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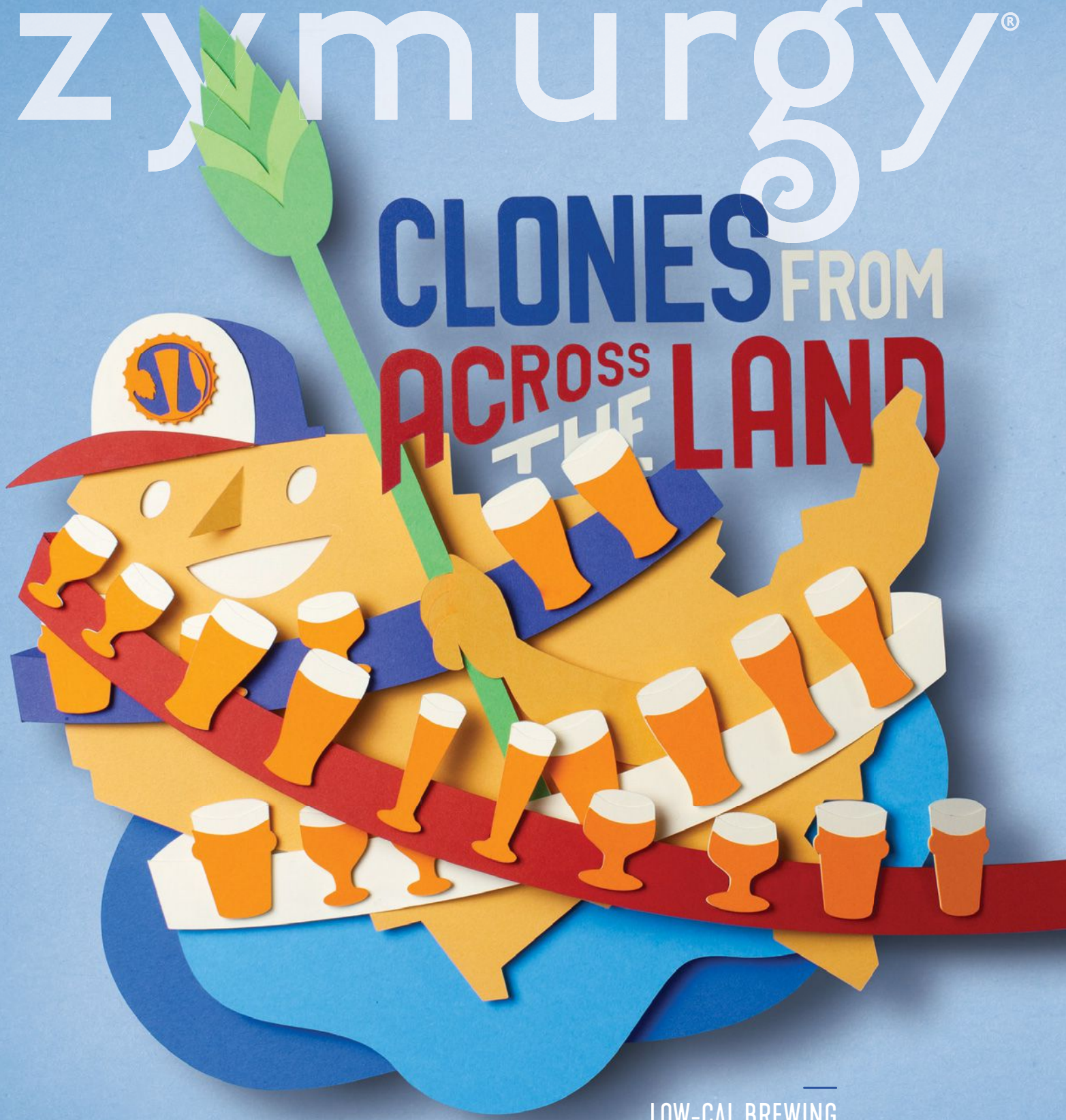

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HOLIDAY GIFT GUIDE

VOL 44 · №6
NOVEMBER/DECEMBER 2021

THE MAGAZINE OF THE AMERICAN HOMEBREWERS ASSOCIATION®

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Editor-in-Chief | Dave Carpenter

Technical Editor | Kaylyn Kirkpatrick

Spanish Translation Editor | Pablo Gomez

Art Director | Jason Smith

Marketing & Communications Director | Ann Obenchain
ann@brewersassociation.org

Sales Director | Kevin Doidge
kevin@brewersassociation.org

Business Development Manager for Advertising & Sponsorship
(East) | Kevin Doidge
kevin@brewersassociation.org

(West) | Kari Harrington
kari@brewersassociation.org

Sales Activation Manager | Joe Damgaard

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CONTRIBUTORS

JONATHAN INGRAM ihas worked as a beer writer, beer-magazine editor, and as a public-relations representative for a brewery. Ingram is currently working on his ninth book and his first on craft beer.

LEANDRO MEINERS is founder of PLACEBO brewery and taproom in Buenos Aires, Argentina, a blogger at *Zythologia*, and co-host, with Matias Cavanna, of the Spanish-language *Birratecnia* podcast.

MATIAS CAVANNA is head brewer at Dos Dingos Cerveza Independiente in Argentina and De Puerto brewpub and Rural barrel program in Uruguay. He is co-host, with Leandro Meiners, of the *Birratecnia* podcast.

JASON SIMMONS has brewed professionally since 2003. He is a brewing consultant, part-time author on beer and brewing, and head brewer at Lindgren Craft Brewery in Duncannon, Pa.

MARK STOBER is a founding member of the Tampa Bay BEERS homebrewing club and a BJCP Master judge. He has been an AHA member for more than 25 years.

Photographic Memory

Is your phone's camera roll full of beer photos? Although I abdicated most social media channels several years ago, I continue to collect pictures of beer at an astonishing clip. Occasionally I still upload one or two *in situ* snaps to Untappd or fire off an image to friends, but mostly they're just for me.

When I review my archive of beer photos, I revisit the places I've traveled. I can't always remember exactly where I was when I framed the scene, but pulling up the metadata points me to the location, Google Maps' timeline offers creepily detailed context, and the memories soon rush back.

A cozy café perched atop the windswept loft of the Zugspitze. A brewpub scattered astride the Calçada do Duque. An infinitesimal, smoky bar near the Kamo River, just off the alley and up the staircase. My own backyard.

Jean Anthelme Brillat-Savarin, author of *Physiology of Taste or Meditations on Transcendental Gastronomy*, famously said, "Tell me what you eat, and I will tell you what you are." The same is true for what, where, when, and with whom we drink. The photos we take help tell our stories. Looking at them months or years later conjures up aromas and flavors that can feel just as vivid as when we were there.

Famous brewing centers get plenty of attention, and deservedly so. Pilgrimages to style-defining breweries in Dublin, Prague, Leipzig, or Brussels are undoubtedly educational. When I look back, though, I usually recall smaller, out-of-the-way locations just as fondly, if not even more so.

I photograph my homebrew, too. It can be instructive to witness the transformation of a cloudy Kellerbier into a bright helles. Just as the finest pint of the keg is the last one, so, too, is the final image usually the prettiest, oxidized NEIPAs excepted.

What do your beer photos say about you? As 2021 draws to a close, we're much further from finding a way to live with COVID-19 than I imagined we'd be when I considered it at the same time time last year. If 2020 was the year of isolation, then 2021 has been one of alternating optimism and frustration. My hope for 2022 is that we can look back at our camera rolls and nonetheless find that we have created plenty of memories to toast.

***Dave Carpenter is editor-in-chief of* Zymurgy.**

Illustration © Getty/Mariia Reshetniak (phone); Photos courtesy of Dave Carpenter

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Departments

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Recipe Guide

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Vol 44 • No. 6
November/December 2021

zymurgy

(zī'm ər jē) n: the art and science of fermentation, as in brewing.

ON THE WEB
Find these homebrewing recipes and more on our website @ HomebrewersAssociation.org/homebrew-recipes

NOW ON Tap

New Gear

GRAINFATHER GLYCOL CHILLER ADAPTER (GCA) KIT

Although glycol chillers have historically been paired with stainless-steel conical fermenters, most homebrewers still use buckets and carboys. But even homebrewers who have a stainless vessel or two may still want to control bucket and carboy fermentations (inexpensive buckets are great for unpredictable wild and sour experiments).

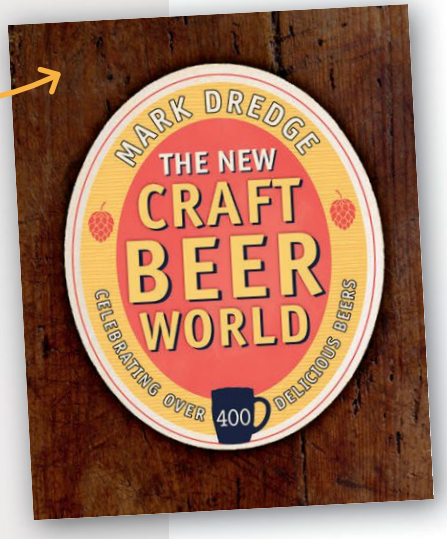
The folks at Grainfather have engineered a system that can maintain a set temperature in virtually any type of vessel, including buckets, kegs, and some wide-mouth carboys. The Glycol Chiller Adapter (GCA) Kit works with Grainfather's glycol chiller, which itself can monitor and maintain temperatures in up to four fermenters at the same time.

Setup is simple—just drop the included stainless coil into your fermenter of choice, attach the heating pad, and connect it all to the Grainfather Glycol Chiller. Then, using the included controller and the Grainfather app, specify the set point and let the electronics do the work for you. You needn't go all-stainless to enjoy the cool benefits of glycol.

The Grainfather GCA Kit retails for $199. Visit Grainfather.com to learn more.

Beer Book

THE NEW CRAFT BEER WORLD
BY MARK DREDGE



Mark Dredge's *A Brief History of Lager*, one of our favorite beer books of 2019, offered readers a historical glimpse into bottom fermentation. Dredge's latest book, *The New Craft Beer World: Celebrating over 400 Delicious Beers*, surveys the most influential beer styles in the modern craft beer landscape.

A complete rewrite of the author's first book, *The New Craft Beer World* walks readers through some of the most relevant brands from around the globe. Standard bearers are well represented, but the many spotlights on more avant-garde takes on classic styles engender a fresh look and feel. In a beer landscape that overflows with possibilities, Dredge's style is mercifully selective and approachable.

The New Craft Beer World would make an excellent gift for any beer lover, but explorers in particular will appreciate it, especially those who have lately spent more time dreaming of travel than actually doing it. Thumbing through this book is the craft-brewed equivalent of unfolding the map and daydreaming.

The New Craft Beer World is published by Dog 'n' Bone and retails for $24.99.

Tested Products

By Dave Carpenter

And now, for something completely different.

Every now and then, manufacturers offer to send us demo products to review. The AHA hasn't historically printed product reviews in *Zymurgy*, but readers have increasingly expressed an interest in just that. As it happens, we received a couple of compelling requests for product reviews in spring and summer of this year. Because COVID-19 was (and still is) keeping many of us home more than we prefer, we said to ourselves, "Well, what the hell," and decided to give it a go.

A caveat: our policy at *Zymurgy* is to only discuss products we genuinely like. No product is perfect (except for a certain brand of hiking boots an unnamed manufacturer discontinued in 1998, which I am still upset about), so we aim to be honest about what we perceive to be the pros and cons of things we would actually recommend to friends. If we test a product and truly wouldn't recommend it, we simply won't review it, and we'll let the manufacturer know why. Readers get to hear about good products, and manufacturers get feedback on how to improve products that need work.

That said, here are two things I tried in 2021 and liked well enough to mention.

BEERMKR

You might have seen Aaron Walls and Brett Vegas on ABC's Shark Tank last May when they attempted to convince humanoid sharks to invest half a million dollars in BEERMKR, a self-contained brewing appliance than turns out a 12-pack of beer in about two weeks. The sharks didn't bite, but Walls's and Vegas's Kickstarter campaign had already managed to reel in nearly $400,000 a couple of years before they even went on the air.

Walls and Vegas are the brains behind BrewJacket Immersion Pro, a clever device that uses thermoelectric technology to chill (or warm) fermentations via an immersible heat-transfer rod. Some of you might already own one, or maybe you've seen the product advertised in *Zymurgy*. The duo applied their experience with solid-state heat exchangers to create BEERMKR, an all-in-one machine that mashes, hops, and ferments in one go. BEERMKR is optimized for the company's own MKRKIT recipe kits, but you can build your own creations as well. I decided to try their Future IPA kit because I'm seriously bad at brewing IPA.

Setup is simple. Just plug in the machine, connect it to your Wi-Fi (you'll need a 2.4 GHz network), and follow the instructions in the BEERMKR app. Brewing is as simple as attaching a few valves to a couple of bags, adding water and malt, and then waiting for the app to prompt you for further steps like pitching yeast and adding hops. When fermentation is complete, you move the bag of beer from the machine to the accompanying BEERTAP unit, which then goes in your fridge for carbonation and serving.

The hazy, juicy IPA that emerged was as good as or better than most IPAs I've made and, crucially, it didn't oxidize. If you don't trust me, trust Christian Chandler, who won a gold medal at the 2021 National Homebrew Competition for the American Porter he brewed using his BEERMKR. For brewers with more money than time, BEERMKR is an easy way to turn out fresh beer at home.

What impresses me:

- Temperature control is built right in, so there's no mucking about with chest freezers, pumps, or ice cubes. Even in my non-air-conditioned kitchen, BEERMKR had no problem cold crashing when the ambient temperature approached 80°F (27°C) in July.
- There are no moving parts to maintain.
- All the bits and bobs are dishwasher safe, which makes cleanup a snap.
- The brew bags can be cleaned and reused a couple of times if you're careful with them.
- There's potential for some "off label" use. For example, you could propagate yeast for a larger batch of high-gravity beer, treating BEERMKR to make a 1-gallon starter.
- In both size and design, BEERMKR resembles a first-generation laser printer, which makes me nostalgic.

What leaves me wanting:

- BEERMKR doesn't boil—it pasteurizes wort at 165°F (74°C)—so the appliance is optimized for Steam Hops, a proprietary isomerized hops product available in 5-, 10-, 15-, 30-, or 60-minute profiles. To use conventional hops, it's best to pull a portion of wort from the machine before pitching yeast, boil it, and make a separate hops tea, which isn't terribly convenient.
- BEERMKR vibrates periodically to prevent yeast and hop material from clogging the valves, and the noise faithfully replicates the sonic output of a foghorn. You can specify up to 12 consecutive hours of daily quiet time in the BEERMKR app, but outside this period, you need to press the device's button to silence it. Do this too often, though, and you risk clogging up the works. The noise would be fine in an out-of-the-way corner of a basement, but it's quite noticeable in a small space.
- One gallon isn't much beer, at least not in my house, where burning through a gallon of beer is just called "Tuesday." But I recognize that a gallon might last longer for others, so take that with a grain of salt.
- BEERTAP aside, the product names have insufficient vowels, but this is more a personal hangup than a genuine complaint.

BEERMKR retails for $579 and is available at beermkr.com.

THE NEW EASYDENS BY ANTON PAAR

Anton Paar have a solid reputation and a proven track record. Tour any large-ish brewery with an in-house lab, and you'll see their equipment. The company's EasyDens digital density meter has been around for a few years, but a second-generation model—simply but unimaginatively called "New EasyDens"—promises a smoother user experience, better accuracy, and faster measurements. We had enjoyed using the first-gen model on a few staff brew days, so we were eager to give this one a spin.

Configuring EasyDens is as easy as downloading the BrewMeister app, available for iOS and Android, and then pairing the meter with your phone. Once you're apped and paired, you're ready to take a measurement in specific gravity, Brix, Plato, or absolute density.

You'll need to degas your sample before measurement, which is something you ought to do for conventional hydrometer readings anyway. Because large particles can clog the meter, it's not a bad idea to run highly hopped samples through a fine-mesh filter or sieve to remove any chunky bits. Then it's just a matter of using the included syringe to push the sample into the EasyDens unit and telling the app to take a measurement.

According to the manufacturer, EasyDens can measure specific gravities from 0.700 to 1.200 with an accuracy of 0.001, which is more than enough for most homebrewers. The unit has built-in temperature compensation and can handle sample temperatures between 5°C and 30°C (41°F to 86°F).

EasyDens is built for density, but it *can* measure alcohol concentrations in simple ethanol solutions such as distilled spirits. Beer's high extract level prevents its doing so directly for your homebrew, but it can infer ABV from original- and final-gravity measurements.

Cleanup is a cinch, requiring only that you flush distilled or reverse osmosis water through the unit. Anton Paar do recommend weekly cleaning with a lab cleaner, and they advise flushing it with high-proof ethanol if you plan to go long periods of time between measurements.

What impresses me:

- The required sample size is ridiculously small, only 2 milliliters.
- There are no moving parts to maintain.
- The unit is IP65 water resistant, which is handy in light of the environments in which it is used. This is a nice upgrade from the first-generation EasyDens, which relied on a removable plastic cover for protection from spills.
- Unlike a standard hydrometer, EasyDens's angular profile prevents its rolling off the table.

What leaves me wanting:

- The BrewMeister Android app requires location permissions to connect to the device using the Bluetooth Low Energy protocol, which may upset privacy-minded users. To be fair, this is an operating system limitation and not specific to EasyDens (Android 12 promises to do better). But those who don't believe GPS coordinates should be required to take a gravity reading may nonetheless think twice.
- The price is a bit steep for homebrewers on a budget.

The New EasyDens retails for $349 and is available directly from the manufacturer at easydens.com, as well as from many online and local homebrew retailers.

Brew This!

Easy Peasy Apple Squeezy

Recipe courtesy Steve Ruch.

To read the story behind this simple cider recipe, see Last Drop on page 96 of this issue of *Zymurgy*.

Batch volume: 3 US gal. (11.4 L)
Original gravity: 1.045 (11.3°P) (juice only)
Final gravity: 1.001 (0.25°P) (juice only)
Alcohol: 5.9% by volume

JUICE AND APPLES

3 gal. (11.4 L) Great Value apple juice
1.5 lb. (680 g) Granny Smith apples
1 lb. (454 g) Pink Lady (Cripps Pink) apples
1 lb. (454 g) Honeycrisp apples
8 oz. (227 g) Envy apples
8 oz. (227 g) Ambrosia apples

ADDITIONAL INGREDIENTS

10 g EC-1118 yeast
3 oz. (85 g) corn sugar to prime, if bottling

CIDERMAKING NOTES

Add the 3 gal. (11.4 L) juice to fermenter and pitch yeast at 68°F (20°C). After one week, core, peel, and cut the apples into small pieces, and gently add to the fermenter. After another week, bottle with priming sugar or keg and force carbonate as desired.

A Message from the AHA Director

A CALL FOR THE SMALL TALK

Beer brings people together. We know this. You've all probably read the historical accounts or heard a speaker regale you with stories of our distant ancestors coming together over fermented beverages. I've been reflecting recently on all the little details of our lives that happen when we actually thought we were doing something else. They say life is about those in-between moments, and Lord knows there are plenty of those when we're brewing.

Here's my request to you: I want you to email me (ryan@brewersassociation.org) with the story of the last random conversation from your brew day. Take me back to some of the downtime when you enjoyed a few beers with your brewing partner or were trying to figure out how to pass time during the mash.

Here's mine: I was doing triple duty—trying my hand at brewing Jeff Klatt's NHC gold-medal-winning Pilsner from the Sept/Oct 2021 issue, making pretzels (boil then bake), and watching my four-year-old son, Lincoln. I literally chose Jeff's recipe because he's pictured in that issue of *Zymurgy* holding a child. This particular conversation was pretty one-sided, me silent while trying to juggle over the stovetop, Lincoln nonstop talking.

"Dad, I am not allowed to drink beer because it's a special treat just for you."

"Dad, sometimes I don't want to go to school because I just don't want to get new undies on."

"Dad, you can't drink all your beer at once. [Pause] Because then you won't have any more."

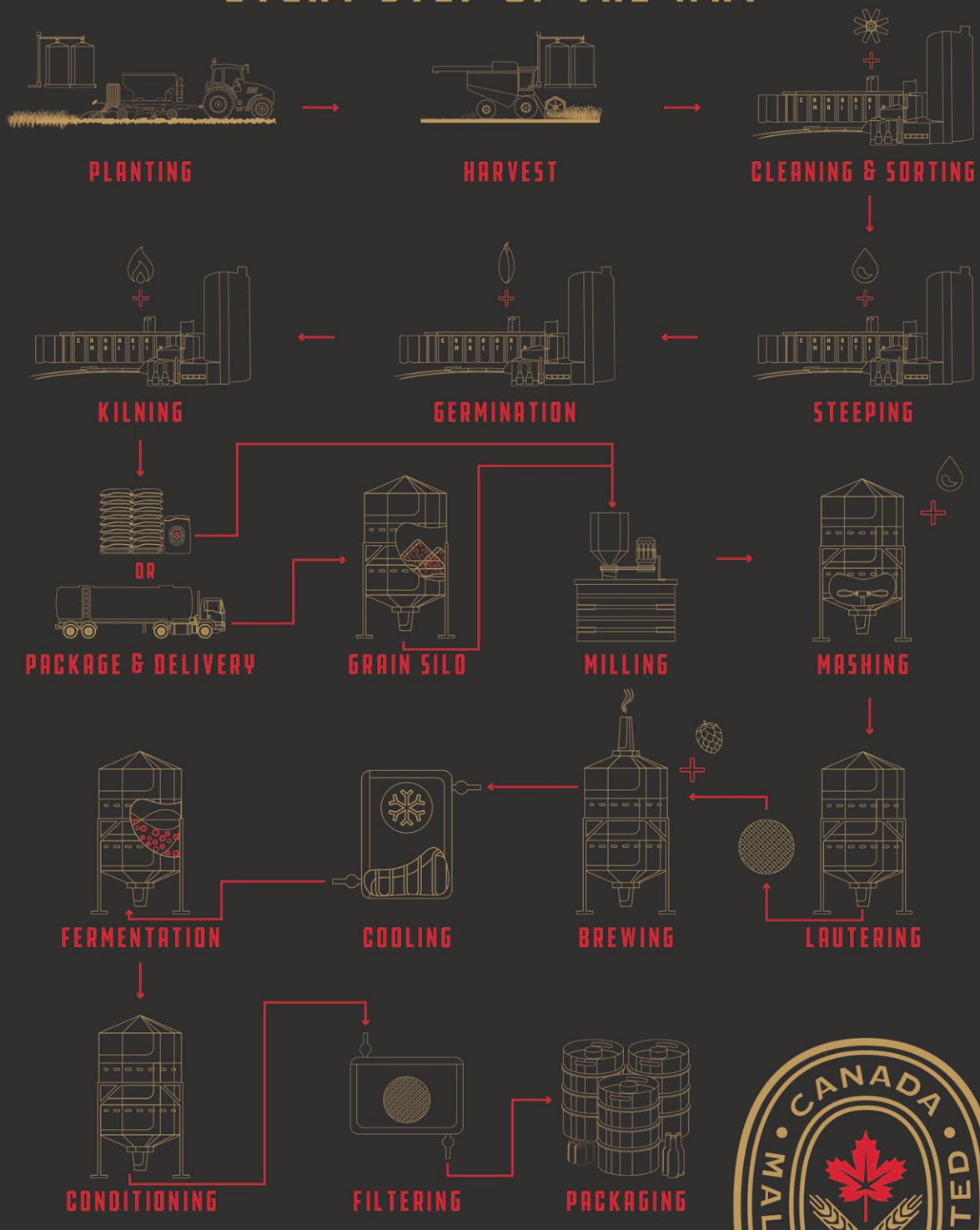
Here's to the moments that make your brew day memorable. And don't worry, the pretzels were for him.

Cheers, Ryan Farrell

Photo @thebeertrekker

FROM FARMER TO BREWER

WE NURTURE DEEP-ROOTED RELATIONSHIPS EVERY STEP OF THE WAY



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SMM, and DMSP, and DMSO My

***Dear* Zymurgy,**

I have enjoyed your magazine since the ’90s, which is when I got into this hobby as an extract brewer. Thanks for all the great information and enthusiasm you have pumped out into the homebrew community all these years. I have remained an extract brewer because I enjoy the results and because keeping brew days relatively short and simple has enabled me to balance the hobby with my other demands of fatherhood and professional life.

J. K. Bywaters’s article (“It Might Be a Schwarzbier”) in the May/June 2021 issue was insightful, but it did bring up a question for me regarding extract brewing and dimethyl sulfide (DMS). His section on DMS formation and elimination has good advice for all-grain brewers, but I was left wondering if malt extract brewers might have different considerations.

Does S-methylmethionine (SMM) remain in the extract after it is produced from malt? Does SMM in malt extract break down into DMS as it is heated, as happens during the mash? In the case of extract, heating only occurs for the brief period needed to dissolve it into solution and up to boiling temperature, so there does not seem to be much opportunity for SMM to DMS conversion. Could Mr. Bywaters or another expert weigh in on those questions?

Thanks, and keep up the good work!
Dave Radomski
Fort Walton Beach, Fla.

> “Malt extract begins with malts that are naturally low in DMS precursors.

***Zymurgy* editor-in-chief Dave Carpenter responds:** *Good question, Dave, and an even better first name. I didn't know the answer, so I asked people who know more than I do, of which there are many. I learned a lot!*

There seem to be two pathways to DMS in finished beer. The first, as you describe, is the conversion of SMM to DMS in the boil. SMM develops in barley during germination and is driven off during kilning. Very light malts that don't get kilned all that much, such as Pilsner malt, retain higher concentrations of SMM, which during the heat of the boil breaks down to DMS. A second, lesser-known source is dimethyl sulfoxide (DMSO), which is also in malt, but created during the kilning process when the temperature exceeds about 60°C (140°F). Yeasts can then convert DMSO to DMS during fermentation. Because both SMM and DMSO are precursors to DMS in the finished beer, the two are sometimes collectively referred to as DMSP—dimethyl sulfide precursors.

Let's look at DMSO first.

Andrew Nguyen of the Canadian Malting Barley Technical Centre notes that "DMSO is water soluble, heat-stable, and non-volatile, with a boiling point of 189°C (372°F). It will not be removed by boiling, will carry on throughout the malt-extract and brewing production processes, and be converted into DMS by brewing yeasts."

A non-volatile DMS precursor carries through from malt kilning to the fermenter sounds grim, but Andrew goes on to say that "DMSO is not as much of a concern in terms of off-flavor compared with SMM since only about 25 percent of the available DMSO is converted to DMS by yeast during fermentation. In addition, the concentrations of DMSO arising in wort from the malts used are typically relatively low compared to SMM. Extreme cases of high levels of DMSO in malt would raise a concern for DMS production via this pathway. These malts are quite rare and typically wouldn't be expected to be used in malt extract production."

In other words, extract manufacturers start with low-DMSO malts to begin with, and of the DMSO that does make it to the fermenter, only a quarter actually gets converted to DMS. So we can reasonably expect that malt extracts won't contribute to DMS problems via this pathway.

OK, but what about SMM? Fabian Clark of Muntons offers that manufacturers go to great lengths to keep SMM and DMS out of your extract, beginning with malt that is already low in DMSP. He then goes on to describe the process by which wort is concentrated to extract.

"SMM to DMS conversion happens in the Muntons brewhouse during our mash and mash filtration. The wort then sits at high temperature in a wort tank where DMS levels increase, but by the time our wort is evaporated and cooled, any worrying levels of SMM have been converted to DMS and evaporated away. So when you brew from extract, the short heating period combined with the very low SMM levels in the extract will keep DMS from causing issues.

"Vacuum evaporation … is at a temperature above the boiling point of DMS, and due to the high amount of evaporation, roughly three-quarters of the wort volume, free DMS is stripped from the product."

[Incidentally, the boiling point of DMS is 98.6°F (37°C), which is also the standard "normal" temperature of the human body.]

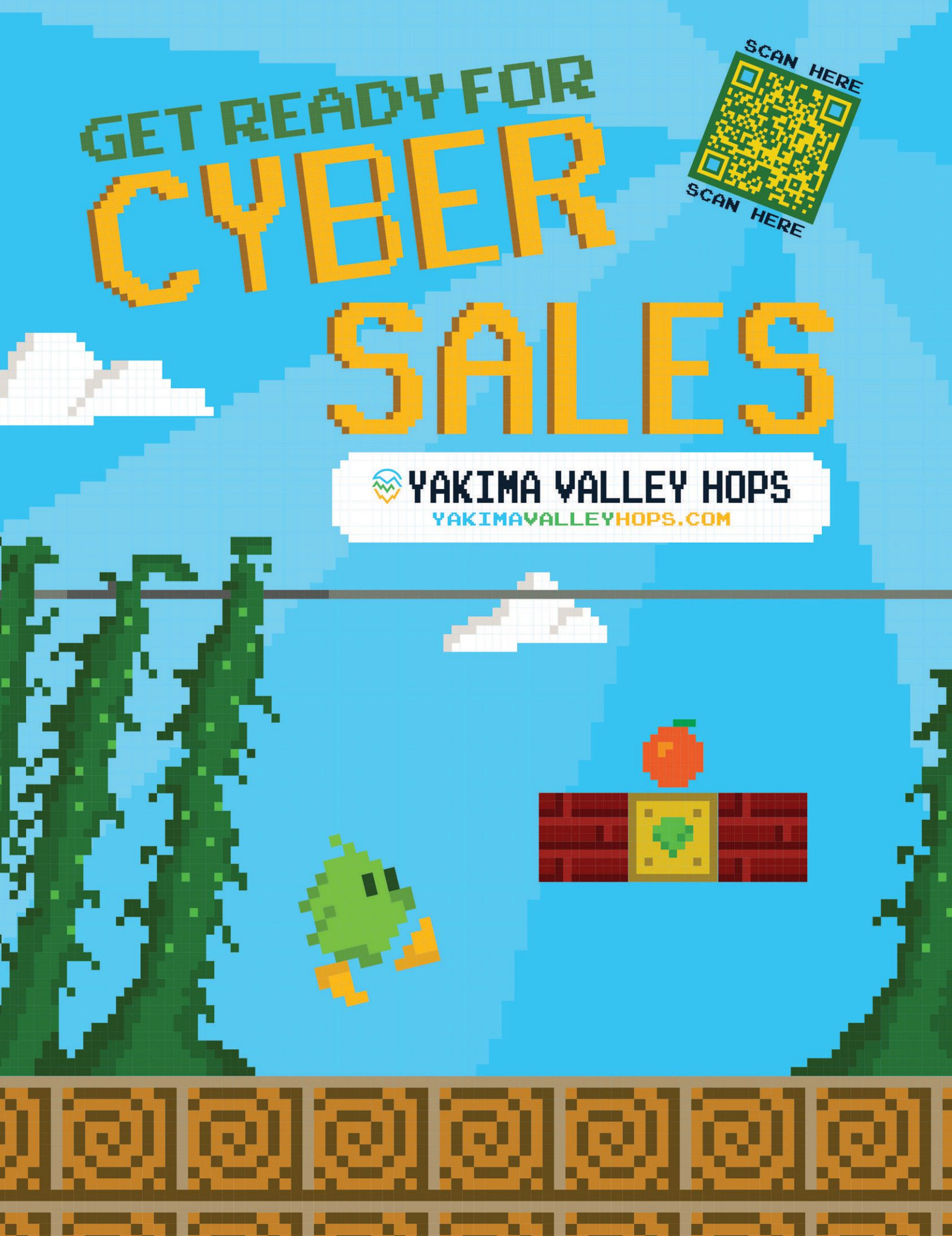
"After evaporation has been completed, the extract is pasteurized and immediately cooled to 55°C (131°F), which ensures that the extract will not pick up any further color from Maillard reactions and also significantly reduces any potential further conversion of SMM to DMS. This reaction is quite fast at 95°C (203°F) and above, which is the reason boiled wort needs to be cooled quickly to prevent creating new DMS after the boil. As malt extract never reaches this temperature, DMS does not pick up in the extract post evaporation."

