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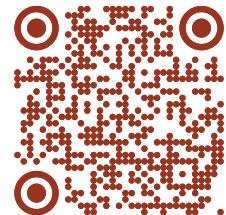
— NOV. 2, 2024 —



LEARN to
**HOME
BREW**
Day

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the JOY of
Homebrewing!

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The 2024 Learn to Homebrew Day official homebrew recipe comes courtesy of the Maltose Falcons homebrew club of California, the country's oldest homebrew club. This commemorative IPA recipe is in celebration of their 50th anniversary.

Get the official recipe at
HomebrewersAssociation.org/LTHD

Shoutout to our sponsor!

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Homebrewers Conquering Challenges

All brewers find themselves facing challenges, but homebrewers are a special lot. They are graced with a certain ingenuity that allows them to address, analyze, and eventually solve problems with astonishing tenacity. One need look no further than our upcoming Jan/Feb 2025 issue of *Zymurgy*, which turns the spotlight on your do-it-yourself, problem-solving spirit: the Gadgets feature, listing all your crafty solutions to brewing's little problems.

But sometimes the problems aren't so small. In this Nov/Dec 2024 issue, we celebrate homebrewers who must overcome seemingly insurmountable barriers. In our lead feature, longtime contributor Ryan Pachmayer takes a rare glimpse at some homebrew heroes: disabled veterans who have returned from fighting for their country with serious impairments. With some help from retired military intelligence officer Jon M. Newton, and some very generous sponsor donations, read how they are able to share an adaptive brew day together, knocking down barriers to a process many homebrewers take for granted, and collectively gaining insight, hope, and long-lasting community. Homebrewer and influencer Fred Coleman, Instagram's Blind Brew Guy, offers similar inspiration to homebrewers struggling with, and through, disabilities.

Adversity comes in many flavors, and sometimes the barrier comes in the form of preserving tradition. Veteran beer writer Lucy Corne looks at sub-Saharan brewing traditions in southern Africa, and the plight of women brewers to keep the ancient, malted sorghum beer known as *umqombothi* from fading into obscurity. Fortunately, many of these brewsters had the art handed down to them by their grandmothers through oral tradition and are able to

retain the secrets of brewing this historical, spontaneously fermented gem at home. African craft brewers in many countries have taken notice and are in close support, some going as far as to host beer competitions to heighten awareness of the style.

Yet another obstacle in this issue comes from AHA member Eric Wahlberg, an avid homebrewer residing in the deep woods of Vermont. Wahlberg, now in his 70s, has battled high cholesterol levels and has been forced to reconcile diet, exercise, and his beloved brewing routine, at the behest of his family doctor. Yet, with typical homebrewer ingenuity, he has settled on a brilliant plan to reuse spent grain from the mash tun in order to concoct Homebrewer's Granola, a delicious high-fiber addition to his diet that (with the help of other necessary dietary adjustments) has resulted in a vastly improved blood lipid panel over the past year—plus the emphatic stamp of approval from his doctor.

Rounding out our features this issue, Dan Jablow reintroduces us to the seasonally appropriate gamut of smoked beer styles and provides some tips on how to add a

little smoke to the fiery holiday comfort brews we've come to know and love this time of year. Franz D. Hofer beckons us back to the forests, lakes, spires, and biergartens of that beloved beer Mecca, Bavaria, with part two of his Beer Hiking series. And finally, Dr. Kristen Boucher, former nano brewer returned to the homebrewing fold, explores an ancient medieval oat, wheat, and barley beer style called *kuit*, which hails from the region now known as the Netherlands. Boucher leads us through a brew day with her own blend of botanical herbs for the beer—so ancient, they pre-date hops.

Many thanks for your loyalty as AHA members! I hope you will enjoy this issue, and as always, I look forward to your comments and suggestions on how we as the American Homebrewers Association can better serve your needs and interests.

Amahl Turczyn is editor-in-chief of *Zymurgy*.



Features



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ADAPTIVE BREWING

Homebrewers with disabilities often need to rethink how they approach a brew day. From cleaning out the mash tun when you're in a wheelchair to taking a gravity reading with impaired vision, Ryan Pachmayer explores how these brewers find creative ways to still enjoy making beer.

By Ryan Pachmayer

**PRESERVING SUB-SAHARAN BREWING TRADITIONS**

Indigenous African beers have been brewed for thousands of years. Spontaneously fermented from corn and malted sorghum, *umqombothi* is still made throughout southern Africa, but fewer women are preserving its secrets.

By Lucy Corne

**MAKING FRIENDS WITH SMOKED BEER**

Rauchbier is arguably the most famous of the smoked beer styles, but small-batch brewer Dan Jablow demonstrates how to apply a smoky flavor and aroma to many other beers in a complementary, rather than overpowering, way.

By Dan Jablow

**BEER HIKING IN BAVARIA PART 2**

Bavarian beer hiking is the quintessential “slow food” adventure. Seasoned beer traveler Franz D. Hofer continues his quest for unparalleled sights, views, fine cuisine, and outstanding beer as he journeys through Bavaria.

By Franz D. Hofer

**BREWING KUIT: LOOKING BEYOND HOPS**

Kuit is an ancient, traditional Dutch beer style that predates the use of hops. Dr. Kristen Boucher explores the history of this forgotten wheat, oat, and barley beer, incorporating a complex host of herbs into her own recreation.

By Dr. Kristen Boucher

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Homebrewers Conquering Challenges

By Amahl Turczyn

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THE NEW AHA FORUM

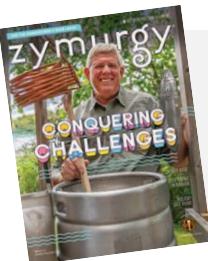
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Cover Photo

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Join the Forum



Join the Conversation

SHARE YOUR EXPERTISE IN THE NEW AND IMPROVED AHA FORUM

For more than 15 years, the American Homebrewers Association (AHA) Forum has been an essential pillar of the homebrewing community, providing a space for homebrewers to ask questions, share expertise, and make connections.

To better reflect its role as a go-to resource for many homebrewers, the forum has undergone a major face lift. Visit forum.HomebrewersAssociation.org to explore improved search tools, seamless incorporation of images and videos, a mobile-friendly interface, enhanced spam protection, and more.

Previous content and post history have been migrated to the new platform, keeping our valuable archive of homebrewing knowledge accessible and searchable. An AHA membership is not required to access the forum.

If you used the AHA Forum previously, log in with your AHA member credentials (or your AHA forum login if you aren't an AHA member) to start using the new forum with your existing username.

New users can sign up with their AHA member credentials or create an account if they aren't a member. Visit forum.HomebrewersAssociation.org to get started.



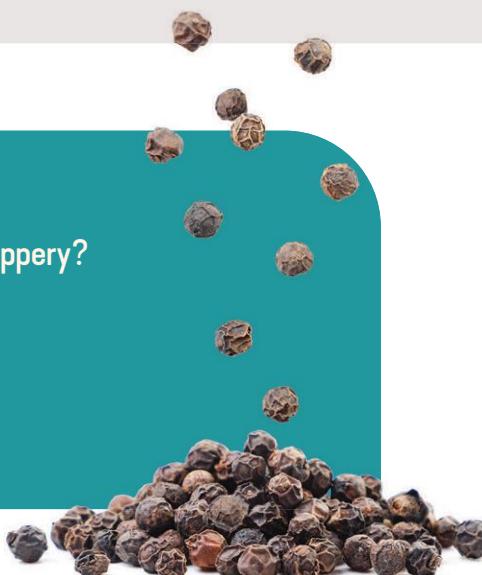
BEER QUIZ

Which beer style has a yeast profile typically described as peppery?

- A. American Brown Ale
- B. Saison
- C. Hefeweizen
- D. Gueuze
- E. Cream Ale

AHA @ GABF®

Due to magazine production schedule and event timing, gold medal recipes from the 2024 National Homebrew Competition will appear in the January/February 2025 issue of *Zymurgy*.





— NOV. 2, 2024 —
LEARN to
HOME
BREW
Day



Learn to Homebrew Day
NOVEMBER 2, 2024

Shoutout to our sponsor!



Maltose Falcons Anniversary IPA

Recipe courtesy of Rick Morales

All-grain version

Batch Volume: 5.5 gal [20.8 L]
Original Gravity: 1.070 [17°P]
Alcohol: 7.1% by volume
Color: 5.1 SRM
Bitterness: 62 IBUs
Efficiency: 73%

FERMENTABLES

13 lb. [5.9 kg] pale 2-row malt [89.7%]
1 lb. [454 g] 10°L Munich malt [6.9%]
8 oz. [227 g] dextrin malt [3.4%]

HOPS

0.5 oz. [14 g] Centennial, 10% a.a., FWH
0.5 oz. [14 g] Centennial, 10% a.a. @ 60 min
0.5 oz. [14 g] Chinook, 13% a.a. @ 60 min
1 oz. [28 g] Cascade, 5.5% a.a., steep/WP 20 min @ 200°F [93°C]
1 oz. [28 g] Centennial, 10% a.a., steep/WP 20 min @ 200°F [93°C]

OTHER INGREDIENTS

1 tablet Whirlfloc @ 15 min

YEAST

1 package Lallemand LalBrew BRY-97™ West Coast Ale Yeast

BREWING NOTES

Mash at 152°F [67°C] for 1 hour. Fly sparge with 168°F [76°C] water to collect 7 gal. [26.6 L] of wort. Boil wort for 60 minutes. Add hops at stated intervals. Chill to 67°F [19°C], oxygenate, and pitch yeast. Allow to ferment at that temperature until terminal gravity is achieved. Allow another 14 days for secondary fermentation at 65°F [18°C]. Carbonate and package.

In 1999, Learn to Homebrew Day was established as the first Saturday in November by the American Homebrewers Association to promote the most rewarding and delicious activity of all time—homebrewing. Beer lovers worldwide are invited to brew, share their knowledge, and celebrate the hobby of homebrewing annually. Learn more at HomebrewersAssociation.org/LTHD. The official 2024 Learn to Homebrew Day recipe below comes courtesy of the Maltose Falcons homebrew club of California.



Maltose Falcons Anniversary IPA

Recipe courtesy of Rick Morales

Extract version

Batch Volume: 5.5 gal [20.8 L]
Original Gravity: 1.070 [17°P]
Alcohol: 7.1% by volume
Color: 5.1 SRM
Bitterness: 62 IBUs
Efficiency: 73%

FERMENTABLES

12.1 lb. [5.49 kg] pale liquid extract [94.3%]
11.7 oz. [332 g] dextrin malt [5.7%]

HOPS

0.5 oz. [14 g] Centennial, 10% a.a., FWH
0.5 oz. [14 g] Centennial, 10% a.a. @ 60 min
0.5 oz. [14 g] Chinook, 13% a.a. @ 60 min
1 oz. [28 g] Cascade, 5.5% a.a., steep/WP 20 min @ 200°F [93°C]
1 oz. [28 g] Centennial, 10% a.a., steep/WP 20 min @ 200°F [93°C]

OTHER INGREDIENTS

1 tablet Whirlfloc @ 15 min

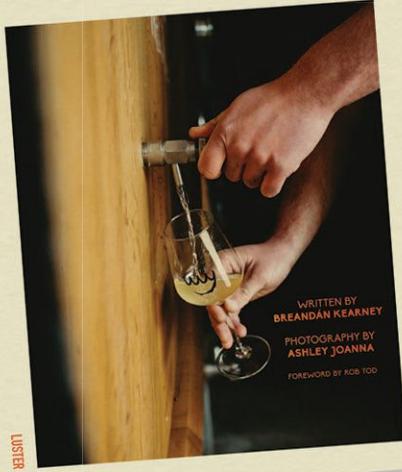
YEAST

1 package Lallemand LalBrew BRY-97™ West Coast Ale Yeast

BREWING NOTES

Dissolve extract to produce 3.68 gal. [13.9 L] of wort. Boil 60 minutes. Add hops at stated intervals. Chill to 67°F [19°C], topping up volume to 5 gallons, oxygenate, and pitch yeast. Allow to ferment at that temperature until terminal gravity is achieved. Allow another 14 days for secondary fermentation at 65°F [18°C]. Carbonate and package.

HIDDEN BEERS OF BELGIUM



Beer Book

HIDDEN BEERS OF BELGIUM BY BREANDÁN KEARNEY

Belgium is the only country in the world whose beer culture is recognized by UNESCO as part of the Cultural Heritage of Humanity. Many Belgian beers are world famous, but under the hood of Belgium's famous beer scene, beyond the big-name brands, exists a trove of breweries producing lesser-known but extraordinary beers. For drinkers and brewers, these hidden beers are often difficult to discover because of language barriers, Belgium's complex beer culture, and just the overwhelming number of beers in Belgium. That is, until now.

Writer Breandán Kearney and photographer Ashley Joanna have profiled



24 of the most exciting Belgian beers you likely never knew existed. The selection is the result of 10 years of completely independent on-the-ground reporting and hundreds of conversations with Belgian brewers and beer professionals. Learn how each beer was made and why it tastes the way it does. Get to know the diverse places these beers are from and the fascinating people who make them. Read their inspiring stories and navigate this landscape of hidden beers with a map and tips for where you can try them. These hidden beers showcase all the reasons that Belgium is the greatest beer nation in the world. Discover them in *Hidden Beers of Belgium*. And then, go out there and find them.

Purchase your copy at [accartbooks.com](http://accartbooks.com/us/book/hidden-beers-of-belgium) /us/book/hidden-beers-of-belgium.



Basic Best Bitter

Recipe courtesy of Steve Ruch

Batch volume: 3 gallons
Original Gravity: 1.040 [10°P]
Final Gravity: 1.010 [2.5°P]
Alcohol: 4% by volume
Bitterness: 26 IBUs
Color: 6 SRM

MALTS

4.5 lb. (2.04 kg) Crisp #19 floor-malted Maris Otter

HOPS

1 oz. (28 g) Progress, 6.3% a.a. @ 20 minutes

OTHER INGREDIENTS

1 pinch Irish moss @ 10 minutes
2.75 oz. (77 g) sugar to prime

YEAST

1 package SafAle S-04 English Ale Dry Yeast

BREWING NOTES

This batch was done using the brew-in-a-bag (BIAB) method. Heat 2 gallons (7.57 L) of water to 162°F (72.2°C) and lower the bag of grains into the kettle. After stirring and making sure there are no dough balls, stabilize the temperature to 153°F (67.2°C). After 30 minutes, sparge with 1.25 gallons (4.7 L) of water, also at 153°F (67.2°C). Bring the wort to a boil and add the hops to boil for 20 minutes. After the boil, seal the lid to the kettle with plastic wrap and put it in a cool place (I used my basement) to no-chill overnight and pitch the yeast the next day. Ferment at 68°F (20°C) for 14 days, then bottle.

ARTICLE

See page 72 for Last Drop
“One Size Fits All?”

Big Brew Competition Winners

Held on the first Saturday in May, Big Brew for National Homebrew Day is an opportunity to gather with friends and celebrate the greatest hobby there is: homebrewing. The Big Brew Day Competition, first held in 2023, began as a friendly bet between the Weiz Guys Homebrew Club from Loveland, Colo., and the Liquid Poets Homebrewing Society from Fort Collins, Colo. The challenge: Which club could brew the best version of the official Big Brew beer recipe? Homebrew clubs enter as groups, not individuals, with a \$25 fee per entry.

