4.0 oz	Chocolate Rye Malt (260.0 SRM)	Grain	5	6.8 %
8.0 oz	Caramel Rye Malt - 60L (100.0 SRM)	Grain	6	2.8 %
8.0 oz	Caramel Crystal Malt - 720L (120.0 SRM)	Grain	7	2.8 %
0.75 oz	Apollo (117.00 %) - 60L 60.0 min	Hop	8	24.7 IBUs

Gravity, Alcohol Content and Color

Est Original Gravity: 1.071 SG
 Est Final Gravity: 1.016 SG
 Estimated Alcohol by Vol: 7.2 %
 Bitterness: 24.7 IBUs
 Est Color: 25.5 SRM

Measured Original Gravity: 1.073 SG
 Measured Final Gravity: 1.022 SG
 Actual Alcohol by Vol: 6.7 %
 Colorize: 251.5 kcal/12oz

Mash Profile

Mash Name: Single Infusion, Light Body, No Mash Out
 Mash In: 168.0 F
 Sparge Water: 6.45 gal
 Sparge Temperature: 168.0 F
 Adjust Temp for Equipment: TRUE

Total Grain Weight: 19 lbs 4.0 oz
 Grain Temperature: 72.0 F
 Tun Temperature: 72.0 F
 Mash PH: 5.20

Mash Steps

Name	Description	Step Temperature	Step Time
Mash In	Add 24.06 qt of water at 163.2 F	150.0 F	75 min

Sparge: Fly sparge with 6.45 gal water at 168.0 F

Mash Notes: Simple single infusion mash for use with most modern well modified grains (about 95% of the time).

Carbonation and Storage

Carbonation Type: Bottle
 Pressure/Weight: 5.97 oz
 Key/Bottling Temperature: 70.0 F
 Fermentation: Ale, Two Stage

Volume of CO2: 2.3
 Carbonation Used: Bottle with 5.97 oz Corn Sugar
 Age for: 30.00 days
 Storage Temperature: 65.0 F

Notes

Created with Beer

There is no right or wrong way to keep a brewing journal – the important part is that if you want to improve your beers, you need multiple data points from your brewing process to learn from them.

like “heat 5.25 gallons (1.4 qts./lb.) to 165 °F to hit 153 °F” (equivalent to “heat 20 L [2.9 L/kg] to 74 °C to hit 67 °C”). Because Denny usually batch sparges in a cooler system, he also keeps track of the volume and specific gravity of his first runoff. Knowing those allows him to figure his conversion efficiency. Knowing your conversion efficiency can be a real

The next information is the boil time, along with any notes about things that maybe didn’t go to plan . . . a boil over, forgotten hop addition . . . hey, it happens to all of us. The final section lists time of pitching, volume into fermenter, temperature of the wort at pitching, OG, and efficiency. You should also record the temperature you have your fermentation set

“ **These days software is the most popular way to track your brewing. You can start by using software to design your recipe.** ”

help in tracking down efficiency issues. For more information about conversion efficiency, see http://www.braukaiser.com/wiki/index.php?title=Troubleshooting_Brewhouse_Efficiency#-Determining_Conversion_Efficiency.

After that he lists the sparge amount and temperature. Once the mash is completed, he writes down the total wort volume pre-boil and specific gravity. Knowing those lets him calculate his mash efficiency. It also allows him to make adjustments to the beer’s final gravity. For instance, let’s say he collects 7 gal. (26.5 L) of sweet wort with a gravity of 1.040. That’s a total of 280 gravity points (total gallons multiplied by the specific gravity points). Since he shoots for a final post-boil volume of 5.5 gal. (21 L), that would give him a post-boil original gravity (OG) of about 1.050–51. If that was below the OG he wanted, he could add more fermentables to the boil to hit his intended OG.

to or ambient temperature of the room that the fermenter is stored in.

As fermentation progresses, you’ll want to record any fermentation temperature swings and gravity readings you take and tasting notes when you drink the gravity samples. What, you don’t do that? You should! Finally, once fermentation is finished, take notes on how things went and your general impressions of both the brewing and tasting of the beer. Especially the tasting. It’s valuable to record not only your first impression of the flavor, but to revisit your notes as the beer ages and jot down how it changes over time. The purpose of all this nit picky stuff is to be able to analyze if your batch went as planned and if not to locate where you went off course so you can adjust on your next brew.