So there you have it. Malt extract begins with malts that are naturally low in DMS precursors, and manufacturers see to it that SMM-to-DMS conversion takes place in their brewhouses instead of yours.

Many thanks to Andrew Nguyen of the Canadian Malting Barley Technical Centre, Fabian Clark and Jason Chalifour of Muntons, and Kaylyn Kirkpatrick of the Brewers Association for helping us find some answers to this question.

DEAR *ZYMURGY*

Send your Dear *Zymurgy* letters to **zymurgy@brewersassociation.org**. Letters may be edited for length and/or clarity.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YOUR HOMEBREW EXPERIENCE

Homebrewing is all about sharing, and we get hoppy when *Zymurgy* readers share their homebrewing and fermentation experiences with us. We'd love to show the AHA community what *your* experience looks like. From 1-gallon batches on the stovetop to 20-gallon brew days on your custom sculpture, we all have fun with family, friends and pets while we make and enjoy our favorite beverage. Show us your brewing/fermentation day, who you brew with, the ingredients you include, what special processes you use, and how you enjoy the final product of beer and beyond.

SCAN ME

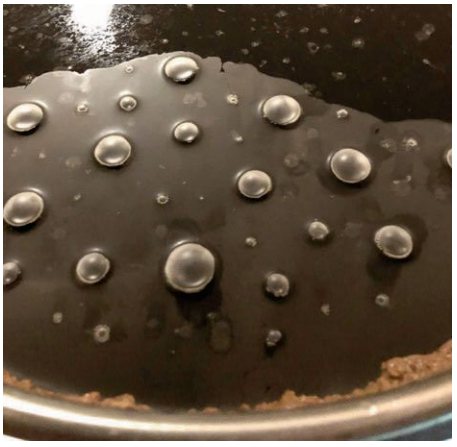
Upload photos of your homebrew-related fun at HomebrewersAssociation.org/your-homebrew-experience

NHC 3rd Place | Category 28: Fruit Beer | Acerva Catarinense Catharina sour with feijoa, dragon fruit and passion fruit.
Chico Milani of *Florianópolis, Santa Catarina, Brazil*

Brew-in-a-bag on the front porch.
Merlinus Monroe of *Dahlonega, Ga.*
Gold City HopMasters

I make custom handles for my husband's homebrew that we serve from a kegerator in our garage.
Eve Stover of *Astoria, Ore.*

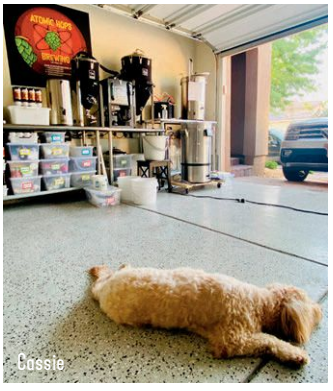
A very fresh SMaSH IPA made from two row and Centennial—in the fermenter(s) and in the glass.
Marty Lutz of *Littleton, Colo.*



Pellicle forming on a dark sour ale.
Nathan Wanger of *Alton, Ill.*
East Side Brewers (ESB)

Double brew day starters.
Two Pilsner varieties.
Dan Little of *Tallahassee, Fla.*

This is Oskar Blue, our bluetick brewhound. He makes sure to alert his humans when there's a boil over.
Dan Brown of *Myrtle Beach, S.C.*



Hi, My name is Cassie and I help my brewers make beer once a month. Cheers!
Cassie the Dog of *Las Vegas, Nev.*
Atomic Hops Brewing

A moonscape of *Lactobacillus* foam just before the boil.
Adam Allen of *Chapin, S.C.*
Palmetto State Brewers

Brewing 10 gallons of Nugget IPA on a nice summer day in Fairbanks, Alaska, with my helper dog Tonks!
Greg Pietsch of *Fairbanks, Alaska*
SouthCoast Homebrewers Association, Zymurgist Borealis

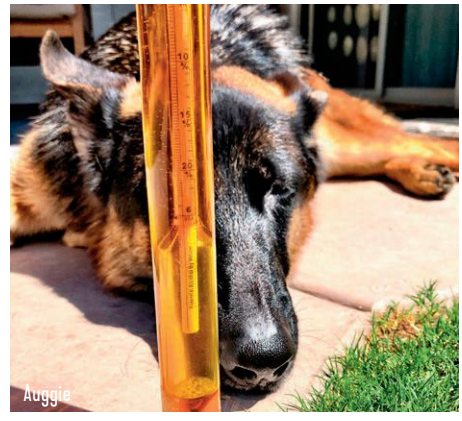
Third time's a charm. Turns out the puppy is the most committed brew dog. The other two prefer naps on the couch.
Scott Key of *Corte Madera, Calif.*
MaSH (Marin Society of Homebrewers)

Here's Buddy, our self-elected foreman, proud of the latest from the homebrewery—apple cider in one and a first try at nitro stout in the other!
Greg Macaulay of Des *Moines, Wash.*

Here are our Dalmatian pup brewing mascots, Bacchus and Ninkasi, helping brew a blonde ale. They love spent grain biscuits and are proud to be part of the brewing community!
Aaron Black and Evelynn Dax of *Eau Claire, Wis.*

This is Chance on his first brew day as an award-winning homebrewer after we took silver in our category in the 2021 Dominion Cup in Richmond in August. He loves that spent grain.
Howard Desper of *Fishersville, Va.*

I love seeing all the brew buddy pictures so I wanted to share mine. This is Maple, my assistant brewer. She's supervising.
Catherine Jarocki of *Minneapolis, Minn.*

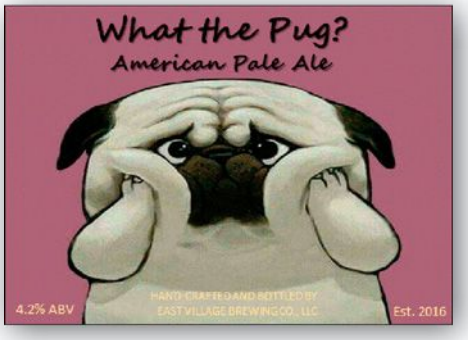


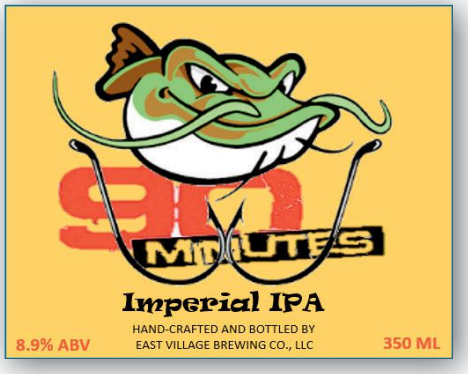
Auggie can't hide his enthusiasm for taking gravity readings
Gregory Kass of *Tucson, Ariz.*
Tucson Homebrew Club

SHARE YOUR BEST HOMEBREWING SHOTS!
Homebrewing is all about fun and sharing. We would love to show others in the community what your homebrewing/fermentation experiences looks like. Upload photos of your homebrew related fun at **HomebrewersAssociation.org/your-homebrew-experience** and you may see it in the pages of *Zymurgy*!

SCAN ME

YOUR HOMEBREW LABELS



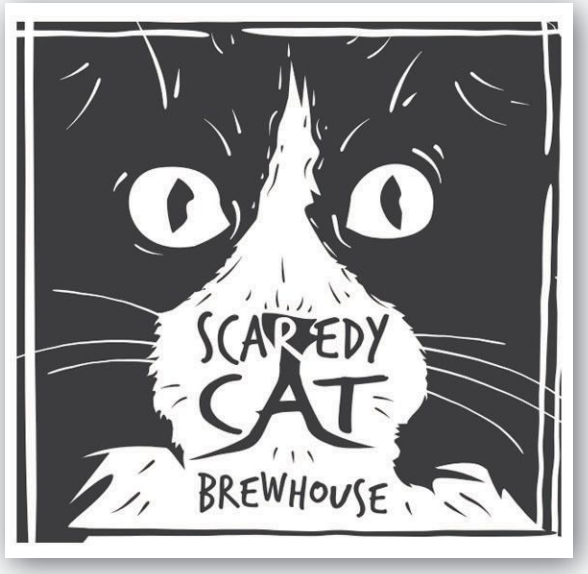


What the Pug was inspired by my day-job sales-account-manager's love of her pugs. Alt Stadtplatz was inspired by my many trips to Germany's old town centers, many of which just happened during their beer festivals. Catfish Hook 90 Minutes was inspired by my clone of Dogfish Head 90 Minute IPA.

Wing Kwang
Wildwood, Mo.

As a graphic designer, I used to design unique labels for each homebrew (some of which I'm still pretty proud of), but I decided to simplify things and make a general brew house logo. This design is based off of the bewildered face of my dear cat, BB, who is also the brew house namesake. This simple illustration can still be customized and made unique to each beer.

Laura Schaffer
Bookcliff Homebrew Club
Grand Junction, Colo.



SUBMIT YOUR LABEL

Do you make custom labels for your homebrew? Want it featured here in the pages of *Zymurgy* for all to see your work?

Send them to us at **HomebrewersAssociation.org/magazines/submit-bottle-label** and we will take it into consideration!

the FERMENTATION KITCHEN

By Gabe Toth

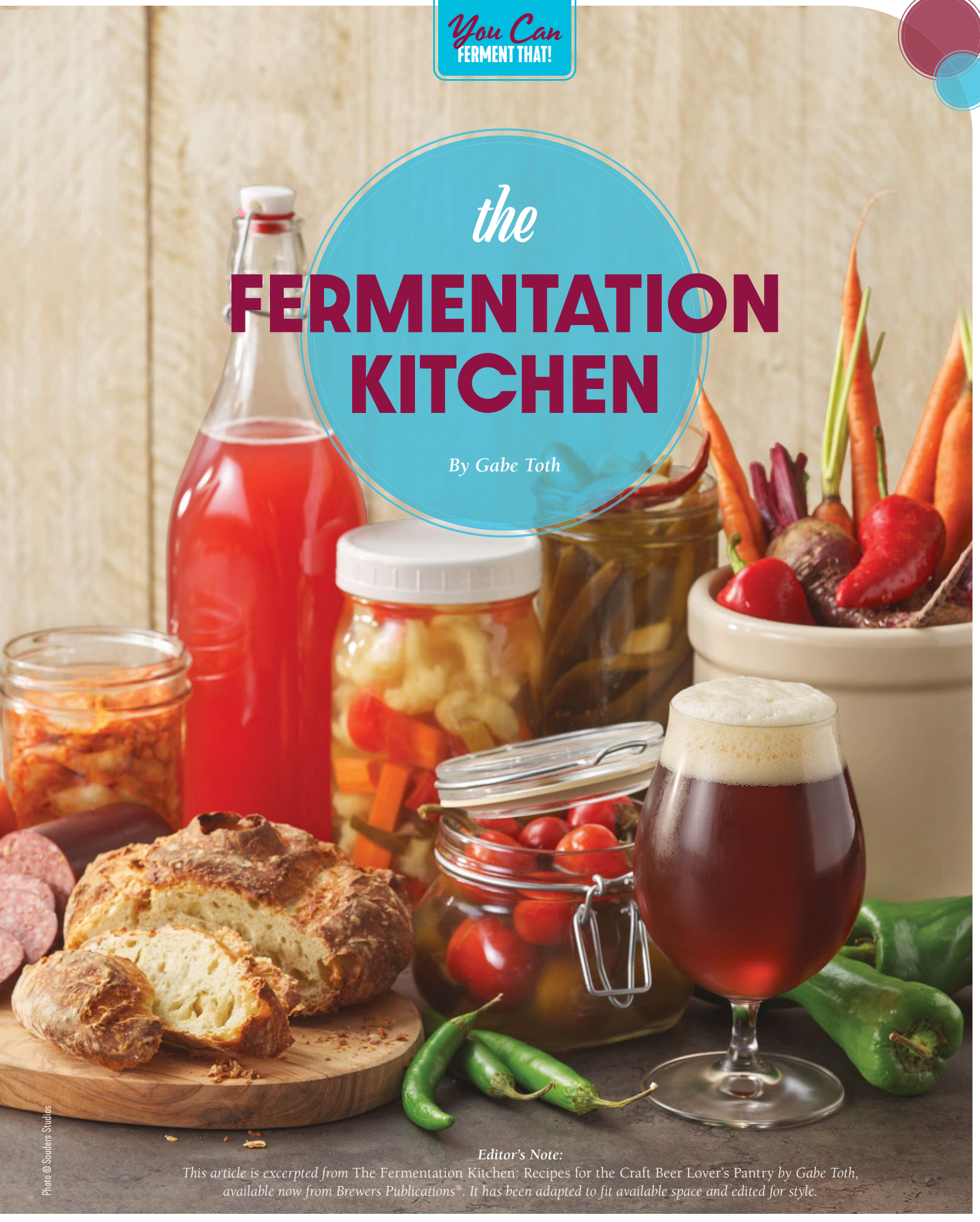


Photo © Souders Studios

Editor's Note:
This article is excerpted from The Fermentation Kitchen: Recipes for the Craft Beer Lover's Pantry *by Gabe Toth, available now from Brewers Publications®. It has been adapted to fit available space and edited for style.*

Fermentation, whether applied to vegetables, meat, grain, or a wide variety of other ingredients, is a fundamental force in the human experience. It is a part of us. The microbiological organisms that drive fermentation processes—fungi, like yeast and mold, and bacteria—are embedded in our culture and our biology. They existed long before we learned to harness them in even the most rudimentary way, and human civilization has evolved in the constant presence of fermented food and drink. It could even be argued that fermentation helped to drive the start of early agricultural civilization. Academics may differ on whether bread or beer impelled early humans to settle down and begin growing grain, but the choice is between one fermented food or another, that is, bread or liquid bread.

An estimated one-third of the food that humans eat every day is fermented. This includes breads, cured or semicured sausages, traditional pickles like sauerkraut, and Asian staples such as miso and fish sauce. Coffee beans are fermented when fresh. The pulp of cacao beans is also fermented, allowing for the conversion of bitter phenolic compounds to less bitter compounds and enabling the breakdown of proteins into simple amino acids and sugars. The cacao fermentation process brings about a remarkable change, converting what were tasteless, astringent beans into "vessels laden with desirable flavors and flavor precursors," yielding flavors of fruit and wine, sugars, complex acids, and floral notes (McGee 2004, 698).

Even the much-maligned monosodium glutamate (MSG) is a product of fermentation. It is the naturally occurring salt of the amino acid glutamate and provides a savory kick to foods such as tomatoes, Parmesan cheese, and meat. Originally isolated from Japanese seaweed (*kombu*) broth, MSG is now created by fermenting starch and sugars (Center for Food Safety and Applied Nutrition 2012).

HOME FERMENTATION

Sandor Katz helped to kick-start the home-fermentation revival in the United States with the publication of his groundbreaking book *Wild Fermentation* in 2003, following it nine years later with the encyclopedic *Art of Fermentation*. The food movement that Katz has come to personify pushes against the modern move towards increasing specialization. Reconnecting with the source of your food is educational, even enlightening, and encourages a greater sense of responsibility for your place in the food chain.

> *Ferments are among the original value-added products, in which the raw outputs of agriculture are transformed, via great technique and artistry, into delicacies that are stable and can be transported, and that fill our kitchens and food stores. … The revival of fermentation at the local and regional scale goes hand in hand with the revival of local agriculture in the movement toward relocalization of our food and our economics. (Katz 2012, 369)*

Michael Pollan (2013, 407) has developed this theme further, describing a transition from a food system in which we are simply consumers, passive recipients who are kept ignorant about the origins of what we consume, to one where we are elevated to partners in the food web.

My own journey into fermentation began in 2005 with homebrewing. I had heard stories about my parents making dandelion wine, so creating booze always seemed nebulous but within reach. I had a roommate my last year of college who had homebrewed and talked about how we could certainly do it in our apartment (though we never did). It was Colorado in the early 2000s, so this roommate turned me to craft beer and high-quality German beers and I never looked back. Within a year of graduating, I was making my own homebrew of questionable quality. A year or two later I started looking at the seasonal bounty at the grocery store: I saw how a given crop would be available in great mounds for low prices at certain times of the year, and I wondered how to take advantage of that. I always loved strong, sharp flavors like vinegar and salt, and decided it was time to start learning how to pickle vegetables.

Vinegar and salt—strong flavors like this have always enticed me. As a kid, once I was old enough to get on my bike and go on adventures through suburban New Jersey, I loved stopping at Wawa for an Italian sandwich piled high with cured meats. And I always got one of those extra-vinegary pickles from the plastic barrel they had at the deli.

A friend in college who was half Japanese and half Samoan first introduced me to kimchi, which he described at the time as "rotting cabbage." Eventually, I found a Korean grocer in town where I could buy kimchi by the gallon and so I often kept it on hand. One year, when I was still spending summer and winter breaks at my parents' house, I picked up a jar at the end of the semester to tide me over until I went back to school. My dad took one sniff and forbade me from bringing home kimchi ever again.

Pickling turned to cheesemaking, which led in turn to cured meat and, once there was some yard space, a garden was in order. Eventually, raising pigs and chickens became part of the rotation. Almost 20 years later, my wife and I visited my parents and I let them know I had brought some meats, cheeses, and pickles. Dad asked, "But no kimchi, right?" I laughed and confirmed that was right. It had made an impression on him, that was for sure.

I do not consider myself an expert in the fermenting arts, but I have been fine-tuning these methods for years, almost 15 years in some cases. More than anything, I am a student. I suspect that the people who want to make their own pickles, bread, sausage, or cheese may ask why a lot. I know I do, and it has led over the years to shelves of vegetables in jars, crocks of fermenting legumes, a fridge full of curing meats and aging cheeses, and even some suburban animal husbandry. The rabbit hole goes deep.

I hope that some of the people reading this will take the next step from fermentation and begin growing their own vegetables. Maybe a few will divorce themselves more fully from the commodity food market by sourcing milk or meat directly from local farmers. Perhaps one or two will go all the way and find a friend with an acre of land that needs pigs, chickens, and goats. Some revolutions happen slowly, but our current agricultural system and food supply chains are ripe for reinvention.

In filling a plate with delicious fare, fermented foods can play a variety of roles. A thick, crusty slice of homemade bread is an

ideal vehicle for homemade cheese, an egg, some pickled and fresh vegetables, a dash of homemade hot sauce. A bowl of rice has been the base of countless meals augmented with kimchi, possibly with some cured meat and fresh vegetables. There are enough permutations to try a new combination every day for the rest of your life without repetition, and your location can play a crucial role. One of the most rewarding things I have gotten from traveling is seeking out local flavors—seafood on the coast; soul food in the American South; the differences between Sonoran, New Mexican, and Tex-Mex cuisines; or pierogi and Polish sausage in the Midwest. When local flavors are paired with local fermentation microbes, the result is a diverse array of truly unique, location-specific foods.

ABOUT FERMENTATION METHODS

Broadly speaking, the practice of fermentation is a collection of methods and techniques that harness microbial life to transform and preserve food. Prior to the advent of refrigeration and modern chemical preservatives, fermentation was used so that humans could continue to make use of food long after it was harvested, the preserved remains of summer and fall crops often carrying people through the harsh winter.

The practice of fermentation, in its various forms, spans the globe. Fermentation may be a uniquely ubiquitous form of food preparation, accounting for as much as a third of the world's diet. It is seemingly a universal facet of humanity; there is no culture that does not practice some fermentation of food or drink, and even in modern industrialized societies it remains one of the most important ways that food is processed (Pollan 2013, 303).

The Wellness Trend

Fermented foods can be beneficial for our health. The fermentation process enzymatically breaks down nutrients that we would otherwise be unable to digest, increasing the bioavailability of these nutrients. These enzymatic processes also produce crucial vitamins. Thus, fermentation increases the amount of vitamin C (ascorbic acid) and B vitamins available in vegetables, including folic acid, riboflavin, niacin, thiamin, and biotin; creates B_{12}, which does not naturally occur in vegetables, and vitamin K; makes iron more soluble; and even increases the stimulating properties of tea (this is why black and oolong teas are more potent than green tea.) The process of fermentation increases the vitamin C content of sauerkraut to 400% more than the plain cabbage

from which it was created (Chun, Smith, Sakagawa, and Lee 2004).

There is a lot of talk these days about "gut health" and the gut microbiome being beneficial to people's overall health. Because probiotics are known to be created by fermentation, this has created a craze and boosted the number of people who are trying home fermentation. Restaurant consumption of fermented foods went up an astounding 149% in 2018 (Saxe 2019). The wellness trend continued through 2019 and even more people began fermenting at home during the pandemic in 2020.

After humanity discovered agriculture, the human diet narrowed dramatically to a few starchy staples: rice, wheat, corn, and potatoes. Intensely flavored fermented foods allowed people to spice up an otherwise uninteresting meal while also supplying much-needed nutrients. Compare the flavors in the products of modern food production—canned food, soy-based "meats," artificial sweeteners, and high-fructose corn syrup—with those in cheese, wine and beer, chocolate, soy sauce, coffee, yogurt, cured olives, vinegar, pickled vegetables, and cured meats. Even after millennia of producing our own food rather than foraging for it, "we still haven't discovered techniques for processed food as powerful, versatile, safe, or nutritious as microbial fermentation" (Pollan 2013, 310).

Fermented foods can evoke strong responses though. One culture's delicacy, perhaps a moldy cheese or a well-aged kimchi, can be extremely unpleasant to someone unaccustomed to those flavors and aromas. Fermentation sometimes hugs the line between fermented and rotten, a very subjective boundary that is often defined culturally. Our innate aversion to signs of decay in food is a natural—even reasonable— evolutionary trait, but one that can cause a person to miss out on unique, delicious, and safe food experiences.

Fundamentally, the process of fermenting food takes advantage of the broader microbial environment. While some common fermentations, such as beer making, occur in a relatively sanitary environment that promotes a cultured microbe added to perform a specific task, fermentations rarely occur in such a biological void. To effectively ferment food, you can harness factors such as salt, acidity, lack of water, and lack of oxygen to favor the desired microbial activity, while undesired microbes are crowded out or unable to grow in such a hostile high-salinity, low-pH, low-moisture, and/or anaerobic environment. Manipulating conditions like this need not be complicated. Something as simple as submerging cabbage under brine to act as a barrier to air and oxygen yields sauerkraut "rather than a puddle of slime" (Katz 2012, 38).

therefore a combination of factors can act as a tag team to fight pathogenic bacteria and help keep food safe.

Different types of fermented foods rely on different factors or combinations of factors to maintain safety. Salt is such a fundamental factor in food preservation and fermentation that it is used in almost every recipe in my book.

Between fresh and rotten, there is a creative space in which some of the most compelling of flavors arise.

— Sandor Katz, *The Art of Fermentation*, p. 35

Yeasts, Molds, and Bacteria

Food fermentation deals primarily with three classes of microbes: yeasts, molds, and bacteria. In different circumstances, there are populations of all three that can transform your food and elevate it, and other populations that can ruin it. Yeasts and molds are both fungi that can transform your food but they are also very different microbes. Yeast can grow both aerobically (in the presence of free oxygen) and anaerobically (in the absence of free oxygen), but mold can only grow aerobically. Yeasts are single-celled organisms that produce asexually by fission or budding, whereas molds are multicellular and reproduce sexually or asexually.

Bacteria are our primary concern when it comes to pathogenic dangers; this includes *Listeria monocytogenes* (the cause of listeriosis), *Escherichia coli* (E. coli O157:H7 poisoning), *Staphylococcus aureus* (staph infections), and *Clostridium botulinum* (botulism), among others. Most bacteria are aerobic (requiring oxygen) and most are dormant at low temperatures. They are most active in what the USDA calls the "danger zone," a temperature range from 40°F to 140°F (4–60°C). To be safe, remember that below 40°F (4°C) many bacteria will slow and stop reproducing, and above 140°F (60°C) many will begin to die; however, there are many species that will remain active and viable outside of this temperature range. Some, such as *C. botulinum*, will create spores that can survive temperatures above boiling.

When the proper methods are used on uncontaminated ingredients, fermented foods are generally considered safe. These methods evolved over thousands of years to provide preserved and nourishing food. Foods do not usually reach an optimal point of safety based on one factor (i.e., only salt, dehydration, or acidity), so most fermentation methods operate on the concept that each individual factor is detrimental to the bacterial population and

Working hand-in-hand with salt, acidification is a widely used approach that can be found in various forms of fermented vegetables (pickled vegetables, hot sauces, relishes, etc.), semicured fermented sausages, cheese, kombucha, and vinegar. Acidity in a product is reflected in the food or drink's pH level. A measure of the concentration of available hydrogen ions, pH is short for "potential of hydrogen" and is measured on a scale that typically runs from zero to 14.0. (In extreme circumstances, values below zero and above 14.0 can be reached, but such solutions would be so highly corrosive that they are of no use for food production.) Pure water is neutral with a pH of 7.0; a pH above that is alkaline (e.g., baking soda, soap, bleach, and lye), and a pH below that is acidic. It should be noted that the pH scale is logarithmic. This means that a drop from a pH of 5.0 to a pH of 4.0 means a ten-fold increase in acidity. Likewise, going from pH 5.0 to pH 3.0 indicates a hundred times more acidity.

Many foods tend to be in the range of pH 5.0 to 7.0, which is right where bacteria will thrive. Below pH 5.0 the environment is more inhospitable for bacteria. Most finished beers have a pH of a little over 4.0, fermented pickles can drop to 3.0, white vinegar is 2.0 to 2.5, lemon juice is about 2.0, and a solution of hydrochloric acid can reach zero.

Lowering the pH of food is a sound way to eliminate pathogenic bacteria. *C. botulinum* will not grow below pH 5.0, while the viability of many others (e.g., *Staphylococcus*, *Campylobacter*, *Listeria*, and *Escherichia* species) falls off between 4.0 and 5.0 in otherwise favorable conditions. Salmonella bacteria can hang on until pH 3.8 in otherwise favorable conditions.

Another aspect you can take advantage of, especially when producing cured meats, is water activity (a_w). This is a measure of the amount of water that is chemically available

to react with (note that a_w is not an indication of how much water is in the product). The a_w of pure distilled water is 1.0, while the complete absence of moisture is an a_w of zero. For context on how much moisture must be removed to get to zero, consider that dried fruit still has an a_w of about 0.6; evaporated milk and instant coffee are still around 0.2. Even in food products that we may think are little more than dust, there are still trace levels of available moisture.

Hard cheeses and salamis, with an a_w of 0.85 or less, are generally at or near the USDA threshold for "potentially hazardous foods"—below that level is considered shelf-stable regardless of other factors. Almost all pathogenic bacteria, including listeria, *E. coli*, salmonella, and *C. botulinum*, are eliminated below an a_w of 0.91. *Staphylococcus aureus* can grow in environments with an a_w as low as 0.86.

Environments with higher levels of available water are more welcoming for pathogenic growth. Water activity can be lowered by binding up water with salt and sugar, by reducing the overall amount of water through drying, or both.

Salt and sugar do not remove water from food, but they combine with it chemically and make it unavailable for use by microbes. However, there is a threshold where food becomes inedibly salty and a wide range where it is edible but unpleasantly salty, so salt must be used in combination with other methods. The practical implications of a_w and moisture loss are discussed in more depth in the book, where they are applied to fermented semicured sausages.

Maintaining an anaerobic environment is also critical for many fermentations, including fermented vegetables and the interiors of sausages and cheeses. Classically, fermentation was defined as an anaerobic process, but it is now used casually to describe any microbial transformation of food or drink. For example, any SCOBY, which is short for symbiotic culture of bacteria and yeast, that is responsible for the transformation of sweetened tea into kombucha contains both microbes that require oxygen (aerobes) and microbes that require a zero-oxygen environment (anaerobes). The SCOBY forms a cellulose mat at the surface of the liquid that serves as an intermediary between the atmosphere and anaerobes that make up the lower layers of the SCOBY. Vinegar production by species of the bacterial genus *Acetobacter* is another example of an aerobic process, where the microbial transformation requires oxygen to proceed.

When making fermented foods, I rely on general cleanliness to prevent the introduction of a massive infection or contamination with unwanted biological material, but I do not generally worry about sanitizing equipment. Some people who ferment foods regularly, in particular those who do it for a living, will encourage you to use bleach or boiling water to minimize unwanted microbes. The fact is, we are surrounded by a tremendous variety of microbes at all times. This world belongs to microbes, and fermentation processes of all kinds were developed under decidedly non-sterile conditions (Katz 2012, 43). You will never ferment in a sterile environment, but if you create the right conditions for your indigenous or cultured microbes, they will crowd out any incidental microbes.

This mindset reinforces the sense of partnership that you, the one directing fermentation, have with the fermentative microbes you are trying to foster. Michael Pollan, when talking about people he knows who are into making their own fermented products, describes them as having "cultivated a relaxed and genuinely humble attitude to their work, which they regarded as a collaboration between species." He explained how "it helped to have the kind of temperament that could tolerate mystery, doubt and uncertainty without reaching for rule or reason" (Pollan 2013, 319).

The ingredients that you use also represent a partnership between yourself and those who work the land and create the ingredients you use: the farmer, the rancher, the butcher, the grocer. I hope that in your pursuit of fermentation, you will seek out fresh ingredients. This may be from a small grocer or local butcher that you trust, or a farmers' market, or even from growing your own. Whatever

the case, pursuing fermentation with an eye on what is freshest will inevitably lead to you consider the question, "What is seasonal?"

These food preservation strategies evolved as a way to preserve seasonal bounty. We now live in a world where we can go to the grocery store in the middle of winter and find, say, asparagus, albeit thin and wilty. That might make an OK pickle, but it will not make a great pickle. It will not justify my efforts to preserve a mediocre, out-of-season ingredient. We may be able to buy anything at any time, and sometimes I am guilty of this, but I hope that learning some of these methods helps you to think more locally and more seasonally.

RESOURCES

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Gabe Toth is a brewer, distiller, and journalist in northern Colorado who has earned awards from the Great American Beer Festival®, World Beer Cup®, ADI, and ACSA. He now oversees operations at The Family Jones production distillery. Toth is a current contributor to* Artisan Spirit, Distiller, *and* The New Brewer *magazines. He holds degrees in communications and sociology and brewing and distilling certifications from the Institute of Brewing and Distilling (IBD). He has been applying his fermentation knowledge to home-fermented food and drink since 2005.