For 2024, the competition has garnered much wider attention, with clubs participating from across the U.S. The first-place winner collected 50 percent of all entry fees, to be paid to the charity of their choice. Chosen charities for the second and third place winners each received 25 per-



cent of the total fees. Results from the 2024 competition saw three clubs win top honors for their charities—see results below.

If your AHA-sanctioned homebrew club is interested in participating in the 2025 Big Brew Competition, go to weizguys.com/bigbrew, or contact the club at weizguys.bbdc@gmail.com.



PLACE

18B: American Pale Ale

Hetch Hatchy Hop Heads

Redwood City, Calif.

Charity: American Cancer Society

The Hetch Hatchy Hop Heads were established in the early 1990s on the mid-peninsula of the San Francisco Bay Area. The name is derived from the Hetch Hatchy reservoir situated within the Yosemite Valley, which is replenished by pure snowmelt from the Sierra Nevadas. This water, devoid of virtually any minerals, serves as an ideal medium for the brewing of various styles of beer. The goal of the club is to further the hobby of home-

brewing through community and friendship. Club members played an important role in the formative years of the Northern California Homebrew Festival (NCHF), filling both the role of chair and serving on the board of directors. The club's size has fluctuated over time, but a small core group remains. Even those members who have relocated outside of the area continue to return annually to NCHF to rejoin their fellow Hop Heads, where their booth will be serving homebrew late into the evening.

The Hop Heads have designated the American Cancer Society as the charitable organization of their choice, in recognition of those impacted by this horrible disease.



2ND PLACE

8A: Munich Dunkel

Ozark Zymurgists

Rogers, Ark.

Charity: Sheep Dog Impact Assistance

The Ozark Zymurgists is a club of homebrewers who meet the first Tuesday of every month. They typically meet at New Province Brewing, GOAT LAB Brewery, or Black Howler Beer Co., three great breweries in the heart of the Ozarks. Their mission is to have fun while educating about the science and art of brewing your own beers, ciders, wines, and even fermented foods. The club's homebrewers love using

their homebrews to make the community a better place. You can find them pouring their hearts and hops into local events such as The Great Southern Beer Festival and Downtown Rogers Oktoberfest, plus a heap of other shindigs all over the Ozarks. They're proud to call Northwest Arkansas home, which is known as the Mountain Biking Capital of the World, and they even have some fantastic fishing too. So, if you happen to be in the Ozarks, look them up, as there are not many things better than hittin' the trails or fishing with your homebrew buddies, and then kicking back with homebrews! Contact club president Lewie Lewis at ozhomebrewers@gmail.com.



The Ozark Zymurgists have designated Sheep Dog Impact Assistance as their charity of choice. →

3rd

3RD PLACE

21C: Hazy IPA

Upstate NY Homebrewers

Association

Rochester, N.Y.

Charity: Wounded Warrior Project

The Upstate New York Homebrewers Association (UNYHA) is one of the oldest homebrew clubs in the country (they think 3rd or 4th oldest) and a big part of the Upstate New York beer scene. Founded in Rochester, N.Y. in 1979, it has recently risen in popularity and grown to over 100 active paying members. They hold monthly



meetings the second Tuesday of every month at Sager-Stoneyard Pub on Sager Drive in Rochester's University Avenue neighborhood.

Meetings entail announcements, educational talks on a variety of subjects such as yeast propagation, mashing techniques, oxygen ingress, and more. Members can take advantage of the club's online grain store where grain and supplies can be ordered and picked up at monthly meetings. Club members can also participate in the Beer Hunter program, where the club pays members to bring back beers from out-of-town breweries to share with the other club members. They also hold a monthly prize raffle for members and run a brewer-of-the-month mini competition at every meeting. Brewers who submit entries are judged in a side-by-side blind tasting. Winners receive prize money and accrue points towards an end-of-the-year Brewer of the Year award. Big events for the club include professional brewery collaborations, team brew-off competitions, Oktoberfest, and their annual BJCP-sanctioned competition. This year's competition was held at Genesee Brewing (always an amazing host) September 21 and 22. This was the 46th year of the competition, and many prizes and ribbons were awarded at their Oktoberfest event at Ellison Park on October 5. This past year UNYHA started a Hall of Fame and inducted four members into its inaugural class: Jack Mansur (who they estimate has tried around 15,000 unique beers), Adam Odegard (who has won Brewer of the Year more times than they can count), Steve Hodos (their longest running member, 12-time president, BJCP pioneer, and organiser of the AHA National Homebrew Competition regionals), and Paul Guerrancini (a 30-year-plus member turned pro, beer educator, and advice-giver). The club will ask for additional Hall of Fame submissions every two years. Submit competition entries to unyha.com/comp.

Moving forward, the club will be focused on brewing education, process and equipment evolution, and keeping the docket full of fun and interesting events for its members.

UNYHA has designated the Wounded Warrior Project as its charity of choice. Without our soldiers fighting for our freedom, there would be no homebrewing. 

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OBSTACLES OVERCOMING

A unique theme for a hobby magazine? No, not at all. As we each know, every time we brew, ferment, bottle, keg, transfer, shop, and share, there are obstacles. Where is my funnel? Crap, the supply shop does not have the hops I want. Hmm, I'm noticing an off-flavor in my English Bitter that I've never noticed before. (&%\$L!) Warm, sticky wort dripped out of my transfer spigot because I forgot the gasket the last time I put it back together. So, what's a homebrewer to do?

We overcome obstacles by brewing, fermenting, and of course drinking, as we learn, grow, and excel. This also applies to the American Homebrewers Association, a 46-year-long membership community with successes and challenges quite unique compared to other hobby groups.

“

The AHA is dedicated to protecting, uniting, and educating homebrewers while empowering an equitable homebrewing culture and showcasing the fun of fermenting. Our members are a part of the AHA membership community, benefiting from unmatched resources and rewards to brew, and this community is supported by a committee of volunteer leaders.

The AHA started as a 501(c)(3) in 1978, and is now an individual membership group, part of the 501(c)(6) Brewers Association (BA), based in Boulder, Colorado. AHA members literally helped birth the entire craft beer and independent brewer movement, and we are a vital part of the beer ecosystem. Big shoes. We take the AHA legacy, homebrewers' importance in culture, and member needs seriously.

What is top of mind right now is that the following are not as robust as they once were: homebrewing as a hobby, supply shop and craft beer sales, and membership numbers. Thus, for the past two years, the AHA has strategically planned to formulate 2025–2027 priorities and assess new business model and association status options. With leadership, support, and an incredible amount of time from your AHA Committee and chair Shawna Cormier, along with BA staff, in 2024, we commissioned a member/non-member survey that garnered 3,755 responses (see infographic), a STEEP (Social, Technological, Economic, Environmental, and Political) analysis, an independent financial review, and more.

It's essential to recognize that every one of us as members (I was an AHA member way before I worked for the organization) varies in our brewing and fermenting approach, and our resource preferences. We can't do it all, but we DO deliver on incredible things. Want community?



2024 State of Homebrewing

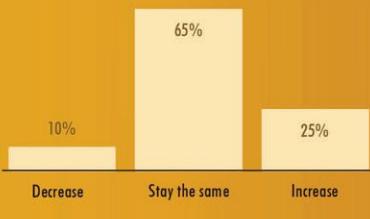
Though fewer people may be joining the hobby, there are signs of a healthy homebrew enthusiast base.

The homebrewers in our survey maintain a steady pace of brewing and fermenting and they're twice as likely to expect their homebrewing to increase rather than decrease.

About how often do you homebrew?



How do you expect your homebrewing activity to change over the next few years?



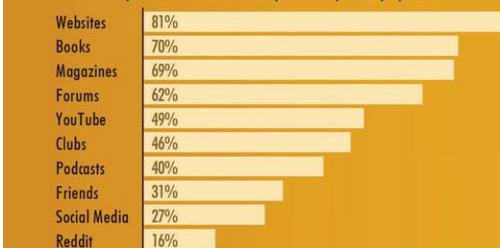
Homebrewers have a variety of tools and resources available to them, and usage varies by generation.

Over ¾ of the survey participants use some combination of the apps on the right to aid in their homebrewing.

Millennials and younger are more likely than their older counterparts to use some of the newer apps on the market.



Where do you learn new techniques, recipes, equipment reviews, etc.?



Most homebrewers in the survey still turn to traditional channels to learn new techniques, recipes, and to read equipment reviews.

However, magazines are a less popular option for younger generations who, more so than older generations, are increasingly using more social media resources such as YouTube, podcasts, and Reddit. →

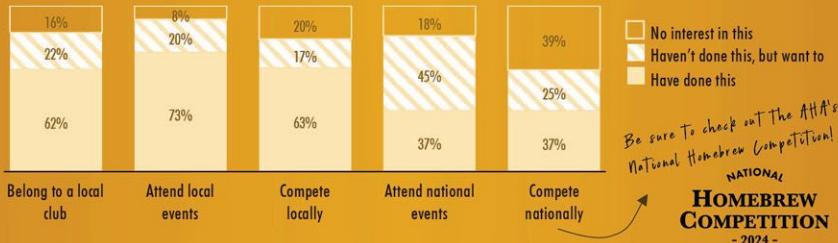


The social and community aspects of the hobby remain important to many, especially at the local level.

How important is the social/community aspect of homebrewing to you?



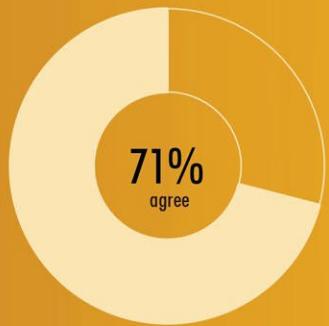
Which of the following apply when it comes to your homebrewing activities?



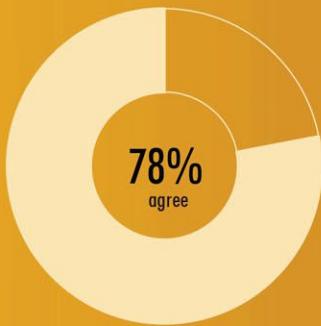
The American Homebrewers Association is seen as playing a vital role in the homebrewing community.

The AHA is dedicated to protecting, uniting, and educating homebrewers while empowering an equitable homebrewing culture and showcasing the fun of fermenting.

The AHA is the primary organization focused on these priorities.



The homebrewing community would be worse off without these efforts by the AHA.



About This Research

The American Homebrewers Association (AHA) commissioned this community survey, which was administered over the web in the spring of 2024. Current and former AHA members, as well as AHA social media followers and members of various homebrew forums were invited to participate. The survey received 3,755 responses. Data have not been weighted and the vast majority of respondents are AHA members.

www.HomebrewersAssociation.org

Participate in an AHA Annual Homebrew Holiday. Check out the new AHA Forum (launched in September 2024). Join or rewatch a Zymurgy Live webinar exclusive to AHA members. Want recipes, reasons to brew, and rewards in the form of discounts? We've got those too.

For example, in the upcoming Jan/Feb 2025 issue of Zymurgy, you will gain access to validated gold medal-winning National Homebrew Competition recipes from the 2024 competition. Our incredible collection of recipes grows each year. After every competition, we provide taste-tested recipes awarded by BJCP judges that you can't get anywhere else. Access them at HomebrewersAssociation.org.

At the time of authoring this column (September 2024), it is not determined what AHA evolutions will be prompted by what we've learned. However, change will help us keep pace, evolve, innovate, grow, and continue to serve you. So brew on, and here's to the FUN of homebrewing and not letting obstacles get in the way. We'd like to thank the 3,755 members and non-members who have helped shape the future of the AHA by participating in this spring 2024 survey.

Julia Herz is executive director of the American Homebrewers Association. You can follow Julia's homebrew talks and travels on Instagram @ImmaculateFermentation or contact her at ahaed@brewersassociation.org.



THE PERFECT GIFT!



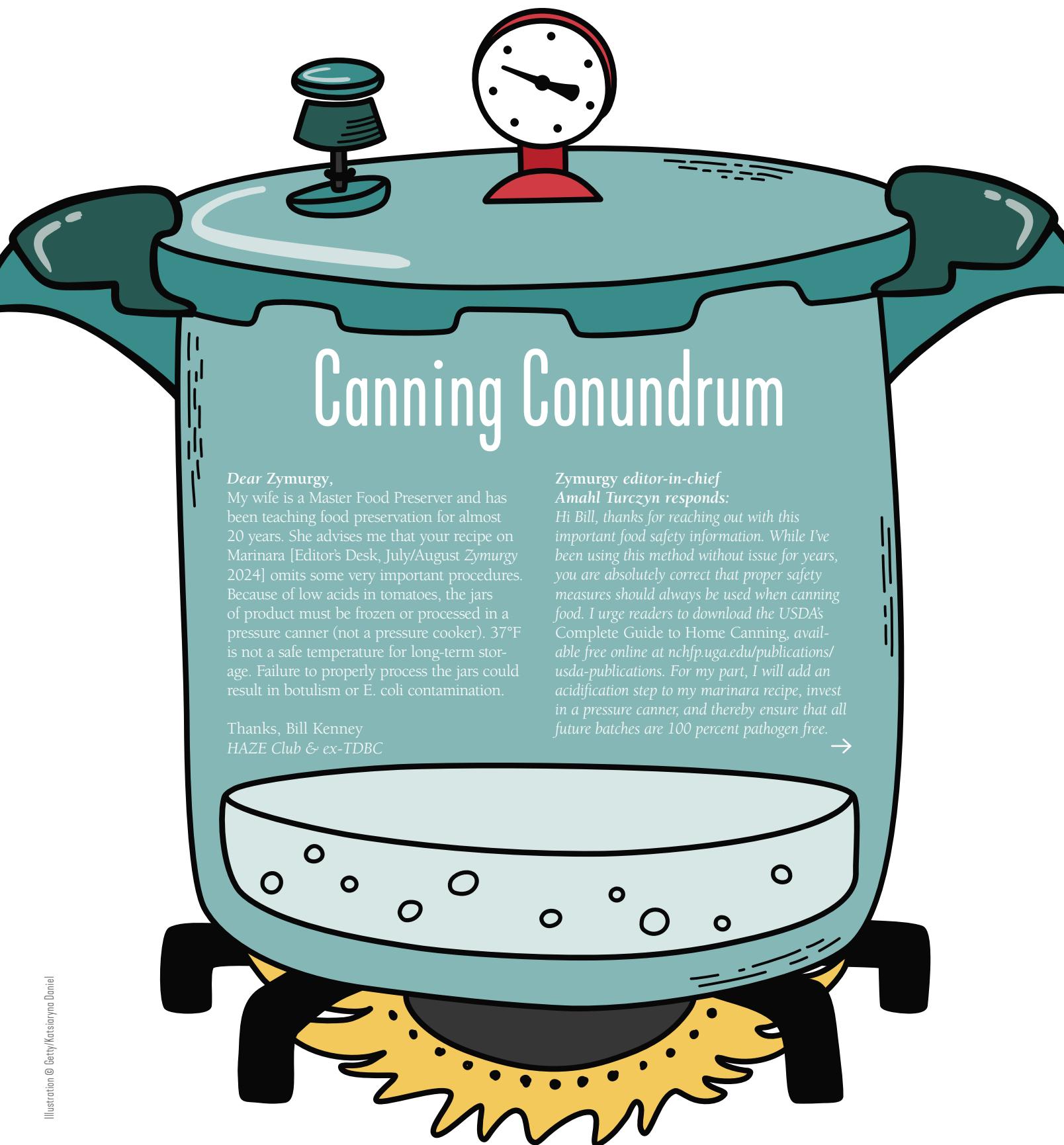
SHARE THE JOYS OF FERMENTATION THIS HOLIDAY SEASON.