While Denny does all this in a spiral notebook, Drew is a bit more . . . let’s say “structured.” He’s designed and published a brewing notebook you can use.

Ok, so this is where I step in – Hi everyone, it’s Drew! Cheers and thank you. Denny’s right, I did create a whole book that was dedicated to logging your brews. I’m also a big fan of the idea of how much simple “expert” checklists can keep mistakes at bay. (There have been a number of studies that show that even rock star surgeons can benefit from a simple checklist to ensure everything’s been started correctly. It’s one of the biggest things the aerospace industry has gotten right that should be drilled into everyone. Turns out that people are process dumb!)

I’m less worried about the individual details and saving them everywhere. (I am a little jealous of Denny’s notebook collection, but then I’d be worried about providing evidence in any prosecution!) I want to know that I’ve hit all the major steps and things seem on track. I’ll note any major deviations on the brew day (e.g. gravity changes, hopping changes, ingredient swaps, timing issues, etc.). All of those will get logged after the brew day is done, kettles are cleaned and beers are drunk – OK, that might mean things are getting logged the next day. After all, we’re not professional brewers – profits aren’t on the line – if you’re on the commercial side, keep your information written down!

TRACKING USING SOFTWARE

These days software is the most popular way to track your brewing. You can start by using software to design your recipe. That’s the most obvious use. But almost all the recipe soft-

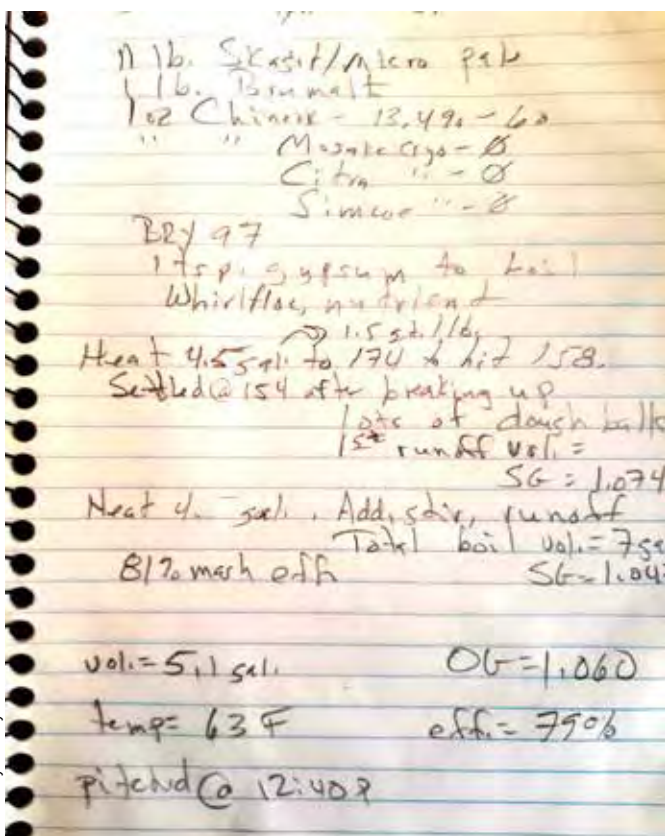


Photo by Denny Conn

A glimpse into the world of Denny . . . one of the hundreds of batches of beer found in Denny’s library of brew journals.

TECHNIQUES

ware around does more than just help you create a recipe. It can track your inventory or help you with water adjustments. But software can also let you take notes on how your brew session goes, which can be valuable information for your next brew.

Denny has been using Promash for so many years that he knows it inside out. While the user interface (UI) is dated and it may not have a couple of the functions of newer software, it does what he needs to get done. This is the good thing about beer math – a lot of it is stable and unchanging. Promash is no longer available so most brewers have moved on to other software like BeerSmith, Brewer's Friend, or one of the other programs out there.


Drew is one of those brewers. He uses either BeerSmith or Brewer's Friend to track his brewing. Actually, Drew's problem now is that he's used so many software programs that who knows where any particular recipe lies! (This is also why it's important to internalize your recipe design philosophy.) Why? Drew's a computer guy and a toy guy – so new software means a new toy! Plus it's interesting to see different UIs and thought patterns.