Brewing Light

By Nick Rodammer

The year 2020 was one of resetting expectations, one that touched all of us in some way, even when it came to homebrewing. For me, this reset meant that four months of preparation for a seminar on designing and brewing light beers for Homebrew Con 2020 in Nashville turned into an 18-month period in which I brewed beers that were almost exclusively around 100 Calories. →

Why put this much focus on brewing light beers? Over the past couple of years, many craft brewers have embraced marketing more health-conscious options in their portfolios, driven by low-Calorie IPAs and hard seltzers. After trying a couple of sub-100-Calorie IPAs from Dogfish Head and Lagunitas in early 2019, I found myself intrigued.

It wasn't necessarily that those beers blew me away. But I did wonder how a homebrewer could successfully scale down recipes like this. How many different styles of beer could be reduced down to a light beer, and what brewing techniques and ingredient choices would be necessary to make it work? Brewing beers this light presents many challenges, and finding solutions to those has been my brewing focus for most of the past two years.

DEFINING LIGHT BEER

Definitions vary on what makes a beer "light." Most people associate the term with fizzy, yellow adjunct lagers bought by the case, but for our discussion, we will expand the idea of light beer to many different styles.

Everyone probably has a different opinion on what makes a beer light, but for our purposes, we'll define a light beer as having less than 120 Calories or 10 g of carbohydrates per 12-ounce (355 mL) serving. For context, that allows an original gravity (OG) of up to around 1.036 and a final gravity (FG) of around 1.007. It's enough to place limits on what we can make, but it allows enough leeway to make many types of beer.

CLASSIC STYLES

Sticking with our 120/10 definition, many classic styles or, in some cases, historical beers that don't neatly fit into the BJCP guidelines, would certainly be considered light beers from a nutritional perspective. Belgian tafelbier, historical saisons and farmhouse ales from the French and Belgian countryside, leichtbier and Berliner weisse from Germany, and a vast array of English styles (bitter, mild, etc.) all would fit our definition.

Many of these don't need any downsizing to be considered light, but other classic styles can certainly be shrunk to make lighter versions. That's where recipe design and technique really come into play, but more on that in a moment.

CALCULATING CALORIES AND CARBOHYDRATES

Before getting into how to make a satisfying light beer, it's important to understand how to measure nutritional values in beer. Thankfully, a method for making a very accurate estimate requires nothing more than a couple of hydrometer readings.

A beer's nutritional content is driven mainly by two factors—original gravity and degree of attenuation. Nearly all of the Calories in beer either come from alcohol or residual carbohydrates (i.e. dextrins and other unfermentable sugars). The higher the original gravity of a beer, the more Calories can fit into either of those buckets.

Alcohol does contribute fewer Calories by weight than carbohydrates, but the difference is not significant, and a fuller-bodied beer will generally only have a few more Calories than one that is bone dry, even at the same original gravity. Ultimately, to brew a beer with low Calories and carbohydrates, we need a low original gravity and high attenuation. Details on how to calculate the nutritional content of your beer can be found in the Calculating Beer Nutrition sidebar.

To test the accuracy of this calculation, I reached out to White Labs, who perform nutritional value testing for commercial breweries. White Labs provided original gravities, final gravities, Calories, and carbohydrates (in grams) per 12-ounce serving for 12 different beers with original gravities ranging from 1.029 to 1.064 and final gravities of 1.000 to 1.011.

Compared to the results estimated in this calculation, on average there was a difference of 1.8 Calories and 0.4 grams of carbohydrates in a 12-ounce serving, with no one beer deviating by more than 3.6 Calories and 1 gram of carbohydrates. While no calculation can deliver perfect results, such good agreement suggests this is a highly accurate method for homebrewers to estimate the nutritional content of their beers.

A CAPITAL QUESTION

How much difference can a capital letter make? When it comes to Calories, it's a factor of 1,000.

A calorie (lowercase) is the amount of energy required to raise the temperature of 1 gram of water by 1°C. A Calorie (capitalized) is the amount of energy required to raise the temperature of 1 kilogram of water by 1°C. One Calorie is equal to 1,000 calories, or 1 kilocalorie (kcal).

Readers who use the metric system can convert Calories (kcal) to kilojoules (kJ) by multiplying by 4.184.

THE IMPORTANCE OF BALANCE

Now that we know what our nutritional targets are and how to measure them, we can get on to building out a recipe. One thing to keep in mind at every step of the process is that light beers require balance. The limited amount of fermentable sugar requires some finesse to pack as much flavor as possible into a small package without throwing any one element out of balance.

The wrong base malt can leave a beer seeming dull and lifeless. Overhopping can make a beer overly bitter and undrinkable. Using the wrong water profile can render a beer that seems thin or astringent. You get the drift, but keep this thought at the forefront as you create your own light beer recipes.

ENZYMES

It would be impossible to thoroughly discuss brewing light beers without touching on supplemental brewing enzymes. If you've been brewing long enough, you probably know something about the naturally occurring enzymes in malt, such as beta amylase and alpha amylase, and what each contributes based on how grain is mashed. The enzymes in question here, though, are added during the brewing process and will convert starch and unfermentable sugars into glucose, thus allowing most yeasts to drive higher attenuation than they would be able to otherwise.

The most commonly available enzyme capable of doing this is amyloglucosidase (AMG). This enzyme is sold under many trade names, such as Amylo 300 by the Kerry Group and Ultra Ferm by White Labs. You may also find it generically labeled as glucoamylase at your local homebrew shop.

Other enzymes can also be used, such as alpha galactosidase (i.e. Beano, found at any local pharmacy), but they will have different properties and denaturing temperatures, so ensure you understand the parameters of any enzyme you choose to use.

AMG can be used both on the hot side in the mash and on the cold side in the fermenter. A benefit of using AMG on the hot side is that it begins to denature at around 149°F (65°C) and fully denatures within 60 seconds at 176°F (80°C), which means it will not carry through to the fermentation vessel.

The downside of hot-side usage is that it may not lead to as fermentable a wort as when used on the cold side, although I have spoken to commercial brewers who have used it successfully on the hot side for beers with a final gravity at or below 1.000. My best results for hot-side use

CALCULATING BEER NUTRITION

A good estimate of a beer's nutritional content can be determined simply by using the original and final gravities from hydrometer readings. The steps to do so are as follows.

1. Convert original gravity (OG) and final gravity (FG), expressed as specific gravity (SG), to original extract (OE) and apparent extract (AE) in degrees Plato (°P). You can use software like BeerSmith or Brewer's Friend, or you can apply the following formula:

$$\text{OE or AE [°P]} = 135.997 \times SG^3 - 630.272 \times SG^2 + 1111.14 \times SG - 616.868$$

2. Calculate real extract (RE), which quantifies actual residual sugars. Apparent extract—what you get from the hydrometer reading—doesn't account for the presence of alcohol, so it is always lower than RE. Real extract is found using the following formula:

$$RE = (0.180 \times OE) + (0.8192 \times AE)$$

3. Once real extract is calculated, determine the beer's alcohol by weight (ABW) using the following formula:

$$ABW = \frac{0.8052 \times (OE - AE)}{\left(2.0665 - 1.0665 \frac{OE}{100}\right)}$$

4. Calculate Calories from the alcohol concentration. The two equations given express Calories per milliliter and per 12 oz., respectively (there are 354.88 milliliters in 12 oz.). You can substitute in any other volume to calculate the Calories for a different serving size by replacing the factor of 354.88 in the second equation by your chosen volume, expressed in milliliters.

$$\textit{Calories per mL} = (6.9 \times ABW + 4 \times RE) \times \frac{FG}{100}$$

$$\textit{Calories per 12 oz.} = (6.9 \times ABW + 4 \times RE) \times 354.88 \frac{FG}{100}$$

5. Calculate estimated carbohydrates per serving. While we'll use many of the values calculated above, we need to estimate the total protein content in the beer, since this would require lab testing otherwise. A reasonable approach is to align this with the gravity of the beer. I've found the following ranges to be reasonably accurate, though you can feel free to adjust them if you feel it is merited. Note that in the calculation itself, you will use the total grams of protein per 100 mL of beer.

< 1.035 OG:	1 g protein per 12 oz.	=	0.279 g per 100 mL beer
1.035–1.050 OG:	1.5 g protein per 12 oz.	=	0.418 g per 100 mL beer
1.035–1.070 OG:	2 g protein per 12 oz.	=	0.558 g per 100 mL beer
> 1.070 OG:	2–3 g protein per 12 oz.	=	0.558–0.837 g per 100 mL beer

$$\textit{Carbs per 12 oz.} = (RE - \textit{protein}) \times \frac{(354.88 \times FG)}{100}$$

Using a real-life example, we'd find the Calories and grams of carbohydrates per 12 oz. serving for a beer with an OG of 1.032 and an FG of 1.001 using the following calculations:

$$OE\ [°P] = 135.997 \times (1.032)^3 - 630.272 \times (1.032)^2 + 1111.14 \times (1.032) - 616.868 = 8.05$$

$$AE\ [°P] = 135.997 \times (1.001)^3 - 630.272 \times (1.001)^2 + 1111.14 \times (1.001) - 616.868 = 0.26$$

$$RE\ [°P] = (0.180 \times 8.05) + (0.8192 \times 0.26) = 1.66$$

$$ABW = [0.8052 \times (8.05 - 0.26)] \div [2.0665 - (1.0665 \times 8.05 \div 100)] = 0.03168 \text{ or } 3.17\%$$

$$\text{Calories per 12 oz.} = (6.9 \times 3.17 + 4 \times 1.66) \times [354.88 \times (1.001 \div 100)] = 101.2$$

$$\text{Carbohydrate per 12 oz.} = (1.66 - 0.279) \times [354.88 \times (1.001 \div 100)] = 4.9$$

Based on the calculation, for a 12 oz. serving this beer has 101 Calories, 4.9 g carbohydrates, and an ABW of 3.2% (4.0% ABV). Our calculations neglect the comparatively smaller contributions from ash.

have been via a very long, two-hour mash with 45-minute rests at 140°F and 145°F (60°C and 63°C), followed by another 30 minutes at 149°F (65°C), which allows for it to work alongside beta amylase to yield a highly fermentable wort.

Using AMG enzyme on the cold side is effective for getting a beer to ferment down to 1.000 or lower, however it works much more slowly at fermentation temperatures. AMG operates most optimally between 104°F and 149°F (40–65°C) and does not denature at fermentation temperatures, which means that, given enough time, it will convert virtually all unfermentable sugars to glucose. This eliminates some element of control, but it is an effective method when a completely dry beer is desired. Be diligent with cleaning, though, as breweries have reported that cold-side enzyme additions can carry through to later batches in the same fermenters.

Adding enzymes is one effective way to make beer with low carbohydrate content, but it's not an absolute must. Many craft breweries make lower-Calorie beers without using enzymes, relying instead on conventional methods to promote attenuation. Whether or not to use enzymes comes down to a brewer's personal preference and what they want to achieve.

INGREDIENTS

Once you've determined what nutritional targets you'd like to hit, it's time to build a recipe. Since we're trying to pack a lot of flavor into a small package, high-quality ingredients are an absolute must, and they are worth it even if you have to pay a little bit more or make a special order to source them.

Malt & Fermentables

Building a malt bill for a light beer is arguably where we can most positively influence the beer's impression, and it all starts with choosing the right base malt. There are many options, depending on what you want to make, but do think extra hard about what each will contribute.

For instance, Weyermann makes several types of Pilsner malt, each of which delivers its own unique character. Their Barke line of malts are known for their malty, sweet flavor, while their floor-malted Bohemian Pilsner has a pleasant grainy note that many brewers love.

For English styles, a high-quality Maris Otter is already a great choice, but this very characterful malt is a great base malt for American style ales as well. Maris Otter can be a little too bready in bigger American style beers, but it's perfect when brewing at this low of a gravity. Again, depending on

the maltster, there can be differences in flavor. I found floor-malted varieties of Maris Otter dialed up the malt flavor wonderfully and were worth the extra trouble to get my hands on since my local shop doesn't normally stock them.

Vienna malt can also be a great substitute for a standard two-row brewers malt, as the extra kilning and color help fill out these beers more than a pale base malt might.

Whichever base malt you choose to go with, think critically about what sensory characteristics you're looking for in your beer, and choose the base malt that will help you achieve those goals.

Another key to building malt character into small beers such as these is to use higher levels of darker-kilned base malt than you might normally consider otherwise, especially Munich-style malts. It would normally be out of character to use a significant portion of Munich malt in an IPA, but doing so at a low gravity can help support generous hopping rates while keeping a beer reasonably pale.

Darker base malts can even successfully be used at 100 percent of the grain bill for the right style. I exclusively used Weyermann's Floor-Malted Bohemian Dark malt (with a color of 6.5°L) for a sub-100-Calorie deep golden SMaSH lager paired with Saaz hops[

Thanks to a generous donation from Briess Malt & Ingredients, I successfully brewed a 110-Calorie Dunkel lager using their 30°L Munich malt. The beer had a wonderful biscuit character and a beautiful chestnut hue that resembled a full-strength Dunkel. Using a 30°L malt for 100 percent of the grist illustrates an important point—don't be afraid to think outside the box, as recipe choices you make at 1.060 may not necessarily translate to a beer starting at 1.030.

As you might expect, specialty malts have a place in many styles you may try to scale down into light beer territory, but they should be used carefully and with finesse. Especially with crystal malt, lean on lighter varieties and use care when incorporating darker ones, as they can easily become cloying if used too heavily.

Caramel or crystal malts in the 8°L to 15°L range, such as Weyermann CaraHell or Caramalt from an English maltster such as Simpsons or Crisp, can be used at higher rates, much like Munich malt, to help fill lighter beers out. Lighter kilned malts usually branded as melanoidin, Brūmalt, or honey malt are also good choices to incorporate, as melanoidin character can help build out palate fullness.

An interesting technique when using a lot of specialty or dark malt is cold steeping, also known as non-enzymatic mashing (NEM). This involves milling the malt and steeping it in cold water for an extended period of time. Dan Bies of Briess has conducted extensive trials of this technique, and he presented his findings at Homebrew Con in 2016. I'd strongly recommend you check out his presentation if you are interested in making dark beers at low gravity, as this technique can deliver great flavor and balance from specialty malts and positively contribute to mouthfeel.

Non-barley malts can also be a key ingredient when constructing a non-traditional malt bill for a light beer. Malts with elevated beta-glucan levels, such as rye or oats, can contribute to added mouthfeel in many different styles. After reading about a brewery that made a rye lager with 30 percent rye malt, I tried this myself in a light lager and found that it added significant mouthfeel with less rye spice than I expected.

Finally, brewing sugars can be a great option for adding character, especially in English styles. Lighter sugars that strip a beer of body should be avoided, but more characterful brewing sugars such as invert sugar or

TABLE 1: SIDE-BY-SIDE SENSORY EXPERIMENT DETAILS.

Variable	Beer A	Beer B
Original gravity:	1.033	
Batch volume:	4 gallons (15.1 L)	
Total grain:	5.5 lb. (2.5 kg)	
Boil time:	60 minutes	
Target color:	5.2 SRM	5.5 SRM
Yeast:	Wyeast 1056 American Ale	
Fermentation temperature:	68°F (20°C)	
Hops:	0.5 oz. Citra Cryo @ 0 min 1.5 oz. Nelson Sauvin, 0.5 oz. Citra Cryo, 0.5 oz. Citra LupoMax @ flameout, 185°F for 25 minutes 2.25 oz. Nelson Sauvin, 1.75 oz. Citra LupoMax dry hopped on day 6 for 4 days	
Grain bill:	58% Crisp Floor Malted Maris Otter 18% Weyermann Dark Munich 9% Flaked Oats 9% Briess RoastOat Malt 6% Briess American Honey Malt	94% Briess 2-Row Brewers Malt 6% Briess Caramel 60
Water:	Ca 121 ppm, SO_4 74ppm, Cl 160 ppm	Ca 45 ppm, SO_4 74 ppm, Cl 25 ppm
Mash:	Step mash: 140/145/149°F w/ glucoamylase enzyme	Single infusion: 158°F
Kettle finings:	None	Whirlfloc
Fermentation enzymes:	glucoamylase	None
Final gravity:	1.001	1.010
ABV:	4.2%	3.0%
Calories/carbohydrates per 12 oz. serving:	106 Calories / 5.5 grams	110 Calories / 12.2 grams

Photos courtesy of Nick Rodammer

TABLE 2: BASIC FORMULATIONS FOR LOW-CALORIE BEERS

Style	Beer	Key Ingredients & Techniques
Malty	Dunkles Leichtbier	• 100% 30°L dark Munich malt • 0.4–0.5 IBU/GU ratio
	Ordinary Bitter	• Floor-malted Maris Otter • Invert sugar #3 (D-90 Candi Syrup is a good substitute) • English Medium & Dark Crystal
	Oak-Aged Mild	• 5°L floor-malted mild malt • Turbinado sugar • Toasted oak cubes • Cask or nitro draft system
	Jr. Irish Stout	• Dark base malt (Maris Otter or mild malt) • 20% or more flaked barley • Non-enzymatically mashed specialty malt (roasted barley and dehusked black malt make a good combination)
Better light lagers	Little Czech	• 100% floor-malted Bohemian dark malt • Very soft water
	Session Lager	• Maris Otter or Vienna base malt • Honey or melanoidin malt • A small (1 oz. per 5 gal.) flameout addition of your favorite fruity/tropical hop (I love Nelson Sauvin for this)
	Leichtbier	• High-quality German Pilsner malt • 15–25% light Munich malt • Weyermann CaraHell malt
	Rye Light Kellerbier	• Your favorite variety of Pilsner malt • 30% rye (malted or mix of malt and flaked) • Noble hops • No finings
Yeast-driven	Farmhouse Table Beer	• Pilsner malt plus rye, wheat, spelt, or oats • Noble hops (don't be afraid to use them generously) • Your favorite mixed-yeast culture • Ferment to dryness and bottle condition to 3.5 or more vol. CO_2 • Hard water
	Petite Saison	• Pilsner malt plus 20%+ Munich malt • Optional adjuncts (wheat, rye, oats, etc.) • Your favorite farmhouse/saison strain fermented very warm • Bottle condition to 3.5 or more vol. CO_2. • Hard water
Hop-forward	Session Imperial Red IPA	• Quadruple (by weight) the malt bill • Non-enzymatic (cold) mashing process • Heavy (1 oz. per gal.) reduced-temperature hop stand and dry hop
	Malty Low-Cal IPA	• Vienna and Munich base malts in place of pale malt • A combination of lighter (25°L or less) crystal or honey/melanoidin malts at 10–20% of the grain bill • High chloride water (target 120–160 ppm) • Reduced temperature (170–185°F) flameout hop addition

Belgian candi sugar are great options that can contribute flavor and increase attenuation. This isn't necessarily an innovative technique, as many English and Belgian styles have relied on dark brewing sugars for decades, but is one homebrewers should keep in mind when designing a recipe.

Hops

Hopping is a little more straightforward, but there are a few key points that can make or break a light beer. First, adjust your bitterness targets to account for the lower gravity. For instance, a beer that might have 40 IBUs at a gravity of 1.050, might only need 25 IBUs when you scale it down to 1.032.

If brewing a beer meant to be hop forward, moving almost all your hop additions to late in the boil or at flameout is a good way to maintain hop character without making it overly bitter. Taking the idea a step further, low-Calorie IPAs can handle relatively significant hop additions at flameout when utilizing a reduced-temperature hop stand or whirlpool.

Because isomerization of iso-alpha acids decreases significantly once the temperature is reduced below 185°F (85°C), this is an ideal temperature for large flameout additions. Note that various studies have shown some bitterness continues to be extracted at these lower temperatures, and even while dry hopping, so brewers shouldn't be intimidated by moving most of their hop additions to temperatures below boiling if maximizing hop character is the goal.

Yeast

While exercising restraint with malt and hops, yeast can be a significant contributor of unique flavors when used correctly. A benefit of brewing beers this light is that a yeast starter isn't usually necessary, as a fresh homebrew pack of yeast typically has enough cells for a healthy fermentation.

To add desirable flavors, you'll want to ferment using a temperature that is typically on the higher end of the suggested range to drive ester production, but do ensure you still use proper pitch rates and oxygenation so as not to create unwanted off flavors. Especially for certain farmhouse styles, an expressive yeast is a must to build character into beers this small.

One lesson I learned while experimenting with various kveik yeast strains is that the small malt bills in low-Calorie beers can come with accordingly small quantities of vital nutrients. These nutrients may require supplementation, so adding yeast nutrient is highly recommended to help ensure a strong fermentation.

Brew This!

Dunkles Leichtbier

Batch volume: 6 US gal. (22.7 L)
Original gravity: 1.034 (8.5°P)
Final gravity: 1.002 (0.5°P)
Efficiency: 80%
Bitterness: 15 IBU
Est. Calories: 110 per 12 oz.
Est. carbohydrates: 6 g per 12 oz.

MALTS

7 lb. (3.18 kg) Briess Munich 30°L malt
1.5 oz. (43 g) Weyermann Carafa III Special malt

HOPS

0.75 oz. (21 g) Tradition, 6% a.a. @ 60 min

ADDITIONAL ITEMS

3 g glucoamylase enzyme @ start of mash
1 tablet Whirlfloc @ 10 min
2.5 g yeast nutrient @ 10 min
3 g glucoamylase enzyme in fermenter before yeast pitch

YEAST

White Labs WLP833 German Bock Lager

WATER

Aim for around 100 ppm chloride, then either acidify or use baking soda to adjust mash pH target to 5.4.

BREWING NOTES

Use a very thin mash or a no-sparge technique. Mash at 144°F (62°C) for 45 min, 149°F (65°C) for 30 min, and 162°F (72°C) for 15 min. If sparging, limit sparge water to 1.5 gal. (5.7 L) or less using 170°F (77°C) water. Collect enough runoff to yield 6 gal. (22.7 L) after a 60-min boil. Boil 60 min, adding hops, Whirlfloc, and yeast nutrient as indicated.

Chill to 46°F (8°C), pitch yeast, and aerate well, ensuring you add glucoamylase enzyme before pitching yeast. Allow fermentation to warm to 50°F (10°C) and ferment until beer is within a few points of final gravity, then allow fermentation to rise to 58°F (14°C). Once complete, transfer to a CO_2–purged keg or other sealed vessel and lager at 30°F (–1°C) for 3 weeks. Carbonate to 2.5 vol. (5 g/L) of CO_2.

Water

Homebrewers who have dialed in how to make proper water chemistry adjustments know just how important this can be for transforming a good beer into a great one. The effect of proper water chemistry in light beers is significant and can easily change the profile both positively and negatively. There isn't a single tip or trick that applies to all light beers, so think about the type of sensory profile you are targeting and craft a water profile around that.

For farmhouse-style beers, harder water can add a pleasant minerality to the flavor profile. English styles may benefit from the increased sulfate levels found in a number of traditional examples. For many beers however, focusing on elevated levels of chloride can beneficially create an additional impression of mouthfeel fullness. This technique is often employed in brewing New England–style hazy IPAs, but it can also be employed in numerous types of light beers as well.

Spices, Fruit, and Other Flavorings

Since we're looking for ways to build character into light beers, our techniques don't have to end with the four main brewing elements. Careful use of spices or other flavorings such as oak will add flavor but not Calories. If using fruit, ensure you do so in such a way that it ferments out and doesn't add sugar to the finished beer.

Consider, too, the additional alcohol that will be created from the fruit sugars, as this will increase the beer's Calorie content. As with all other recipe considerations, start with a light hand and go up from there to ensure your beer isn't thrown out of balance.

One ingredient that has become somewhat well known in the brewing of low-Calorie IPAs is monkfruit. Monkfruit is a small, round fruit native to southern China; extracts made from it are most commonly used as a non-caloric sweetener that is reportedly 150 to 200 times sweeter than sugar.

The first known major use of monkfruit in beer happened at Dogfish Head, which included it in its low-cal IPA, Slightly Mighty. The brewery even went so far as gaining approval from the TTB to add it to the list of approved brewing ingredients. Other brewers have included monkfruit in low-cal IPAs, as its subtle sweetness pairs well with modern hop varieties and can help fill out the sensory profile where additional malt might be used in a normal beer.

If you choose to try monkfruit, liquid extracts can be found in many health food stores or online, but be aware that a little goes a very long way. For the extract I used, I found the right amount to be only 0.5 to 1.5 milliliters per gallon of beer, added either at bottling or to the keg. Start low and taste till you find your desired flavor profile. Adding too much can easily ruin a batch.

MOUTHFEEL: MORE THAN JUST DEXTRINS

One common perception I've heard since I began researching how to brew lighter beers is that a beer with a very low final gravity would come off as thin. For many brewers, the idea that a beer needed a high finishing gravity to have a fuller mouthfeel has been ingrained in our psyche since we started brewing. And while it's true that dextrins, which make up most of the sugars that remain unfermented in most beers, do contribute to mouthfeel, there are many other factors that come into play as well.

What gives a beer mouthfeel is complex and can be influenced not only by dextrins but also water composition, beta glucans, glycerol, polyphenols, and even alcohol content. Many academic studies on beer mouthfeel have been completed over the years; without going into too much detail, many concluded that dextrin content did not correlate well with mouthfeel fullness. If you are interested in exploring this topic further, Scott Janish's excellent book *The New IPA* delves into this topic in great detail and is one I highly recommend checking out (see also "Skeptical Brewing" on page 72 in this issue of *Zymurgy*).

Since brewing lighter beers inherently means lower final gravities and few remaining dextrins, what can we do to build mouthfeel into these beers?

- **Water adjustments:** Many studies have shown that the chloride content of your brewing water can significantly influence the mouthfeel fullness of the finished beer. When building a water profile, don't be afraid to elevate your chloride levels. I've gone as high as 160 ppm in lighter beers with positive results.

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Petite Saison

Batch volume: 6 US gal. (22.7 L)
Original gravity: 1.030 (7.6°P)
Final gravity: 1.000 (0°P)
Efficiency: 80%
Bitterness: 27 IBU
Est. Calories: 96 per 12 oz.
Est. carbohydrates: 4 g per 12 oz.

MALTS

3 lb. (1.36 kg) Weyermann Floor-Malted Bohemian Pilsner malt
1.5 lb. (680 g) Weyermann Munich Type II malt
1.5 lb. (680 g) Weyermann Dark Wheat malt

HOPS

2 oz. (57 g) Saaz, 3% a.a. @ 60 min
0.75 oz. (21 g) Hallertau Mittelfrüh, 3.8% a.a. @ 15 min
0.75 oz. (21 g) Hallertau Mittelfrüh, 3.8% a.a. @ 5 min

ADDITIONAL ITEMS

3 g glucoamylase enzyme in fermenter before yeast pitch

YEAST

White Labs WLP565 Belgian Saison I Ale Yeast or Wyeast 3724 Belgian Saison

WATER

Target a hard water profile using either calcium sulfate (gypsum) or calcium chloride, using baking soda or lactic acid if needed to adjust mash pH target to 5.4.

BREWING NOTES

Use a very thin mash or a no-sparge technique. Mash at 144°F (62°C) for 45 min, 149°F (65°C) for 30 min, and 162°F (72°C) for 15 min. If sparging, limit sparge water to 1.5 gal. (5.7 L) or less using 170°F (77°C) water. Collect enough runoff to yield 6 gal. (22.7 L) after a 60-min boil. Boil 60 min, adding hops as indicated.

Chill to 80°F (27°C), pitch yeast, and aerate, ensuring you add glucoamylase enzyme before pitching yeast. Allow fermentation to warm to 95°F (35°C) and hold until fermentation is complete. Once complete, bottle with priming sugar to target 3.5–3.7 vol. (7–7.4 g/L) CO_2.

- **Beta glucan:** Grains with higher beta glucan content, including oats, rye, wheat and spelt have been shown to increase wort viscosity and contribute to mouthfeel fullness.
- **Glycerol:** It is well known that many yeast strains generate elevated glycerol during fermentation, a byproduct which does create a perception of fullness in beer. Finding a yeast strain that is known for high glycerol production may offer benefits to your beer's mouthfeel.
- **Hop polyphenols:** A 2012 study on the sensory contribution of late hopping very low alcohol beers found many sensory benefits, including palate fullness. Especially for low cal IPAs, adding most to all of the hops after flameout could certainly increase polyphenol concentrations in the wort, with the ability to increase total additions if added at a temperature below boiling.
- **Melanoidins:** A 1989 white paper on the contribution of dextrins to mouthfeel in beer suggested that melanoidins likely had a stronger contribution to mouthfeel than dextrins, and choosing malts with higher melanoidin content may be beneficial in lighter, well attenuated beers.

To test the effectiveness of some of these techniques on mouthfeel, I brewed and compared two similar beers. One was fully attenuated using the techniques noted above, while the other relied mostly upon a higher dextrin content for the same purpose. Similarities and differences between the two beers are give in Table 1.

Thirty tasters from two homebrew clubs local to the Grand Rapids, Mich., area where I live took part in this tasting. First, participants were asked to participate in a triangle test in which they were blindly given one cup of Beer A (fully attenuated) and two cups of Beer B (high finaly gravity) and asked to pick the beer that was different. While 15 of the 30 participants would have needed to pick out the different beer to reach statistical significance, 16 actually made the correct selection, indicating that participants were able to reliably distinguish the two beers from each other.

The second part of the evaluation involved tasting the two different beers side by side (they still did not know which was which) and answering two questions. First, they were asked which beer had a fuller mouthfeel. Second, they were asked which beer they preferred more. Sixteen participants believed Beer A exhibited fuller mouthfeel, while 11 chose Beer B. Three did not perceive any difference. Fifteen participants preferred Beer A, 12 preferred Beer B, and three did not have a preference.

Ultimately, this was really a test of whether other brewing techniques could create the impression of mouthfeel more effectively than just relying on a higher final gravity. While one sensory exercise isn't enough to offer any definitive conclusions, the results do offer some interesting takeaways.

First, that tasters could reliably distinguish Beer A isn't entirely shocking. Despite the similarities, the grain bill, water profile, final gravity, and alcohol content were all different. What may be more interesting, however, is that a majority of participants thought that Beer A had a fuller mouthfeel.

Beer A's recipe was intentionally designed to test the suggestions on mouthfeel noted earlier. Eighteen percent oats in the grain bill led to increased beta glucan content, and a combined 24 percent Munich and honey malts favored increased levels of melanoidins.

The chloride content was significantly higher in Beer A's brewing water at 160 ppm, which many academic studies have shown to correlate to palate fullness. While this certainly doesn't disprove that dextrins are an important piece of the puzzle, it does strongly suggest that brewers have techniques available to them to build mouthfeel into beers even if they are fermented to dryness.

While I doubt any homebrewers will suddenly decide to downsize all their beers (and having done just that for a year and a half I don't recommend it), I do hope some of the observations I made offer brewers a way to successfully make beers with fewer Calories and carbohydrates when the time is right. After all, while a well-executed double IPA, doppelbock, imperial stout, or barleywine is a wonderful thing, successfully making a light beer that keeps you coming back for another pour is a feat any brewer can be proud of!