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Dear Zymurgy,

My wife is a Master Food Preserver and has been teaching food preservation for almost 20 years. She advises me that your recipe on Marinara [Editor's Desk, July/August Zymurgy 2024] omits some very important procedures. Because of low acids in tomatoes, the jars of product must be frozen or processed in a pressure canner (not a pressure cooker). 37°F is not a safe temperature for long-term storage. Failure to properly process the jars could result in botulism or E. coli contamination.

Thanks, Bill Kenney
HAZE Club & ex-TDBC

Zymurgy editor-in-chief

Amahl Turczyn responds:

Hi Bill, thanks for reaching out with this important food safety information. While I've been using this method without issue for years, you are absolutely correct that proper safety measures should always be used when canning food. I urge readers to download the USDA's Complete Guide to Home Canning, available free online at nchfp.uga.edu/publications/usda-publications. For my part, I will add an acidification step to my marinara recipe, invest in a pressure canner, and thereby ensure that all future batches are 100 percent pathogen free.





INDUCTION BREWING FOR CARBON NEUTRALITY

Dear Zymurgy,

I always wanted to make a T-shirt with Euler's formula on it, $e^{int} + 1 = 0$. This magazine's name, Zymurgy, is as eclectic and science-nerdy as Euler's formula. I love it. I love, too, the sense of newness in layout and depth of content with Amahl at the helm, and I say this as a past contributor. I'm glad I'm not the only one that noted the lack of picture captions B.A. (Before Amahl).

The carbon footprint of a six-pack of store-bought beer, in bottles, has been estimated to be on the order of 3,200 grams of CO₂ equivalents. It turns out that a little less than half of the footprint has nothing to do with the production of the beer. In terms of lessening humankind's

overall carbon footprint, I see homebrewers playing a heroic role. Still, we can tighten our carbon-footprint belts a little tighter by being keenly aware of our brewing energy and water usage. Thank you, Zymurgy, for Josh Weikert's refresh on induction heating ("Getting In On Induction," July/August 2024).

Patti and I live completely off-grid, at the end of a mile-long driveway, in the middle of the northern Vermont woods. We live in sync with the intensity and quantity of the sun's photons. With a brew's grains (always 8 pounds), water, hops, and yeast poised and at the ready, I wait until the house batteries are fully charged on a sunny day before I execute. I have two induction burners, a 1.5-kilowatt (kW) and a 3.5-kW.

For all my beers, I do an 88-minute, multi-rest mash on the 1.5-kW burner. There is a Keep Warm button on the burner, so when the mash is at my target temperature, I hit the button and start a timer until the next step. I still have to keep an eye on the temperature, but it holds pretty constant (it helps that my mash kettle is wrapped in Reflectix). After rinsing the grains—I call my brewing technique Eights to the Bar Brewing (a topic for another day)—I boil the wort for 88 minutes on the 3.5-kW burner.

Given the fact that all my brew energy (even muscle energy moving 8 gallons of pre-boil wort around) comes from the sun, I'm feeling pretty carbon-minimal smug. So, thanks again for the article. Tell your readers: If most of your electricity is coming from renewable sources, induction is the only way to go, as Josh well knows.

Eric and Patti Wahlberg
WasteWater Technology Trainers

Zymurgy editor-in-chief
Amahl Turczyn responds:

Eric and Patti, thanks so much for your thoughtful letter and feedback. I too hope more homebrewers make the switch to induction for their brewing needs. Even if they are not able to use a renewable source of power such as solar, in my opinion, the time saved and gains in energy efficiency still make it a worthy brewhouse upgrade.

WEIGHING IN ON INDUCTION

Dear Zymurgy,

In Josh Weikert's article "Getting In On Induction" [July/August Zymurgy 2024], he does not mention the weight these burners will handle. It's one reason why I never thought this would work. The manufacturers don't list the maximum weight tolerances in their product specs.

Brian Haley,
Longtime AHA member

Getting In On Induction author

Josh Weikert responds:

Hi Brian, I've heard that some induction heating elements produce a whine from the

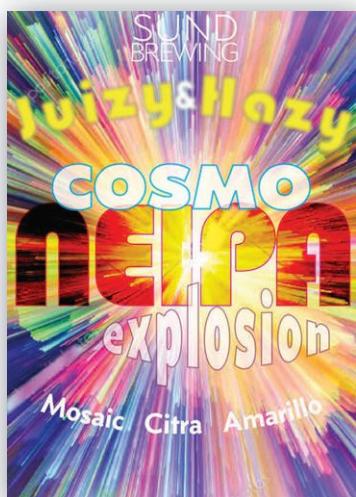
cooling fan when they are loaded with too much weight—it kind of sounds like microphone feedback—which would indicate some compression of the frame. But even that's pretty minimal. I've also never heard of anyone who's cracked or broken one yet due to too much weight, though there are the odd urban legend-style "I know someone who knows someone who did" stories. However, if it's a concern, one could always fabricate a metal stand to hold the kettle just above the element, or even surround the burner with cinder blocks to support the kettle's weight. As long as the magnetic field is close enough to reach the metal base of the kettle, the element can still do its job.



DEAR ZYMURGY

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

YOUR HOMEBREW LABELS



17 U.S gal. (65 liters) of American Blonde Ale and 17 gal. of Belgian Wit.

Enjoying the craft and art of brewing in my home in Norway with my fantastic Brewtools equipment! Skaal!
(Homebrewer 4 years, AHA member 2 years)

Thor Sund | Sund Brewing | Drammen, Norway



Elevenses was based on the clone recipe of Maine Beer Company's Lunch, in "Clones From Across the Land" in the Zymurgy Nov/Dec 2021 issue. For the label, I wanted the name and label of my clone to reflect this wonderful beer and the origin of Lunch.

According to MBC, Lunch is the name of a locally and routinely spotted whale that has "what looks like a bite taken out of her fin." This is illustrated in a subtle squiggly line above the beer's name on the label.

After a bit of collaboration with a local artist, both of us being Lord of the Rings fans, we came up with Elevenses and the image of Gollum biting into the back of a whale. My home brewery is named Plaid Eye. The artwork was done by Cats.On.Venus (@cats.from.venus on Instagram). (Homebrewer 14 years, AHA member 5 years)

Aron Ruthe
Vienna, Va.



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?
Upload your label to HomebrewersAssociation.org/your-homebrew-experience and we will take it into consideration!

SCAN ME



YOUR HOMEBREW EXPERIENCE

Show us your labels, 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.

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



Our newest brew dog (Hazel) making a hazy IPA.

Scott Key
(Homebrewer 10 years, AHA member 10 years)
MaSH
Corte Madera, Calif.



A license plate worth bragging about!

Gray Maxwell
(Homebrewer 45 years, AHA member 16 years)
Washington, Va.



Bodhi, a 15-month-old Alaskan Eskimo, supervises his first homebrew, an Alaskan Pale, of course.

Larry Ungerer
(Homebrewer 15 years, AHA member 7 years)
Cincinnati, Ohio



Brewing in the middle of beautiful Puget Sound at Lookout Point Brewing, on my (relatively new) all-in-one 240v G40 brew system (after years of multi-vessel on gas).

Since a recent update to stainless and glycol freed up my fermentation chamber (a \$40 used freezer), I converted it to a keezer. Great upgrade.



Eric Pavey
(Homebrewer 6 years, AHA member 6 years)
Peninsula Fermentation Society
Poulsbo, Wash.



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 look 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



Homebrewer's GRANOLA

By Eric J. Wahlberg

It's cliché but true: there's a big, white elephant lurking behind the fermenter in every brew room. We make alcohol.

Yes, ethanol isn't on the dirty dozen list of pesticide-laden fruits and vegetables (hint: it's neither a fruit nor a vegetable). But last I checked, ethanol also doesn't show up on any what's-good-for-you lists either. Pick a headline—they all say alcohol is bad for you. Indeed, GoodRx.com cites a recent World Heart Federation policy brief that says, "no amount of alcohol is safe for health, especially if you have heart disease or other chronic illness."



But we all drink responsibly, right? And we all make really good beer and are proud of it, right? My wife Patti and I had neighbors from the top of the hill down recently for happy hour. They had tried brewing several times in their early days, but never got to that “this-is-really-good-beer” stage. We indulged in four of my beers: Something’s Awry Ale, Anne Fulton’s Porter, Green Mountain Scottish Ale, and Pale Hooker Mountain Ale. They were amazed. They left completely fired up about resurrecting and refining their brewing craft. What had I done?

I had my annual physical in late January this year, right around my 70th birthday (how did *that* happen?). My

doctor read me the riot act about cholesterol levels measured in my blood the previous July.

There are many people who are genetically predisposed to high cholesterol levels. For them, statins can be lifesaving. I am not genetically predisposed and my cholesterol levels in my younger days were always in acceptable ranges, although, I admit, they had been creeping up with the passing years.

“If you don’t get your cholesterol numbers down in six months,” she said, finger pointing sternly, “I am obligated to put you on a statin whether you like it or not.”

Something had to be done.

The significantly elevated probability of suffering from a heart attack or stroke at 70 sealed the deal. If it’s happening to me, I know it’s happening to a lot of you, because, I can safely say, none of us are getting younger.

Diet plays a huge role in blood cholesterol levels, although eggs don’t seem to be the devilish culprit they were once considered to be. What kept coming up as likely blood cholesterol wrongdoers were dairy products and sugar. I was a big consumer of both, so I had to adjust my inputs.

Study after study has shown increased consumption of fiber *decreases* blood cholesterol levels. Although I don’t really get the connection, it got the cerebral wheels turning. Much to Patti’s chagrin was the apple cider doughnut I ate every day with my first cup of coffee (actually, 1/2 cup coffee, 1/2 cup milk). Nothing about that breakfast was good for cholesterol levels.

Fiber, fiber, fiber. It’s been repeated so many times by so many people how fiber is so gigantically important to our overall health, most of us have tuned it out. I decided to rethink my fiber intake for the second time. I already considered myself “fiber-aware” due to a diverticulosis diagnosis I received many years ago. One of the best things you can eat to prevent diverticulitis from becoming painful and dangerous diverticulitis is, you guessed it, fiber!

Turns out I needed more. Oatmeal has long been touted as a supreme source of fiber. “Have a bowl of oatmeal every day for breakfast,” I’ve heard. I have oatmeal for breakfast occasionally, but I couldn’t consider having it every day because I always eat it with milk and maple syrup, and plenty of both. The dairy and sugar would cancel out the fiber benefits, so that wasn’t going to work.

DRY INGREDIENTS

[See recipe for key]



WET INGREDIENTS



Oats made me think of barley, and barley made me think of brewing. In fact, I use flaked and golden naked oats in several of my brew recipes. Many of us do. And the good news is, beer has some fiber in it with or without the oats! So, all I had to do was drink more beer, right? No, I was fooling myself.

Recently, on my way to the compost bin with my spent grains from a brew

day, it occurred to me that these grains are steeped in enzymes and lactic bacteria during starch conversion in the mash tun—a fermentation of sorts—and then nearly all their sugars and remaining nutrients are rinsed out during the sparge. The resulting spent grains are as close to 100 percent fiber as you can get. What culinary transformation could make these almost tasteless spent grains pleasantly ingestible?

It comes as no surprise to probably all Zymurgy readers that there are a lot of people doing a lot of good things with spent grain—our favorite local brewpub makes soft spent-grain pretzels as well as doggie treats with theirs. They even have their own acronym: BSG for Brewers' Spent Grain. With fiber and oatmeal in mind, I was drawn online to find recipes for granola.

My quest for the ultimate fiber-packed granola recipe began. After looking at countless recipes and trying out multiple iterations, I've settled on what I call Homebrewer's Granola. It's a recipe that's guaranteed not to disappoint, and it will make you...regular, if you catch my drift. You might see other health benefits as well.

Instead of that apple cider doughnut, for about the last six months I've been having a cup of Homebrewer's Granola with my first cup of coffee (now, 2/3 cup coffee, 1/3 cup 2-percent milk). Talk about fiber. I considered naming it "Fiber-Blast Granola." Besides the spent grains and oatmeal, the six nuts used in the recipe (who knew pistachios are not really nuts?) are among the top 10 most fiber-rich nuts; the pumpkin and sunflower seeds also are jam-packed with fiber. I add nothing else to the granola, because it is delicious as is. I also have some of it anytime I feel the need for a between-meal snack.

Yes, there's sugar in the granola—including maltose, a brewer's favorite sugar—but it is not a major ingredient compared to what you'll find in many processed foods.



HOMEBREWER'S GRANOLA

Recipe by Eric J. Wahlberg

DRY INGREDIENTS

1. 3 cups [270 g] oatmeal
2. 2.5 cups [120 g] brewer's spent grains, dried
3. 1 cup [125 g] unsalted dry roasted peanuts
4. 1 cup [86 g] sliced almonds
5. 0.25 cups [32 g] walnuts
6. 0.25 cups [32 g] pecans
7. 0.25 cups [32 g] Brazil nuts
8. 0.25 cups [32 g] pistachios
9. 0.25 cups [32 g] pumpkin seeds
10. 0.25 cups [32 g] sunflower seeds
11. 0.5 tsp. [3 g] salt (add after baking the nuts and seeds)
12. 2 heaping Tbs. [26 g] dry malt extract (add after baking the nuts and seeds)

WET INGREDIENTS

13. 0.5 cups [125 g] peanut butter, crunchy
14. 4 Tbs. [56 g] unsalted butter
15. 1.5 oz. [42 g] unsweetened baking chocolate (I use Ghirardelli)
16. 0.25 cups [37 g] chopped dates
17. 0.25 cups [37 g] dried cherries
18. 0.25 cups [85 g] unhopped liquid malt extract
19. 3 Tbs. [63 g] honey
20. 3 Tbs. [60 g] maple syrup
- 1 Tbs. [10 g] instant coffee

INSTRUCTIONS

- A. Pre-heat oven to 350°F (177°C).
- B. Combine all wet ingredients in a saucepan over low heat to melt the butter and chocolate, stirring occasionally (using kitchen scissors, I cut up the cherries and dates to approximately 1/4-inch pieces).
- C. Combine all dry ingredients except the salt and DME in a bowl and mix (using kitchen scissors, I cut up the nuts to approximately 1/4-inch pieces).
- D. Place the dry-ingredient mixture on a baking pan no more than 1/2 inch deep.
- E. Bake mixture for 10 minutes, then redistribute the grains, nuts, and seeds.
- F. Bake mixture an additional 10 minutes, then redistribute.
- G. Bake mixture for a final 10 minutes, then transfer it back to the mixing bowl and add the salt and DME. Mix.
- H. While the ingredients are still warm to hot, add wet to dry and mix as thoroughly as possible (there is so little wet stuff in proportion to dry stuff, this step is not easy).
- I. Transfer the mixture back to the baking pan and bring to room temperature, breaking it up as it cools.
- J. Store the granola in an airtight container.