No matter the software UI design, they all pretty much do the same thing, which is why Denny can still use Promash to do his beer calculations. The key for tracking your brews is to lean into the brew session functionality. Choose your recipe, open a new session, and just like Denny, keep your notes in there. With today's new tools for temperature control and

gravity measurements, there's even the ability to incorporate your tracking data into the sessions. You can do this all in real time or do what Drew does – print out the recipe and session information, take notes, and input those later. (This saves your computer from meeting water/wort in a spectacular fashion.)

And because of Drew's long years in the information technology (IT) world – there's another cardinal rule of brewing software – back your stuff up. Throw it on a floppy disk (remember those?), CD, a spare drive, or the cloud. Make two backups – one onsite and one offsite. This is a lesson hard learned. That my friends is why one of the most important functions in a piece of software is an export function. Even something as simple as "Save as Text" – can save your bacon.

All of those files – including the brew session files – get uploaded to the cloud automatically. There is nothing like knowing that stuff gets backed up and Drew will never lose another recipe – like his Summer Bloody Summer Citrus Red Ale that's been lost to the ages!

No matter what kind of records you decide to keep or how you decide to keep them, the point is that knowledge is power. Start tracking more than just your recipe when you brew. Start with what you think you need, then add what you find out you need that you didn't know you needed until you needed it! Next time you set out to brew, you'll have data at your fingertips that can help you turn out the best beer you can brew. 



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WET HOPPING

How to maximize fresh hop use

The first time I went to the hop harvest in Yakima, Washington I was able to go into an operating hop kiln. In a hop kiln a machine lays fresh hop cones onto a large burlap-lined floor about 18–36 in. (16–91 cm) thick, 20 ft. (6.1 m) wide, and 20 ft. (6.1 m) long and then hot air from a large gas-fired blower blows up through the burlap-lined floor until the hops are about 8% moisture. The burlap is then moved so the hops can be conveyed to the hop bailer. The most striking part of the hop kiln, other than the sheer volume of hops it contained, was the amazing aromas being driven off by the drying process. I was there with about 30 other brewers and we all commented on how we wanted that flavor in our beers and not dried off. This started a quest in my mind about how to retain these amazing flavors and aromas.

Hops are dried because otherwise mold will quickly take foot on the cones. While some of the oils that are driven off in the kilns are absolutely amazing, others, like the onion/garlic-causing thiols, are considered an off-flavor in beer. Any program of working with wet hops needs to focus on the extraction of these desired oils and their related flavor and aroma impacts while minimizing the off-flavors. This is our goal today.

When Vinnie Cilurzo acquired the Russian River Brewery from Korbelt Champagne Cellars he was bequeathed all of the hop rhizomes that were being grown by Korbelt. Russian River's new home would be in downtown Santa Rosa, California and there was no room for a hop field. So Vinnie asked Brian Hunt, owner of Moonlight Brewing, if he could plant them on Brian's brewery property. Brian had the only registered

abbey brewery in California and needed to have an agricultural use to allow the brewery to operate in the middle of wineries. It was a perfect match. They shared the hops and many of the responsibilities of cultivating and harvesting them. Each year they would brew wet hop beer with their own hops. While Sierra Nevada Brewing Co. had been brewing wet-hopped beers for about a decade at that point, this was the first wet hop beer I had ever tried and I knew I would need their help if I was going to succeed in this adventure.

Brian graciously agreed to share some of the recipe formulation concepts with me as well as allow me to taste a half dozen batches he had done that year (2006). I made an appointment to go to the brewery, a place very few people got to visit, and excitedly got in my car to go. I should mention, Brian had taught me to brew about nine years earlier and we spoke every week while he made deliveries. When I arrived he called to tell me he decided to go on deliveries early but the brewery was unlocked and to pull samples from Tanks 3, 4, and 7 and call him back. I pulled the samples in pint glasses and took them out to the loading dock. I used one empty keg as a table and another as a chair and gave him a call. He walked me through each recipe and what he tasted and what he would do different. Then he sent me in for three more samples from different tanks. This went on for a few hours, the whole time he was dropping kegs at bars in San Francisco, when he finally had me pull a sample from a keg that had clearly been in the cellar for a long time. This beer was a wet hop beer that was one year old and it was a great example of a beer past its prime.