Nick Rodammer is a past gold medalist in the National Homebrew Competition and a past presenter at Homebrew Con. Nick has had technical research published by the American Homebrewers Association, is a contributing writer for* Brew Your Own *magazine, and helped found the Beer City Pro-Am competition in Grand Rapids, Mich., in 2017.

Recipes Continued >

Brew This!

Shifty Session Lager

Batch volume: 6 US gal. (22.7 L)
Original gravity: 1.032 (8.1°P)
Final gravity: 1.000 (0°P)
Efficiency: 80%
Bitterness: 20 IBU
Est. Calories: 102 per 12 oz.
Est. carbohydrates: 5 g per 12 oz.

MALTS

6.5 lb. (2.95 kg) Crisp No. 19 Floor-malted Maris Otter malt
5 oz. (142 g) Briess American Honey malt
3 oz. (85 g) Simpsons Medium Crystal malt

HOPS

0.25 oz. (7 g) Warrior, 14% a.a. @ 60 min
0.25 oz. (7 g) Hallertau Mittelfrüh, 3.8% a.a. @ 10 min
1 oz. (28 g) Nelson Sauvin, 11% a.a., whirlpool

ADDITIONAL ITEMS

3 g glucoamylase enzyme @ start of mash
1 tablet Whirlfloc @ 10 min
2.5 g yeast nutrient @ 10 min
3 g glucoamylase enzyme in fermenter before yeast pitch

YEAST

White Labs WLP840 American Lager or Wyeast 2035 American Lager

WATER

Target a soft water profile using reverse osmosis (RO) or distilled water and add calcium chloride to reach around 50 ppm chloride. Adjust mash pH target to 5.4.

BREWING NOTES

Use a very thin mash or a no-sparge technique. Mash at 144°F (62°C) for 45 min, 149°F (65°C) for 30 min, and 162°F (72°C) for 15 min. If sparging, limit sparge water to 1.5 gal. (5.7 L) or less using 170°F (77°C) water. Collect enough runoff to yield 6 gal. (22.7 L) after a 60-min boil. Boil 60 min, adding hops, Whirlfloc, and yeast nutrient as indicated.

Chill to 48°F (9°C), pitch yeast, and aerate well, ensuring you add glucoamylase enzyme before pitching yeast. Allow fermentation to warm to 52°F (11°C) and ferment until beer is within a few points of final gravity, then allow fermentation to warm to 58°F (14°C). When complete, transfer to a CO_2-purged keg or other sealed vessel and lager at 30°F (–1°C) for 3 weeks. Carbonate to 2.5 vol. (5 g/L) CO_2.

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Brew This!

Hopfeather

This recipe forms a basis for a low-calorie IPA. The brewer can substitute in any of their favorite hops in similar quantities. Note that all hop additions are post-boil.

Batch volume: 6 US gal. (22.7 L)
Original gravity: 1.032 (8.1°P)
Final gravity: 1.000 (0°P)
Efficiency: 80%
Est. Calories: 102 per 12 oz.
Est. carbohydrates: 5 g per 12 oz.

MALTS

4 lb. (1.81 kg) Crisp No. 19 Floor-malted Maris Otter malt
1.25 lb. (567 g) Weyermann Munich Type II malt
0.65 lb. (295 g) Simpsons Golden Naked Oats
0.65 lb. (295 g) flaked oats
0.45 lb. (204 g) Briess American Honey malt

HOPS

0.5 oz. (14 g) Citra Cryo Hops, 24% a.a. @ 0 min, whirlpool 5 min
2 oz. (57 g) Nelson Sauvin, 11% a.a., whirlpool 25 min @ 180°F (82°C)
0.5 oz. (14 g) Citra Cryo Hops, 24% a.a., whirlpool 25 min @ 180°F (82°C)
1 oz. (28 g) Citra, 12% a.a., whirlpool 25 min @ 180°F (82°C)
3.5 oz. (99 g) Nelson Sauvin, 11% a.a., dry hop on day 6
2.5 oz. (71 g) Citra, 12% a.a., dry hop on day 6

ADDITIONAL ITEMS

3 g glucoamylase enzyme at start of mash
2 g yeast nutrient @ 10 min
3 g glucoamylase enzyme in fermenter before yeast pitch

YEAST

Omega OYL-501 Gulo Ale
or your favorite characterful ale yeast

WATER

Target 160 ppm chloride and 75 ppm sulfate using a combination of calcium chloride and calcium sulfate (gypsum). Adjust mash pH target to 5.4.

BREWING NOTES

Use a very thin mash or a no-sparge technique. Mash at 144°F (62°C) for 45 min, 149°F (65°C) for 30 min, and 162°F (72°C) for 15 min. If sparging, limit sparge water to 1.5 gal. (5.7 L) or less using 170°F (77°C) water.

Collect enough runoff to yield 6 gal. (22.7 L) after a 60-min boil. Boil 60 minutes, adding yeast nutrient as indicated.

Add first addition of Citra Cryo Hops immediately at flameout and rest 5 min before chilling wort to 180°F (82°C). Add remaining whirlpool hops and rest 25 min before chilling to yeast pitching temperature. Pitch yeast at 68°F (20°C) and aerate well, ensuring you add glucoamylase enzyme before pitching yeast.

Hold fermentation at 68–72°F (20–22°C) until complete. Lower temperature to 58°F (14°C) and add dry hops, taking care to introduce as little oxygen as possible to fermenter. Dry hop 3 days, then lower beer temperature to 30°F (–1°C) for 2 days, then transfer to a CO_2-purged keg or other sealed vessel and carbonate to 2.5 vol. (5 g/L) CO_2.

CHERISHED RECIPES FROM AMERICA'S SMALL AND INDEPENDENT BREWERIES

By Brewers Association member breweries

What's your favorite beer? If you're like me, you dread that question. It's like being asked to name a favorite child, a favorite pet, or a favorite toilet-paper orientation (over the front, clearly).

What's my favorite beer? "The one in my hand," while often holding an element of truth, is such an overused response that it borders on cliché, at least when deployed within beer circles. "All of them" is as unsatisfactory as it is patently false.

Nevertheless, we all keep certain beers and recipes close to our hearts, whether we'd readily identify them as favorites or not. It could be a house ale you brew every other batch to always keep on hand. Or maybe it's a holiday seasonal you make annually to age for the upcoming year.

I don't have a favorite recipe, but even though I'm a big lager nerd, I've probably brewed more hefeweizen over the years than anything else. I like it, and everyone who drinks it also seems to like it. In fact, I have one fermenting right now.

A while back, I wondered what would happen if we asked professional brewers to share their favorite recipes with *Zymurgy* readers. Would we get a lot of hazy IPA? Would it be mostly Pilsner? Would we get a bunch of fruited sours? Or maybe American brown ale—remember those?

Then I recalled how pointless it is to ask for favorites. So, we simply asked a few brewers to pick recipes they'd like to share with American Homebrewers Association members. Dealer's choice, just something they thought we all might like.

The selection of recipes in front of you now is the result of that request. They're here for you to brew at home, obviously, but if you're able to visit any of these featured breweries, I encourage you to do so. Brewers have had a rough couple of years. Be sure to visit your local, too.

I'd also encourage you to purchase a few bottles, cans, pints, or crowlers of the featured beer, if it's still in production. Much of the fun of brewing clone recipes is to see how close you can get, and for that you need some control samples.

While you're visiting those breweries, please thank the brewers for sharing with us. And also, while you're there, ask them to please bring back American brown ale at the earliest opportunity.

***Dave Carpenter is editor-in-chief of* Zymurgy.** →

ALASKAN PALE

AMERICAN BLONDE ALE

Recipe courtesy of Alaskan Brewing Co., Juneau, Alaska.

Alaskan Brewing Co. brewed its Pale golden ale from 1987 to 2013. The brewery discontinued Pale because of decreased availability of US Tettnang hops. Homebrewers may have an easier time obtaining small amounts of US Tettnang (particularly if you grow them in your backyard), but Santiam and UK Fuggle would be reasonable substitutes.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.047 (11.7°P)
Final gravity: 1.008 (2.1°P)
Color: 5 SRM
Bitterness: 24 IBU
Alcohol: 5.2% by volume

MALTS & ADJUNCTS

7.0 lb. (3.18 kg) pale malt
1.1 lb. (499 g) Munich malt

HOPS

0.2 oz. (7 g) Chinook, 11.3% a.a. @ 60 min
0.8 oz. (24 g) Willamette, 4.5% a.a. @ 30 min
3.9 oz. (110 g) US Tettnang, 4.2% a.a., dry hop
1.5 oz. (42 g) Chinook, 11.3% a.a., dry hop

YEAST

12 M cells American ale yeast

BREWING NOTES

Mash in at 120°F (49°C) with 2.9 gal. water and hold 20 minutes. Raise mash temperature to 140°F (60°F) for 20 minutes, 153°F (67°F) for 20 minutes, and 160°F (71°F) for 10 minutes. Mash out at 170°F (77°F) for 10 minutes and then sparge with enough 170°F (77°F) water to achieve a pre-boil volume of 6 gal. (22.7 L).

Boil 60 minutes, adding kettle hops as indicated. Chill to 63°F (17°C), aerate, pitch yeast, and ferment at (18°C).

When specific gravity reaches approximately 1.019 (4.8°P), add the dry hops. If you have the ability to ferment under pressure, spund 48 hours after dry hopping to allow natural carbonation. Otherwise, allow fermentation to complete and final gravity to stabilize before bottling or kegging with 2.65 vol. (5.3 g/L) of CO_2.

RIVER TRIP

BELGIAN-STYLE SESSION ALE

Recipe courtesy of Allagash Brewing Co., Portland, Maine.

A companion to backyards, backwoods, and balconies alike. River Trip is a low-ABV, Belgian-style table beer with hop-forward grapefruit and stone-fruit notes. It's brewed with local grains and spiced with coriander for an extra hint of citrus. Dry hopping with Comet and Azacca contributes to the mix of melon and grapefruit notes in the beer's aroma. Good for any adventure.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.040 (10°P)
Final gravity: 1.004 (1°P)
Color: 3 SRM
Bitterness: 40 IBU
Alcohol: 4.8% by volume

MALTS & ADJUNCTS

6.5 lb. (2.95 kg) pale malt
1 lb. (454 g) Munich malt, 10°L
1 lb. (454 g) flaked oats

HOPS

0.5 oz. (14 g) Nugget, 13.0% a.a. @ 60 min
1.5 oz. (43 g) Cascade, 5.5% a.a., @ 15 min
1.5 oz. (43 g) Comet, whirlpool 20 min
1.5 oz. (43 g) Azacca, whirlpool 20 min
1.5 oz. (43 g) Comet, dry hop
2.0 oz. (57 g) Azacca, dry hop

YEAST

Wyeast 3463 Forbidden Fruit, White Labs WLP400 Belgian Wit Ale Yeast, or Imperial Yeast B44 Whiteout

ADDITIONAL ITEMS

0.25 oz. (7 g) crushed coriander seed, whirlpool 10 min

BREWING NOTES

Heat 12.7 qt. (12 L) strike water to 162°F (72°C) and mix with grains. The mash should stabilize at about 149°F (65°C). Hold 60 min, then raise temperature to mash out at about 168°F (76°C), either by infusion of boiling water, decoction, or other means. Vorlauf until wort runs clear, then begin sparge. Collect 7 gal. (26.5 L) of wort and bring to a boil. Boil 60 min, adding kettle hops as indicated.

When boil is complete, turn off the heat, give a long stir to create a whirlpool, and add the whirlpool hops and coriander. Steep spices 10 min and remove. Rest an additional 10 min.

Chill wort to 68°F (20°C). There should be about 5.5 gal. (21L) of wort in your fermenter. Add yeast and aerate wort. Ferment in a temperature-stable location at 70–74°F (21–23°C). On day 4 of fermentation, add dry hops directly to fermenter. Bottle or keg when fermentation is complete.

Photos courtesy of individual breweries unless otherwise noted.

ROD'S BEST CREAM ALE

CREAM ALE

Recipe courtesy of Big Beach Brewing Co., Gulf Shores, Alabama.

From brewer Rod Murray: "In the early '90s, my second batch of beer was an American cream ale from a homebrew shop in Kansas City, Bacchus & Barleycorn. I wanted a beer that my friends and family could all enjoy. I loved the traditional cream ale style and wanted to perfect my recipe. Fast forward a few decades, and this is the version that, for my palate, was my best. This version of Cream Ale has won more awards and best-of-show honors than any other beer I make.

"I like the grainy taste of the American two-row barley with the gentle Pilsner character. The flaked rice and sugar help to dry it out. The flaked corn is there to mimic what is traditionally found in many of the mass-produced lagers of our time. Folks expect and are often thrilled to find a light touch of the maize flavor and aroma. Drinking this beer for decades, I have become very sensitive to the level of corn so, the amount in my recipe may be too light for some.

"This recipe is all about experimentation and finding what you love. I've gone from single-malt to multi-malt batches, creamed corn, corn candy, you name it. I still tinker with it today, but this version always comes out on top—the cream of the crop."

Batch volume: 6.0 US gal. (22.7 L)
Original gravity: 1.044 (11°P)
Final gravity: 1.004 (1°P)
Efficiency: 70%
Color: 3 SRM
Bitterness: 11 IBU
Alcohol: 5.2% by volume

MALTS & ADJUNCTS

3.0 lb. (1.36 kg) BEST Pilsen Malt
3.0 lb. (1.36 kg) Briess Brewers Malt 2-Row
2.0 lb. (907 g) flaked rice
8.0 oz. (227 g) flaked maize
1.0 lb. (454 g) cane (beet) sugar

HOPS

0.1 oz. (4 g) Pahto (2019), 18% a.a. @ 90 min
0.5 oz. (14 g) Hallertauer Hersbrucker, 1.4% a.a. @ 10 min

YEAST

Fermentis SafAle US-05

ADDITIONAL ITEMS

1 tablet Whirlfloc @ 15 min
1 tsp. yeast nutrient @ 5 min

BREWING NOTES

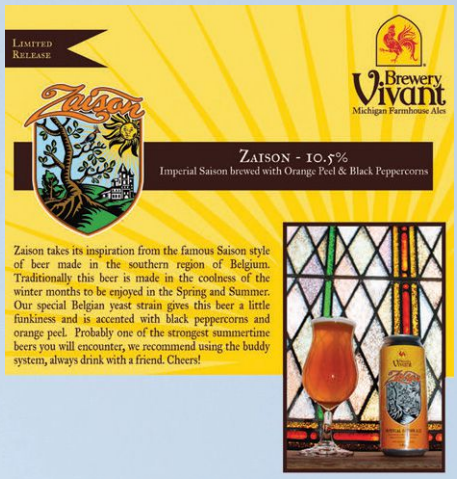
Mash 75 minutes at 148°F (64°C). Boil 90 minutes, adding hops, Whirlfloc, and yeast nutrient as indicated. Ferment at 67°F (19°C) until specific gravity stabilizes at or near 1.004 (1°P). Cold crash to 34°F (1°C) and cold condition for two weeks before kegging or bottling to 2.5 vol. (5 g/L) CO_2.

ZAISON

IMPERIAL SAISON

WITH TELLICHERRY BLACK PEPPERCORNS AND ORANGE PEEL

Recipe courtesy of Brewery Vivant, Grand Rapids, Michigan.



Zaison takes its inspiration from the famous saison style of beer made in the southern region of Belgium. Traditionally this beer is made in the coolness of the winter months to be enjoyed in the Spring and Summer. Our special Belgian yeast strain gives this beer a little funkiness and is accented with tellicherry black peppercorns and orange peel. Probably one of the strongest summertime beers you will encounter, we recommend using the buddy system, always drink with a friend. Cheers!

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.080 (19.3°P)
Final gravity: 1.013 (3.3°P)
Efficiency: 70%
Color: 4 SRM
Bitterness: 40 IBU
Alcohol: 9.0% by volume

MALTS & ADJUNCTS

12.4 lb. (5.62 kg) Pilsner malt
1.1 lb. (499 g) unmalted white wheat
1 lb. (454 g) beet sugar, whirlpool

HOPS

1.5 oz. (43 g) Cascade, 8.9% a.a. @ 30 min
2.5 oz. (71 g) French Strisselspalt, 2.2% a.a., whirlpool

YEAST

Bière de garde yeast

ADDITIONAL ITEMS

4 oz. (113 g) sweet orange peel, whirlpool
1.5 oz. (43 g) Tellicherry black peppercorns, whirlpool

BREWING NOTES

Mash grains at 148°F (64°C) for 45 min. Boil 90 minutes, adding Cascade hops as indicated. Add beet sugar, Strisselspalt hops, and spices to whirlpool. Ferment at 80°F (27 °C).

PIPE ORGAN PALE ALE

AMERICAN PALE ALE

Recipe courtesy of The Church Brew Works, Pittsburgh, Pennsylvania.

This beer has a light body with just enough residual sweetness to hold up to the fruity flavors. It is pale red in color and hopped with Azacca hops. The perfect summertime beer!

Batch volume: 5.25 US gal. (19.9 L)
Original gravity: 1.048 (11.9˚P)
Final gravity: 1.010 (2.6˚P)
Efficiency: 75%
Color: 4 SRM
Bitterness: 50 IBU
Alcohol: 5% by volume

MALTS & ADJUNCTS

7.0 lb. (3.18 kg) pale malt
11.2 oz. (318 g) dextrin malt
11.2 oz. (318 g) oat malt
11.2 oz. (318 g) light rye malt
4.0 oz. (113 g) melanoidin malt

HOPS

0.1 oz. (3 g) Azacca, 12.0% a.a. @ 60 min
0.6 oz. (17 g) Azacca, 12.0% a.a. @ 10 min
4.0 oz. (113 g) Azacca, 12.0% a.a., whirlpool/steep 10 min

YEAST

Omega OYL-091 Hornindal Kveik

WATER

Target 150 ppm sulfate in strike water

BREWING NOTES

Mash 60 min at 145˚F (63˚C). Boil 60 minutes, adding hops as indicated. Ferment at 95˚F (35˚C).

THE CHURCH BREW WORKS®

RED CHAIR NORTHWEST PALE ALE

AMERICAN PALE ALE

Recipe courtesy of Deschutes Brewery, Bend, Oregon.

Our winter seasonal, now available whenever you want! Deschutes Red Chair NWPA blends citrus hops with malty balance to make this quintessential beer to Central Oregon. Bold hops with a clean finish.

Batch volume: 5.5 US gal. (20.8 L)
Original gravity: 1.063 (15.4˚P)
Final gravity: 1.018 (4.6˚P)
Efficiency: 75%
Color: 13 SRM
Bitterness: 60 IBU
Alcohol: 6.2% by volume

MALTS & ADJUNCTS

9.5 lb. (4.31 kg) Great Western two-row malt
1.2 lb. (553 g) Great Western Pilsner malt
11.5 oz. (327 g) Great Western Munich malt
8.0 oz. (227 g) Great Western crystal 150 malt
6.4 oz. (181 g) Great Western unmalted wheat
5.4 oz. (154 g) Great Western crystal 75 malt

HOPS

1.2 oz. (33 g) Herkules, 14.3% a.a. @ 60 min
0.9 oz. (25 g) Cascade, 4.8% a.a. @ 5 min
4.0 oz. (113 g) Centennial, 7.0% a.a. @ 0 min
2.7 oz. (77 g) Centennial, 7.0% a.a., dry hop 3 days
2.7 oz. (77 g) Mosaic, 12.8% a.a., dry hop 3 days

YEAST

Wyeast Labs 1187 Ringwood Ale or Fermentis SafAle S-04

BREWING NOTES

Mash at 150˚F (66˚C) for 60 minutes, followed by a 5-minute mash-out at 170˚F (77˚C). Chill wort to 65˚F (18˚C) and ferment at that temperature until final gravity is reached. After fermentation, either allow for a 48-hour diacetyl rest or store two weeks in dark, temperature-controlled area. Package with 2.32 vol. (4.64 g/L) CO_2.

DESCHUTES

RED CHAIR NWPA
NORTHWEST PALE ALE

GALAXY MONSTER

DOUBLE IPA

Recipe courtesy of F.X. Matt Brewing Co., Utica, New York.

An unfiltered double IPA brewed with Australian Galaxy and New Zealand Nelson Sauvin hops for flavors of juicy passion fruit, guava, pine, and gooseberry, Galaxy Monster was one of our more popular hoppy beers that is no longer brewed.

Avoid overmixing the dry hops, or you can easily extract harsh polyphenols that will make the beer very dry and bitter. We always aim to achieve the bright juicy hop flavors without any of the hash or bitter dry hop character. This recipe was originally brewed with WLP001, but it also makes a very nice beer brewed with London Ale as well.

Batch volume: 6.0 US gal. (22.7 L)
Original gravity: 1.075 (18.2°P)
Final gravity: 1.014 (3.6°P)
Efficiency: 75%
Color: 5 SRM
Bitterness: 60 IBU
Alcohol: 8.0% by volume

MALTS & ADJUNCTS

12 lb. (5.44 kg) pale malt
2.5 lb. (1.13 kg) white wheat malt
1 lb. (454 g) Weyermann Carafoam
1 lb. (454 g) flaked oats

HOPS

1 oz. (28 g) Columbus/Tomahawk/Zeus (CTZ), 14.5% a.a. @ 60 min
2 oz. (57 g) Galaxy, 14.0% a.a., hop stand, 20 min
2 oz. (57 g) Nelson Sauvin, 12.0% a.a., hop stand, 20 min
3 oz. (85 g) Galaxy, 14.0% a.a., dry hop
2 oz. (57 g) Nelson Sauvin, 12.0% a.a., dry hop

WATER

Mash with 5 gal. (18.9 L) reverse osmosis or carbon-filtered water with 1.5 g gypsum and 5 g calcium chloride. Adjust mash pH with lactic acid to 5.2. Acidify sparge water to pH 5.5 with lactic acid.

YEAST

Wyeast Labs 1318 London Ale III (preferred)
or White Labs WLP001 California Ale Yeast

ADDITIONAL ITEMS

3 g gypsum, half in mash and half in kettle
10 g calcium chloride, half in mash and half in kettle

BREWING NOTES

Adjust mash and sparge water as indicated above. Mash 45 min at 150°F (18°C). Mash out at 170°F (77°C). Vorlauf until clear. Collect 7 gal. (26 L) wort, sparging with 170°F (77°C) water.

Boil 60 min with first hop addition. With 15 minutes left in boil, add 1.5 g gypsum and 5 g calcium chloride. When boil is complete, chill wort to 180°F (82°C) and add hop stand hops. Allow to settle for 20 min.

Chill wort to 64°F (18°C). Aerate wort and pitch yeast. Ferment no warmer than 70°F (21°C). At end of fermentation add 1 oz. (28 g) Galaxy and 1 oz. (28 g) Nelson Sauvin dry hop and let sit for 3 days. Add the remaining dry hops and let sit for an additional 3 days.

Rack beer, cold crash, and age for a week. Bottle or keg beer.

TOLLHOUSE

AMERICAN STOUT

Recipe courtesy of Fibonacci Brewing Co., Cincinnati, Ohio.

Jet black with moderate bitterness, Tollhouse American Stout has a strong roasted coffee flavor and aroma with hints of chocolate. Mount Healthy's Toll House Gang gathered around the old toll house to swap stories, share a cup of coffee, and keep Mount Healthy's past alive. Frank Stout was a prominent figure of the Toll House Gang, hence the name of the beer, and has many relatives still in and around the Mount Healthy area.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.076 (18.4°P)
Final gravity: 1.017 (4.3°P)
Color: 44 SRM
Bitterness: 45 IBU
Alcohol: 7.9% by volume

MALTS & ADJUNCTS

7 lb. (3.18 kg) US pale malt
5 lb. (2.27 kg) Maris Otter
12.0 oz. (340 g) dextrin malt
12.0 oz. (340 g) chocolate malt, 450°L
8.0 oz. (227 g) black patent malt, 500°L
8.0 oz. (227 g) roasted barley, 300°L
4.0 oz. (113 g) caramel malt, 120°L

HOPS

1.50 oz. (43 g) Northern Brewer, 8.5% a.a. @ 60 min
0.50 oz. (14 g) Northern Brewer, 8.5% a.a. @ 30 min
0.25 oz. (7 g) Northern Brewer, 8.5% a.a. @ 0 min

WATER

8.55 gal. (38.9 L) distilled water
adjusted to the following profile:
Ca 52 ppm, Mg 9 ppm, Na 37 ppm,
SO_4 34 ppm, Cl 44 ppm, HCO_3 139 ppm

YEAST

2 sachets Lallemand BRY-97
American West Coast Ale yeast

BREWING NOTES

Mash in with 4.61 gal. (21 L) of 163°F (73°C) water and hold steady at 152°F (67°C) for 60 min. Fly sparge with 3.94 gal. (17.9 L) of 168°F (76°C) water. Boil 60 min, adding hops as indicated. Chill wort to 68°F (20°C) and pitch yeast.

DAS ÜBERKIND

VIEILLE SAISON

Recipe courtesy of Jester King Brewery, Austin, Texas.

Most of the Das Überkind we make ends up being refermented with fruit, but every year or two, we like to take some of our favorite barrels and blend them without fruit. The average 10- to 12-month aging period allows the beer to pick up vanilla oak character as it develops more acidity and lots of stone fruit and tropical fruit character. The resulting beer is tart and dry, but with a medium-full body that carries the bright fruit complexity. It is bottled and kegged, a small dose of priming sugar is added so that it can be 100% naturally conditioned through refermentation in the serving vessel.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.041 (10.2°P)
Final gravity: 1.000 (0.0°P)
Efficiency: 75%
Color: 2 SRM
Bitterness: 15 IBU
Alcohol: 5.4% by volume

MALTS & ADJUNCTS

6 lb. (2.72 kg) TexMalt Llano Pilsner or other Pilsner malt
1.5 lb. (680 g) TexMalt Denton County Wheat or other wheat malt

HOPS

0.75 oz. (21 g) U.S. Goldings, 5.0% a.a. @ 60 min
0.75 oz. (21 g) aged low-alpha noble-type hops, 0.0% a.a. @ 60 min

YEASTS & BACTERIA

Wyeast 3711 French Saison
White Labs WLP565 Belgian Saison I Ale Yeast
Bottle dregs from your favorite wild ale

BREWING NOTES

Mash 60 min at 152°F (67°C). Oxygenate wort and boil 60 minutes, adding hops as indicated. Co-pitch the three sets of microbes and ferment at 75°F (24°C) until terminal gravity is reached.

TIMBER BEAST

IMPERIAL RYE IPA

Recipe courtesy of Lazy Magnolia Brewing Co., Kiln, Mississippi.

This beer made history as the very first high-gravity beer ever produced and sold in the state of Mississippi. We packaged it for the first time at 12:00:01 a.m. on July 1, 2012—the very second that the new law went into effect allowing high-gravity beer to be produced and sold in the state.

Our team threw a big party on June 30, 2012, to celebrate the new law. Guests included members of the Mississippi legislature, local community and business leaders, a preacher and a priest to bless the occasion, and our distributor partners, several of whom showed up in pickup trucks to take the first shipments back to their warehouses early that Sunday morning. The county sheriff was on hand to call the official start time for the bottling run at midnight.

The name "Timber Beast" honors our friend Butch Bailey, who started the advocacy group Raise Your Pints, a group dedicated to improving beer laws in Mississippi. Without his leadership, Mississippians would still be unable to enjoy most beer styles without crossing state lines. Butch's day job is in forestry. The image on the label shows him in his natural habitat.

Timber Beast continues to be Lazy Magnolia's second bestselling brand, still going strong after nearly 10 years in the market. We hope you enjoy brewing and drinking this delicious imperial IPA that celebrates a small step in Mississippi's progress.

Batch volume: 5.5 US gal. (20.8 L)
Original gravity: 1.082 (19.8°P)
Final gravity: 1.015 (3.8°P)
Efficiency: 75%
Color: 8 SRM
Bitterness: 80 IBU
Alcohol: 8.8% by volume

MALTS & ADJUNCTS

12.0 lb. (5.44 kg) pale malt
1.7 lb. (794 g) flaked rye
12.8 oz. (363 g) caramel malt, 40°L
12.8 oz. (363 g) Briess Carapils malt
9.6 oz. (272 g) rye malt

HOPS

1.25 oz. (35 g) Nugget @ 60 min
3.5 oz. (99 g) Simcoe @ 10 min
1.25 oz. (35 g) Ahtanum @ 10 min
1.5 oz. (43 g) Amarillo @ 10 min
1.25 oz. (35 g) Cascade @ 10 min
5.0 oz. (142 g) Simcoe, whirlpool, 160°F (71°C)
2.5 oz. (71 g) Ahtanum, whirlpool, 160°F (71°C)
2.5 oz. (71 g) Simcoe , dry hop 5 days
2.0 oz. (57 g) Centennial, dry hop 5 days
0.75 oz. (21 g) Ahtanum, dry hop 5 days
0.75 oz. (21 g) Amarillo, dry hop 5 days
0.75 oz. (21 g) Cascade, dry hop 5 days

YEAST

Fermentis SafAle US-05

ADDITIONAL ITEMS

Rice hulls, optional, as lautering aid

BREWING NOTES

Mash at 150–152°F (66–67°C) for 45 min. Mash out, vorlauf, and sparge. Boil wort 60 min, adding hops as indicated. Chill wort, pitch yeast, and ferment at 68°F (20°C). Dry hop after primary fermentation is finished for 5 days, and then cold crash. Bottle or keg as usual.

LUNCH

AMERICAN IPA

Recipe courtesy of Maine Beer Co., Freeport, Maine.

Our East Coast version of a West Coast–style IPA. Intense hop flavors and aromas of tropical and citrus fruits and pine dominate. A subtle malt sweetness brings the beer into balance. Lunch is named after a whale that has been spotted off the Maine coast since 1982. She has what looks like a bite taken out of her fin, which adds to her unique character. We dedicate this beer to her determination and persistence. Keep on swimming!

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.061 (15.0˚P)
Final gravity: 1.009 (2.2˚P)
Efficiency: 70%
Color: 8.5 SRM
Bitterness: 63 IBU
Alcohol: 7% by volume

MALTS & ADJUNCTS

10.2 lb. (4.65 kg) US pale malt
8.0 oz. (227 g) caramel malt, 40˚L
8.0 oz. (227 g) Munich malt, 10˚L
8.0 oz. (227 g) red wheat malt
4.0 oz. (113 g) Briess Carapils malt

HOPS

0.11 oz. (3 g) Warrior, 15.0% a.a. @ 60 min
0.21 oz. (6 g) Centennial, 10.0% a.a. @ 45 min
0.18 oz. (5 g) Centennial, 10.0% a.a. @ 30 min
0.14 oz. (4 g) Amarillo, 8.3% a.a. @ 30 min
0.11 oz. (3 g) Simcoe, 13.0% a.a. @ 30 min
0.35 oz. (10 g) Centennial, 10.0% a.a. @ 15 min
0.18 oz. (5 g) Amarillo, 8.3% a.a. @ 15 min
0.14 oz. (4 g) Simcoe, 13.0% a.a. @ 15 min
0.71 oz. (20 g) Amarillo, 8.3% a.a., whirlpool 10 min
0.71 oz. (20 g) Centennial, 10.0% a.a., whirlpool 10 min
0.71 oz. (20 g) Simcoe, 13.0% a.a., whirlpool 10 min
2.0 oz. (57 g) Amarillo, 8.3% a.a., dry hop 3 days
2.0 oz. (57 g) Centennial, 10.0% a.a., dry hop 3 days
2.0 oz. (57 g) Simcoe, 13.0% a.a., dry hop 3 days

YEAST

Wyeast Labs 1056 American Ale

BREWING NOTES

Mash 60 minutes at 149˚F (65˚C). Boil 60 minutes, adding hops as indicated.