SERUM LIPID PANELS— MEASURED AND RECOMMENDED¹

July 20, 2023²

| | | |
|----------------------------------|-----|---------|
| Cholesterol, total | 221 | < 200 |
| Triglyceride | 51 | < 150 |
| HDL cholesterol ³ | 62 | 40 - 60 |
| LDL cholesterol ⁴ | 149 | < 100 |
| July 18, 2024² | | |
| Cholesterol, total | 165 | < 200 |
| Triglyceride | 34 | < 150 |
| HDL cholesterol ³ | 64 | 40 - 60 |
| LDL cholesterol ⁴ | 95 | < 100 |

NOTES: ¹Recommended for good health by the National Cholesterol Education Program; ²All concentrations in mg/dL; ³High-density lipoproteins, the “good” cholesterol; ⁴Low-density lipoproteins, the “bad” cholesterol.

After six months, I had blood drawn for a lipid panel, and it showed a 25-percent decrease in total cholesterol, a 33-percent decrease in triglyceride, and a very respectable and welcome 36-percent decrease in “bad” (LDL) cholesterol.

Needless to say, my doctor was very, very congratulatory. The results lowered the probability of me having a heart attack or stroke to almost “normal” for a disease-free 70-year-old (my blood pressure, slightly high, remains a risk factor). She was keenly interested in how I did it. But, full disclosure, Homebrewer’s Granola is not the only thing I changed. Following are other highlights.

MILK — It’s always been 2 percent, but I have decreased my consumption from approximately a half gallon every five days to every 10 days.

BUTTER — We used to go through a stick every three days. Now it takes us about three weeks.

YOGURT — Was whole milk, now nonfat.

CHEESE — We’ve decreased our consumption from approximately 1½ pounds per week of all cheeses (we live in Cabot, Vermont, the original home of Cabot cheese, advertised as the “world’s best cheddar”) to an occasional use of only feta and Parmesan cheeses.

SUGAR — Except for the sugar in the Homebrewer’s Granola and the 1 teaspoon of maple syrup I add to my coffee (I actually do measure), I’ve pretty much zeroed out my sugar consumption. I don’t miss the whole-milk yogurt or the cheese, and



I much prefer the granola over the doughnut, but the no-sugar (translation: no dessert) is killing me. I miss it terribly. I long for a Reese’s Peanut Butter Cup, my favorite sugar bomb.

OVERALL DIET — When I say “diet” here, I’m referring to our overall eating habits. We used to eat whatever we wanted, which occasionally included, for example, tuna noodle casserole (lots of cheese), vegetarian lasagna (lots of cheese), pizza (lots of cheese), and grilled cheese sandwiches (by definition, lots of cheese). We now follow a Green Mountain version of the Mediterranean diet, whatever that means. Example: Instead of slathering a warm slice of baguette with Cabot butter, we dip it in extra-virgin olive oil. Exercise is also important for controlling blood cholesterol levels. I don’t belong to a gym, and never have, but I work my butt off on our land. After we first moved to Vermont in 2016, I lost nearly 30 pounds (good riddance to the corporate life!).

For example, I clear our mile-long driveway with a walk-behind snowblower. Two round trips is four miles, multiplied by however many times a year it snows. In the year between the test results given above, I didn’t exercise any more or any less than the previous year. In the six months between visits to my doctor, January to July, I lost another 10 pounds due to the aforementioned dietary changes.

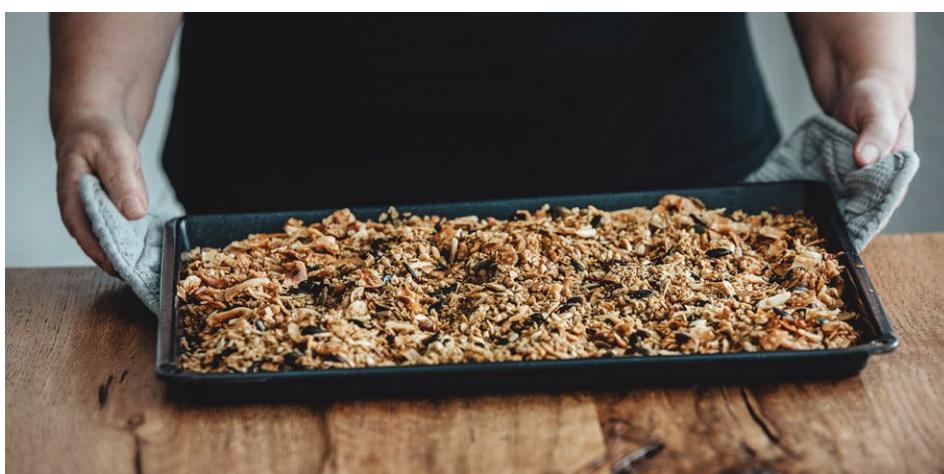
If we want to keep drinking our wonderful homebrews, we have to take care of ourselves in other ways. For me, being more conscious of dairy and sugar in my diet and continuing to exercise played key roles in improving my health. And homebrewing helped me get there. Tracking your blood cholesterol by means of a so-called lipid panel is the go-to metric to check where you are on the cardiovascular disease spectrum. It doesn’t tell the whole story, but it’s hugely important: heart disease is the number one killer of Americans; stroke, depending on the year, is the number five killer.

So homebrewers unite! Continue to drink responsibly. Continue to share your beer proudly. *But get your blood tested.* Pore over the results the same way you pore over your water chemistry profile, then pour yourself a beer. As in brewing, take action when action is called for. Don’t fool around. Together, we have a lot of beer to brew.

REFERENCES

1. nbcnews.com/better/health/7-science-backed-ways-beer-good-your-health-ncna788986

Eric Wahlberg’s professional career has been in wastewater treatment (fun!) as an operator, researcher, engineer, and trainer. He taught himself how to brew during COVID, and is now obsessed. He lives with his wife Patti, two cats, and three dogs in the middle of the northern Vermont woods. He is currently writing a book on his brewing technique, Eights to the Bar: Zen and the Science of Homebrewing. 





The Impact of pH on Beer

By Thomas Kraus-Weyermann
& Horst Dornbusch

Maintaining a proper pH value throughout the entire brewing process—from the mash-in, to the boil, to fermentation, to packaging—is an often overlooked variable that contributes to the finished beer's flavor, foam stability, and shelf life. If the pH is out of range in the mash, it is likely to remain so all the way into the glass. Chemically, an unfavorable pH can reduce a beer's colloidal stability, cause permanent, non-biological hazes, and accelerate trans-2-nonenal staling. On the palate, it can cause the beer to taste ➤

A version of this article was published in the July/August 2024 issue of *The New Brewer*.

harsh, astringent, and mouth-puckering, or conversely, broad and empty. This article looks at the links between proper pH management during the brewing process and various finished-beer characteristics.

Most classic beer styles are based on a bitter-sweet balance between hundreds of flavor-active hop and malt compounds, all supported by a slight acidity. There are only a few exceptions to this rule. They include sour, fruited, barrel-aged, or extremely dry-hopped beers, in which an imbalance of one kind or another is deliberate; and the management of pH values seems to be less of a quality factor in these beers.

TABLE 1:
Generally Accepted Water Softness/Hardness Ranges

| Descriptor | PPM as Calcium Carbonate | $^{\circ}\text{dH}$ |
|-------------|--------------------------|---------------------|
| Soft | 10 – 50 ppm | 0.56 – 2.8 |
| Medium Hard | 50 – 100 ppm | 2.8 – 5.6 |
| Hard | 100 – 200 ppm | 5.6 – 11.2 |
| Very hard | >200 ppm | >11.2 |

Source: Various

Conversely, there are also some technically imbalanced beers, especially non-alcoholic beers, for which the correct pH value is of heightened organoleptic significance. Therefore, before delving into the sensory impact of suboptimal pH values, here is a brief refresher of pH fundamentals.

A BRIEF RECAP OF PH

The abbreviation stands for the Latin *potentia hydrogenii* (or *puissance d'hydrogen* in French, as well as *power of hydrogen* or *potential of hydrogen* in English), whereby H is the chemical symbol of hydrogen on the periodic table. Chemically, pH refers

to the concentration of hydrogen ions (H^+) in solution. Their concentration, in turn, is a measure of a solution's acidity or alkalinity. The pH scale ranges from 0 to 14, with 0 as the most acidic value, and 14 as the most alkaline value. A pH of 7 marks the neutral point. Distilled water is considered pH-neutral, while battery acid, for instance, can have a pH of 0, and drain cleaners, a pH of 14. Perhaps fittingly, this pH scale was developed in a brewery in 1909 by the Danish chemist Søren Peter Lauritz Sørensen. He was the head of the Chemistry Department of the famous Carlsberg Laboratory in Copenhagen—the same lab, incidentally, where, in 1883, Emil Christian Hansen isolated and cultured the first pure strains of lager yeast.

In the mash, the pH is determined by a combination of factors, including the grist composition, the characteristics of the brewing liquor (water), and the mash viscosity. Generally, with all other factors being equal, darker mashes are more acidic than paler ones; and thinner mashes (those with a high liquor-to-grist ratio) are slightly less acidic than high-viscosity mashes. In most locations around the globe, natural, untreated water sources tend to be slightly acidic, but not sufficiently so for an ideal mash pH. In addition, municipal water works often treat drinking water to make it more alkaline.

After the mash, the pH value declines gradually by a total of as much as 1 during the brewing process until it stabilizes in the finished beer.¹ The most frequently cited optimal pH values for the different stages of beer making are:

- **Mash:** Approximately 5.2 to 5.6. In this pH range, zinc, an important yeast nutrient, is leached from the malt into the wort.
- **Wort at the end of the boil:** Approximately 5 to 5.2, after a 0.1 to 0.3 pH drop in the kettle. This pH range is ideal for yeast growth and fermentation efficiency.
- **Finished beer:** Approximately 4.2 to 4.6. For most drinkers, this range ensures a pleasing sensory experience on the palate, especially in conjunction with some carbonation. It also enhances foam and shelf-life stability.

The pH scale is not linear but logarithmic, similar to the Richter scale for earthquakes. This means that a change of 1 increment represents a 10-fold change in actual acidity or alkalinity, and a change of

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2 increments represents a 100-fold change. Therefore, even a seemingly small change in the pH value, such as the pH drop in the kettle, can have significant effects on the finished beer.

The brewing liquor contribution to the mash pH is based mostly on its hardness or softness. Simplified, water rich in dissolved minerals such as calcium and magnesium (Ca and Mg) as well as naturally occurring bicarbonates, such as sodium bicarbonate (NaHCO_3), commonly known as baking soda, is hard (alkaline), while water containing relatively few minerals but plenty of hydrogen ions is soft (acidic). Chemically, several trace elements naturally found in water, including sodium bicarbonate, neutralize (buffer) hydrogen ions, causing the pH level to rise. Therefore, acidity-reducing and acidity-promoting elements can cancel each other out to varying degrees depending on their concentrations; and the difference between these two opposite forces is called residual alkalinity (RA), a term created by the German brewing chemist Paul Kolbach.

RA values can be positive or negative. A brewing liquor with a positive RA value raises the mash pH, while one with a negative value lowers it. Because of the many possible chemical pathways for the production of both acidifying elements and their buffering agents, “two waters,” to quote Charlie Bamforth, “might be identical in terms of inherent alkalinity (e.g., the waters of Burton-on-Trent and Munich have very similar bicarbonate levels and therefore alkalinity) but very different with respect to residual alkalinity (Burton water contains far more calcium and magnesium than does the Munich equivalent).”²

From a sensory perspective, the correct pH at the beginning of the brewing process is critical for the character of the finished beer because such dissolved solids as calcium, magnesium, sodium, and chloride compounds are significant not just by themselves but also as reactants with malt, hop, and yeast compounds. They thus enhance or detract from the beer's mouthfeel and structure—not unlike table salt often does in a dish. If present in excess, these elements can make the beverage taste harsh, astringent, and imbalanced while their absence can make it taste empty.

In theory, most sources agree that a single-malt Pilsner mash made with distilled water (pH 7) might have a pH of 5.7 to 5.8. Therefore, such a pale mash could benefit from a downward correction with a negative RA liquor. As the earlier comparison between Burton-on-Trent and Munich water indicates, water corrections can be fairly complex. They are not covered here in depth because there are already many



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Briefly, one simple method of acidification is to add food-grade lactic, phosphoric, or sulfuric acid to the brewing liquor, the mash, or even to the wort. There are also acidic salts such as calcium and magnesium chlorides, which counteract the buffering capacity of bicarbonates. In Germany, where the country's Purity Law forbids the use of food-grade acids in beer, brewers often use biologically acidulated malt with a pH of roughly 3.4 to 3.8. When combined with the mash, the addition of 1 percent acidulated malt by weight to the total grist reduces the mash pH by roughly 0.1. Because the share of acidulated malt should not exceed roughly 10 percent of the total grist weight, the maximum achievable mash pH correction with acidulated malt is -1.

THE ROLE OF PH IN THE MASH

One of the key objectives of mashing is the optimum enzymatic conversion of desirable malt elements for extraction into the wort and beer. Enzymes, however, perform at their peak not only at specific temperatures and, to some degree, viscosities, but also at specific pH ranges (see Table 2). As previously noted, a mash pH of 5.2 to 5.6 is generally considered the optimum. This is a compromise range because all mash enzymes peak at different acidities. A mash pH above or below the optimum reduces enzymatic conversion efficiencies, increases conversion times, and might extract excess tannins and other harsh grain flavors, all of which can have an indirect influence on beer flavor. In the extreme, enzyme activity can even stop.

The activity of gum-converting β -glucanase, for instance, peaks at pH 4.7 to 5, which is within this enzyme's broader optimum activity range of pH 4.5 to 5.5, but slightly below the compromise mash

pH range. A substantial reduction of glucanase activity because of excess alkalinity (or a lack of acidity) allows β -glucans to maintain their high-molecular state and can impede the access of amylase enzymes to starches in the mash, thus leaving many unconverted but gelatinized starches. This can contribute to a rise in mash viscosity, decrease the overall extract yield, slow down the lautering speed, and decrease fermentability and alcohol production.

Likewise, the key protein-converting enzymes, endopeptidase and carboxypeptidase, have peak performance ranges of 3.9 to 5.5 and 4.8 to 5.6, respectively, which partially overlap with the optimum compromise mash pH of 5.2 to 5.6. Aminopeptidase and tripeptidase, incidentally, are additional protein-degrading enzymes in the mash, but they play no role in beermaking because their activity ranges of pH 7 to 7.2 and 8.2 to 8.8, respectively, are too alkaline.

The activity of carboxypeptidase in the mash, on the other hand, is of critical importance because it initiates a lengthy chain of events throughout the brewing process that has serious consequences for the organoleptic character of the finished beer. Importantly, carboxypeptidase is a key producer of free amino nitrogen (FAN), both in the malting plant and in the brew house. FAN is a degradation product of protein and serves as an essential yeast nutrient.⁴ Yeast needs FAN for its growth and metabolic activities, especially within the initial 24 to 36 hours of fermentation, after which yeast growth generally slows down and ultimately stops.

Conversely, FAN deficiency in the wort can lead to yeast stress and a drop in yeast vitality, which, in turn, can slow down or even stop attenuation and fermentation. If yeast struggles, it tends to produce less ethanol and more undesirable flavors and aromas, including fusel alcohols, diacetyl, acetaldehyde, and sulfur compounds.

While these compounds, if present as trace elements, can contribute pleasant hints of wine, fruit, rose, or almonds, and thus add complexity to the taste of beer, they can be perceived as unpleasantly bitter, pungent, or solvent-like if present in excess. In short, the temperature and pH conditions that stimulate FAN production by carboxypeptidase in the mash are crucial parameters in finished beer quality.