Any program of working with wet hops needs to focus on the extraction of these desired oils and their related flavor and aroma impacts while minimizing the off flavors



Using wet hops in your beer is fun and rewarding. But if you're harvesting your own hops, we highly recommend trying to get a team together for harvest and brew day. It's more enjoyable when you have friends and/or family helping out.

This education and tasting was an amazing head start on the road to making a nice wet-hop beer. Much of the information I am sharing is from Brian and Vinnie and the rest is what I learned after ten seasons of brewing wet-hop beers.

The first problem is how to acquire wet hops. I did not have room to grow hops but many homebrewers do grow them. If you are lucky enough to grow them or be in a club with someone who grows enough to share — that would be your best source. You will have to work with the varieties available, as it will be limited. Also, the window for harvest is very narrow so you will only have a few days a year you can acquire each variety. I needed 100 lbs. (45 kg) for my recipes and I had to organize a grower to stand in the middle of a very automated process of shaking off the cones from the bines and sending them to the kiln and convince him to box them and overnight them to me. In the beginning this was a challenge but as the popularity of wet-hop beers were on the rise back then, it became easier and large hop dealers started providing the service. Usually I would get 30-days notice of an expected harvest date and a list of varieties to choose from. Then, 48 hours before delivery, I was given the right of refusal in case I didn't have an empty fermenter.

Once I knew the hops were coming and the variety I was receiving, I had to devise a recipe to make the best use of them. For me, these were simple pale ales or West Coast IPAs, using the character of Maris Otter as a base malt to build off of. Building grain bills was something I was quite familiar and comfortable with — working with the wet hops on the other hand was a new concept. The first problem was: I had no idea what the alpha acid percentage was in the hops. The lab work would not be complete before my brew was already in the fermenter so I had to make an educated guess. I used the middle of the hop average as published by Hop Union as my guideline. If you grow your own hops, you may want to consider testing the alpha acid % one year on your hops. A test costs roughly \$60 (USD) and several companies, such as White Labs, offer the test to the public.

The next problem was accounting for the water weight of the un-dried hops. A dried hop is normally about 8% water. I had to measure the water in my hops so I could get an idea of how many to use. A simple solution to do that is bake them at a low temperature in the oven to dry them to a paper consistency. But before I could do that, I needed to come up with a recipe using standard dried hops. I can then convert the recipe to wet hops once I get the % water found in the wet hops. So let's say I got the call that Centennial hops were on course for my brewery. The following is a favorite recipe of mine scaled to 5 gallons (19 L) for this exercise:

Wet Your Whistle (pellet-hop version)

IBU = ~70 SRM = ~6 ABV = ~6.3%

Water (for mash and sparge):

- Reverse osmosis (RO) water
- 0.5 g/gal. gypsum
- 0.1 g/gal. CaCl₂
- 0.1 g/gal. baking soda
- 5 mL/gal. 10% phosphoric acid

Grist:

- 10 lbs. (4.5 kg) Crisp Maris Otter malt
- 1 lb. (0.45 kg) Weyermann Vienna malt
- 1 lb. (0.45 kg) Castle Château Cara Ruby malt

Target mash pH 5.4 measured at room temperature

Hop Schedule:

- 2 oz. (57 g) Centennial hops (60 min.)
- 2 oz. (57 g) Centennial hops (5 min.)
- 2 oz. (57 g) Centennial hops (0 min.)
- 1 oz. (28 g) Centennial hops (hop back)
- 2 oz. (57 g) Centennial hops (dry hop for 3 days)

This was an easy recipe that fit the mold in my mind as a perfect balance between hops and grains for a wet-hop brew day. Just for fun, you may even want to brew your base recipe so you can compare the two — maybe brew it a couple weeks before to have on hand. But back to the story . . . on wet-hop day the first thing I did was lay out newspaper on the brewhouse floor and open all the boxes and dump out all the hops. This let me look for leaves and twigs as well as find some of the brown cones and mix the hops together so I could get a good sample. I would then take exactly 100 grams and put them in the oven at 140 °F (60 °C) for 30 minutes and re-weigh them. I would get a number like 17 grams. (Your number is likely to be between 15 and 30 grams depending on harvest and transportation conditions.)

So let's run with this. My 100 grams of wet hops was 17 grams of hops and 83 grams of water, which means it is 17% hop material and 83% moisture. Of course you don't need to use 100 grams but it does make the math just that much easier.