IMPERIAL COCONUT PORTER

IMPERIAL AMERICAN PORTER WITH COCONUT

Recipe courtesy of Maui Brewing Co., Kihei, Hawaii.

MAUI BREWING Co

Maui Brewing Co.'s Imperial Coconut Porter won a gold medal at the 2016 Great American Beer Festival in the Field Beer category. A deeper, more intense version of the brewery's flagship Coconut Hiwa Porter, Imperial Coconut Porter is brewed with hand-toasted coconut and offers subtle hints of cacao and coffee. The rich, slightly sweet, and malty ale pours with a dark tan head and drinks with a silky smooth yet warming finish.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.087 (21.0˚P)
Final gravity: 1.019 (4.8˚P)
Efficiency: 70%
Color: 45 SRM
Bitterness: 25 IBU
Alcohol: 9.0% by volume

MALTS & ADJUNCTS

8.5 lb. (3.86 kg) pale malt
3.0 lb. (1.36 kg) Golden Promise malt
1.5 lb. (680 g) Munich malt
12.8 oz. (363 g) Simpsons Chocolate malt
11.2 oz. (318 g) rolled oats
9.6 oz. (272 g) crystal malt, 77˚L
8.0 oz. (227 g) Weyermann Caramunich Type II malt
8.0 oz. (227 g) brown malt
8.0 oz. (227 g) caramel malt, 120˚L
8.0 oz. (227 g) cane sugar @ 20 min

HOPS

0.5 oz. (14 g) Cascade, 6.2% a.a. @ 90 min
1.0 oz. (28 g) Cascade, 8.0% a.a. @ 20 min

YEAST

Chico ale yeast

ADDITIONAL ITEMS

2 lb. (907 g) toasted coconut, secondary

BREWING NOTES

Mash grains 60 min at 152˚F (67˚C). Boil 90 min, adding hops and cane sugar as indicated. Ferment at 65˚F (18˚C) until final gravity is reached. Rack to secondary and add toasted coconut. Allow to condition 7 days before bottling or kegging.

HOPLANDIA

AMERICAN IPA

Recipe courtesy of New Realm Brewing Co., Atlanta, Georgia.

A New Realm-style IPA. Dense with sought-after hops and lush with a heavenly hit of citrus. It's got a deep golden color, a lot of hops, some lemon and peach, pine resin. And a little bit of dankness—you'll know it when you smell it.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.065 (15.9°P)
Final gravity: 1.010 (2.6°P)
Efficiency: 70%
Color: 6 SRM
Bitterness: 70 IBU
Alcohol: 7.3% by volume

MALTS & ADJUNCTS

12.2 lb. (5.53 kg) US pale malt
8.1 oz. (229 g) Simpsons Caramalt
4.4 oz. (124 g) Weyermann Acidulated malt

HOPS

1.5 oz. (43 g) Warrior, 15.6% a.a. @ 60 min
0.7 oz. (21 g) Centennial, 9.7% a.a., whirlpool 20 min
0.7 oz. (21 g) Simcoe, 13.5% a.a., whirlpool 20 min
2.5 oz. (71 g) Centennial, 10.0% a.a., dry hop 3 days
2.5 oz. (71 g) Simcoe, 13.0% a.a., dry hop 3 days

YEAST

Chico ale yeast

WATER

Ca 49 ppm, Mg 11 ppm, Na 16 ppm, SO_4 105 ppm, Cl 45 ppm, HCO_3 32 ppm

BREWING NOTES

Mash 30 minutes at 156°F (69°C), targeting a mash pH of 5.2. Boil 60 minutes, adding kettle hops and whirlpool hops as indicated. Chill wort to 62°F (17°C) and pitch yeast. Ferment at 68°F (20°C) until specific gravity falls to 1.016 (4°P), and then raise temperature to 75°F (24°C) for diacetyl rest. After diacetyl rest, chill to 60°F (16°C) and add dry hops. Carbonate to 2.65 vol. (5.3 g/L) CO_2.

FLOOF

HOPPY LAGER

Recipe courtesy of Purpose Brewing & Cellars, Fort Collins, Colorado.

Floof is an unfiltered quencher made with Barbe Rouge and Elixir hops from Alsace, France. Crisp with floral notes and hints of lemongrass and blackcurrants.

Batch size: 5.0 US gal. (18.9 L)
Original gravity: 1.050 (12.4°P)
Final gravity: 1.008 (2.1°P)
Efficiency: 70%
Color: 3 SRM
Bitterness: 45 IBU
Alcohol: 5.6% by volume

MALTS & ADJUNCTS

8.5 lb. (3.86 kg) Pilsner malt
1.0 lb. (454 g) pale wheat malt

HOPS

1.0 oz. (28 g) Columbus/Tomahawk/Zeus, 14% a.a. @ 15 min
2.0 oz. (57 g) Barbe Rouge, 8.5% a.a. @ 1 min
2.0 oz. (57 g) Elixir, 6% a.a., 5 min into whirlpool
3.0 oz. (85 g) Barbe Rouge, 8.5% a.a., dry hop on day 4
3.0 oz. (85 g) Elixir, 6% a.a., dry hop on day 4

WATER

Ca 240 ppm, Mg 2 ppm, Na 3 ppm, SO_4 127 ppm, Cl 316 ppm, HCO_3 45 ppm

YEAST

Andechs lager yeast

ADDITIONAL ITEMS

Yeast nutrient @ 15 min
Irish moss @ 15 min

BREWING NOTES

Mash at 150°F (66°C) for 45 minutes. Vorlauf 15 minutes and collect runoff. Boil 90 minutes, adding kettle hops as indicated. Whirlpool for a total of 20 minutes, adding whirlpool hops 5 minutes in.

Knockout at 48°F (9°C) and pitch a healthy starter of Andechs lager yeast. Ferment at 50°F (10°C). Add dry hops four days after pitching yeast. Ferment to completion. After beer passes diacetyl check, cool young beer by 2°F (1°C) per day to lagering temperature of 34°F (1°C). Lager 3–4 weeks or until beer is bright.

COSECHA

BELGIAN-STYLE TRIPEL

WITH PINEAPPLE AND SMOKED POBLANO AND PASILLA CHILES

Recipe courtesy of Raíces Brewing, Denver, Colorado.

Cosecha is Spanish for "harvest." Other breweries create a pumpkin beer at harvest time, but we wanted to be different. So we focused on creating a specialty vegetable beer with pineapple, smoked poblano chiles, and pasilla chiles.

Batch volume: 5 US gal. (18.9 L)
Original gravity: 1.085 (20.5°P)
Final gravity: 1.019 (4.8°P)
Color: 6 SRM
Bitterness: 13 IBU
Alcohol: 8.6–9.0% by volume

MALTS & ADJUNCTS

8.75 lb. (3.97 kg) Belgian Pilsner malt
3.75 lb. (1.70 kg) pale malt
0.8 lb. (363 g) melanoidin malt
8 oz. (227 g) red wheat malt
8 oz. (227 g) acidulated malt
1.5 lb. (680 g) Belgian clear candi sugar @ 10 min

HOPS

1 oz. (28 g) German Tettnanger, 4.5% a.a. @ 60 min

YEAST

Inland Island INIS-231 Belgian Gold Ale or other Belgian-style strong ale yeast

ADDITIONAL ITEMS

3.75 lb. (1.70 kg) pineapple purée, primary
5 lb. (2.27 kg) roasted poblano chiles, secondary
5 lb. (2.27 kg) pasilla chiles, secondary (not to be confused with poblano or ancho)

BREWING NOTES

Roast the poblano chiles at least one day before brew day and refrigerate until ready to add to secondary.

Mash 10 min at 130°F (54°C), 45 min at 146°F (63°C), and 30 min at 156°F (69°C). Boil 2 hours, adding hops and candi sugar as indicated.

Ferment at 72°F (22°C). Add the pineapple purée when fermentation is about 75% complete, i.e. specific gravity falls to approximately (1.035) 8.7°P. When terminal gravity is reached, reduce temperature to 50°F (10°C) and rack to secondary.

Add poblano and pasilla chiles to secondary. Sample the beer every 2 days. When the chile aroma and flavor are to your liking, bottle or keg.

FROSTY THE HAZEMAN

HAZY IPA

Recipe courtesy of Second Chance Beer Co., San Diego, California..

Second Chance Beer Co.

Frosty the Hazeman is brewed once a year as a hop-forward seasonal beer. Showcasing a blend of Mosaic, Amarillo, Cashmere, and Citra hops, Frosty satisfies your thirst for the fruity and tropical even in the depths of winter.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.069 (16.8°P)
Final gravity: 1.015 (3.8°P)
Efficiency: 79%
Color: 5 SRM
Bitterness: 23 IBU
Alcohol: 7.0% by volume

MALTS & ADJUNCTS

7.7 lb. (3.52 kg) Rahr pale malt
2.5 lb. (1.13 kg) oat malt
1.4 lb. (635 g) Rahr white wheat malt
8.0 oz. (227 g) Weyermann acidulated malt
3.2 oz. (91 g) Great Western crystal 15 malt

HOPS

0.6 oz. (17 g) Mosaic, 10.5% a.a., whirlpool 20 min, 190°F (88°C)
0.6 oz. (17 g) Amarillo, 10.7% a.a., whirlpool 20 min, 190°F (88°C)
0.4 oz. (11 g) Cashmere, 7.3% a.a., whirlpool 20 min, 190°F (88°C)
0.3 oz. (9 g) Yakima Chief Cryo Hops Citra, 23.2% a.a., whirlpool 20 min, 190°F (88°C)
0.3 oz. (9 g) Citra, 12.3% a.a., whirlpool 20 min, 190°F (88°C)
0.5 oz. (14 g) Yakima Chief Cryo Hops Citra, dry hop 1
0.5 oz. (14 g) Amarillo, dry hop 1
0.5 oz. (14 g) Cashmere, dry hop 1
0.5 oz. (14 g) Mosaic, dry hop 1
0.5 oz. (14 g) Yakima Chief Cryo Hops Citra, dry hop 2
0.8 oz. (27 g) Amarillo, dry hop 2
1.0 oz. (28 g) Mosaic, dry hop 2
0.5 oz. (14 g) Citra, dry hop 2

YEAST

Imperial A38 Juice

BREWING NOTES

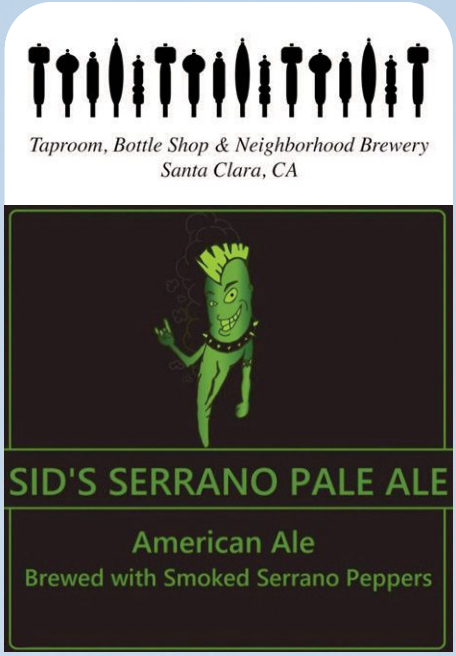
Mash at 158°F (70°C) for 60 minutes. Boil 90 minutes. There are no kettle hops. After boil, chill wort to 190°F (88°C) and add whirlpool hops. Whirlpool 10 minutes and then chill wort to 70°F (21°C). Pitch yeast and ferment at 70°F (21°C) for 7 days. Add first dry hop addition about 3 days into fermentation, or when specific gravity has fallen to 1.024 (6°P).

After primary fermentation is complete, rack beer off yeast and first dry hop addition. Chill beer to 57°F (14°C) and add second dry hop addition. Condition for 3 days before bottling or kegging.

SID'S SERRANO ALE

AMERICAN PALE ALE WITH SERRANO CHILES

Recipe courtesy of Taplands, Santa Clara, California.



To smoke your own serrano chiles for this beer, split 1 lb. (454 g) of fresh serrano chiles in half, but don't remove the seeds. Smoke over hickory for 2 hours. Note that half of the chiles go into the kettle with 15 minutes remaining in the boil, and half are added to secondary with the dry hops. The chile character increases as the beer ages.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.054 (13.3°P)
Final gravity: 1.012 (3.1°P)
Efficiency: 72%
Color: 10 SRM
Bitterness: 42 IBU
Alcohol: 5.6% by volume

MALTS & ADJUNCTS

6.75 lb. (3.06 kg) pale malt
2.50 lb. (1.13 kg) caramel malt, 20°L
1.25 lb. (567 g) caramel malt, 10°L

HOPS

1.0 oz. (28 g) Cascade, 5.5% a.a. @ 60 min
0.5 oz. (14 g) Amarillo, 9.0% a.a. @ 30 min
0.5 oz. (14 g) Amarillo, 9.0% a.a. @ 10 min
1.0 oz. (28 g) Amarillo, 9.0% a.a., dry hop
1.0 oz. (28 g) Centennial, 10.0% a.a., dry hop

YEAST

White Labs WLP001 California Ale

WATER

Reverse osmosis with 1.3 g calcium chloride and 0.2 g gypsum added to mash

ADDITIONAL ITEMS

1 tablet Whirlfloc @ 15 min
8.0 oz. (227 g) hickory-smoked serrano chiles @ 15 min
½ tsp. yeast nutrient @ 10 min
8.0 oz. (227 g) hickory-smoked serrano chiles, secondary

BREWING NOTES

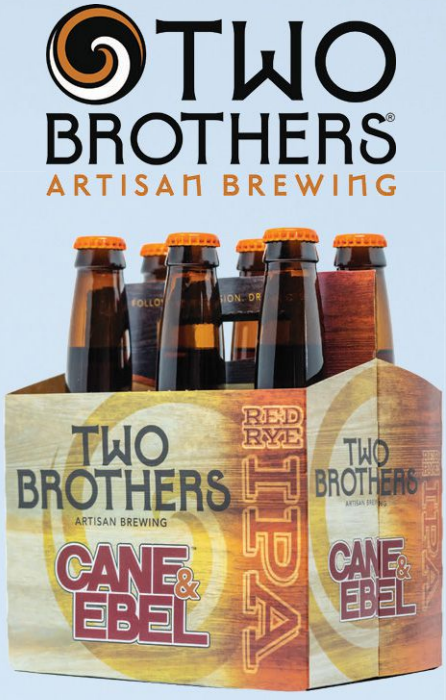
Mash 60 min at 152°F (67°C) with a mash thickness of 1.25 qt./lb. (2.6 L/kg). Sparge with enough 168°F (76°C) water to collect 6 gal. of pre-boil wort. Boil 60 min, adding hops, Whirlfloc, chiles, and yeast nutrient as indicated.

Chill wort to 65°F (18°C) and pitch yeast. Ferment to completion and add chiles and dry hops 5 days before bottling or kegging with 2.3 vol. (4.6 g/L) CO_2.

CANE & EBEL

RYE IPA

Recipe courtesy of Two Brothers Brewing, Warrenville, Illinois.



A true original, this hybrid Red Rye IPA balances the creamy sweetness of Thai palm sugar with the crisp bitterness from the hops and is rounded out by a smooth, dry finish.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.072 (17.5°P)
Final gravity: 1.017 (4.3°P)
Color: 15 SRM
Bitterness: 68 IBU
Alcohol: 7% by volume

MALTS & ADJUNCTS

9.5 lb. (4.31 kg) pale malt
1.75 lb. (794 g) rye malt
1.0 lb. (454 g) caramel malt, 10°L
8.0 oz. (227 g) crystal rye malt
8.0 oz. (227 g) melanoidin malt
8.0 oz. (227 g) Munich malt
1.6 oz. (45 g) black malt
8.0 oz. (227 g) Thai palm sugar @ 75 min

HOPS

0.35 oz. (10 g) Columbus/Tomahawk/Zeus (CTZ), 15.5% a.a., FWH
0.35 oz. (10 g) Summit, 17.0% a.a., FWH
0.25 oz. (7 g) Summit, 17.0% a.a. @ 30 min
0.25 oz. (7 g) Columbus/Tomahawk/Zeus (CTZ), 15.5% a.a. @ 25 min
0.25 oz. (7 g) Simcoe, 13.0% a.a. @ 20 min
2.0 oz. (57 g) Simcoe, 13.0% a.a., dry hop 3 days

YEAST

CHICO ALE YEAST

BREWING NOTES

Mash at 152°F (67°C) for 60 minutes. Boil 75 minutes, adding sugar and kettle hops at the indicated times. Ferment to completion and dry hop before kegging or bottling.

FRESH HOP PALE ALE

AMERICAN PALE ALE

Recipe courtesy of Weathered Souls Brewing Co., San Antonio, Texas.

This single-hop pale ale showcases fresh-harvested Citra, but feel free to use whatever variety of fresh hops you enjoy most. Fresher is better!

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.058 (14.3°P)
Final gravity: 1.013 (3.3°P)
Efficiency: 72%
Color: 5 SRM
Bitterness: 43 IBU
Alcohol: 6.0% by volume

MALTS & ADJUNCTS

9.7 lb. (4.40 kg) pale malt
1.2 lb. (544 g) dextrin malt
5.6 oz. (159 g) caramel malt, 40°L

HOPS

2.25 oz. (65 g) fresh Citra hops, 12.0% a.a., in the mash
4.0 oz. (108 g) fresh Citra hops, 12.0% a.a., whirlpool 25 min, 180°F (82°C)

YEAST

White Labs WLP001 California Ale

WATER

Treat 14 qt. (13.2 L) mash water with 0.13 g gypsum, 0.08 g calcium chloride, and 1.29 mL lactic acid.

BREWING NOTES

Mash grains with mash hops for 60 min at 152°F (67°C). Sparge with 170°F (77°C) water and collect 6.5 gal. (24.6 L) of pre-boil wort.
Boil 60 min. Cool wort to 180°F (82°C), add whirlpool hops, and whirlpool 25 min.

Chill wort to 65°F (18°C), pitch yeast, and ferment 2 weeks. Carbonate to 2.3 vol. (4.6 g/L) of CO_2.

BIG 'STONER

HAZY DOUBLE IPA

Recipe courtesy of Whetstone Craft Beers, Brattleboro, Vermont.

With all late-addition hops and intense dry hopping, our dank Vermont double IPA is big, balanced, and delicious.

Batch volume: 5.0 US gal. (18.9 L)
Original gravity: 1.072 (17.5°P)
Final gravity: 1.014 (3.6°P)
Efficiency: 75%
Color: 7 SRM
Bitterness: 30 IBU
Alcohol: 7.5% by volume

MALTS & ADJUNCTS

10.25 lb. (4.65 kg) Rahr pale malt
2.25 lb. (1.02 kg) Rahr white wheat malt
8.0 oz. (227 g) Simpsons Golden Naked Oats
4.0 oz. (113 g) Crisp Crystal 60

HOPS

1.0 oz. (28 g) Simcoe, 13.0% a.a. @ 10 min
2.0 oz. (57 g) Citra, 12.0% a.a., whirlpool 15 min
1.0 oz. (28 g) Cascade, 5.5% a.a., whirlpool 15 min
1.0 oz. (28 g) Citra, 12.0% a.a., 24 hours after fermentation start
8.0 oz. (227 g) El Dorado, 15.0% a.a., dry hop 5 days before packaging
4.0 oz. (113 g) Citra, 12.0% a.a., dry hop 5 days before packaging
4.0 oz. (113 g) Mosaic (HBC 369), 12.2% a.a., dry hop 5 days before packaging

WATER

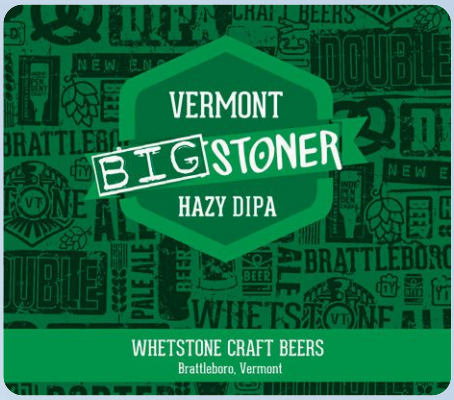
Ca 100 ppm, Mg 10 ppm, Na 10 ppm, SO_4 150 ppm, Cl 150 ppm, HCO_3 16 ppm

YEAST

White Labs WLP067 Coastal Haze

BREWING NOTES

Mash 60–90 minutes at 152°F (67°C). Boil 60 minutes, adding kettle and whirlpool hops as indicated. Pitch yeast and ferment at 68°F (20°C). Add first Citra addition 24 hours after fermentation begins. Ferment for 48–72 hours, and then raise to 72°F (22°C). Add dry hops 5 days before kegging or bottling. If possible, rouse dry hops 3 days before packaging using CO_2 or by gently rocking the fermenter.




HOMEBREWERS
TURN TO
CANNING
BY JONATHAN INGRAM
BREWED AT HOME WITH LOVE
6.8% ALC. BY VOL. | 12 FL. OZ.

"Presentation-wise and giving it to people, it's more exciting."

– David O'Neal

When Tim Hobbs bought a hand-cranked tabletop can sealer at Homebrew Con 2017 in Minneapolis, he joined a growing list of homebrewers looking for a way to can their beers. The $600 price tag was attractive, and a free box of cans sealed the deal, so to speak.

Hobbs, an engineer who is also a gunsmith in his spare time, was confident about his ability to can beers cleanly without dissolved oxygen. And, he knew there would be a cool factor once he applied his own Twisted Mustache Brewing label, a name taken from the former State Department employee's handlebar mustache.

After four years, Hobbs is more than glad he dispensed with bottles. Whether shipping his first entry—a New England IPA—to the National Homebrew Competition (NHC) or preparing to share his beers with friends, family, or neighbors, Hobbs fills a can from one of his kegs, cranks his All American S202A sealer, applies his custom label, and is done.

"It's not a big deal. It takes 20 cranks and it goes by very quickly," said Hobbs, who was a longtime member of two homebrew clubs in Hampton Roads, Va., before he moved to Florida. "I think I have more control over the sealer than if I was motor driving it. It's all about consistency and control." Dissolved oxygen? Not a worry, he said, after a little bit of practice at slipping the lid across the top before sealing it.

David O'Neal is not convinced about dissolved oxygen issues with cans and still prefers bottles for contest entries because of the smaller opening. But for friends, the Atlanta attorney relies on canning his brews with an SL1 by October Design.

The winner of gold, silver, and best-in-show awards with his first-ever contest entry at Nashville's Music City Brewoff in 2019, O'Neal hardly needs to impress his friends with packaging. But he likes the cool factor of cans.

Mile Zero Brewing's O'Neal likes having a SL1 tabletop handy, but uses bottles for competitions.

"It's closer to what craft breweries are doing," said O'Neal, who cans lagers and IPAs before attaching his Zero Mile Brewing labels. "Presentation-wise and giving it to people, it's more exciting. It's more what they're used to seeing from a craft brewery, and it makes it more likely that they think what you're brewing is cool." →

Homebrewers can add a cool factor when giving their beers to friends in cans.

> "I hate bottles. Price. And, I hate bottles."
>
> – Lee Jorgensen's top three reasons why he decided to make the switch to cans.

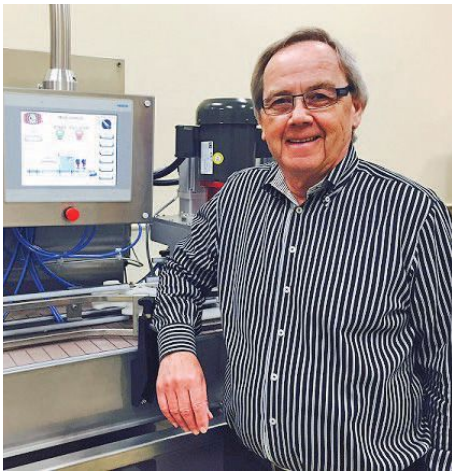
For Lee Jorgensen, another Atlanta-area brewer, it was all about getting rid of bottles. He first experimented with an MK16, the original October sealer owned by friend Thomas Monti of Schoolhouse Brewing, but found its dual-lever process cumbersome. An architectural products salesman, Jorgensen decided to buy a single-lever Cannular tabletop from MoreBeer! for three reasons.

"I hate bottles. Price. And, I hate bottles," he said. Also helping to seal his deal was free shipping on boxes of cans. In this year's NHC, Jorgensen entered a New England IPA, a coffee stout, and a West Coast IPA. He said none of the judges' notes mentioned issues with oxidation.

Given the array of choices for homebrewers when it comes to tabletop aluminum can sealers—which now includes entry level Twistees with caps that are fully "hand operated"—the canning of craft beer has come full circle.

How so?

The canning line first used by craft brewers was inspired by owners of brew-on-premises businesses and their homebrewing clientele. Cask Brewing Systems, based in Canada, built its first small-volume canning machine in 1999, a system that filled two purged cans and sealed them one at a time. It wasn't until three years later that Cask sold the same kind of machine to Oskar Blues Brewery and Pub in Lyons, Colo., which is recognized as the first craft brewer to commit to brewing and canning its own beers in house.



Peter Love's canning line helped homebrewers before micro-canning started at Oskar Blues.

Cask founder Peter Love originally was in the business of building and distributing brewing equipment in Canada, the US, Australia, and the UK. When the owner of a brew-on-premises shop asked him about a method to can beers for those who wanted their beers to be packaged just like those in the commercial marketplace, Love was intrigued. Even if the cans on most store shelves in the US and Canada were distributed by brewers of light lagers, it was obviously an efficient way to package beer. *Maybe these homebrewers were onto something*, he thought. "That's what got us started in the canning business," he said.

Can sealers have been in use for over a century by those wanting to can fruits and vegetables in containers now made of tin-plated steel. But Cask's version was uniquely designed for relatively small volume with aluminum beer cans. For homebrewers with access to one, it provided an alternative to bottles in addition to a safe haven from light. "When the beer was gone," said Love, "the homebrewers simply recycled their cans and got new cans for the next batch. They loved it."

In 2013, Jeremy Rudolph, packaging manager at Oskar Blues, started the 32-ounce Crowler revolution, which eventually led to the production of tabletop canning units for homebrewers by All American, a brand of Wisconsin Aluminum Foundries. To create the Crowler, an agreement was struck between Oskar Blues and All American to convert a motor-driven sealer used for 28-ounce vegetable cans for use with 32-ounce aluminum beer cans provided by Ball Packaging, which trademarked the Crowler name. The three companies formed Crowler Nation, now a subsidiary of CANarchy, the Oskar Blues–organized craft brewing collective.

All America's hand-crank models introduced tabletop sealers to aluminum cans and homebrewers.

All American soon adapted its tabletop sealers designed for vegetable and fruit cans to handle aluminum lids specifically for 12-ounce and 16-ounce beer cans. To approach the homebrewer market with a reasonable cost—at events such as Homebrew Con, where Hobbs bought a S202A—the Wisconsin-based brand initially converted its reliable and cost-effective hand-cranked machines.

Photos courtesy of David O'Neal; Cask Brewing Systems (Peter Love); All American; October Design; Jonathan Ingram (MK16); KegLand (Cannular)

Although bar-top Crowlers have been making a big, 32-ounce impression since they hit the market in 2013, an automated tabletop sealer for homebrewers at an affordable price continued to go missing. Dennis Grumm, who built his first prototype sealer for his brother-in-law, an avid homebrewer, soon stepped into the void.

"We were talking about him cleaning bottles and how much a pain they were," said Grumm, the founder of October Design. "He said, 'Man, wouldn't it be cool if we could can the beer?'" An engineer who was designing CNC grinding equipment for an aerospace company, Grumm asked the proverbial question: why not? His online research revealed that the market didn't have automated can sealers specifically designed for short runs that small brewers or homebrewers could use, which reinforced his pursuit of what became the MK16, the launching point for October Design in 2016.

The SL1 Homebrewer brought automated tabletops into the affordable category.

"We used it with a bunch of homebrew," said Grumm, who stored a pallet of cans in a friend's garage. He then lent that first sealer to Grand Armory Brewing in the Lake Michigan beach town of Grand Haven. Located near the popular Musical Fountain and municipal marina, the brewery "sold 12-ounce cans with it all day long." From that beginning, a production version of the MK16 designed for 16-ounce cans arrived in less than two months. Along with a Model 7 for 32-ounce cans and a stovepipe can version, the sealers put October Design in business through direct online sales. The robust MK16 appealed to on-premises brewers and their homebrewing customers, as well as brewers.

This MK16 at Schoolhouse Brewing in Marietta, Ga., was one of October Design's early models.

Manufactured in China, the Cannular tabletop offers a lower-cost automated option.

October's SL1 Homebrewer was a redesign from scratch to create an automated tabletop seamer, which arrived in 2018. It was price conscious, with fewer parts and rollers oriented to smaller annual volumes than might occur at a brewery with a MK16. Operated by a single lever for each of the two sealing stages, it's easier to use, although it requires more maintenance due to a single steel shaft and bearing that needs to be oiled regularly. This "at home" tabletop version was successful enough to inspire the subsequent automated Cannular tabletop seamer, distributed by Australian company KegLand and built in China.

No matter the manufacturer, the eternal concern for prospective tabletop owners revolves around dissolved oxygen, which can ruin a friend's experience or competition entry if a beer is stored for a long period. Best practices for canning are found in video guides posted by each of the tabletop manufacturers on their sites. (Those who want to learn how to measure the dissolved oxygen in cans can find project videos on YouTube as well.)

Schoolhouse Brewing's Monti, a physics major and former school teacher, was among the first to purchase a MK16 model and share it as part of his effort to build a brew-on-premises business. "It takes time to learn how to do it," he said. "There are tips I give to anybody who wants to get into it. I tell them, 'These are the three things you have to do. If you follow these three rules, you're going to be fine. It's not like bottling.'"

"First, make sure your cans are sanitized. Glass is more forgiving than aluminum. Aluminum is somewhat more porous. Most of them have a lining, but by comparison, glass is very scratch resistant. It's very hard. So, sanitation first."

For those using counterpressure, Monti suggests using "as much CO_2 as you can. When you're pouring your beer into that can, you'll have less head, or less foaming, from CO_2 displacement out of the liquid. You're going to have some. You want to make sure you have a low oxygen level in that can at any given time."