THE ROLE OF PH IN WORT

In the brewing process, the wort pH is a dependent variable relying almost entirely on the brewer's control of the mash variables. The pH is the highest in the mash and then drops from there to the bottle, with the most significant drop as much as 0.3 during the wort boil in the kettle. This drop is caused mostly by reactions of calcium with phosphates, as well as by polyphenols with oxygen to form new, insoluble compounds that precipitate into both the kettle and the whirlpool trub. Organoleptically, the drop greatly affects the quality of hop bitterness in the finished beer. The heat and pH drop during the vigorous boil also help in coagulating, denaturing, and precipitating proteins, a process that enhances the so-called colloidal (from the Greek word *kόlla* meaning glue) stability of the wort and the packaged beer.

The acidification step during the wort boil is much more significant than its small numerical value might suggest, simply because of the logarithmic nature of the pH curve. Assuming the wort is produced from a mash at the optimum pH range of 5.2 to 5.6, the pH drop in the kettle brings the cooled wort pH down to the range of 5 to 5.4, which is an ideal environment for most yeast strains at the start of a vigorous fermentation—assuming the wort contains adequate supplies of zinc and FAN.

TABLE 2:
Key Mash Enzymes and Their Activity Parameters

| Enzyme | pH Optimum | Activity Start Temp | Peak Temp | Denature Temp | Conversion Product |
|-------------------|------------|------------------------|-------------------------|---------------|---|
| β Amylase | 5.4 – 5.6 | 104°F (40°C) | 140 – 149°F (60 – 65°C) | 158°F (70°C) | Maltose (a disaccharide of two glucose molecules) |
| α Amylase | 5.6 – 5.8 | 140°F (60°C) | 158 – 167°F (70 – 75°C) | 176°F (80°C) | Oligosaccharides, Maltotriose (three glucose molecules), Maltose, Glucose |
| Endopeptidase | 3.9 – 5.5 | 68 – 104°F (20 – 40°C) | 113 – 140°F (45 – 60°C) | 140°F (60°C) | Peptides (short amino acid chains) |
| Carboxypeptidase | 4.8 – 5.6 | 86 – 158°F (30 – 70°C) | 122°F (50°C) | 158°F (70°C) | Amino Acids (building blocks of proteins) |
| β Glucanase | 4.5 – 5.5 | 95°F (35°C) | 117°F (47°C) | 131°F (55°C) | Low Molecular-Weight β Glucans (gums) |

Source: Various

THE ROLE OF PH IN FERMENTATION

Once the cooled wort reaches the fermenter, it is a very complex and highly nutrient-rich environment of fermentable sugars (mostly fructose, sucrose, glucose, and maltose), as well as other dissolved compounds such as dextrin, nitrogenous molecules, vitamins, and minerals. These elements promote the rapid growth and metabolism of pitched yeast. During fermentation, yeast absorbs, synthesizes, and otherwise processes many of the suspended wort solids that are passed on from the malt and the hops, while also releasing many metabolic products and byproducts, most notably ethanol and carbon dioxide.

Keys to a successful fermentation are proper pitching rate, plenty of upfront aeration for the yeast's aerobic life cycle, enough essential amino acids, and the correct pH value.⁵ Many yeasts can happily tolerate an environment of roughly 4.0 to 6.5 pH. In the extreme, some yeasts can even metabolize at a pH of 3 and slightly below, as well as up to 9, albeit at a much-reduced rate. Despite these broad activity ranges, most yeasts multiply best and ferment most efficiently at a pH close to 5.2. Fortunately, after the pH drop in the kettle, the yeast's metabolism causes a further pH drop in the fermenter, usually by about 0.5 to 0.7. Therefore, the typical barley-based beer that started out in the mash at a pH of 5.2 to 5.6 usually ends up at a pleasant (to humans) pH of 4.1 to 4.5 at the end of fermentation, whereby a pH of 4.4 is ideal. The pH of wheat-based beers tends to be slightly lower.

Some finished beers, of course, such as lambics and other sour beers, end with

much lower pH values because of the acids produced by bacteria. Any finished-beer pH below 4 is often an indication of acid production either by "good" bacteria or by spoilage organisms, while a finished-beer pH higher than 4.5 is usually the result of a lack of pH control well before fermentation. The pH control of the finished beer also involves careful management of lagging times on the yeast. If the pH value moves out of range in the maturation tank, it may be a sign that the yeast is releasing unpleasant compounds. In the extreme, it causes yeast autolysis, which raises the beer pH because the yeast's internal pH is always higher than the beer's pH. This creates off flavors often described as meaty or rubber-like. Autolysis also all but eliminates any foam stability.

THE ROLE OF PH IN PACKAGED BEERS

As the authors of a 2005 article on the relationship between a beer's pH value and its organoleptic properties explain, "From a sensory standpoint, if the pH of fresh beer decreases below 4, sharp, acid, bitter, and drying effects increase rapidly in intensity, with a markedly enhanced metallic after-palate for pH values below 3.7. On the other hand, above 4, palate effects relate to increased mouth-coating, with higher scores for biscuity and toasted characters, and even soapy and caustic notes if the pH rises above 4.4."⁶

One of the key effects of pH on the quality of the finished beer is its influence on colloidal stability, that is, on non-biological haze formations. While biological hazes are usually caused by spoilage microbes, non-biological hazes are formed

primarily by molecular bonds between simple proteins (such as malt-derived hordein), which are soluble in alcohol but not in water, and polyphenols (such as tannins derived from both malt and hops), which are soluble in both alcohol and water. By themselves, proteins and polyphenols are invisible in solution, but once they join in the form of gelatinous colloids, they become visible. However, two factors limit the possible number of haze-forming bonds. First, plenty of proteins and polyphenols never make it past the kettle and whirlpool because they end up in the trub. Second, many times fewer polyphenols than proteins remain for bonding. Yet, it is neither possible nor desirable to generate completely protein- and polyphenol-free wort and beer because proteins are essential building blocks not just of hazes but also of beer foam, while polyphenols in minuscule quantities can give beer a mildly astringent and refreshing edge.

Some of these colloidal hazes, such as those created by weak hydrogen bonds between relatively small particles, are reversible. Their formation accelerates as the temperature of the packaged beer drops to the freezing point or below. Their bond loosens, however, and they become soluble again as the beer temperature approaches 70°F (21°C). Permanent colloidal hazes, on the other hand, are created by strong (covalent) bonds between relatively larger particles. Technically, a beer is considered colloidally stable "if it can be stored for several months at 25°C [77°F] without exhibiting any changes in composition or other properties; specifically, beer has to be able to remain clear without any signs of precipitation."

According to most sources, haze formation is partially dependent on pH, with an optimum formation at pH 4 to 4.4, which happens to be within the preferred finished-beer pH range. While this overlap constitutes an unfortunate and challenging dilemma in traditional beers, it is this fact that many brewers of New England IPAs rely on to create the dense hazes of the style through extensive, polyphenol-excreting dry-hopping. Haze formations lessen as the pH value moves up or down from this range. From a sensory perspective, however, shifting the beer pH deliberately as a means of reducing hazes is not desirable. Luckily, colloidal hazes have no effect on beer flavor, but they still influence the perception of certain beer styles, which consumers have come to expect to be brilliantly clear...at least since the invention of the beer filter in 1878.



SPECIAL CASE: PH AND NON-ALCOHOLIC BEER

Given the great variability of both brewing raw materials and beermaking processes, there is an equally large variability in the combination of flavor-active compounds that can define the character of different beers. Yet, there is one compound that ties even beers as distinct as a Munich *helles*, a Russian Imperial Stout, and a hazy, juicy-fruity New England IPA together: alcohol. A large consumer segment prefers to reduce its alcohol consumption, which is why breweries have found several methods for making beer with little or no alcohol. The absence of alcohol, however, can have significant consequences for the flavor perception of beer, as researchers at the Department of Nutritional Sciences of the University of Vienna discovered in a sensory study comparing “regular beers” (between 4.9 and 5.4 percent ABV), “alcohol-reduced beers” (between 3 and 3.5 percent ABV), and “alcohol-free beers” (<0.5 percent ABV). All beers in the Vienna test were Märzen-like brews, and the tasters were asked to rate them in terms of several flavor variables, including worty, bitter, astringent, and malty.⁸

While they found that bitterness is the variable with the “best congruence” among the three beer categories, they also noticed that the perception of worty off-flavors increases dramatically as the alcohol level decreases, and the authors pronounced the prevention of such off flavors the most challenging task in making low- and non-alcohol beers. This increased the role of astringency as a pH-related variable. While it causes the mouth to dry up and pucker if present in excess, if it is lacking, it fails to balance the raw wort flavors. Especially when low alcohol values are

achieved by stopping fermentation, the starting gravity should be lower than that of “normal” beers and not exceed about 3.5 to 7°P. In addition, the mash pH of such beers must be adjusted to the optimum described above because, in the absence of alcohol, even slightly out-of-range mash pH values can have a disproportionate impact on beer flavor.

SUCCESS OR FAILURE

A beer’s flavor profile stems from the interactions of many different flavor-active components, some extracted from the raw materials, others created by complex reactions during the brewing and fermentation process. Each of these compounds has its own perception threshold. On the palate, however, their organoleptic impact is a holistic experience that is more than just the sum of its parts.

Consumer perception can be thrown off balance by a poor choice of raw materials, by mistakes during the brewing process, and by inappropriate storing of the beer after packaging. Therefore, paying attention to the proper pH value throughout the entire beermaking sequence is a critical condition that determines the success or failure of a brew.

Given the importance of proper pH values throughout the entire beermaking process, perhaps the simplest and most cost-effective way for a brewer to ensure beer quality is to purchase a top-quality pH meter... and to use it often! When measuring pH during fermentation or after packaging, always do so after first agitating the liquid thoroughly to remove any CO₂ in solution, because the gas is mildly acidic and can affect your measurements. Since temperature also affects pH, measurements should always be taken at room temperature.

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PH METER OPTIONS

Editor's note: These are some of the most widely used pH meters by both amateur and professional brewers according to various forum posts, and they are available for a range of prices, but Zymurgy does not necessarily endorse any one device over another. While all are touted to be accurate within a 0.01 resolution, storage, calibration, ease of upkeep, and longevity all vary.

- Milwaukee mw102
- Hach Pocket Pro +
- Omega PHH-7011
- Kegland Pen-Style pH Meter
- Apera PH20
- Hanna pHep5



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ADAPTIVE BREWING

in the Modern World

By Ryan Pachmayer

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This March, retired military intelligence officer Jon M. Newton was asked to speak about brewing at a recent Paralyzed Veterans of America (PVA) event. He accepted the offer and took samples of his homebrewed beer for them to taste. At the end of the talk, he asked the 10 vets in attendance if this might be something that they wanted to try. There was a resounding yes throughout the room, which was a key moment in his soon-to-start journey into adaptive brewing.

Newton got to work. He asked the group of veterans which sports they enjoyed playing and what adaptations, if any, they employed to make participation possible. Then he began his research on adaptive brewing. He searched for things related to brewing in wheelchairs, physical challenges, and the logistics of the brewing process. He reached out to a number of homebrew clubs as well. “I literally found nothing,” he said.

Newton wasn’t about to give up. “[There] seemed to be a need out there,” he said. “Our brewing community calls itself inclusive, but I don’t see a lot of people in wheelchairs around. But everybody likes beer,” he added.

Starting with his strongest lead, the adaptive processes used for sports, he dove right in. His background in military intelligence helped him put things into perspective. “When you have a person with certain given abilities, and you have a task to accomplish, you figure out what you need to do to either modify the equipment or modify the process.”

He then tried to brew while seated in a chair. “I took the point of view of somebody who would have to [be seated],” he said. He went through the various tasks of the brew day. “What I saw was a lot of lifting and twisting and everything,” he said. “And even a person in a chair might have further limits to mobility. They might only have use of their upper body, or may not be able to bend at the waist.”



PVA booth on brew day. **Right:** Brew Crew Bravo 1, with Dan Dupree, Greg Martin, Tracy Reddick, and Victor Tran (L to R).



Dan

Greg



Victor





COMMUNITY ONE GLASS AT A TIME

Newton also embraced the perspective that brewing is a social function. "We've been brewing since time immemorial," he said. He came up with a system to start the PVA

members on the right track towards getting into the hobby: a buddy system. "We take an able-bodied brewer, pair them up with [a PVA member], and during the adaptive process, what can't be adapted the buddy performs." The goal was to have the new

adaptive brewers perform as much of the brewing process as possible.

He set a brew date, May 4th for Big Brew Day, and it quickly gained momentum. Newton is no stranger to big events—he runs a nano brewery, 4 Barking Dogs Brewery, in his hometown of Burien, Wash.

It all started way back in 1983, when Newton was fresh off an assignment in Germany. He quickly discovered there wasn't the quality or variety of beers available in the United States, so he decided to begin making his own. Today, he runs a half-barrel Ss Brewtech system and opens his doors to the community once a month for an outdoor event. He makes all the visitors wear name tags, and seating is at long communal tables,

Photos courtesy of Dan Dupre; Tom Kaplan; Katherine Gooding; Jon Newton



Overnight Sensation Cream Ale

Cream Ale

Recipe by John Smith

John Smith is the previous owner of Sound Homebrew Supply and is an officer in the Rat City Homebrew Club. His cream ale recipe won silver at the Cascade Brewers Cup twice, while also taking second place in the Lights On! Homebrew Competition.

Batch volume: 6.30 U.S. gallons [23.8 L]

Original gravity: 1.050 [12.5°P]

Final gravity: 1.010 [2.5°P]

Efficiency: 80%

Color: 3.2 SRM

Bitterness: 17 IBU

Alcohol: 5.3% by volume

FERMENTABLES

5 lb. (2.27 kg) two-row pale malt [46.5%]

5 lb. (2.27 kg) Pilsner malt [46.5%]

8 oz. (227 g) flaked maize [4.7%]

4 oz. (113 g) flaked wheat [2.3%]

HOPS

0.25 oz. (7 g) Nugget, 15.6% a.a @ 60 min

1 oz. (28 g) East Kent Goldings, 5% a.a @ 0 min

YEAST

1 pack White Labs WLP080 Cream Ale Yeast Blend

OTHER INGREDIENTS

1 Tbs. (15 g) calcium chloride (sparge)

0.5 tsp. (2 g) yeast nutrient @ 10 min

1 tablet Whirlfloc @ 10 min

White Labs ClarityFerm, in primary

BREWING NOTES

Single infusion mash at 152°F (67°C) for one hour. Sparge at 168°F (76°C).

Run in 8 gallons (30 L). Boil 70 minutes. Ferment at 65°F (19°C). Condition for 5 days and package.

Far Left: Brew Crew Charlie—Brent King, Joy Cochran, Tron Kaplan (Team Alpha Captain), Brew Crew Captain Gino Clement, and Scott Smith. **Left:** Adaptive and able-bodied brewers enjoy a BBQ lunch. **Top Right:** Brew Crew Bravo.

just as it is in German beer gardens. "That way, it forces people to get together and helps to create community," he said.

The modest size (192 square feet) and lack of revenue (Newton gives the beer away) at 4 Barking Dogs keeps him on the right side of both state and federal laws. He does a lot of on-site education and takes it as a challenge to convert people who think they don't like beer by finding something that they enjoy. "When people say they don't like beer, it's usually more that they don't like bitterness," he said. "So, I tend to offer them more malt-forward beers. I give them something with low IBUs, and they go, 'OK, I do like beer.'"