Weight in recipe	=	Weight required in wet hops
Dried hops water content – 8%		My hops water content – 83%

If we rearrange this a little we get wet-hop equivalent for 4 out of our recipe's 5 hop additions = $(0.83 \times 2 \text{ oz.}) / 0.08 = 20.75 \text{ oz. (588 g)}$ of wet hops for each of those additions. The hop back was required in my brewery to prevent clogging. You could either drop this addition if you don't have a hop back or can simply add the 10 oz. (280 g) either as a hopstand addition or the dry hop addition. This calculation is performed for each addition and we get our new hop schedule (note that I rounded down):

Wet Your Whistle (wet hop schedule)

- 20 oz. (570 g) Centennial wet hops (60 min.)
- 20 oz. (570 g) Centennial wet hops (5 min.)
- 20 oz. (570 g) Centennial wet hops (0 min.)
- 10 oz. (280 g) Centennial wet hops (hop back)
- 20 oz. (570 g) Centennial wet hops (dry hop for 3 days)


Now that we know how to weigh our hops we can start the brew. The first thing you will notice is there is a lot more

vegetal matter in the kettle and you may have to change the way you deal with hops by using a bag or changing how you rack out of the boil kettle. The next thing you have to cope with is storing the hops till you are ready for a dry hop addition. Wet/dry hopping sounds odd but it is the best descriptor for the process. After trying many things, including dry hopping with a variety that is harvested later and shipped later I found that freezing wet hops does a great job of preserving them for a few weeks. It is not the perfect solution but it works well enough.

When you get to the dry hop process, just like when working with whole-leaf hops, the hops will float on the surface of the beer and you need to find a way to get them wet. In a professional brewing situation, I set up a pump-over system and would splash the beer (in a CO₂ environment) for a few days. I have also put all of the wet hops in a keg with a sock gasket and pushed the finished beer through it for a few days; like a larger version of a Randall. This method had a problem with clogging. There are a couple good small-batch (homebrew) approaches. First, if you own Corny kegs and a CO₂ regulation system, putting the hops in a CO₂-purged keg and inverting the keg every time you walk by for a few days is one solution. Getting the beer off the hops could be a challenge if you simply let the wet hops float though. Another idea would be to bag the hops and place a weight in the bag (such as glass marbles or stainless steel washers . . . something that is easy to

clean and sanitize) then tie it off. The bagged hops can be added to a keg or the fermenter, but be sure to attach an anchor chain outside of the fermenter, like a long strand of unscented floss, in order to rescue the hops from the beer when complete. Take note though, pulling this much hops through a Corny keg top opening can get messy. I recommend placing the keg in a pan of some sort if you are pulling inside your house to catch the beer that might trickle out from the sides of the bag.

I can't stress how important it is to not leave the beer in contact with the hops for too long. A strong flavor that the drying process removes from hops is the flavor of fresh cut grass. Prolonged contact will continue to extract more and more of this flavor. Yes, you will get some of that character and that is part of the wet-hop experience, but the idea is to stay on the side of freshly mowed lawn and not towards decomposing pile of grass. For a small batch, the easiest method to separate the hops from the beer is to bag them with weights.

I like the flavor of wet-hop beers served clear so I always used finings in the final transfer. Then I carbonate as normal. These beers are very fragile and ethereal – much like the hazy IPAs, they are best consumed fresh. It's fun to experience those flavors and aromas that get pushed out of the hop cones during the typical drying process. If you haven't already tried this, I implore you to give it a try. If brewed correctly they are like hop candy. 

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KEG POLISHER

Give your kegs a shine

Next came the tricky part, how to keep the keg firmly solidly attached since wood lathes are made for wood, not stainless kegs.

So the first question that may be asked is “Why?” For me it came after I successfully built an effective keg washer and had nice clean kegs on the inside but that were scuffed, scratched, dented, and oxidized on the outside. And not that it’s necessarily an issue but we all know, a scratched and oxidized stainless surface is harder, if not impossible, to sanitize. Not that the outsides need to be sanitized ... but it surely can’t hurt and they certainly look nicer.