Capping on foam, he said, gets the best results. "You want to make sure that liquid has a meniscus, which is that little veil that comes over the top. If you were filling a glass of water all the way to the top, you could actually fill it to above the rim. There's tension in that liquid. That molecular tension will hold that liquid. You want to fill that can as far as you can until that foam is sitting on top of the liquid."

Single unit canning is not a quick process. There's a temptation, said Monti, to try to speed it up. "Do one can at a time," he said. "Don't line up four cans, then put the caps on them one by one. If you're good, you can do two or three at a time." It's also important to avoid squeezing the filled cans while moving them to the sealer, which sucks in oxygen.

Styles more sensitive to oxidation and off flavors need not be avoided when it comes to cans once a homebrewer is confident about the process. What about canning bombs or bulging, disfigured cans? That process is the same for cans or bottles. "There are some things you can do

for highly sugared beers to make sure the yeast remains dormant," said Monti, who doesn't recommend can conditioning.

Two of the other fundamentals for low-volume tabletops are regular maintenance, which is required as part of a lower-cost design, and making sure the rollers are properly aligned. Tabletop models generally do not require much alignment unless the chucks are changed to accommodate different can sizes. Matching can size to the proper lids is mandatory for a proper seal. (Most homebrewers end up buying matching cans and lids from their tabletop manufacturers, which is one of the cost considerations when buying a unit.)

O'Neal, who uses a Blichmann BeerGun, cans up to one keg at a time. His learning curve was relatively quick. "The first dozen cans were a little slow," he said. "I had a couple that were underfilled. Having it full when you seam it is probably the hardest thing. The first batch in, I realized the thing to do is you really fill it up with the BeerGun. It's not only foaming. You're starting to see the beer come over the top. It's by no means a ton of waste. We're talking a fraction of an ounce."

Is a counterpressure filler necessary? Hobbs and Jorgensen are confident using alternate methods.

"I keg all my beers and fill from the tap," said Hobbs. "I have a BeerGun, but I was not about to fool with a BeerGun or try to shoot CO_2 under the can lid when I put it on. What I do is turn the pressure down real low so I get no foaming coming out. I take my time filling the can. This is the slow part of the process. I fill it until it's bubbling at the rim and the beer is domed up over the lid."

Hobbs believes his early oxidation issues resulted from too much foam and headspace. Once he has the liquid and as little foam as possible over the top edge of the can and has installed it on the sealer, he slips the lid on side to side. "I carefully carry that can and set it in the sealer, slide the lid on, and the excess beer slides off."

Jorgensen likes using a Tapcooler, which combines pouring from the tap with a counterpressure CO_2 purge, a system that is customarily used for bottling. When it comes to filling cans to the top, he said, "All I had to do was learn how to judge the amount of beer in the waste tube."

> "You want to fill that can as far as you can until that foam is sitting on top of the liquid."
>
> – Advice from Thomas Monti of Schoolhouse Brewing in Marietta, GA.

New to the market is a "gateway" canning product called Twistee. which is a can with a cap. Available in sizes ranging from 8 to 32 ounces, the Twistee is another idea from Jeremy Rudolph and is designed for breweries looking to easily can samples. They are also useful for homebrewers not ready to invest in a tabletop sealer. A cap, which has what's described as an oxygen scavenger, is twisted on by hand. Those wanting to try Twistees can visit the company's website and purchase a sample box containing all six sizes for just one penny plus shipping.

Twistees are designed as short-term solutions and are not as cost-effective over the long haul for homebrewers. Prices for automated tabletops—always subject to change—range from a basic Cannular model at $549 to $879 for the SL1. Depending on the distributor, All America's hand-crank models tend to run closer to the cost of an SL1.

Whether canning becomes a standard method for homebrewers remains to be seen. During the pandemic, sales increased considerably. For those who prefer easily recycled aluminum cans to bottles and eliminating sunlight as well as those who like the alignment with commercial craft brewers, tabletop canners present an attractive addition to an equipment inventory.

"It's not a cheap thing," said O'Neal, "but it's not prohibitively expensive. It's worked like a charm for me."

***Jonathan Ingram is a veteran of the independent brewing industry. He has worked as a beer writer, beer-magazine editor, and as a public relations representative for a brewery. Ingram is currently working on his ninth book and first on craft beer. "Homebrewers Turn to Canning" is his first contribution to* Zymurgy.**


Saint Obnoxious
Beer T-Shirts

So, You Want to Go Pro?

By Jason Simmons

Think you have what it takes to become a professional brewer? There are many types of positions in the brewing industry, all of which require great attention to detail. It can be hard work in a hot environment, but at the end of the day, a frothy glass of your hard work makes it all worthwhile.

EDUCATION

How are your algebra and science skills? Does "Please Excuse My Dear Aunt Sally" sound familiar? How about volume, weight, and temperature conversions? This science-based industry relies heavily on math that, done incorrectly, costs a brewery money, time, and deadlines. In the worst cases, such errors could injure or even kill someone. There are a few books available that specialize in brewery math with detailed equations and formulae. It would be wise to brush up on those skills. →

YOUR PREVIOUS LIFE

There's a running joke when brewers meet other brewers: "What did you do in your previous life?" Brewers commonly have past careers that we worked at for years before deciding to switch. People come from all walks of life, and it is interesting to discover which industries brewers had previously specialized in and what tricks they bring from those settings to the brewery. I have seen, lawyers, doctors, and high-end CEOs completely abandon their corporate jobs to become brewers.

The brewing industry respects other brewers, and I have been shown warm hospitality when visiting other breweries. Every brewery I have worked for has been eager to return that friendliness. Brewing beer is fun, but it's not a get-rich-quick industry. Many of us gave up secure, well-paying jobs to become brewers, but you *can* make a respectable living in beer if you put in the effort. Beer is a passion, and it takes someone with that passion and dedication to make world-class beers.

BREWING SCHOOL OR NOT?

If you are serious about switching careers to become a full-time brewer, then I would suggest looking into one of the many accredited brewing schools. The Siebel Institute of Technology and the University of California, Davis, have two of the best-known brewing education programs in the United States, but many local universities and community colleges now offer brewing classes and fermentation science programs. Some classes are available online, while others require being on site. Some classes take just a couple of weeks; others can last several months. Coming into the brewing industry with brewing education on your resume will give you an advantage and help prepare you for your daily tasks.

Can you get into brewing without attending brewing school? Absolutely. I am one of those success stories, but it took dedication and hard work to get to where I am today. Even though I did not attend brewing school, I studied every day and read book after book on everything brewing-related I could find.

I started as an annoyingly persistent homebrewer who showed up to a local brewery every Saturday for the tour, made my face and presence known, and asked every time for just one chance to work at the brewery. One day, they finally invited me to come in and help with packaging and bottling-line activities. This was my chance to make a positive impression, even though it was only a part-time position. Eventually, a full-time position became available. I was in.

INTERNSHIPS

On plenty of occasions, we did not have an open position at the brewery, but a candidate was determined to learn, so we brought them on as an intern. Usually an internship is unpaid, but interns receive free education on a professional system, some company swag, free beer, and solid starts to their résumés.

I have seen interns come in and get overwhelmed, only to quit a week later. Others have gone on to become head brewers at large facilities. A few have started their own breweries. One intern I trained ended up becoming my current employer, so anything is possible. Internships offer a great way to get a taste of the brewing industry before you abandon your current career or spend thousands of dollars on brewing education.

ENTRY-LEVEL POSITIONS

Whether you made it into the brewery through an internship, formal brewing education, or simple luck, you have finally made it as a brewery employee. This moment is exciting for new hires, but it can also be stressful. This is not your homebrewing setup! You will be working with serious chemicals and will be around numerous hazards that can prove fatal in extreme cases.

Full and complete awareness of your surroundings and what you are doing is essential. More often than not, you will start off with basic brewery tasks as we gain our trust in you. Not everyone is cut out to handle

My past career was in emergency medical services and firefighting.


Gloucester County Times, Woodbury, N.J., Monday, May 14, 2001 A-5

Staff photo by Tim Hawk

Students Sam Teague, Sharon Daniels and Jason Simmons discuss what happened during a simulated rescue exercise at the county fire training academy in East Greenwich Township.

Photos courtesy of Jason Simmons (unless indicated otherwise); Tim Hawk (newspaper)

chemicals or operate heavy machinery. It is our job to keep everyone safe.

All brewers have to clean pretty much everything in sight. Cleaning vessels, walls, floors, windows, and kegs and making packaging are often the first tasks to master. Once you've proven yourself, we'll start offering more difficult tasks like CIP (clean-in-place) inside vessels, sanitizing and purging vessels, cleaning hoses and other equipment, and using chemicals properly. Remember that it can be a long road to the brewhouse. Dedication, hard work, and patience will get you there.

WORKING THE PACKAGING LINE

Working on the packaging line is often the first job of a new hire. Making packaging for the bottling or canning line can sometimes take days, depending on your brewery's equipment, or lack thereof. Even lead brewers often find ourselves scheduling our brew days around packaging days because we need all hands on deck to successfully operate the machinery, ensure a smooth process, and troubleshoot any issues that arise. And they *will* arise.

New hires are often given a position, or station, to operate on the packaging line to learn. Once you have mastered that section and demonstrate an ability to think on your feet, you may be cross-trained in other more detailed positions such as labeling, loading bottles, or handling drums of glue. Watch those beads—I have seen some gnarly things happen with glue and moving machine parts.

KEGGING

When we have a batch of beer in the bright tank ready to be packaged, we know how much needs to be bottled or canned to meet orders, and about how much volume needs to be kegged off. Depending on your brewery size, some may bottle first to guarantee that case orders are met and then keg the rest. Another option is to keg off a large portion first, bottle or can, and then keg the remaining volume if any is left.

Packaging beer into kegs is a fairly easy counter-pressure process that can be learned quickly. Usually, you will also be shown how to use a "Zahm" (Zahm & Nagel), which is a device that measures CO_2 saturation volumes in a liquid using temperature and pressure after a classic "Zahm shake."

PAPERWORK

Many of your initial tasks won't require that you fill out paperwork, but every process that involves product movement must be documented. Proper documentation is needed to understand how your system works, account for losses, and review final product, but the main reason is for Uncle Sam for taxation purposes. Keep your notes honest, no matter what. That is how you learn to fix mistakes, stay on track with a consistent product, and keep yourself out of legal trouble.

Mistakes happen, and when they do, the best course of action is to fix the problem, share with everyone so that we may all learn from the experience, and make a prevention plan. While paperwork is needed for tax purposes, it's only useful to the brewery if you take as many notes on the daily task as you can. The more data you have that can help the team make a consistent product, the better.

EQUIPMENT

The biggest hurdle I had as a new brewer was learning to use industrial-sized equipment. I have never worked with industrial machinery before and was overwhelmed by all the large stainless-steel vessels. As mentioned earlier,

Top to Bottom:
Zahm & Nagel device for measuring carbon dioxide saturation.

You probably won't see many of these old kegs today.

Always know where your emergency shutoff buttons are!

the first few things that you learn are packaging-line operations, kegging, and eventually prepping vessels for use (CIP, sanitizing, and purging). There are several pieces of equipment to learn, depending on what your brewery has, and it is critical that those tasks are done correctly.

CELLARING

Cellar work begins the moment you place wort and yeast into the fermenter and ends with a bright tank full of beer. Cellar operators are responsible for everything from pitching to packaging:

- ❏ Ensuring fermentation fully completes
- ❏ Measuring daily gravities
- ❏ Adding post-fermentation ingredients such as dry hops or cacao nibs
- ❏ Bunging or spunding the fermenter at the appropriate time
- ❏ Cold crashing
- ❏ Checking for diacetyl and conducting appropriate lagering practices
- ❏ Harvesting yeast
- ❏ Filtering or fining
- ❏ Transferring beer to its final bright tank
- ❏ Carbonating beer to a specific level.

Other duties in the cellar might include making casks, firkins, or pins.

Most homebrewers complete these tasks in a short amount of time, but in a brewery, this can take an entire day or week of work. A brewery's size usually dictates whether cellar operations comprise a full-time job or are included in the weekly tasks of the brewer. While "brewing," or wort production, in the brewhouse takes all the glory, it is the cellar work that truly makes the beer in the glass.

SINGLE BATCHES VS. MULTIPLE BATCHES WITH SHIFTS

At most breweries I have worked in, a single brewer could brew a double batch alone, but when you start blending multiple wort batches into fermenters, you need to work in shifts with other brewers. This may be as simple as a two-person crew with early and late shifts that overlap by a few hours. As you move to larger facilities, your work shifts will vary according to the most efficient way to run the brewhouse. Brewhouse equipment, fermenter sizes, number of fermenters, and brewery operations dictate how often and how much you brew.

Once you have made it to the brewhouse, you will be trained on that brewing system. Even if you have been brewing for years, every system runs differently, and your employer will have processes in place to maintain consistency. Occasionally, you might find a better way to perform a task, but the boss will insist that it be done a particular way. Continue to take pride in your work while doing as instructed.

As with everything in life, practice makes perfect. It is an amazing feeling when a crew works well together and hits the brewing targets in a timely fashion. This takes practice and training on each piece of equipment to be consistent with one other's work. Once you are familiar with the equipment and the company's procedures, your supervisor will give you approval to fly solo.

RECIPE FORMULATION

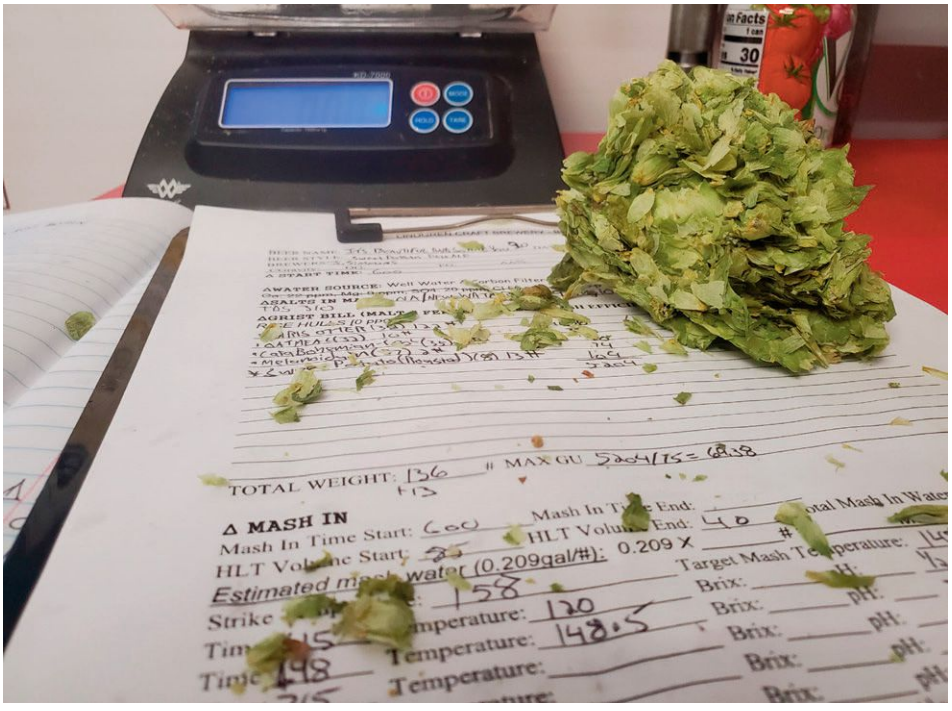
When I decided that I wanted to brew beer, I told myself that my ultimate goal was to be able to write a proper recipe if I were left alone in the woods with only a stick and the dirt to write on. This approach has allowed me to learn about all ingredients that go into to making a batch of beer. Having a complete understanding of starches, enzymes, simple and complex sugars, yeast selection and performance, hop usage and utilization, and your brewing equipment will help you write accurate recipes for repeatable products.

Serious homebrewers may have already learned much of this thanks to the luxury of today's easy access to a wide range of ingredients. Some brewers use software to write recipes, which is perfectly acceptable, but understanding the math and science that go on behind the scenes helps one make better-informed decisions.

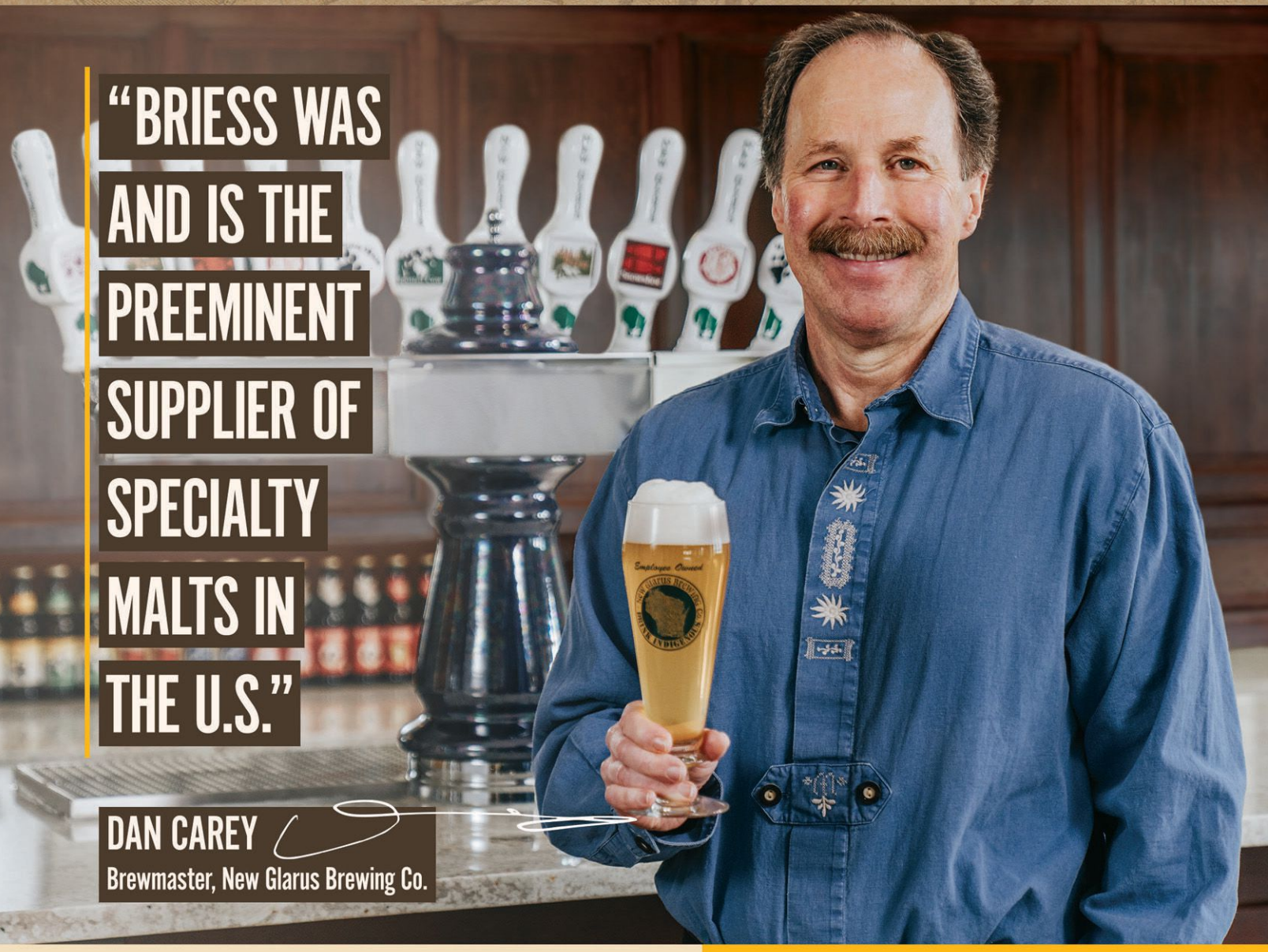
WHAT MAKES YOU STAND OUT?

Answering this question isn't just about getting hired but about becoming the best brewer you can be. How will your peers view you as a worker and as a brewer? Do you possess math and science skills and take excellent notes? Are you a quick learner who can think on your feet? Do you have engineering skills or a microbiology

Your experience as a homebrewer will come in handy for creating recipes.



WHY I BREW WITH BRIESS



"BRIESS WAS AND IS THE PREEMINENT SUPPLIER OF SPECIALTY MALTS IN THE U.S."

DAN CAREY
Brewmaster, New Glarus Brewing Co.

When we asked Dan Carey at New Glarus Brewing Co. why he brews with Briess he replied, **"Because like us they are family owned and quality led...and they always surprise us with new and interesting products."** As a fifth-generation family-owned company, it's our core values and commitment to the brewing industry that ensures **you get the highest quality, most consistent specialty malt every time.**

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MALT & INGREDIENTS Co.
All Natural Since 1876

Watch Dan tell us Why He Brews with Briess
BrewingWithBriess.com/NewGlarus

As with everything in life, practice makes perfect.

background? Do you have brewing education? What will you bring to the brewing team? If you have a strong work ethic and a desire to learn all you can, you can succeed even without a brewing degree.

DRINKING ON THE JOB

I saved this topic for last. You always want to be at your best and within the legal limits of the law at all times. Breweries have their own policies on this matter that may range from one extreme to the other. As a supervisor, I am responsible for every crew member and for keeping them safe as possible. If something bad does happen and there is an injury, loss of product, or equipment and building damage, then questions will soon follow. Being intoxicated will not help the situation, nor will it help your career.

I hire the people I hire because I trust them to successfully accomplish their jobs and handle themselves respectfully and professionally. My suggestion is to keep it safe, keep it legal (0.08 percent blood alcohol concentration in most states, but 0.05 percent in Utah), stick to samples only, and keep it professional. The best policy that complies with OSHA standards was a rule a prior supervisor had—no pints until the last chemicals have been used. Keep in mind that it is also possible to get a DUI on a forklift and that doing so will seriously complicate your home- and work lives.

Most brewers who have been in the industry a while have found that we drink more water and coffee than anything else during our workdays. It's often hot, and the work can be exhausting. Water and coffee are the true heroes of this industry.

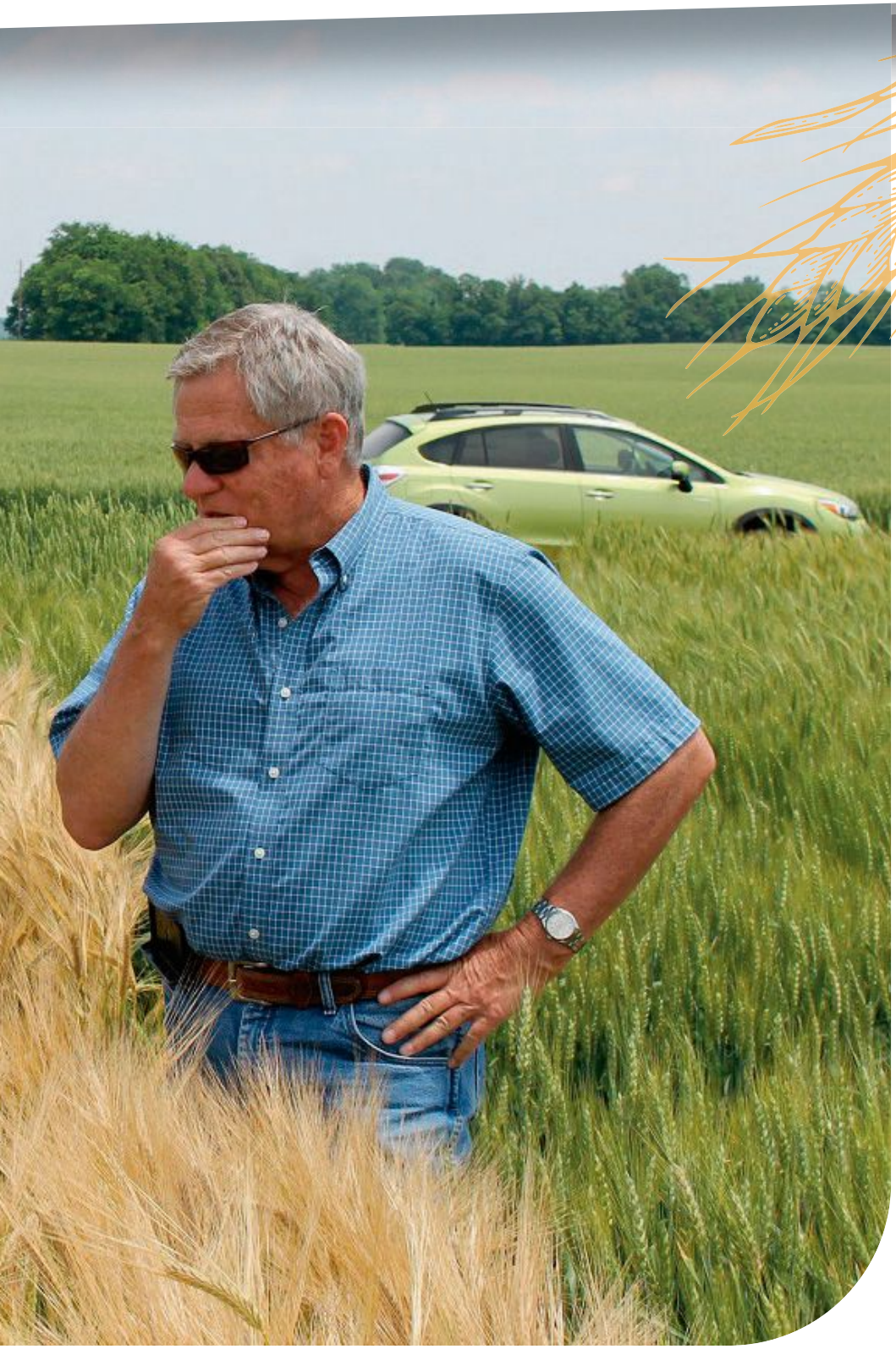
Jason Simmons has brewed professionally since 2003 and has worked for several breweries on the East Coast. He is a brewing consultant, part-time author on beer and brewing, and currently head brewer at Lindgren Craft Brewery in Duncannon, Pa. His passion for homebrewing somehow turned into a full-time career.

Even small brewhouses require learning to use specialized industrial equipment.

FROM HOMEBREWER

Alan and grower Don Halcomb inspecting two-row barley trials in Kentucky.

TO MALTSTER



THE STORY OF PENNSYLVANIA'S DOUBLE EAGLE MALT

By Mark Stober

Alan Gladish began homebrewing in the dark ages of the hobby. A 1971 visit to a winemaking shop in his hometown of Cincinnati, Ohio, had piqued his interest in giving beer brewing a shot. Learning how to brew in those days was challenging, though: ingredient selection was sparse at best, and reliable information about how to brew was even harder to come by.

But Alan tried his best nonetheless and eventually graduated from using generic cans of malt extract to trying all-grain brewing, even going so far as to fashion a copper mash tun at his father's metal fabricating shop. After several years and dozens of attempts, he finally brewed one pretty good beer and convinced himself that he could do it. In the end, however, he gave up because of other challenges in his life, such as raising a young family and working full-time at his father's business. →

Scala winter barley ready for harvest.

Fast forward to 2012. Alan's brother Jeff had embraced homebrewing with much success, brewed award-winning beers, and become a master judge. Inspired, Alan decided to take another stab at brewing. What he found this time, though, was vastly different from the early '70s. Not only was there a plethora of brewing information available from the internet and other sources, but ingredient quality and availability had opened whole new worlds compared to what was around in his earlier brewing days.

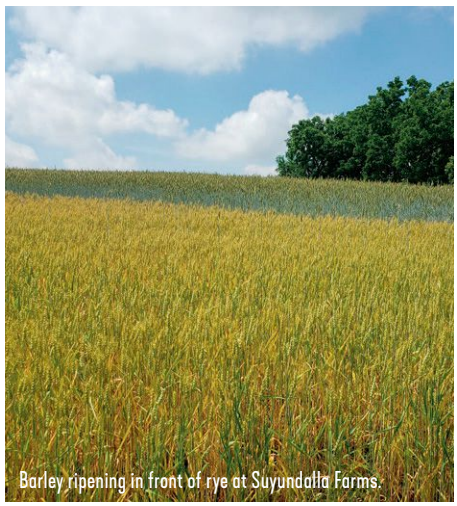
In the Mar/Apr 2013 issue of *Zymurgy*, an article by Coleman Wood called "It Takes a Village: Brewing a Truly Local Beer" piqued Alan's interest in brewing with locally sourced ingredients. However, when he began planning to brew his own local beer, he discovered there was no regionally available malt. Then, an additional twist occurred in his brewing endeavors that would end up reaping big rewards. The annual AHA Homebrew Con was held in Alan's hometown of Philadelphia, Pa. After attending a session entitled "Blame the Maltster: An Overview of Malting Operations and How They Influence Your Beer," by John Mallett, Alan had the epiphany that this is what he wanted to do: become a maltster!

The market for brewing barley in the United States had been dominated for years by a small number of large companies. This was largely a holdover from recent decades in which American beer production itself was also largely dominated by a small number of large brewers. Alan had watched the brewery business shift—new breweries were opening every day by loads of enthusiastic craft brewers, but he was reluctant to enter a business landscape that was already exploding with growth.

Alan reasoned there might be a niche here; why not explore creating craft malt for craft brewers? Some research revealed that just a few small malting operations had opened up in the US in recent years. One of those was a tiny mom-and-pop operation called Farmhouse Malt in Newark Valley, N.Y. He contacted the owners and learned that they were beginning to host some work-

Scala winter barley harvesting.

Brasetta rye three-day germination.



Barley ripening in front of rye at Suyundalla Farms.

FieldStudy an annual summer release made with Double Eagle Rustic Ale malt.

Alan at Double Eagle Farmers Workshop at Tröegs, Hershey, Pa., 2020.

shops for people interested in learning more about malting and the malting business. After attending two sessions with the owners, Alan discovered another workshop hosted by Valley Malt in Hadley, Mass., called "The Farmer-Brewer Winter Weekend" where Alan met other valuable contacts in the malting business, including a number of experts from the barley-growing regions of the north-central US and Canada, and a Kentucky farmer looking for a market for his malting barley. From these experts, Alan learned that one of the best technical training programs for malting barley was held at the Canadian Malting Barley Technical Centre (CMBTC) in Winnipeg, Manitoba.

By now, Alan had become convinced that there was a future in craft malting and committed himself to a new business venture. He named it Double Eagle Malt after a historic coin and as an homage to the arrival of a pair of nesting bald eagles in his home township.

In March 2014, Alan set off for an intensive training session at CMBTC in Winnipeg. He was greeted by temperatures approaching 30 below zero, but he found a valuable wealth of information on the intricacies of the business of making malted barley. He realized he had three challenges ahead: procuring raw malting barley in the east, where it is not commonly grown; obtaining space and equipment to malt the barley; and cultivating a customer base to purchase his malt.

After leasing warehouse space outside Philadelphia, Alan located a used dairy tank, which he fashioned into a vessel capable of steeping, germinating, and kilning barley into malt. Then he was able to purchase his first 13,000 pounds (5,900 kg) of barley from the Kentucky farmer he had met earlier at Valley Malt, and the inaugural batch of Double Eagle Pilsner malt was created in spring of 2015.