Newton has managed to get dozens of people into the hobby over the years. "If someone wants to learn to brew, all they have to do is fall in on my equipment and we'll teach them how to brew," he stated. He usually starts new brewers on an extract kit and completes a four-hour brew day alongside them. They come back for a two-hour bottling session, and before long they're back to make another brew. "It's all about creating community, one glass at a time."

THE LOGISTICS OF AN ADAPTIVE BREW DAY

Throughout the process of launching an adaptive brew day, Newton was in touch with manufacturers, initially inquiring about tips to make the brewing go as smoothly as possible for the newcomers. This led to an outpouring of generous



donations. Sound Homebrew Supply provided the brewing supplies, Blichmann Engineering sent an Anvil Foundry 10.5-gallon system, Brewers Supply Group offered up two G30 Grainfathers, and Five Star Chemicals donated cleaning and sanitizing supplies.

Brew day was a giant success. Thirty-six brewers, brew buddies, and supporters turned out for Big Brew 2024. Ten adaptive brewers participated, with 17 brew buddies assisting, many from Newton's Rat City Homebrew Club. Jim Larson, a retired brewmaster from Rainier Brewing, shared his expertise and brought his friend who is in a wheelchair to learn about the process.

Newton approached brew day with the same process-oriented mindset he honed in the military. "This was breaking new ground," he said. "In the military, they always say, you have to get to your objective. When you have an obstacle in front of you, you still have the mission. So what are you going to do?"

He split the participants into three groups: Alpha Brew Crew, Bravo Brew

Lower Left to Right: Newton answering questions; Joy Cochran taking a gravity with a refractometer; Matt Mickunas and Brent King of Brew Crew Alpha.



"I do have family and friends who like to brew with me, but now I can demonstrate to them how to do it, without needing any help."

— Fred Coleman



Crew, and Charlie Brew Crew, each with its own brew captain. “There was cross-pollination,” noted Newton, adding that when one group finished a step in the process and had a break, they would gather around to see what was happening with other groups. “There were points in the day where someone would have a good tip to share,” he remembers, “and they would call everybody over.”

Styles brewed that day included two extract beers, a festbier and an Irish stout, and an all-grain hazy IPA. “A lot of the newer brewers had some pretty in-depth questions about processes and technologies. The interest level was really high,” said Newton.

All-in-one systems provided a lot of advantages for the adaptive brewers. Newton says the integrated pumps helped clean those systems faster than cleaning could be performed on his own system, for example. But several obstacles still remained.

The primary challenges they faced on brew day were lifting and hoisting things.

Lowering the brewing systems allowed the team to tackle those hurdles. Lower-level tables, tipping some of the units during certain parts of the process, using brushes attached to long arms for cleaning, and even setting up a hoist system were all ideas discussed for future brew days.

Newton has been involved in the veteran community in the Pacific Northwest, but he hasn’t seen any adaptive brewers yet. “Now that we’ve started talking about it, we’ve had all kinds of people [show up],” he said. One potential brewer was concerned about being in a social situation where they weren’t on the same eye level as the other participants, Newton explained. In a group of people who are all in a similar situation, that intimidation factor can be reduced or eliminated for many, knocking down a common barrier to entry for newer brewers.

Newton is hoping that the adaptive brew days continue to generate interest and serve as a sort of blueprint for others around the world to follow.

A DIFFERENT KIND OF ADVERSITY

Fred Coleman had to retire in 2015 due to failing eyesight. Known as “Blind Brew Guy” on Instagram, Coleman took up homebrewing, since he couldn’t enjoy as many of his previous hobbies. “I enjoyed craft beer,” said Coleman. “I started thinking that maybe I should try to brew some of my own.”

His deteriorating vision was a major factor to consider when he started brewing, but initially the degradation progressed slowly, allowing him time to adjust. Over the last five years, it has deteriorated much more quickly, making things more challenging. He cites several



Left: Fred Coleman enjoying a draught homebrew.
Right: Coleman and his propane-fired brew kettle.

challenges he's had to overcome in the brewing process, such as reading thermometers, determining boil intensity, transferring between vessels, as well as cleaning and sanitizing.

However, an electronic magnifier and, more recently, a Tilt hydrometer have proven useful in overcoming some obstacles. “[The Tilt] has made it so much easier for me to check gravities during fermentation,” he said, mentioning struggles using a standard hydrometer prior to acquiring the Tilt. A refractometer was never an option, as it was too difficult to see the numbers.

Coleman also makes sure to prepare for a brew day the night before, and uses his iPhone’s camera throughout the brew day itself, enlarging the digital display on his scales when weighing ingredients and chemicals. “Before using the camera, I had to rely on someone else to weigh all of my ingredients,” he said.

As for determining adjustments to his boil intensity, Coleman turns to his ears. “Over time, I’ve developed a pretty good sense of how hot my burner is going, and if I need to make adjustments,” he said.

Despite his vision being worse than when he started, Coleman can now brew full batches by himself. When he started brewing, his wife and daughter

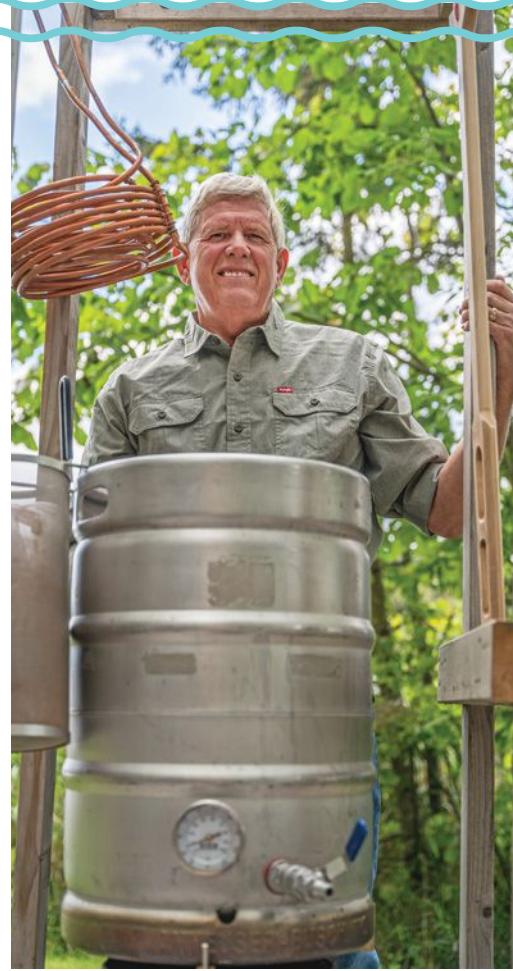
ON THE WEB

Find two of Fred Coleman’s homebrew recipes at HomebrewersAssociation.org/nd24

would help him out. “I do have family and friends who like to brew with me, but now I can demonstrate to them how to do it, without needing any help,” he said. “It is nice having someone else to double-check my temps and boil vigor, though,” he added.

With a little strategic planning, a bit of trial and error, and the help of modern electronic gadgetry, adaptive brewing has found its place in the homebrewing community and has welcomed hundreds of new brewers into the fold. As it continues to gain in popularity with physically challenged beer enthusiasts and all their supporters, and as techniques become more refined, it will be exciting to see how adaptive brewing further evolves.

Ryan Pachmayer is the marketing and events director at New Image Brewing in Wheat Ridge and Arvada, Colo., and former head brewer at Yak and Yeti Restaurant and Brewpub in Arvada.



4th Quarter Porter

English Porter

Recipe by Eitan “Tron” Kaplan

2021 Rat City Homebrew Club Rat Cup Competition Winner of Best-in-Show

Batch volume: 5.5 U.S. gallons [20.8 L]

Original gravity: 1.055 (13.5°P)

Final gravity: 1.017 (4.25°P)

Efficiency: 73%

Color: 27 SRM

Bitterness: 25 IBU

Alcohol: 5.1% by volume

MALTS

8.5 lb. [3.86 kg] Maris Otter

1.5 lb. [0.68 kg] brown

1 lb. [454 g] 120°L crystal

6 oz. [170 g] chocolate

HOPS

2 oz. [57 g] Willamette, 4.5% a.a @ 45 min

WATER

Add gypsum, calcium chloride, and baking soda to achieve desired water profile (see notes): Ca 52ppm, Mg 5 ppm, Na 46 ppm, Cl 54 ppm, SO₄ 30 ppm.

YEAST

Lallemand LalBrew London English Style Ale Yeast

OTHER INGREDIENTS

1.5 g. gypsum

2.3 g. calcium chloride

0.3 mL lactic acid

3 g. baking soda

BREWING NOTES

Heat 7.5 gallons [28.4 L] carbon-filtered water to strike temperature and add 1.5 g gypsum and 2.3 g calcium chloride. Set aside 2 gallons sparge water and add 0.3 ml lactic acid to it.

To remaining 5.5 gallons mash water, add 3 g baking soda. Mash at 154°F (68°C) for 60 minutes. Sparge with enough water to collect 6 gallons (22.7 L) preboil. Boil for 45 minutes, cool to 68°F (20°C), aerate the wort, and pitch yeast. Ferment at 68°F for two weeks. Transfer to keg, carbonate, and serve.

ENDANGERED FLAVORS

PRESERVING AFRICA'S RICH BREWING TRADITIONS

BY LUCY CORNE

Traditional
African beer pot.





Above: Red sorghum in Rwanda.
Right: A traditional wood-fired kettle.



The judges' decision is unanimous. The victorious beer is thick and creamy, with a perfect sweet-sour balance, completely opaque and ever so slightly chewy. The winning brewer, Itumeleng Motsoeneng, has been brewing for more than three decades, learning the skills from her grandmother, as is often the case with traditional African beer. Dressed in the traditional garb of the South Sotho people, a wide grin on her face, she is crowned Best Brewer in the annual Umqombothi Brewing Competition in Johannesburg, South Africa.

It is one of the most challenging beer competitions I have ever judged. For a start, I'm still learning about the beer—its flavors and aromas, and most importantly, how to tell a good one from a great one.

Umqombothi (pronounced um-kom-BOH-thee) has almost nothing in common with the beers you'd find at a typical BJCP competition. It has the consistency of a yogurt drink, but with added texture from the grains still in suspension. It comes not in hues of amber, gold, or black, but in a shade of pinkish brown, somewhat similar to the color of strong tea with a generous splash of milk added.

The beer is topped with a foamy crown, but is served neither chilled nor carbonated, and it isn't presented to judges in a glass, either. Traditionally, it would be drunk from a communal clay pot passed from drinker to drinker. For the purposes of this competition, though, each judge is equipped with a tin camping mug, which is half filled with thick and sour sorghum-based beer at each of the 16 brewer stands. →

A DRINKABLE HISTORY

The processes behind indigenous African beer have likely remained largely unchanged for thousands of years. I say “likely” because little is written about the origins of traditional African brewing. This is an oral history, generally passed down from mother to daughter or, as in the case of Itumeleng Motsoeneng, from grandmother to granddaughter.

This brew predates the use of specially cultured yeast and hops in beer. Spontaneously fermented, it is made primarily from malted sorghum and contains no barley or wheat, at least in South Africa. The brewing process kicks off with an overnight sour mash, with the boil and gelatinization process taking place on day two. A day or two of fermentation follows; then, rudimentary straining before the still-fermenting beer is served on day five or six.

I've brewed umqombothi at home a few times, drawing recipes from various sources, and they've always followed similar steps. But as I move from table to table at the competition, I find plenty of variation in brewing methods. All use a combination of sorghum and maize meal, something that would not have been found in African beer until the Portuguese brought maize to African shores in the 1500s. One brewer uses frozen spent grains as a starter, some add store-bought yeast, and one or two, including Motsoeneng, use a splash of



Above: Rwandan Ikigage (traditional sorghum beer).

Right: Malting sorghum.

commercially available sorghum beer to kickstart fermentation.

Despite the obvious difficulties in packaging a still-fermenting beer, there is a commercial sorghum beer sector throughout sub-Saharan Africa. It is usually packaged in what look like milk cartons, the main difference being the small vent on the side designed to allow CO₂ to escape as the beer continues to bubble on the shelf. Sales figures for the traditional beer sector are nigh on impossible to come by, but consumption is less common in South Africa than in Zimbabwe, Zambia, and Malawi, where stronger sorghum beer cultures exist.

Even in those countries, though, the art of brewing this ancient beer at home is slowly in decline, so it's great to be in a room full of people working hard to keep the brewing culture of their ancestors alive. The competition has attracted people from many of South Africa's ethnic groups: Zulu, Tswana, Pedi, Xhosa, Swati, and Sotho, who now bring their people's traditions into one shared space.

TRADITIONS MEET INNOVATIONS

There is a lot more to Africa's brewing culture than simply passing along recipes and methods. More fascinating even than the variations in ingredients and processes are the traditions and superstitions that surround traditional brewing, for this is a practice born out of intuition and handed-down ritual.

Mma Chwane, a Bapedi woman from central South Africa, explains how she keeps the spent grains aside until the entire batch of beer has been drunk, for discarding them



too quickly is said to make the beer go off. Bees on brew day are a sign that all will be well with the beer. Lighting a match next to the brew is a common way to check that the beer is ready—if the match remains lit, the beer needs another day; if it's blown straight out, it is time to serve. Nomsa, a Zulu woman, explains how she always pours the first runnings into a calabash as a gift to the ancestors, which is a common theme across cultural groups, for traditional brewing is a deeply spiritual practice and the beer is used as a way to communicate with those who came before.

The beers possess diverse aroma and flavor profiles. As spontaneously fermented beverages, all have acidic notes, though in some cases the sourness is smooth and balanced, while in others it is assertive and puckering. Barnyard notes are common but should not be too overpowering. There's often a fruitiness that can be apple- or strawberry-like, as well as a low grainy, nutty character. Some of the beers are slightly smoky, likely due to the heavy mash catching on the bottom of the pot while boiling over an open fire. Less enjoyable examples have strong cheesy notes.

The addition of cake flour in one competition entry made for a difficult-to-drink brew with a paste-like texture and the flavor of uncooked dough. Other additions were more successful, such as banana, mocha fruit, ginger, and juniper berries. For me, this was the most exciting aspect of the competition—a desire to modernize traditional beer and turn it into something



Commercial sorghum beer.



Above Left: Readyng the sour mash on day one.
Above: The finished product, ready to serve at the homebrew club meetup.
Left: Brew day with Thembu Ndlovu.

new and fun, for traditional African beer is slowly dying out and something must be done to preserve it.

BREWERS PRESERVING HERITAGE

Umqombothi enjoyed a brief renaissance during the COVID-19 pandemic, when South Africa sat under a total ban on the purchase of alcohol. People turned to brewing what they could with supplies available in supermarkets. The flurry of interest was brief. It is something of an acquired taste, and with an average alcohol content of only around 3 percent by volume, it probably wasn't filling the hole suddenly left by unavailable double IPAs. But even this momentary flirtation got a lot of people thinking about traditional beer.

One of the chief cheerleaders for the preservation of African brewing is Apiwe Nxusani-Mawela, an ex-South African Breweries (SAB) brewmaster who only learned the art of traditional brewing from



MORE AFRICAN BEER NAMES

South Africa has 11 official languages and many ways to refer to traditional sorghum beer, but *umqombothi* is the most commonly used and most widely understood. The term comes from the isiXhosa language (the language of Nelson Mandela's clan, spoken in the Eastern Cape province), which features tricky-to-master clicks. For example, the letter Q is pronounced as a loud popping sound, perhaps best likened to the noise you'd make if you were "geeing up" a horse or imitating its galloping hooves.