So I began thinking of how I could efficiently recondition the outside of my Corny kegs. It started with my 2-roller rock polisher. It was too small, too slow, and provided no way to keep the keg in place. And then I thought about using a wood lathe but all I could think about was knocking my teeth out if the keg spun off the lathe. But the lathe seemed to be my best bet ... so I started off with thinking about rotational speed (RPMs). I wanted slower, maybe about 500 RPM, so I hit the obvious places like Facebook Marketplace and Craigslist – where lo and behold, I found a 1994 vintage Craftsman wood lathe, ½ horsepower, 12-in. (30-cm) max diameter, variable speed that could accommodate up to a 36-in. (0.91-m) length of wood. Unfortunately it’s slowest rotation was 875 RPM but it looked as though it could work and the price was right at only \$75. I’m not a wood lathe expert but I knew I had to make some modifications.

Next came the tricky part, how to keep the keg firmly attached since wood lathes are made for wood, not stainless kegs. The solution I came up with was to get a ¾-in. (19-mm) thick, 9-in. (23-cm) pine circle from a hobby store. But I needed something to attach to the wood circle that would accomplish two things, center the keg to hold down wobble and keep the keg secure on the lathe. I needed a bowl-like piece with

slightly slanted sides and about 8 in. (20 cm) in diameter across the bottom. I finally found it at a Tractor Supply store – a stainless steel dog food bowl.

I bought two dog food bowls (I renamed Keg Centering Cups), one for each end of the keg, both mounted on a wood circle. What I quickly discovered was that there is absolutely no standard or consistency to the rubber end on Corny or Firestone kegs, there is a pretty wide variance. Also, my 3-gallon (11-L) kegs have NO rubber top, only a single handle and I had no way to securely attach them to the lathe. I was getting a substantial wobble, some worse than others and I kept thinking about my teeth, I needed a better way. In looking through my stuff, I found a Corny lid that had a pressure relief dead center of the lid. I removed the pressure relief and now have a perfect center point on that end of the keg. Success!

I’ll probably never have to re-polish my own kegs in my lifetime, we are just not as abusive to them as their commercial life was. That’s why I’ve offered up the machine’s use to members in my homebrew club, and this project to you.

Tools and Materials

- Wood lathe (I found a ½-HP, 12-in./30-cm lathe)
- Lathe faceplate (I purchased a 4-in./10-cm size)
- 9-in. (23-cm) pine circle (Michaels)
- Spot Puppy Litter Feeding Pan, SKU: 240845899 (Tractor Supply Company)
- MT1 Live Center Tailpiece
- Several grades of polishing abrasives and liquid Bar Keepers Friend
- Small length of ½-in. (2.5 cm) silicone tubing
- ⅝-in. (16-mm) leg cup floor protectors



Photos by Mark Rames

STEP BY STEP

1. THE LATHE

I have the lathe clamped onto my table saw as a temporary work surface. When not in use, it can stand on-end out of the way somewhere. As can be seen, the slowest rotation is 875 RPM. I'd prefer more like 500 RPM for one simple reason, I feel like at slower speeds, the abrasives would be less likely to "skip over" some dents.



2. RETRO FIT THE FACEPLATE (KEG CENTERING CUPS)

My lathe has a $\frac{3}{4}$ -in. spindle and 16 threads per inch (TPI) so what I bought is a Craftsman 4-in. faceplate (OEM 718926), $\frac{3}{4}$ in. x 16 TPI (metal plate seen in picture 2a). For what it's worth, I wish I had purchased the 6-in. faceplate instead. I found wood circles at Michaels hobby store. I mounted the dog bowl upside down to the $\frac{3}{4}$ -in. (19-mm) thick circles (seen in picture 2b). The slanted sides help to center the kegs but, some kegs are slightly too small and will not self-center. In these cases, I've cut little 2-in. (5-cm) lengths of $\frac{1}{2}$ -in. inner diameter silicone tubing, slit it lengthwise and place on kegs bottoms to bridge the space.



3. TAILPIECE AND LID

My lathe came with a fixed tailpiece center point, which means it does not turn. I purchased a Live Center tailpiece, which has ball bearings and spins with the keg (seen in picture 3a). MT1 indicates the size and angle taper of the shaft.