At the same time, Alan and a partner were also busy marketing their business and traveled all over the state of Pennsylvania to talk to just about any brewer or brewery owner who was willing to speak with them. He was surprised to find that, particularly in those early days, many brewers showed little interest in using locally sourced malt. They were well accustomed to using the popular major malts that brewers have long used, with recipes that were already dialed in using them. Many brewers were also hesitant to take on the potential variability of a new malt source; on top of that, Alan's locally sourced malt cost more than the major brands.

Slowly, though, he started to find some brewers who were as excited as he was about the idea of brewing with locally sourced malt. Double Eagle's first commercial customer was the Old Forge Brewing Company in Danville, Pa. Their brewery had been founded with a credo to utilize local businesses, farmers, artisans, and craftsmen whenever possible. In summer of 2015, 300 pounds (136 kg) of Double Eagle malt were used in a beer that also featured locally grown hops. That experience inspired a new beer series called Born


Germination testing.


SlyFox-Wegmans malt turning in 5-ton germ-kiln vessel.


Returning spent grain to compost for Circle of Progress Ale.

Photos courtesy of Alan Gladish/Double Eagle Malt; Tröegs Independent Brewing (beer)

and Bred, in which Old Forge strived to reserve one year-round tap for beer made using locally sourced malt.

Now that Alan was beginning to build a customer base, the final piece of the puzzle remained—sourcing locally grown barley. He knew this would be a challenge, as barley production east of the Mississippi is limited, and what little is grown there is almost always used as feed barley, which is quite different from malting barley. He needed to find farmers willing to take a chance on growing something new and unfamiliar, and that would mean educating them on everything from choosing varieties and obtaining seed, to proper methods for harvesting and storage, all of which are crucial to ensuring quality.

Alan started by contacting agricultural extension agents around the state to see if they could help find willing farmers. The agent in Lancaster County seemed particularly interested in the idea, and he put together a meeting with a group of local farmers. After extensive discussions with them, one farmer agreed to do a trial run and plant around 15 acres (6 ha) of barley in spring of 2014. This became Double Eagle's first locally sourced barley, which was subsequently harvested in early 2015 and delivered for malting in July 2015.

From there, Alan slowly began adding additional farmers who were willing to take a shot on growing malting barley, but it also became clear that the challenges of growing and storing malting barley in the east were many. High humidity and summer heat contributed to greater problems with Fusarium head blight, a fungal disease that can develop toxins and render grain unusable for human consumption. Nearby Delaware College grew a crop of two-row malting barley as part of its agricultural program, but the entirety of it went bad from field mold.

Once malt is grown and harvested, it must also be stored in an aerated bin to maintain very low moisture levels. Different barley varieties have different storage requirements depending on their sprouting dormancy, with some requiring as much as six months of storage to develop sufficient germination energy before it can be malted. All of these risks must be taken by the farmer, as they don't get paid until the malt is verified by a lab and then delivered to the maltster.

Double Eagle banner at Philly Homebrew Outlet.

SlyFox COP group


Winter barley harvest, Montgomery County, Pennsylvania.

As time went by, it became clear that farmers were going to be much more than simple ingredient suppliers to Double Eagle. Rather, they would be invaluable partners in the symbiotic relationship between farmer, maltster, and brewer. This, in turn, would become a foundation of the "brew and drink local" ideal that many breweries and craft beer enthusiasts have embraced.

As Alan's relationships with local farmers evolved, he built committed partnerships with several independent growers and farm families who continue to supply the vast majority of Double Eagle's grain. One way he achieved these relationships was to offer farmers a competitive price and include them in marketing and promotion of the malt. Double Eagle's website profiles these farms and farmers, and the certificate of analysis of every batch of Double Eagle malt contains a QR code by which customers can access information about the farm where their malt originated.

At a 2015 Master Brewers Association of the Americas meet-and-greet at Sly

Fox Brewing Co. in Pottstown, Pa., the brewery's production manager mentioned having been approached by a local farmer, Ned Foley, who grew malting barley on spec. It turned out Ned also ran a commercial composting operation called Two Particular Acres, and he suggested they pitch an idea to Sly Fox for a "full circle" sustainable beer.

The barley would grow in fields ten minutes from the brewery, be malted by Double Eagle, and mashed into beer by Sly Fox. Then the spent grain would be returned to the farmer to compost and spread on the field to fertilize the next crop of barley. Thus was born a beer series called Circle of Progress, a successful project repeated several times over the years in a variety of different beer styles from pale ales to saisons.

By 2017, Double Eagle was sufficiently established to need upgraded equipment. The original setup fashioned from dairy equipment performed all three steps of steeping, germinating, and kilning in a single vessel. Alan and his partners designed and commissioned a new system utilizing a Saladin box design that separated the germination phase into another vessel, thereby increasing efficiency and capacity.

The original dairy-based equipment remains in use today and is used primarily for malting Munich, Vienna, and caramel malts, as well as small batches of specialty grains such as wheat, rye, oats, and heirloom corn. As of this writing, Double Eagle is commissioning a brand-new 5-ton drum malting system to improve productivity, consistency, and availability of locally grown malts.

Not long after the upgrade, the drum roasting process was moved to another site. When Alan was roasting an especially dark wheat malt one Sunday, a passing motorist called the fire department upon seeing the smoke billowing from the open door aside the roaster. Local zoning officials were not pleased, and Double Eagle chose to move that process to a remote site separate from the industrial-park space where the main malthouse is located.

Another contributing factor in Double Eagle's growth is the increasing popularity of craft distilling. Small distilleries have emerged as an important secondary market for craft malt alongside the brewing industry. Many distillers have found that even after the distillation process, the unique flavor characteristics of craft malt impart a quality and depth of flavor that larger distilleries can't match.

Some distilleries lack the equipment and capacity that brewers have for mashing, and they sometimes request their grains be crushed prior to delivery. That presented a challenge, as Double Eagle wasn't equipped with a large-scale mill, but Alan found a unique solution that has fit well into his mission of local sourcing.

Not far from the Double Eagle malt house is Washington Crossing State Park, within which is the historic Thompson-Neely Grist Mill. This water-powered mill dates to the early 1800s and several years ago was fully restored to working condition. Shortly after the restoration, the park sourced a supply of red winter wheat from Double Eagle to mill and sell in the gift shop. A working relationship developed, and Double Eagle now partners with the mill to have malts ground for use by local distilleries and breweries.

Although distilleries have become an important customer base for Double Eagle, breweries remain at the heart of the maltings' mission for spreading the gospel of craft malt. Alan explains that although it can be challenging to convince breweries to experiment with craft malt, many have found that it can add a whole new level of flavor.

The explosion in popularity of IPA and other hop-forward styles has naturally prompted craft brewers to embrace a wide variety of hops and hopping methods to create unique flavors, aromas, and complexity. Yet many don't realize that a similar level of flavor depth and control can be achieved in malt-forward styles by taking a new approach to how malt is used. Brewers have long built a malt backbone on a foundation of relatively tame pale or Pilsner-type base malts augmented by specialty or roasted malts for flavor. In essence, the

base malt is the blank canvas and other malts add the color and character. Craft malt creates the opportunity for a whole new approach in which flavor depth and quality are woven into the canvas itself.

Increasing numbers of Pennsylvania brewers are trying Double Eagle malts and appreciating the quality they add to their beers. Great Barn Brewery in Bucks County, Selin's Grove Brewing in Snyder County, The Millworks in Harrisburg, and Old Forge in Danville are steady customers who regularly offer beers that feature Double Eagle malts. Alan has also worked with breweries as far away as East End in Pittsburgh.

Tröegs Brewing in Hershey is the largest packaging brewery to use Double Eagle malts, incorporating them into special-edition beers that emphasize locally sourced ingredients and highlight the family farmers who grow the grain. Since 2019, Tröegs' annual summer release of a beer called Field Study has used 100,000 pounds (45,359 kg) of Double Eagle Rustic Ale malt, a malt comparable to Maris Otter and Golden Promise in that it is kilned slightly darker to develop melanoidins.

The size and logistics at Double Eagle make it difficult to promote their malts at the micro-level that would be necessary for widespread distribution at homebrew scale or to homebrew shops. However, Philly Homebrew Outlet in West Philadelphia usually carries Rustic Ale malt and may be a source for obtaining Double Eagle products.

Today, Alan continues to spread the gospel of craft malt to brewers all over Pennsylvania. He also remains an avid homebrewer who brews 10-gallon batches roughly once a month. Although Alan primarily brews for himself, friends, and family, his beers have convinced more than a few brewers to try Double Eagle.

Mark Stober is a founding member of the Tampa Bay BEERS homebrewing club and a BJCP Master judge. He has been an AHA member for more than 25 years.

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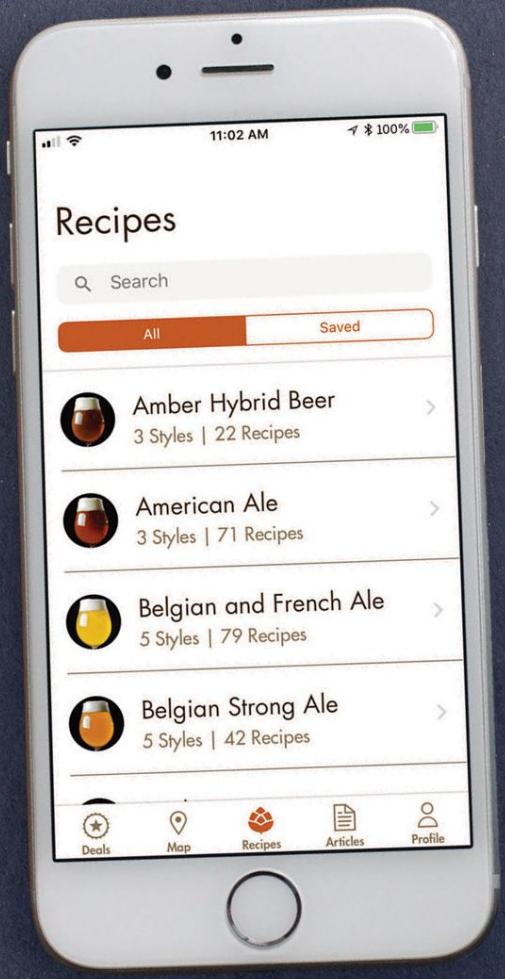

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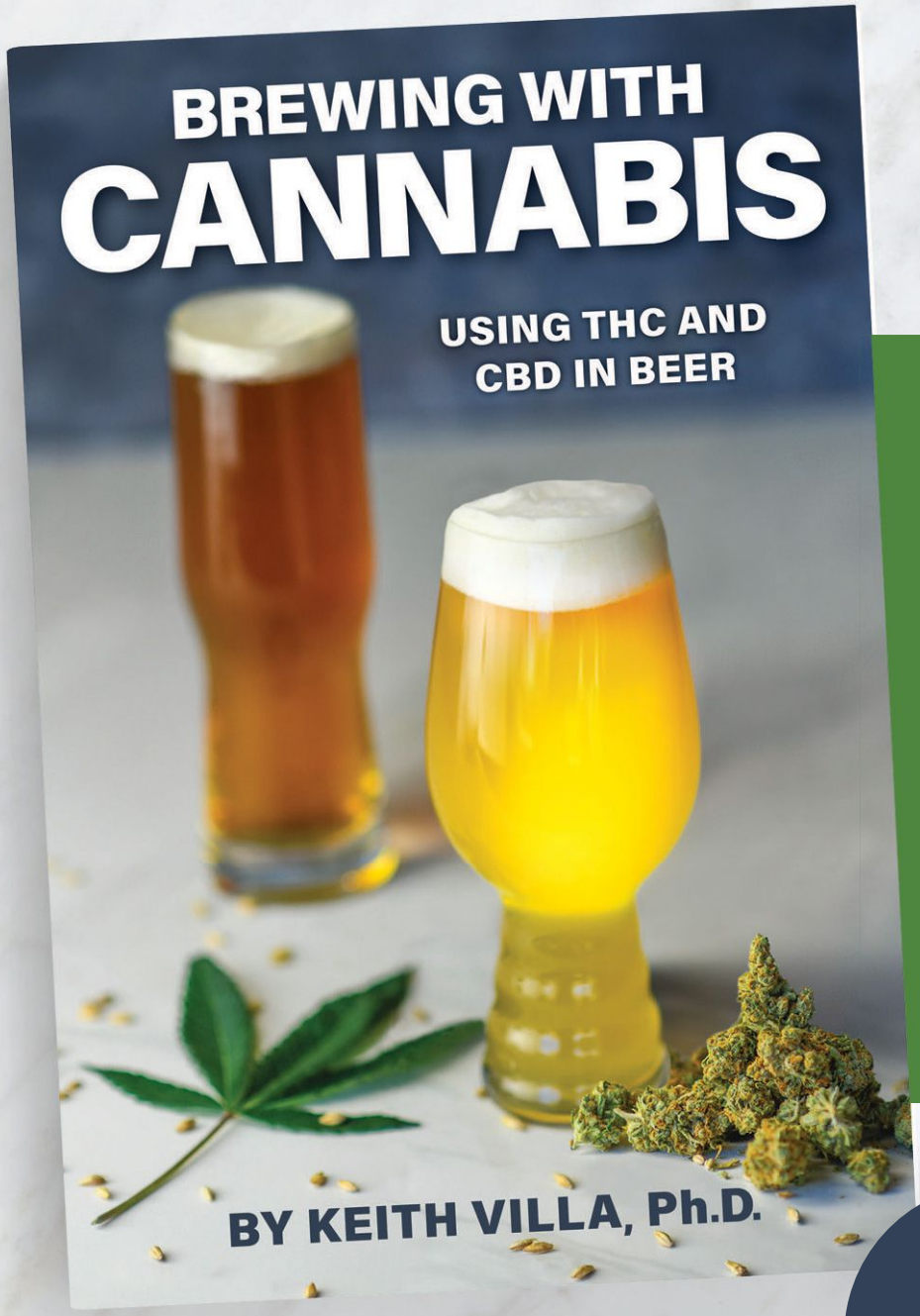

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SKEPTICAL
BREWING

This is the first in a series of articles called "Skeptical Brewing," a deep dive into commonly held brewing beliefs. In this series, we discuss their origin stories and review the science and research behind them to reach a verdict on their plausibility. We have chosen common brewing superstitions to try to challenge established paradigms and shed light on many supposedly unquestionable truths. We hope this helps foster the habit of questioning handed-down wisdom.

Always be skeptical!

By Leandro Meiners and Matias Cavanna

1 HIGH-COHUMULONE HOPS PRODUCE HARSH BITTERNESS

Cohumulone is one of the chemical analogues (aka one of the many compounds that are similar enough to all be included in the same family) that make up alpha acids. Hence, it appears in beer as one of the iso-alpha acid forms. It has a bad reputation among many brewers: hops high in cohumulone (in proportion to the rest of the analogues that make up alpha acids) are said to confer a "harsher" bitterness, normally considered unpleasant.

This statement originates from a 1970s paper called "A theory on the hop flavor of beer" by Rigby,[1] a fact that is confirmed in the recent review on hop chemistry by Ting and Ryder.[2] It is worth recalling that Rigby first described alpha acids in the 1950s, as well as isomerization and their important role in the bitterness of beer.

Rigby's work had marked repercussions in the hop industry:[2,3] it unleashed an international demand for varieties low in cohumulone, with its consequent impact on hop breeding programs for new varieties that sought to respond to this demand. Furthermore, Stan Hieronymus, author of *For The Love of Hops*, maintains that it even explains why suppliers usually indicate the percentages of cohumulone on the technical data sheets of a hop lot but not those of the other analogues.

→

WHAT DOES SCIENCE HAVE TO SAY?

Rigby's experiments[1] consisted of brewing two beers, one with humulone (96% purity), another of the alpha acid homologues, and the other with cohumulone (60% purity). In their sensory tastings, the beer made with cohumulone was rated as more bitter in intensity and "harsher." In addition to the lack of purity of the cohumulone, the two beers had significantly different iso-alpha acid levels (IBUs): 21 mg/L for the pure humulone vs. 34 mg/L for the cohumulone sample. Thus, this comparison does not allow conclusions to be drawn about the difference in the quality of bitterness imparted by both compounds as it is not possible to differentiate bitterness quality in beers with such a marked difference in bitterness.

Rigby himself states so in his article: "This very large quantitative difference makes the comparison of qualitative properties almost impossible, and little if any significance can be attached to the data."

WHAT DO OTHER ACADEMIC STUDIES SAY?

While Rigby's data do not support the hypothesis of poorer bitterness quality from cohumulone, it is interesting to see whether or not later studies were able to substantiate this hypothesis. Since this study, multiple additional studies have been carried out that have not been able to establish the relationship proposed by Rigby between a higher proportion of cohumulone and a lower quality of bitterness:

- A study from 1993[4] analyzed a beer made with pure humulone and another with pure cohumulone and did not find a significant difference during the sensory tests aimed at evaluating the intensity and quality of bitterness.
- A later study from 2000,[5] evaluated the four purified isomers of iso-cohumulone and iso-humulone using a methodology designed to measure the intensity of bitterness over time. The researchers did not find any significant difference regarding the quality of bitterness produced by iso-cohumulones vs. iso-humulones.
- A more recent study from 2004,[6] investigated the quality of bitterness using a Topaz extract high in iso-cohumulones and another made from Horizon low in iso-cohumulone. It found no differences in the quality of bitterness.

TEST IT YOURSELF!

Still skeptical and unwilling to let this scientific research change your mind? Make this experimental brew and challenge your mates and your taste buds!

Pick your favorite West Coast IPA recipe with "C hops" (Cascade, Chinook, Columbus, or Centennial) and brew it two different ways by changing or replacing the bittering addition hop(s) (i.e., 90 and/or 60 min addition):

1- High-cohumulone version: Use Chinook (cohumulone of about 30%)

2- Low-cohumulone version: Use Simcoe (cohumulone of about 15%)

Adjust hop quantity for each addition one based on the actual hop lot's alpha acid content to ensure the addition(s) have the same IBU contribution as the original recipe. Keep the rest of the recipe the same, and when you finish, conduct a triangle test.

VERDICT

It is evident that Rigby's warning in the interpretation of his results was not heeded, giving the starting point for the snowball from which the myth that cohumulone gives a lower quality bitterness derived. Hence, we must label this belief as **outright myth**.

Nevertheless, another conclusion from Rigby's study is important: "These results do, however, thoroughly confirm the higher utilization of cohumulone, which, according to the theory, is the result of lower fermentation losses due to less association with foam-forming materials, yeast, and trub."

In layman's terms, cohumulone is more efficiently isomerized compared to other alpha acid analogues. This result might help explain why brewers are so convinced of this myth: when using high-cohumulone hops, brewers experience higher bitterness levels from better efficiency and therefore are not comparing like for like.

Sadly however, this myth has led hop breeders down a path of searching for lower cohumulone hops and potentially depriving brewers of interesting varieties, or at least isomerization efficiencies, as pointed out in a review paper on cohumulone.[7] Nevertheless, all does not seem to have been in vain, as low-cohumulone hops appear to improve foam retention.[8]

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2
AGED HOPS CONTRIBUTE TO BITTERNESS VIA BETA ACIDS

It is not possible to pinpoint a specific moment in time when this idea arose, but we have managed to trace it back to the book *Lambic*,[1] in which the author states, "The Lambic brewer uses aged (*surannés*) hops that have lost most, if not all of their bittering properties." Likely, this assertion was something that was thought to be common knowledge, at least shared by the lambic brewers.

Furthermore, the author then explains the biochemical processes behind this loss as a result of oxidation: "Upon oxidation, alpha-acids, the main bittering acids in hops, lose their bittering ability. On the other hand, beta-acids, which are not bitter, gain bittering power upon oxidation. The amount of bitter beta-acid oxidation products is not sufficient, however, to compensate for the loss of alpha-acids, and the bittering potential decreases. After being aged (oxidized) for two or three years, hops have lost virtually all their bittering power."

WHAT DOES SCIENCE HAVE TO SAY?

Although using aged hops is traditional in lambic brewing, and common knowledge from lambic brewers indicates that this has been done for the bacteriostatic effect from hops, science has not examined aged hops in depth, judging from the few scientific articles on the matter.

When the IBU method was still being agreed upon in the 1960s, research[2] into the bittering compounds found that humulinones (oxidized alpha acids) could not on their own explain the bittering power of aged hops; nevertheless it acknowledged which humulinones were bitter and contributed to bitterness of aged hops. More recent research[3] confirms that humulinones are bitter (roughly 65% as bitter as iso-alpha acids), are formed during hop storage, and are more polar and hence more soluble in beer, thus playing a role in bittering with aged hops.

Hulupones are oxidized beta acids, and in fresh hops make up a tiny fraction (less than 0.1% by weight[4]), yet could be of importance in oxidized hops as they are 84% as bitter as iso-alpha acids[5] and more polar, hence more soluble, than iso-alpha acids.[4] Figure 1, reproduced from Taniguchi et al., shows how beta acids decrease and hulupones increase during storage at 20°C (68°F) and hence would affect bitterness when using aged hops. In fact, it has also been shown that the oxidation to hulupones occurs during wort boiling.[7] (See Figure 1)

Other studies conducted during the same time showed that not all hops' alpha acids are lost even after six years of storage, and therefore their isomerization still contributes to beer bitterness.[8]

Worth noting is that hulupones have been identified to be more bacteriostatic than humulone and even iso-alpha acids,[7] confirming lambic brewers' intuition and experience of using aged hops for preservation.

DO AGED HOPS BRING ANYTHING ELSE?

In addition to the bittering and antiseptic properties of aged hops, they can contribute to the aroma profile of beers. Unsurprisingly, using aged hops changes the aroma profile of the resulting beer. In hops aged for up to a couple of months, a more pronounced spicy note resulted in the beers.[9] Furthermore, recent research has shown that the esters that exhibit the cheesy, rancid smell of aged hops are key precursors of highly positive aromas of late-hopped beers.[10]

VERDICT

In order to be precise, we would have to state that "aged hops contribute to bitterness via oxidation products of alpha and beta acids as well as remaining alpha acids," thus the assertion is at least misleading as it does not include the role of oxidation and the fact that the alpha acids still play a part. Also of note is that the explanation in Guinard is not completely wrong, as

- Aged hops do contribute to bitterness,[2]
- The contribution to bitterness of aged hops occurs due to remaining alpha acids (which are isomerized[8]) and both oxidized alpha and oxidized beta acids,[2]
- The level of oxidation products depends on storage conditions, hop variety, hop product type (leaf/bale, pellets, extract), and hop storage index,[3]
- Beta acids are not bitter (only one taster of fifteen managed to identify it as bitter and ranked it of very low intensity),[11] and
- Due to lower sensory bittering potential of oxidized products and the loss of acids to non-bittering compounds during aging,[6] the overall bittering power of hops decreases with age.

FIGURE 1: EVOLUTION OF BETA ACIDS AND HULUPONES WITH TIME.

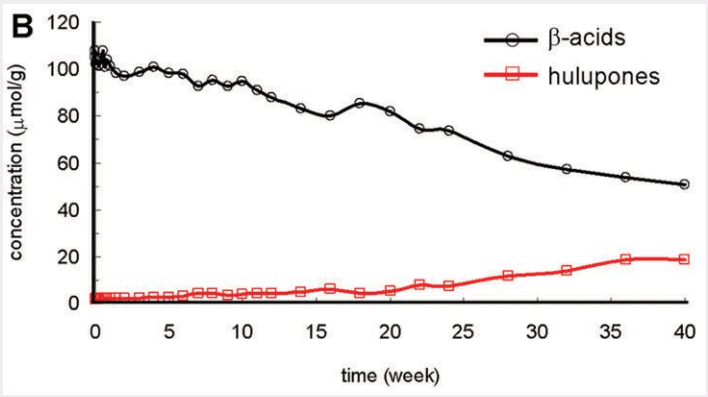

Figure 1 courtesy of Journal of Agricultural and Food Chemistry 2013

Yet, it's wrong to state that hops after two to three years of storage lose virtually all their bittering power and that oxidized alpha acids are not bitter.

Lambic beers are not very bitter, likely due to the extended aging that is part of their brewing method; beer aging has been showing to decrease bittering.[12]

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3
DEXTRINS AND DEXTRIN-RICH MALTS ENHANCE BODY

Dextrins are long-chained sugars that are unfermentable by brewer's yeast and created as a byproduct of starch breakdown. Brewers use alternative methods to increase dextrin content in beer, given that they are widely believed to positively impact beer's body and mouthfeel:

- High temperature mashing,
- Using "dextrin-rich" malts (such as CaraPils, CaraFoam, Dextra Pils, etc.) in their grist, and
- Adding Maltodextrin powder.

It is uncertain where this idea comes from. Our guess is that it all most likely started with "common sense," given that high-temperature mashing reduces beta-amylase activity and produces a wort richer in dextrins, which results in a higher final gravity. Higher final gravity means denser beer, and most would assume that translates into more body.

This is taught in most brewing courses and books. Some of the earlier examples is De Clerk's 1962 brewing course book from Louvain University in Belgium,[1] in which it states that dextrins increase beer viscosity. Another book from that same year, Vermeylen's *Process for Making Malt and Beer* from ARFB (Belgium),[2] suggests that high levels of dextrins in wort produce beers with thick and pasty mouthfeel. Yet another example of this is from 1977—Bradee's book *The Practical Brewer*[3] (USA) states that even though dextrins have no taste, they do have an effect on beer viscosity and mouthfeel.

Some of the earlier academic research about this subject supports the claim, such as work presented in 1969's European Brewery Convention[4], which concluded that dextrins are tasteless but mentions they do have an effect on viscosity and head retention, even though the research presented had no evidence to support this last claim.

Maltsters also got on that bandwagon and began producing so called "dextrin-rich" malts, with marketing claims such as:

- "Carapils® Malt is a unique, dextrin-style malt that consistently increases foam, improves head retention and enhances mouthfeel without adding flavor or color to your beer."
- "Carafoam (in USA, aka Carapils in the rest of the world) is a drum-roasted caramel malt … which is especially successful when used to aid in creating better foam improvement, improved head retention and a fuller body."
- "Dextra Pils® malt adds foam retention and mouthfeel to your brew but leaves the flavor and aroma up to you."

In light of this, it makes sense that most brewers believe that body is enhanced by dextrins and dextrin-rich malts. However, most of these early studies and claims lack actual evidence to support such claims.

Most recently, several of Brülosophy's anecdotal experiments challenged this common knowledge. Seven out of the eight experiments made on this subject (comparing high vs. low mash temperature beers or beers made with or without 10% high dextrin malt) resulted in no significant mouthfeel differences. This started sparking doubts within the homebrewing community.

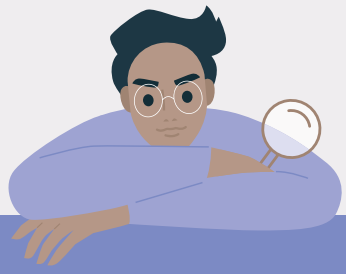
WHAT DOES SCIENCE HAVE TO SAY?

The earliest study on record on this subject dates from 1957.[5] Several mashes were designed to produce worts with different dextrin profiles and found that high-dextrin beers lacked palette fullness, concluding that dextrins do not contribute to palate fullness of beer.

Scriban's research from 1971[6] added exogenous enzymes to conditioning beers to break down dextrins and had no sensory impact on beer fullness. This study concludes that dextrins and attenuation are not directly linked to mouthfeel.

One of the most comprehensive studies in this subject was done in 1989 by Ragot.[7] In the study, different maltodextrin levels were added to a commercial light lager (aka dextrin free), and their viscosity and mouthfeel were assessed using instrumental and sensory techniques. Its conclusions show that even though viscosity increase is directly proportional to dextrin increase, close to 52 grams of maltodextrins per liter of beer (about 7 ounces per gallon) are needed to produce a detectable increase in mouthfeel, or about 20 gravity points. The authors believe that dextrins are part of the compounds that have impact on beer mouthfeel, however at considerably much lower rates than suggested in literature, and nominate beta glucans, ethanol, glycerol, melanoidins, and proteins as more significant contributors to body.

Another interesting paper from 1991 made physical and chemical measurements on 30 commercial beers (comprising different beer styles including non-alcoholic, light lager, Pilsner, pale ale, Vienna, brown ales porter, stout, barleywine). This study identified a low correlation between dextrins and mouthfeel.[8]



TEST IT YOURSELF!

Still skeptical? Challenge your mates and your taste buds to a triangle test! Brew the accompanying recipe for Arnie Gone Troppo and divide the finished beer into two 2.5-gallon (9.5-liter) batches.

At packaging, add 8.8 oz. (250 g) maltodextrin to one of the two half-batches to increase the final gravity from 1.012 to 1.020. Then keg and force carbonate to 2.4 vol. (4.8 g/L) or prine and bottle, being sure to divide the corn sugar equally between the two half-batches. Don't forget to label which batch is which!

Invite your friends over to taste the two. Without allowing the taster to see, or even telling them what you are testing, serve TWO samples of one of the recipes and ONE sample of the other recipe. Use opaque glasses or plastic cups so that visual differences don't influence the taster. Try to balance out the total number of each sample across tasters.

Make sure you label the three glasses with random letters and/or numbers (i.e., X1, Y7, Z3), place them on the table randomly (i.e., the odd one out not always on the left), and also write down somewhere (a notebook or your phone) what you poured in each.

Ask your tasters to identify which of the three samples is the different one and write down if they successfully identified it or not.

When you finish all your samples, calculate how many test repetitions you and your mates did (total number of participants) and how many times the correct different beer was selected (number of correct participants).

Input those values to an online calculator such as that at onbrewing.com/triangle-test and get the answer. If keen, send your triangle test results to us at birratecnia@gmail.com.

VERDICT

Without ruling out that dextrins and the use of dextrin malt, can have some impact in mouthfeel, this impact is certainly much lower than commonly believed thus we can conclude that this belief is an outright myth.

While a study did find that more than 52 grams per liter (about 7 ounces per gallon) of dextrins are needed to achieve mouthfeel impact, to put this number into perspective, the dextrin addition needs to make a 20 gravity point increase to start detecting the change in mouthfeel.

This threshold can't be reached by adding the recommended 1 to 5 percent suggested by most maltsters of high-dextrin malts. As a reference point, using 50% Carapils in the grist bill might not even get you over the 50 g/L dextrin sensory threshold.[9]

Another option to achieve this level of dextrins is by adding maltodextrin to the wort or beer; however, close to 0.7 kg (1.55 lb.) would be needed for an average 19-liter (5-gallon) brew with a final gravity of 1.010 to reach the threshold level.

It certainly seems more fruitful to increase melanoidins, beta glucans, proteins, and glycerol when looking to enhance body and mouthfeel.

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Brew This!

Arnie Gone Troppo

Tropical pale ale

This tropical pale ale—easy to drink, with hoppy tropical notes and balanced bitterness on a nice, malty background—is perfect to test whether dextrins play a role in mouthfeel.