The names of traditional African beers change several times per country as you travel through. In Ghana and Nigeria, it is *pito* or *burukutu*; Uganda has *tonto*; Eswatini uses *umcombotsi*; while in Lesotho, where brewers' homes are denoted with a colored flag, traditional beer is known as *joala*.

her mother and aunt after she'd spent years studying the science of "clear beer" brewing, as it is known in Africa.

Nxusani-Mawela is the founder of the annual Umqombothi Brewing Competition, which launched in 2019. "We started the competition to celebrate traditional brewing and also to help preserve the traditions, to educate a new audience," she says. "We've started hosting a free master class before the competition, where we teach the methodologies of traditional brewing. This gives people time to go and brew and prepare, so it's not just for people who already know how to brew. The goal is to make sure that the tradition doesn't die."

When Thembu Ndlovu entered the competition in 2021, she had only brewed umqombothi once before, but she clearly has what is referred to as "a good arm" for brewing. Her entry came in third place, which inspired her to take up traditional brewing as a profession. Ndlovu now brews several times a week under the moniker "The Queen of Umqombothi." She brews to order, with most clients purchasing five liters at a time to serve at special events. Operating from her home in Soweto, 25 kilometers (15.5 miles) southwest of Johannesburg, her business is proof that there is still a thirst for traditional beer.

Traditional beer has always played an important role in celebrations, including weddings, funerals, births, and coming-

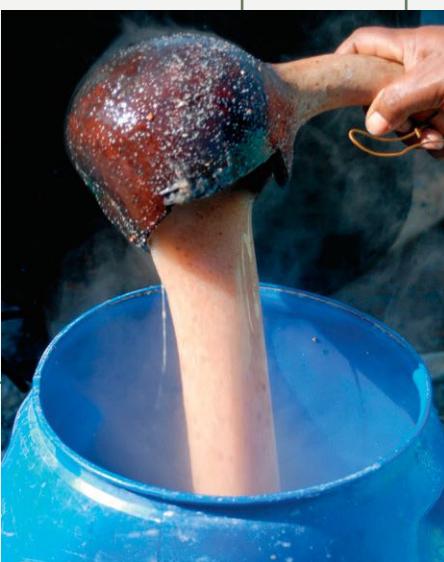


Left: Umqombothi Brewing Competition.

Above: Winners of the 2022 Umqombothi

Brewing Competition.

Below: A traditional brew day.



of-age ceremonies, but when it comes to everyday drinking, its popularity has certainly waned. Many young people associate the beverage with old timers, and while it's still common to find a group of elders sitting in a circle and sharing a vessel of umqombothi in a rural village, young city dwellers are shunning traditional beer in favor of premium lagers, mainstream ciders, and to a lesser extent, craft beer.

CRAFTING TRADITIONAL BEERS ACROSS AFRICA

While hazy IPAs, fruited sours, and hop-forward Pilsners are ubiquitous on South African taproom menus, many of the country's craft brewers are increasingly looking for local inspiration, and finding it in traditional African beer. One of the biggest proponents of marrying traditional and modern brewing is Nick Smith, the American-born owner of Soul Barrel Brewing in the Cape Winelands. His Wild African Soul, a collab brew with Nxusani-Mawela's Tolokazi, has won major awards and widespread acclaim. Blending umqombothi with his house-blended sour in oak barrels, it's a one-of-a-kind beer that tips a hat to Africa's brewing roots but manages to transform it into something more familiar to the modern-day beer drinker.

It's not just South African craft brewers who are getting inspired by indigenous brewing practices. In neighboring Botswana, the country's sole microbrewery is heavily influenced by traditional brewing culture. In northern Botswana, millet, rather than sorghum, is the main grain used in traditional brewing, and Okavango Craft Brewery uses the hardy, drought-resistant grain across their core range, which includes a lager, a pale ale, and a session IPA. Head brewer Murray Stephenson took inspiration, and yeast residue, from *mberera*, the local opaque beer, for a limited-edition barrelled sour that was blended with a golden ale and flavored with marula fruit.

And in Rwanda, the country's first and only microbrewery is heavily influenced by traditional brewing, honoring not only the traditional ingredient of sorghum in all of its beers, at a ratio of 60 to 70 percent, but also the traditional brewers: women. Kweza Craft Brewery, which officially launched in 2023, is a female empowerment initiative that not only trains women to run the brewhouse, but also sources malted sorghum from traditional brewsters and marries their inherited knowledge with current brewing science.

One thing that ties the brewing traditions of Africa together is that it has always been, and still remains, the domain of women. When Itumeleng gleefully accepted the prize

money for winning the annual Umgqombothi Brewing Competition, I'm sure she was feeling much gratitude for her ancestors, both distant and recent, especially the grandmother who passed on the family's brewing knowledge to her when she was just nine years old. In the household of Itumeleng, who is a mother of five children, traditional African brewing knowledge has a great chance of being kept alive.

Lucy Corne is a freelance writer and editor based in Cape Town, South Africa. She is the founder of the African Beer Cup and South African National Beer Day, and is the first Advanced Cicerone in Africa.



Brew This!

UMQOMBOTHI

Traditional African sorghum beer

Batch Volume: 5 gallons (18.9 L)

INGREDIENTS

17.6 lb. (8 kg) malted sorghum
8.8 lb. (4 kg) maize meal

BREWING NOTES

You can put away your thermometers, hydrometers and pH testing strips. Traditional brewing is more about feel than science. It's a five- or six-day process, depending on the ambient temperature and the level of sourness you're looking for. Recipes of course vary, but the following is a tried-and-tested version of traditional South African umqombothi.

DAY 1

Add 4 kg of malted sorghum and 4 kg of maize meal to a fermentation bucket and mix. Add 12 litres of previously boiled water. The water needs to be warm, but not too hot or the maize meal will clump together and create dough balls. It should be a temperature that allows you to mix the mash by hand, although you can also use a long-handled spoon. Once all of the ingredients are well mixed, add a further 10 litres of cold water, cover with a cheesecloth or similar non-airtight covering, and leave overnight at an ambient temperature to sour.

DAY 2

You'll notice small bubbles on the surface of the mash, and a yogurt-like aroma. Taste the mixture to assess the sourness level. If it's not as tart as you would like, you can leave it for another 12–24 hours before moving onto the boil process. If you're happy with the level of sourness, it's time to boil.

First, boil 8 litres of water in a large pot on a stovetop or outside over a fire. Umgqombothi is traditionally made over an open fire outside the home. This is largely due to a historical lack of ventilation in traditional dwellings. During the boil, a lot of volatile compounds evaporate, including butyric acid, so the aromas can get a little overwhelming if you're boiling inside the house.

Once the water is boiling, slowly add your sour mash, stirring constantly. Bring to a light boil—not the rolling boil you're used to on a normal brew day. Remember, you're boiling the whole mash, not just the wort, so there is a danger of burning the grains if the heat is too high.

Boil the mixture for an hour, stirring regularly. During this time you will notice the grains gelatinizing and the mixture darkening.

Transfer the boiled mash back to your bucket and add 6–8 litres of water depending how thick your mash became during the brew. You're looking for the consistency of thin porridge.

Cover with a cheesecloth and leave at ambient temperature overnight.

DAY 3

You will find that overnight, the mixture has thickened to a very stiff porridge. Add cold water gradually and mix by hand until you reach the consistency of loose oatmeal. As a guideline, you might have to add as much as 10 or 12 litres of water, but the way it feels and looks is more important than the measurement. Once you're happy with the consistency, add the remaining 4 kg of malted sorghum, and more water as necessary to retain the look and feel. If you want a stronger version, you can add sugar and/or yeast at this stage, but traditionally, the sorghum alone is the agent that restarts fermentation. Cover again and leave in a warm place overnight.

DAY 4

You should see signs of active fermentation in the form of bubbles rising to the surface of the beer. If fermentation is evident, it's time to strain using a cheesecloth or large sieve. If fermentation seems slow, you can leave it for a further 12–24 hours before straining. Once the beer is strained, cover again with a loose lid or cloth, and leave in the corner for one more night.

DAY 5

On the final day (which could be day 6 or 7, depending on how the process has gone), you will see creamy bubbles sitting atop the liquid—a sure sign that the beer is ready to serve. Umgqombothi is served while still fermenting, and usually at room temperature. Traditionally it would be served in a communal gourd or clay pot, passed around a circle of drinkers, but can of course be poured into glasses. At one homebrew club meeting, we even served our umqombothi competition entries in champagne flutes!



Making Friends with

SMAZ





By Dan Jablow

Homebrewers are known to be an opinionated group, and we are certainly not afraid to share our opinions with others. For example, →

*As far as I'm concerned,
almost any time is a good time
for a nice smoked beer.*

we all have thoughts on dry-hopping times and amounts, extract versus all-grain, whether or not to implement secondary fermentation, or what constitutes a cold IPA. Sometimes there is a clear majority on a topic. More likely, you'll get 10 different answers. With that said, one particularly polarizing topic is that of smoked beer. Most of the homebrewers I know say "no thanks" when one is offered. As a big fan of smoked beers, I'm clearly in the minority. One of my homebrewing friends even went so far as to say they once sampled a smoked beer that tasted like "someone had put out a cigarette" in it. That's disappointing to hear, as I'm sure that's not the flavor the brewer was hoping to achieve.

I can't say I'm surprised to hear that so many folks don't seek out smoked beer. It's a category of beer with some historical significance that has fallen out of favor with modern drinkers. Anything beyond a very well-known smoked porter produced annually by Alaskan Brewing Company, up until recently, was very hard to find in the United States. As far as I'm concerned, almost any time is a good time for a nice

smoked beer. In a previous life I built a food service business that featured homemade smoked meats (pastrami, bacon, ham, and so much more, but that's a whole 'nother story), so it's not surprising that I'm a bit biased towards all things smoked.

My intent with this article is to spread the gospel of smoked beer by providing some history, a few different styles and ingredients for you to consider, along with a recipe that I brew on a regular basis. As a frequent brewer of small, single-gallon batches, I've spent lots of time understanding how to apply a smoky flavor and aroma to a beer in a complementary, rather than overpowering, way, using these small-batch experiments as a way to overcome the obstacle that is working with a

unique ingredient. I also combed through my ever-growing collection of homebrewing books to see what authors like Randy Mosher, Charlie Papazian, Mike Kurnowski, and John Palmer had to share on this topic.

HISTORICAL BACKGROUND

Humans have been smoking meat for centuries as both a way to flavor and preserve something that would otherwise spoil in times before refrigeration. Malt used to make beer and liquor goes through a drying, kilning, and curing process, which is necessary to lend flavor and color to beer as well as to fully dry out the kernels and facilitate milling. The removal of water through drying is necessary for many reasons, one of the most important being that malted barley with any residual water content spoils much quicker.

Before modern times, there were a few ways to dry malt: spread it out on a floor somewhere, place it outside in direct sunlight, or put it over an open wood fire. In Britain, Ireland, and Scotland, where wood wasn't as widely available, peat was used instead. Peat is a primitive sort of coal made of decomposed vegetation that is dried and then burned to produce heat. It adds a distinctively phenolic smoke to malt that differs from the more resinous smoke contributed by wood. Wood smoke character generally has less bacon/iodine character, but can vary



FUN FACT

Master Cicerone, National BJCP Beer Judge, and co-host of the False Bottomed Girls brewing podcast, **Jen Blair** is also a huge fan of smoked beers, and believes there's a smoked beer out there for everyone.

Jen is currently the Exam Manager for the Cicerone Certification Program. Learn more about Jen at UnderTheJenfluence.beer.

widely depending on the type of wood used and time spent over it.

This method of drying over an open flame is referred to as direct heat, where smoke and combustion gases emitted by the heat source come into direct contact with the wet malt, thus imparting a smoky flavor to it as it dries. With indirect heating, malt is dried in a kiln with the heat source off to the side so that the smoke emitted from the heat source does not contact the wet malt, only the heat itself. Beer made from malt dried in this manner will have no smoke flavor. While methods of indirect heat kilning of malt go back centuries, Randy Mosher explains, “Over time, there was a gradual transition from direct-fired, wood-fueled kilns to indirectly heated kilns fueled by coal, coke, or other fuels. By 1700, most English maltsters and brewers (who malted their own) had switched to indirect kilns making for smoke-free malts”.¹ Over the next two centuries, indirect kiln firing became the preferred method of drying. With more malt dried this way, less of it was naturally smoky. According to Mosher’s research, “Smoked beers were dropped from production in most places as soon as maltsters figured out how to dry the malt without the smokiness”. Mosher also adds, “Even back then, with industrialization came a trend for drinkers to prefer lighter beers and those with smoky flavors started to fall out of favor”.²

There are some exceptions to this, most notably in the German state of Bavaria. In the northern part of Bavaria lies the region of Franconia and the town of Bamberg, which is well known as an epicenter of a specific style of smoked beer called rauchbier. Mosher points out that those living in Bamberg never grew tired of rauchbier, in part because it pairs so well with the region’s many varieties of smoked sausages.

SMOKED BEER STYLES

The styles outlined here are not meant to be a comprehensive list but rather a few good benchmark examples. Rauchbier is arguably the most famous of the smoked beer styles, so I’ll cover that first. Most traditional German beers are lagers or wheat beers—rauchbier falls into the lager category. Germany has many varieties of lagers and it’s possible for all of them, be they helles (light) or dunkel (dark), to be smoky. However, rauchbier is most often brewed as a Märzen, which is a malty lager similar to an Oktoberfest, just not as strong. Märzen is a good base for rauchbier because it has enough malt flavor and residual sweetness

to balance out the smoke flavor. Also, since hops tend to compete with smoke rather than complement it, Märzen’s low hop flavor and aroma serve to prevent that conflict. Traditionally, the smoke flavor is provided by beechwood. Weyermann Specialty Malts was founded in Bamberg in 1879, so it makes sense that they produce a very high-quality beech-smoked rauch malt—a pale malt with rich and assertive smokiness added to it. Rauchbier’s popularity is increasing, if the number of breweries in my area that produce it at least seasonally is any indication.

To produce a rauchbier, one could modify a recipe for Märzen by swapping out a proportion of its unsmoked malt for beech-smoked malt. The smoked malt should have the same diastatic power, so they can be interchanged at a 1:1 ratio. I’ve seen the proportion of smoked malt used in rauchbier from as low as 20 percent of the total grain bill all the way up to 100 percent. How much beech-smoked malt should one use in a rauchbier is totally up to the brewer. I personally prefer a nicely balanced, not-too-assertive smokiness in my rauchbier,

so you’ll see that in the recipe I provide. My proportion of smoked malt in the grain bill is 42 percent, which I found to be the ideal level for my palate after a few test brews.

While we’re on the topic of rauchbier, it’s worth mentioning the correct way to pronounce it. It’s pronounced “row-(rhymes with ‘cow’) -kh- (like the ‘ch’ in ‘school’) -beer.”

As mentioned above, it’s also possible to have smoky variants of other common German lagers. For example, I brew a smoked helles lager, swapping out a much lower percentage of Pilsner malt (10%) with rauch malt because helles doesn’t have as much of a malty backbone as Märzen.

The same basic theory applies to bock or doppelbock. I also like to keep the rauch malt percentage in these styles lower than a rauchbier (typically 10–15%) because I believe that too much smoke can overpower some of the more nuanced flavors found in bocks. Conduct your own experiments to see what you like.

Another historical style that fell out of favor, but is also making a resurgence, is Grodziskie (phonetically pronounced





Brew
This!