Finding the proper lid may be the biggest challenge to this build, a lid with the pressure relief dead centered on the lid (seen in picture 3b). I just happened to get one on a keg I bought and it had a very small relief valve compared to normal lids and I accidentally lost the washer down the drain so it was useless, until I found it was the magic I needed to make this all work. It's a common placement on racetrack style lids. After a bit of looking, these are available online, many are the plastic lids, which I wouldn't recommend for safety reasons. I think they are old Firestone keg lids. Your best bet may be to ask your brew buddies if they have one to trade for a normal lid. As you can kind of see, I've placed a small o-ring in the hole so it's not metal-on-metal contact. Once placed on the keg, it ensures as smooth of a rotation as I can expect.



4. PREPARE FOR THE CLEANING

As I mentioned before, to ensure the kegs are as centered as humanly possible, given that all kegs are slightly different, I use bits of silicone tubing on the bottom of every keg (seen in picture 4b). They really do make the keg more secure with less wobble. Space them evenly on the bottom of the keg. I also slip little $\frac{3}{8}$ -in. (16-mm) leg-cup floor protectors over the keg's gas and liquid posts (seen in picture 4a) just to keep them clean during the cleaning and polishing. Slide the tail pieces with the live center into lid orifice and tighten down the tail piece lathe-dog to secure it into position. Now adjust the live center against the lid (seen in picture 6a) until you feel resistance and secure it in place with the lathe-dog. **This is very important**, DO NOT fail to tighten down both the tail piece and live center lathe-dog if you value your teeth. Also, be sure all stickers and adhesives have been removed from the keg with a scraper and isopropyl alcohol.

5. THE ABRASIVES

This is where all the magic happens, the abrasives. I over purchased because I had no idea what I needed. What I've found out was that more coarse grits, in the range of 80 to 220, were most effective and 400 to 4,000 grit are ineffective. Also useful were coarse sanding sponges and 3M Scotch-Brite pads. I've found I used the white, maroon, brown, and tan 3M Scotch-Brite pads the most. You can find them on eBay if you cannot find them locally.

I start off with 80 grit and spend 4–5 minutes before going to the sanding sponge for another 4–5 minutes, then moving to the TAN Scotch-Brite pad. Then it's on to some 120, 220, and 320 grit abrasives. At this point I will look for low spots or dents that may have been missed and use some 320 grit by hand to clean them up. As for the final polish, I use liquid Bar Keepers Friend, it contains oxalic acid which will re-passivate the stainless, helping to prevent oxidation.

6. FEEL THE SHINE

The keg should rotate mostly without a wobble, if it wobbles excessively, double check all your mounting points, some kegs may wobble more than others but not excessively. If you continue to get wobble, try adding additional silicone spacers to the bottom of the keg.

Turn on the lathe and finish it to your satisfaction, you can do one keg in 15 minutes but if you wanted to spend 30 it will look even better. The keg will rotate towards you, which is why I was concerned about my teeth. You can hold the abrasive and finish along the upper side of the keg or along the bottom, working your way back and forth, whichever works best for you. When using a sheet of abrasive, it will generate some heat so I place the abrasive on a Scotch-Brite pad (seen in picture 6b) and use it kind of like a hot pad of sorts.

Once polished you will want to wash off the rubber tops and/or bottoms as well as the posts to remove the black oxidation residue. Make sure to clean the kegs inside if you've gotten anything inside. If you want to go an extra step, you can apply some automotive UV protection to the rubber ends of the keg to give them a little shine. BYO



4a



4b



5



6a



6b

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Many BYO readers around the globe used the recent COVID-19 stay-at-home orders to pull out their brew kettles and crank up their homebrewing to pass the time. As a result of all this increased pandemic brewing, we saw quite a few timely homebrew labels submitted to our 25th Annual Label Contest. Here are just a few of our favorite pandemic-themed homebrew labels from readers.