Batch volume: 5 US gal. (18.9 L)
Original gravity: 1.049 (12.2°P)
Final gravity: 1.012 (3.1°P)
Bitterness: medium-low
Color: 6 SRM
Alcohol: 4.8% by volume

MALTS

7.2 lb. (3.25 kg) Maris Otter
2.2 lb. (1 kg) pale wheat malt
7 oz. (200 g) honey malt

HOPS

0.8 oz. (24 g) Galaxy, whirlpool
0.8 oz. (24 g) IDAH07, whirlpool
1 oz. (28 g) Citra CRYO, dry hop, mid-fermentation
1 oz. (28 g) Galaxy, dry hop, last few gravity points
1 oz. (28 g) El Dorado, dry hop, last few gravity points

WATER

Ca 51 ppm, Mg Less than 10 ppm, Na Less than 10 ppm, SO_4 31 ppm, Cl 67 ppm HCO_3 Less than 20 ppm

YEAST

Wyeast 1318 London Ale III, White Labs WLP006 Bedford British Ale Yeast, Omega OYL-052 DIPA Ale, Lallemand Verdant IPA, or other East Coast IPA–type yeast

ADDITIONAL INGREDIENTS

0.5 tablet Whirlfloc @ 10 min
½ tsp. (1.5 g) yeast nutrient @ 5 min
3.9 oz. (110 g) corn sugar (if bottle conditioning)

BREWING NOTES

Mash for 45 min at (153°F) 67°C with a mash pH of 5.2–5.5. If sparging, do so at 167–172° F (75–78°C). Collect enough wort in the kettle to yield a post-boil volume of 5 gal. (18.9 L) into the fermenter.

Boil vigorously for 30 minutes, adding Whirlfloc and yeast nutrient as indicated. After knockout, add whirlpool hops steep 10 minutes before chilling wort.

Chill wort and transfer to fermenter. Aerate thoroughly and pitch yeast per yeast manufacturer's recommendation. Ferment at 68–72°F (20–22°C). Add dry hops as indicated.

After 3 days with no yeast activity (no gravity change), cold crash to as close to 32° (0°C) as you can without freezing the beer. Keep chilled for a week and carbonate to 2.4 vol. (4.8 g/L) CO_2 at packaging.

Leandro Meiners earned an MSc. in brewing and distilling at Heriot-Watt in Scotland. Having gained practical experience working at two breweries in France, he returned to his homeland of Argentina to start a brewery and taproom called PLACEBO (@placebo.brewing). Leandro also has a blog in Spanish about brewing science called Zythologia, and he is co-host of Birratecnia, a podcast in Spanish focused on sharing academic research and putting it into context of day-to-day brewing activities.

Matias Cavanna is head brewer at Dos Dingos Cerveza Independiente in Argentina and De Puerto brewpub and Rural barrel program in Uruguay. Matias started homebrewing in Australia and developed practical and technical knowledge in Australia, New Zealand, and Japan at Asahi's small and large breweries. Matias also co-hosts Birratecnia.


To:
From:
AMERICAN HOMEBREWERS ASSOCIATION

Zymurgy's 2021 Holiday GIFT GUIDE

30 new and/or noteworthy items for the homebrewers and beer lovers on your list.

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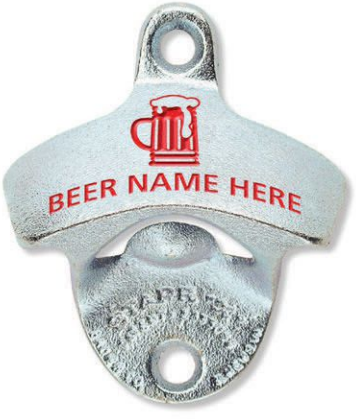

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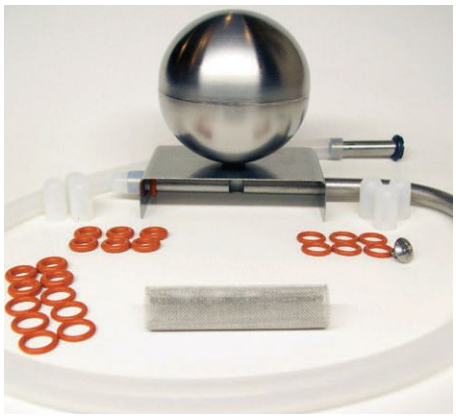

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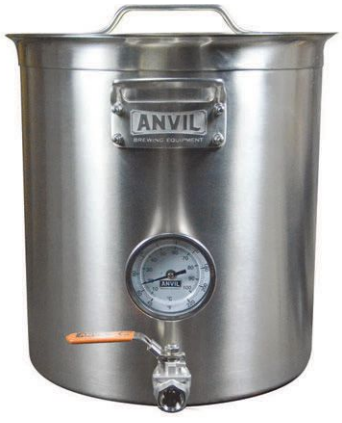

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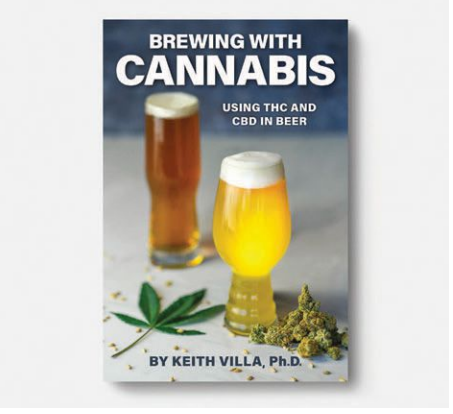

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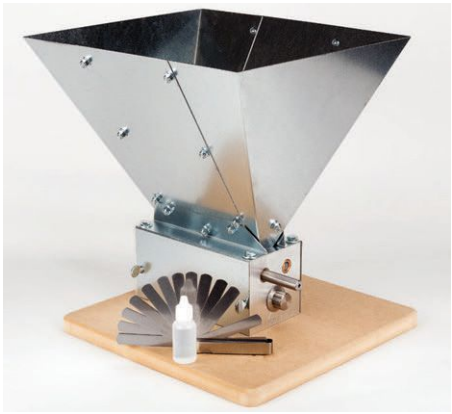

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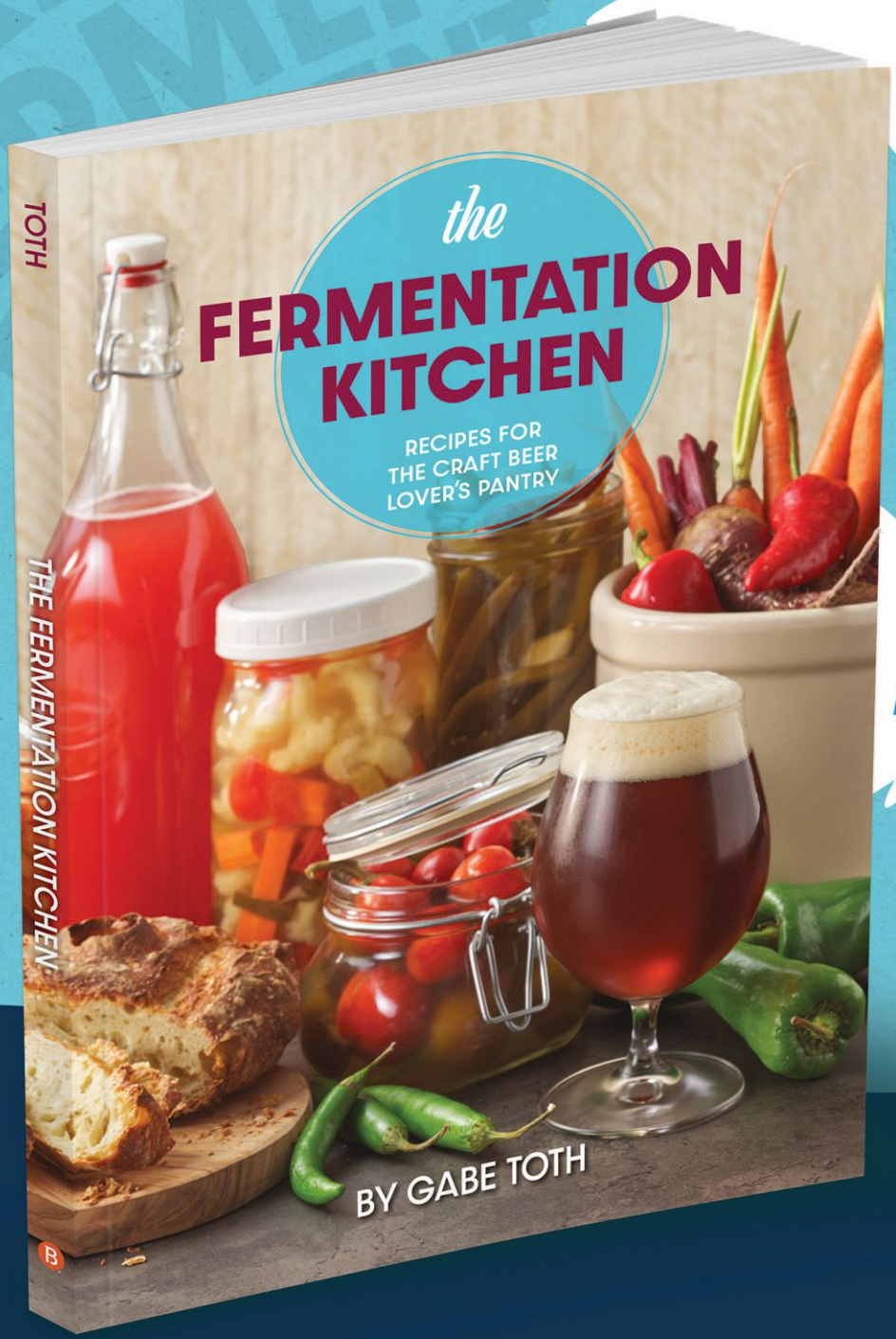

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Relax, Don't Worry, Have a *Homebrew!*

That mantra rings as true today as it did in 1978 when Charlie Papazian cofounded the American Homebrewers Association with Charlie Matzen. Homebrewing can be as simple or as complex as you want to make it, but the first step is always to relax and not worry.

To aid your relaxation and help you get the most out of *Zymurgy*, here are some standard assumptions and methods for our recipes. Of course, when a recipe says to do something different, follow the recipe. But you can always fall back on these general tips to brew great beer.

ON THE WEB
For more detailed info, head over to HomebrewersAssociation.org and dive into our How to Brew resources.

BREWING WITH *ZYMURGY*

MAKING WORT

Most recipes in *Zymurgy* offer an all-grain version and a malt extract or partial-mash alternative. Pick the procedure you prefer and prepare some wort! Some recipes might include a water profile. If you can't (or don't want to) deal with water chemistry, don't worry about it: just go ahead and brew! Extract brewers needn't add minerals to water.

Malt Extract Recipes
Making wort from malt extract is easy.

- Crush specialty grains, if any.
- Place milled grains in a mesh bag and tie it off.
- Steep bag of grains in 150–160°F (66–71°C) water for 30 min. in your brew pot.
- Remove bag of grains from the pot.
- Fully dissolve extract in the hot, grain-infused water (if there are no specialty grains in the recipe, you can skip directly to this step).
- Top up with water to your desired boil volume. (Leave some room for foam!)

All-Grain and Partial-Mash Recipes
Unless otherwise specified, all-grain brewers can conduct a single-temperature infusion mash with these parameters:

- Water/grain ratio: 1.25 qt./lb. (2.6 L/kg)
- Mash efficiency: 70%
- Mash temperature: 150–153°F (66.7–67.2°C)
- Mash duration: 60 minutes

Partial-mash recipes make the same assumptions but use a smaller amount of grain and augment the wort with malt extract.

BOILING

No matter how you get here, everyone loves adding hops.

- Boil time is 60 minutes unless otherwise stated.
- Boils are assumed to be the full batch volume, but you can also boil a concentrated wort and top up with water in the fermenter.
- Hop additions are given in minutes before the end of the boil.

Brew Lingo

Every field has specialized language, and homebrewing is no different. Here are a some of the key terms, abbreviations, and acronyms you'll find throughout *Zymurgy*.

AA – alpha acid

ABV – alcohol by volume

AHA – American Homebrewers Association

BBL – US beer barrel (31 US gal or 117.3 L)

BIAB – brew in a bag

BJCP – Beer Judge Certification Program

Chico – American ale yeast, AKA Wyeast 1056, WLP001, SafAle US-05, and others

CTZ – Columbus, Tomahawk, and Zeus: interchangeable high-alpha-acid hops

DME – dry malt extract

DMS – dimethyl sulfide, an off flavor similar to canned corn or cooked vegetables

DO – dissolved oxygen

EBC – European Brewing Convention (beer color)

FG – final gravity

FWH – first wort hops, added to the boil kettle as it fills with sweet wort after mashing

HERMS – heat exchange recirculating mash system

HLT – hot liquor tank

IBU – international bittering unit

LHBS – local homebrew shop

°L – degrees Lovibond (malt color)

LME – liquid malt extract

LTHD – Learn to Homebrew Day

MLT – mash-lauter tun

NHC – National Homebrew Competition

OG – original gravity

°P – degrees Plato (density of wort or beer)

RIMS – recirculating infusion mash system

RO – reverse osmosis, a water purification process that removes most dissolved ions

SG – specific gravity (wort/beer density)

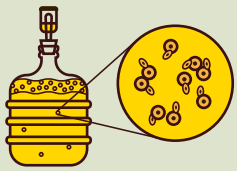
SMaSH – single malt and single hop

SMM – S-methyl methionine, precursor to dimethyl sulfide (DMS)

SRM – Standard Reference Method (beer color)

FERMENTING & CONDITIONING

Pitch yeast into chilled, aerated or oxygenated wort.



- Use twice as much yeast for lagers as you do for ales.
- Ales ferment at 60–70°F (15–20°C). Lagers ferment at 45–55°F (7–13°C).
- Condition ales at room temperature or colder for a week or two.
- Condition lagers at close to freezing for several weeks if you can (traditional but not required).

BOTTLING & KEGGING

If you bottle,

- Use 1 oz. of dextrose (corn sugar) per gallon of beer (7.5 g/L) for a good, all-purpose level of CO_2.
- Use less sugar for less fizz.
- Take care with higher carbonation levels—many single-use beer bottles aren't designed for high pressure.

If you force carbonate in a keg,

- Use the chart to dial in the gauge pressure on the regulator.
- Add 0.5 psi (35 mbar) for every 1,000 feet (300 meters) you live above sea level.
- To convert psi pressures to mbar, multiply by 69.
- To convert volumes of CO_2 to g/L, multiply by 2.

REGULATOR PRESSURES (PSI) FOR VARIOUS CARBONATION LEVELS AND SERVING TEMPERATURES

TEMP. (°F)	VOL. CO_2 2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1
33	5.0	6.0	6.9	7.9	8.8	9.8	10.7	11.7	12.6	13.6	14.5
34	5.2	6.2	7.2	8.1	9.1	10.1	11.1	12.0	13.0	14.0	15.0
35	5.6	6.6	7.6	8.6	9.7	10.7	11.7	12.7	13.7	14.8	15.8
36	6.1	7.1	8.2	9.2	10.2	11.3	12.3	13.4	14.4	15.5	16.5
37	6.6	7.6	8.7	9.8	10.8	11.9	12.9	14.0	15.1	16.1	17.2
38	7.0	8.1	9.2	10.3	11.3	12.4	13.5	14.5	15.6	16.7	17.8
39	7.6	8.7	9.8	10.8	11.9	13.0	14.1	15.2	16.3	17.4	18.5
40	8.0	9.1	10.2	11.3	12.4	13.5	14.6	15.7	16.8	17.9	19.0
41	8.3	9.4	10.6	11.7	12.8	13.9	15.1	16.2	17.3	18.4	19.5
42	8.8	9.9	11.0	12.2	13.3	14.4	15.6	16.7	17.8	19.0	20.1

■ = PSI

Source: Brewers Association Draught Beer Quality for Retailers

MY WIFE GETS TOGETHER WITH A GROUP OF LADIES AROUND LUNCHTIME, ONE TIME, I HAD A SIXTEL KEG THAT WAS BREWED WITH SOME WHITE PROSO BISCUIT MILLET ABOUT 15% OF THE GRIST. . . . I REALIZED THAT THE DRIVEWAY WAS STILL FULL OF CARS AND THEY ALL SAT THERE AND DRANK THAT WHOLE SIXTEL KEG BECAUSE OF HOW GOOD IT TASTED.

JOSH CODY
Colorado Malting Company
Millet - Business in the Front, Party in the Back
Season Two, Episode Fourteen

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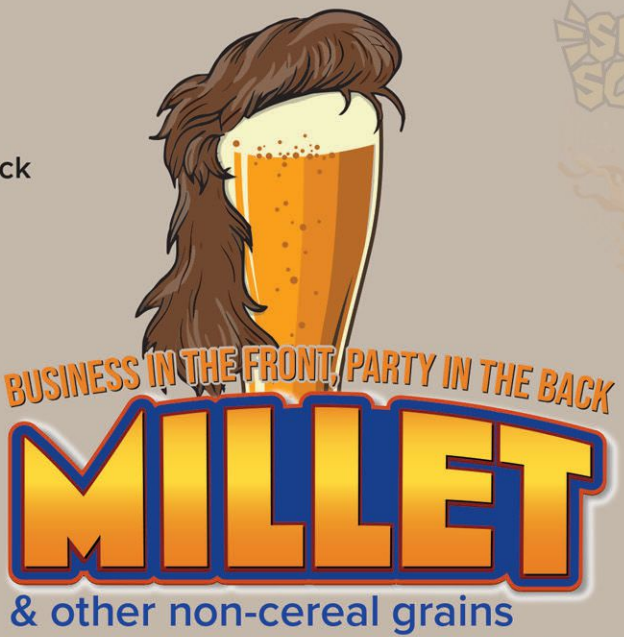

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BRAVE NOISE

Understanding through Collaboration

Homebrewer Andrew Lewandowski of Fort Mill, S.C., brews Brave Noise.

By Jen Blair and Ash Eliot

What started as a call out to followers on Notch Brewing brewer and production manager Brienne Allan's Instagram account, asking if anyone had experienced sexism in the beer industry, quickly ignited a #MeToo movement. Now, more than a thousand stories about gender discrimination, sexual harassment, assault, and racism have been shared.

In an effort to honor the brave voices who have shared their stories and ensure action is taken, Allan has launched a global collaboration brew and initiative called Brave Noise. The collaboration advocates for safe spaces and inclusive environments by requesting that breweries be transparent with their policies and commit to long-term work. →

Brave Noise is a chance for the entire beer community to come together, not just commercial breweries and beer-related businesses, but homebrewers and beer drinkers. Since the collaboration launched in July, more than 400 homebrewers have signed up to join the effort.

Andrew Lewandowski, a homebrewer in Fort Mill, S.C., was one of the first homebrewers to register to brew Brave Noise. "It just made sense," he says. "I didn't have to think twice about it. There's never a good reason why a group of people should be marginalized in this industry."

Lewandowski credits the craft beer movement for having creativity and artistry behind it but says, "We can't tap into that full potential unless everyone has a seat at the table."

Other homebrewers echo similar sentiments when asked why they signed up to brew Brave Noise.

Jeffrey Craig, a homebrewer in Anaheim, Calif., says, "I signed up for the Brave Noise collaboration because I want to take an active role in standing up against misogyny, racism, and sexism in the craft beer industry. The shocking revelations shared by Brienne Allan were a call to action. We must all stand together in this fight to end this horrific treatment of our fellow beer lovers. It's time to speak up and take action."

Shannon Jutras, a homebrewer and Homebrew Con speaker in Foster, R.I., says, "Engaging more diverse people in brewing, especially women, has been a personal passion since I started homebrewing in 2013. This is even more personal now that I also work in the industry. A project like Brave Noise is such an important initiative to bring attention to and celebrate, and I'm grateful to everyone who was brave enough to share these important stories."

Several homebrewers shared how sexism and racism in homebrewing have affected them.

Jutras presented at Homebrew Con 2019 on the topic of engaging more diverse homebrewers in the hobby and received overwhelmingly positive feedback on her presentation with two notable exceptions: low ratings from male attendees who didn't seem to have even attended her presentation. She says their feedback said that they felt discriminated against because of her topic on diversity. "They didn't hesitate to center themselves at the heart of this work, or to criticize my efforts and lower my presenter rating from the cover of anonymity."

Mark Solomon, one of the founders of the Indigenous Brew Crew in Innisfil, Ontario, shared that he is often told that "racism doesn't exist in craft beer and thus diversity has no place."

Many homebrewers see registering for Brave Noise as another way to demonstrate their allyship and support of a more inclusive homebrewing industry.

"All brewing should be inclusive, including homebrewing. I believe there is just as big of a problem in homebrewing as commercial brewing," says Garry Lienhard, a homebrewer in Castle Rock, Wash. "I have seen women brewers from all walks looked at as less of a brewer just because they are female. I believe a person's ability to brew is not limited by who or what they are or whey they come from."

Craig says, "I signed up for the Brave Noise collaboration because I want to take an active role in standing up against misogyny, racism, and sexism in the craft beer industry. I joined this community many years ago because it is one of the most inclusive groups I've come across."

"I want Brave Noise to continue the conversation for those that are aware and hopefully start the conversation for those that are opening their eyes to this cause," Lewandowski shares. "If people don't know it's going on, then how will they know that there needs to be a change?"

Other homebrewers have worked to mobilize their homebrew clubs and beyond. Michele Wonder, a Portland, Ore.–based homebrewer, has created a Brave Noise homebrew fundraising digital toolkit. Wonder created a similar fundraising campaign last year as part of the Black is Beautiful collaboration. Last year, Wonder organized twelve homebrew teams to package forty 12-packs of homebrew as thank-you gifts to people who donated to a list of local charities that fight racial injustice in Oregon. By the end of the fundraising campaign, homebrewers had assisted in raising over 10,000 dollars for local nonprofits.

"Last year during the Black is Beautiful collaboration, I was immediately struck by my own desire to use my homebrewing passion and skills to actively fundraise for racial justice charities in my area." Wonder says, "When I heard about the Brave Noise collaboration and the fact they were actively seeking homebrewers to participate, I wanted to get the word out."

Wonder adds, "There are so many ways for homebrewers to jump on board with this initiative and spread the word about the need for less misogyny, aggression, and disrespect of women in the beer world. Simply showing up and brewing an amazing beer and sharing it with your community can be powerful in and of itself. However, if you want to take it to the next level and directly utilize homebrewing for fundraising, we have some suggestions."

Homebrewers who are interested in the Brave Noise homebrew fundraising digital toolkit can visit the Women's Craft Fermentation Alliance website to register and receive the toolkit: wcfa.beer/digital-toolkit. The toolkit contains step-by-step instructions on assembling a team of homebrewers, selecting local nonprofits, and soliciting sponsorships. The toolkit also con-

Photos courtesy of Andrew Lewandowski; Label art courtesy of Notch Brewing

Andrew Lewandowski mashes in Brave Noise Pale Ale.

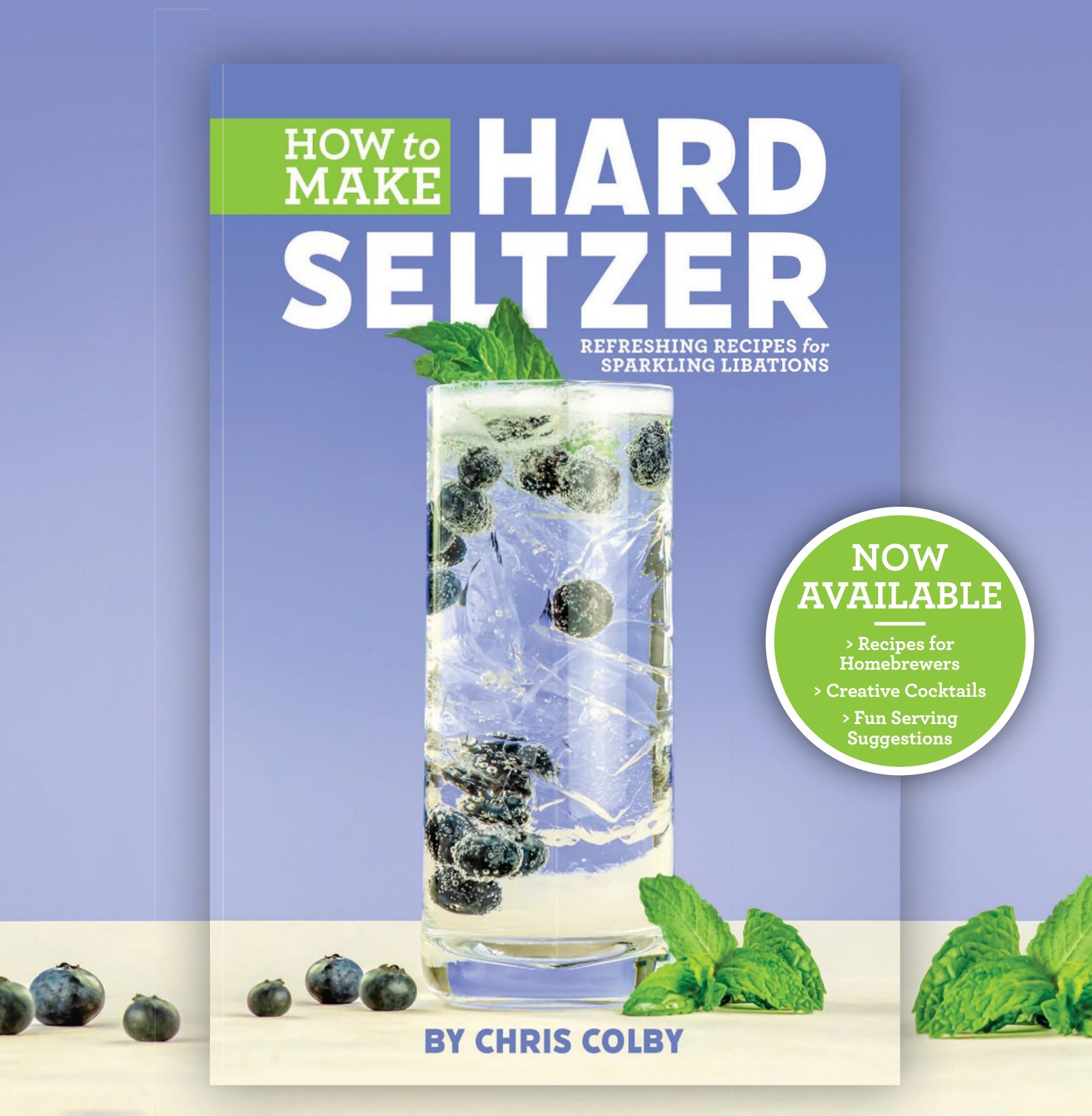
tains templates and forms for homebrewers to register donors and track donations.

Wonder says, "I think it is monumental to have the homebrewers participate in this type of collaboration. While so many commercial brewers began their careers as homebrewers, misogyny, gender discrimination, and harassment also begin on the homebrew level."

It all starts on the ground floor. And that's where homebrewers can really make a difference. Brave Noise is making the commitment to long-term work for a better beer world. It's a step in the right direction for change.

Homebrewers, if you'd like to make some noise and join the cause, go to BraveNoiseBeer.com.

Jen Blair is co-host of the beer and brewing podcast* False Bottomed Girls. *She is an Advanced Cicerone, a National BJCP beer judge, a member of the AHA Governing Committee, and chair of the AHA industry subcommittee. Ash Eliot is a communications and marketing professional focused on digital strategy, partnerships, and creator relations for beverage brands, tech, nonprofits, and musicians with an emphasis on making a positive impact on our world. She founded Women of the Bevolution, a platform to empower and support women in the beverage industry.



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LAST Drop

BY STEVE RUCH

Easy Peasy Apple Squeezy

It's been a while since my wife and I moved from a 280-square-foot school bus in California to our 1,244-square-foot house in Indiana. We're pretty much settled in, and I recently got the itch to start brewing again. Luckily, I had one remaining set of ingredients from the compromised brewing situation that I had left behind in California (Last Drop, Jul/Aug 2018) so I brewed one last 2-gallon batch of "sorta bitter."

Then, having replaced much of the essential equipment I had to leave behind because we could only fit so much in our car (brew kettle and bottles), I got a hankering for something different. Something that would go down nice and easy. Something thirst-quenching in warm-to-hot, sometimes humid, summer weather.

My first thought was to make a dry mead, which I haven't done in quite a long time. But making my normal-strength batch of mead would mean waiting until summer 2022 or later for it to be ready to drink, not to mention the cost of honey nowadays. Then I thought about sake, which would be really different, but after reading Amahl Turczyn's sake article ("Molded and Polished," Jul/Aug 2021), I realized that sake brewing would be more complicated and spendy than would suit my preference to keep things simple, quick, and low cost.

(The only time I've ever tried sake was many—never mind how many—years ago when I was stationed in Sasebo, Japan. I can't for the life of me tell you if I liked it. To tell the truth, that entire weekend is somewhat hazy, and not just because I've become an old far— … fogey.)

Then it came to me, miraculously, like a bolt out of the clear, blue sky: cider. OK, maybe the idea wasn't all *that* miraculous, given the empty apple juice jug in the recycling bin that was left over from right before my recent colonoscopy. Apple juice was my favorite of the liquids allowed the day before that dreaded procedure.

So, I rubbed my hands together, cackled semi-insanely, and began to plan. According to my research, it takes somewhere in the

vicinity of 60 to 75 pounds (27 to 34 kg) of apples, or about 200 to 250 individual pieces of fruit, to make the 3-gallon (11.4 L) batch that I wanted to produce.

I then pictured myself peeling, coring, chopping, and otherwise processing 250 apples by hand and then dealing with the mess of leftover apple mush. Once I regained consciousness, I concluded that it wasn't going to happen, by hand, by me, anytime soon.

Time to bring in some modern technology. I shopped around for an apple grinder and a fruit press, which were $250 and $100, respectively, for manually operated versions, more for powered models. When I regained consciousness again, I realized I needed a new plan.

I was starting to think that delicious homemade hard cider was beyond my physical capability and financial means and that I should just get some more extracts and specialty grains for another batch of beer.

Extracts and specialty grains? Hmm—could that process translate to cider? I'd added other kinds of fruit to beer, and I didn't see any reason that adding fresh apples to plain juice wouldn't increase the complexity of the final product without the wallet- and back-breaking hassles of buying and processing 250 apples.

I researched readily available grocery store apples and created a list of varieties that could add desirable hard cider flavors not found in plain juice alone. Five tasty varieties, in particular, could add tartness, acidity, tanginess, sharpness, and a touch of sweetness to plain juice. Granny Smith is crisp, juicy, tart, and acidic; Pink Lady (Cripps Pink) is crisp, tart, and sweet; Honeycrisp offers balanced sweetness, acidity, and tartness; Envy (Scilate) is sweet and slightly flowery; and Ambrosia is sweet with floral notes.

I'm very happy with the results and with only having to process 12 apples. See my recipe for Easy Peasy Apple Squeezy in this issue of *Zymurgy*. It's a winner in my book, but hundreds of apple varieties make possible an enormous number of combinations to suit your own taste. Time to get creative and make some easy peasy hard cider that you'll be very happy with.

***Steve Ruch lives in Fort Wayne, Ind., and is a regular contributor to* Zymurgy.**

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