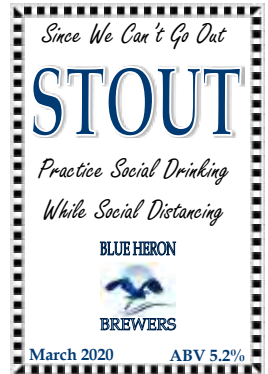
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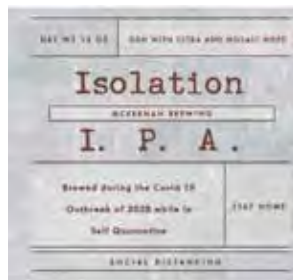
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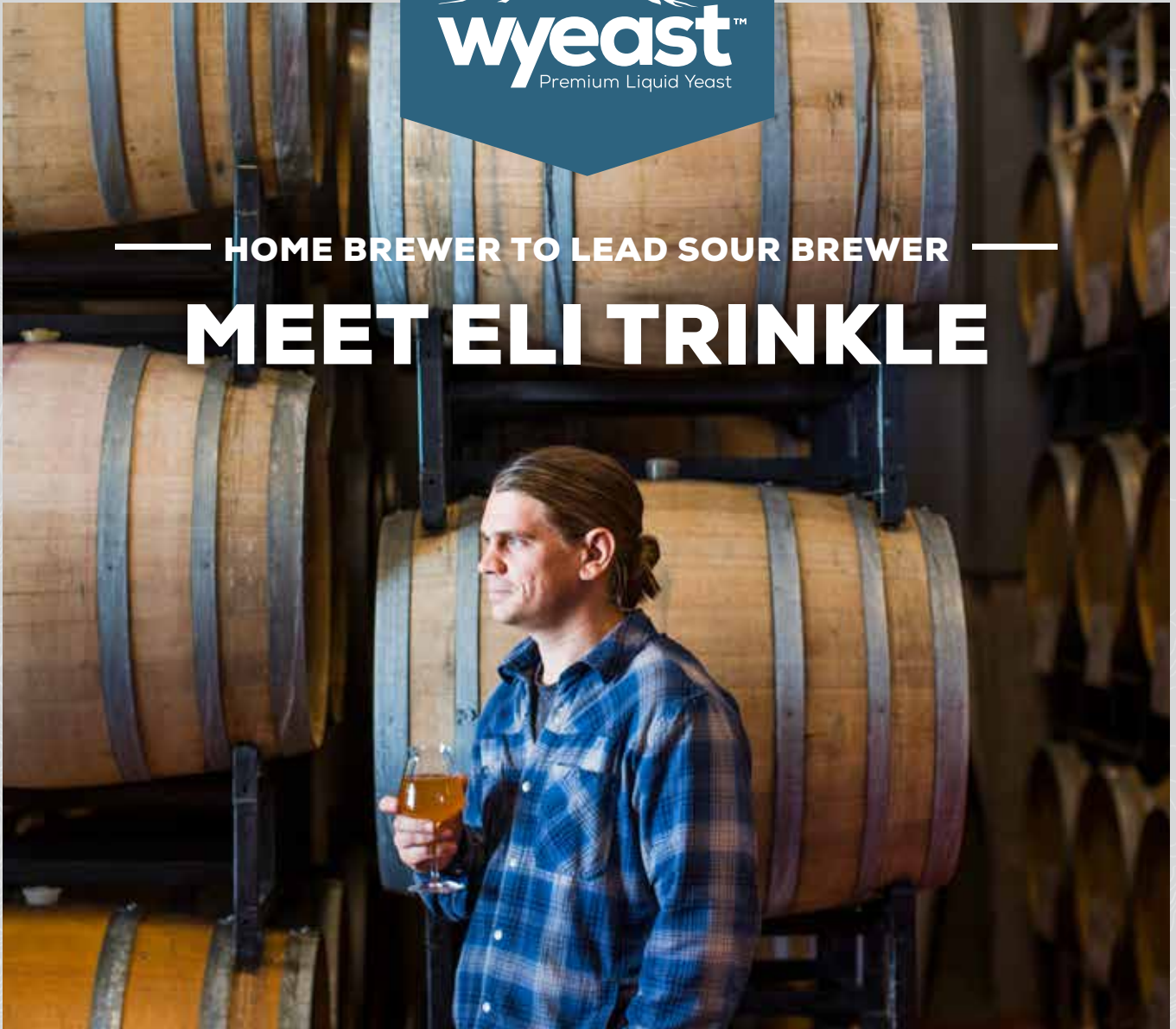
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Today, Eli has crafted a diverse portfolio of award-winning sours for Upland. He attributes his present-day brewing devotion to his colleagues at Upland, to the people of Bloomington, IN and the pride associated with pioneering a quality fermentation product. At Wyeast we share these same values, which is why we're pleased to toast the work of Eli and the rest of the Upland Brewing team.



See [wyeastlab.com](https://www.wyeastlab.com) for homebrewing recipes from Eli and other commercial craft brewers.

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