Let There Be Rauch!

Rauchbier is one of my favorite winter-season beers, especially when sitting by a roaring fire. At its core, think of rauchbier as a Märzen with smoke flavor. I have a Märzen recipe I like that uses equal parts Munich I and Pilsner malt. In coming up with this recipe, I slowly swapped out equal parts of those two base malts, replacing them with beech-smoked malt until I reached a flavor I was happy with, which was when 42 percent of the grain bill was beech malt. For me, the key to this beer is balance—I don't want the smoke flavor and aroma to overpower the maltiness.

Randy Mosher suggests that "rauchbier can be startling on the first sip, but hang in there. The beer tastes better and better as your palate grows accustomed to it."³ I don't disagree with that. Give it a chance and see if you develop a taste for it. If this is your first foray into brewing the style, you can adjust down the amount of smoked malt and substitute back in more Pilsner and Munich malt.

Single-gallon sizes are my preferred batch sizes, especially when experimenting with smoke.

| | |
|--------------------------|---|
| Batch Volume: | 1 U.S. gal. (3.8 L) |
| Original Gravity: | 1.050–1.055 (12.5–13.5°P) |
| Final Gravity: | 1.012–1.017 (3–4.2°P) |
| Color: | 12–22 SRM (medium amber to light copper) |
| Bitterness: | 20–30 IBU |
| Alcohol: | 5–5.6% by volume |

MALTS

| | |
|--------|--|
| 15 oz. | (425 g) Weyermann beech-smoked barley malt |
| 9 oz. | (255 g) Munich I malt |
| 9 oz. | (255 g) Pilsner malt |
| 3 oz. | (85 g) CaraMunich II malt |

HOPS

| |
|--|
| 0.25 oz. (7 g) Hallertauer Mittelfruh @ 60 min |
| 0.25 oz. (7 g) Hallertauer Mittelfruh @ 15 min |

YEAST

I recommend working with dry yeast when brewing beer in single-gallon batches as it is easy to measure out what you need. Dry yeast is typically found in 11-gram packets—weigh out 2.2 grams of yeast to produce a single-gallon batch, tightly packaging up any remaining yeast to store in the refrigerator for a future batch. I recommend LalBrew Diamond Lager as it ferments clean, allowing the malt to shine. SafLager S-23 or SafLager W-34/70 would also work well.

OTHER INGREDIENTS

1 tablet Whirlfloc @ 15 min

BREWING NOTES

Heat 1 gallon (3.8 L) of water to 165°F (74°C). Add the malt and stir well to combine, breaking up any dough balls. Mash at 154–156°F (68–69°C) for 60 minutes. Stir the mash and check its temperature every 10 to 15 minutes. After the 60-minute mark, increase the mash temperature to 170°F (77°C) and hold, mashing out for 10 minutes.

While you're mashing out, heat 0.75 gallon (2.8 L) of water to 170°F (77°C) in a separate pot. Set a large mesh strainer over a third pot, 12-quart Cambro, or other large vessel, and pour the mash through the strainer to separate the wort out from the spent grains. Slowly pour the hot sparge water over the spent grain until you've collected 6 quarts (5.7 L) of wort.

Pour the wort into a pot and bring to a boil. Watch closely to avoid a boilover. Total boil time is 90 minutes. After 30 minutes, add the 60-minute hop addition. With 15 minutes remaining, add the second hop addition and a Whirlfloc tablet.

Chill the wort down to the recommended pitching temperature, then transfer it to a cleaned and sanitized fermentation vessel. Make sure anything that touches the wort from this point on is sanitized.

Add the yeast, oxygenate, and ferment according to the temperature on the yeast package.

Within 12 to 24 hours there will be a decent amount of bubbling that will quiet down after about 3 to 4 days. Two weeks later, fermentation will be complete. Perform a diacetyl rest for 3 days. Rack the beer to a serving keg or a secondary fermenter, making sure to leave sediment, yeast, and trub behind. Lager your beer for a minimum of 6 weeks before serving or bottling.

"grow-JEES-kee-uh,") AKA Grätzer, which hails from Poland. It features oak-smoked wheat malt, which usually makes up most if not all of the grain bill. This beer style was almost unheard of in the U.S., but now is enjoying time in the spotlight again, though it's still relatively rare. It's a light, low-gravity, refreshing, highly carbonated beer with very low hop flavor and aroma. Some can be quite smoky while others have a muted smokiness.

Another example from Germany is Lichtenhainer, which is similar to Grodziskie in that it uses oak-smoked wheat malt but also includes Pilsner malt and possibly other base malts such as Vienna. This style is also slightly acidic.

One other category is smoked porter. Homebrewers and commercial brewers produce a staggering array of porters, so there isn't one blueprint to follow when brewing a smoked one. Porters are generally rich, highly flavorful beers that can stand up to the addition of smoked malt in a manner that's complementary to the other flavors present. I usually target about 12 percent for my smoked malt, depending on the type used. With that, let's look at some different smoked malts available.

SMOKED MALT TYPES

I've covered two well-known examples of smoked malt—rauch malt, which is a beech-smoked malt used in German lagers, particularly rauchbiers, and oak-smoked malt used to brew Grodziskie and Lichtenhainer. The flavors that these two malts lend are quite similar, but there are some differences. According to the flavor and aroma profiles posted on Brewers' Supply Group (BSG), one can infer that oak-smoked malt's aroma profile is a bit more complex, yet more rounded and smooth. Beech-smoked malts have a more assertive aroma profile, with malty/sweet, clove, vanilla, and almond notes. Some would say that higher proportions of beech-smoked malt can create a hammy, bacony flavor and aroma. Oak-smoked malt has less malty/sweet and clove aromas, and can also impart honey, vanilla, biscuit, raisin, and almond notes.

Other woods that can be used for smoking malt are the same as those that can be used when barbecuing meat—cherry, apple, peach, pecan, alder (used in Alaskan Brewing Company's Smoked Porter), mesquite, and hickory.

As mentioned previously, malt can also be smoked over peat instead of wood. Due to peat's phenolic character, its flavor and aroma can be an acquired taste. While not traditional, a very small percentage of peat-

smoked malt can make a nice addition to a Scotch Ale—but no more than 5 percent of the total grain bill is recommended.

Making smoked malt at home is relatively easy to do with the right equipment. Most importantly, you'll need a smoker. Electric smokers are ideal because they are very easy to set up and run—mine is literally "set it and forget it" save for the occasional addition of smoking wood. You can also make use of a charcoal or pellet smoker if that's what you have. Like barbecuing meat, the object is to go low and slow when smoking malt. In an electric smoker, it's easy to maintain a sub-200°F (<93°C) temperature for hours.

To smoke malt at home, start with something light-colored and mild: pale, two-row, or Pilsner malt. Spread the malt in a thin, even layer on a metal tray. Smoke anywhere from 1 to 5 hours using any of the wood varieties previously mentioned. How long to smoke and what wood to use is totally up to you. Use one wood or even a combination (for barbecue, I love a mix of equal parts apple, cherry, and pecan). Allow the smoked malt to cool completely before packaging.

TIPS FOR BREWING BEER WITH SMOKED MALT

- Err on the side of using less smoked malt the first time you brew smoked beer. A greater proportion of smoked malt can be used for follow-up brews.
- My preferred single-gallon batch size lends itself well to experimentation, and brewing smoked beer is no exception. With such a small batch size, it's easy to manipulate one variable, such as amount of smoked malt to use, over a few different brews.
- Make malt teas to compare different smoked malt samples at the same time. Use the results from these samples as a rough guide for amounts to add to a grain bill. For example, if one sample is more intense than another, apply them in different proportions. Also note that stored malt may lose some of its smokiness over time.

Some say smoked malt needs some time after smoking to "mature," so they won't use it for a week or two, believing that the smoke flavors mellow out a bit over time.

One word of caution—whatever you do, do not make smoked beer with liquid smoke extract, as it can lend an artificial flavor to your beer. Just as a barbecue aficionado wouldn't use liquid smoke, neither should you!

RETURN OF THE SMOKED BEER RENAISSANCE

Back in the day, all malted barley was dried after sprouting by using wood smoke (or perhaps peat in parts of the U.K.), so all beer had a bit of smoke flavor. Nowadays, smoked beer is making a comeback among craft brewers, especially rauchbiers and smoked porters. Some brewers use pre-smoked malt, which is available from several maltsters, and some prefer to smoke their own. Smoking a large quantity of malt is a huge endeavor—I've seen some brewers work with barbecue restaurants on this—but for homebrewers who need maybe a few pounds at a time, this is much more

manageable (any smoker you have access to will get the job done).

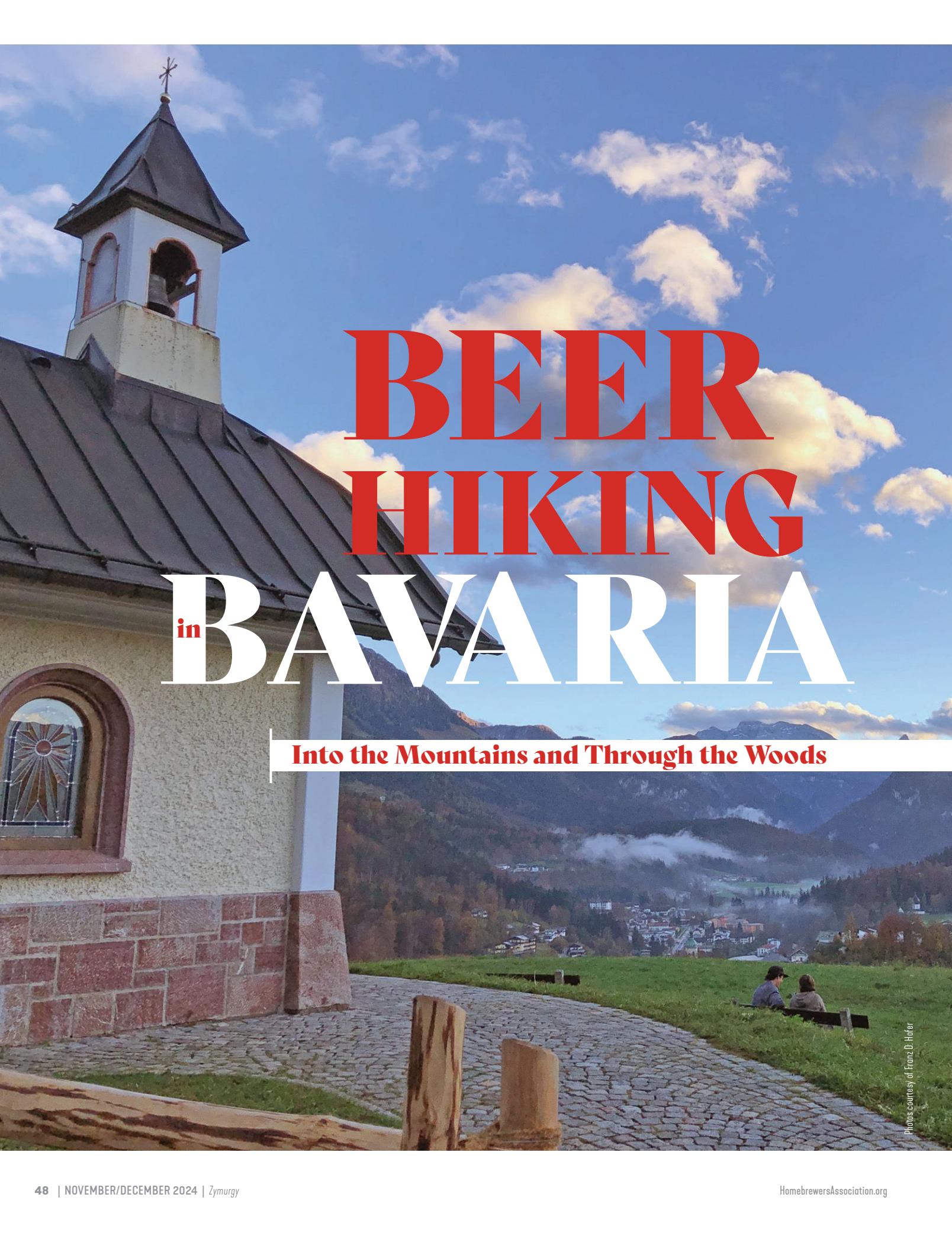
It's likely that the smoked beer renaissance will continue. My hope is that those of you who have been dismissive of the style give it another chance. Go to your favorite local breweries to sample modern-day interpretations of smoked beers. Talk to brewers about how they produced them. It's an exciting space to watch as modern brewers are likely to come up with their own versions of these once-forgotten beer styles.

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Dan Jablow is a homebrewer with a passion for brewing beer in single-gallon batches. He is a graduate of the Beer Brewing Professional Certificate program at the University of Richmond.



A photograph of a traditional church with a bell tower in the foreground, set against a backdrop of majestic mountains and a sky filled with soft, golden clouds. The church's stonework and copper roof are visible, along with a small arched window featuring a sunburst stained-glass design.

BEER HIKING BAVARIA

in

Into the Mountains and Through the Woods



By Franz D. Hofer

“The ground is all
memoranda and signatures.”

— Ralph Waldo Emerson, 1850

“Paths are habits of a landscape.
Many regions still have
their old ways, leading over
passes or round mountains,
to church or chapel.”

— Robert Macfarlane

Paths are not only a means of getting from here to there, they are also a way to feel the rhythm of a place and remember times past. Wandering through meadows, woods, and villages sets the imagination free to ponder what life might have been like there a decade, or even centuries ago: salt miners and glassmakers passing pilgrims and monks on the trail; merchants toting their wares from one village to the next past shepherds tending their flocks; and the village butcher, baker, and brewer providing food and drink for these journeys.

Each hike detailed here comes alive through a combination of landscape, folklore, and of course, beer. The Rothaus hike plies the ancient byways of the Black Forest. The alpine meander in Berchtesgaden reverberates with the legends of tyrannical kings. And the stroll through the woods of southern Munich echoes with the sounds of raftsmen who once transported their wares along the Isar River.



ROTHAUS: BEER HIKING IN THE BLACK FOREST

Rothaus is a short train ride from Freiburg, southwestern Germany's city of Gothic spires and medieval gates. The ride up offers a preview of the hiking that awaits you in the region, like a curtain lifting on a stage. The train traverses meadows and trundles through narrow valleys with rushing waterfalls. Black Forest houses with sloped roofs and carved balconies dot the fields and cling to hillsides overlooking pristine lakes.

A Morning Beer at Rothaus

The rush of cool mountain air was bracing as I stepped off the train on the banks of the Schluchsee Lake. A short bus ride later and I was in front of an old beer wagon laden with barrels, the coral-colored



Rothaus brewery rising up in the background. By then the fresh air was starting to warm, mingling fragrances of the forest with the aromas of brewing.

Your trail choices are endless once you've had your morning beer on the terrace. You can do this 16-kilometer loop through pastures and brooding forests after the noontime brewery tour, followed by a quick lunch, and you'll be back in time for dinner.

Rothaus to Schluchsee

At the bus stop across from Rothaus Tourist Information, drop down toward the Café Jägerklause, pass a cluster of houses, and then pick up the trail waymarked with a yellow diamond toward Seebrugg. Soon you'll cross the Mittelweg long-distance hiking trail before continuing along forestry roads past cows grazing on flower-decked slopes, with brief stretches along the roadway.

In Seebrugg, cross the highway junction and stay south of the railway until you reach the station along the Schluchsee, the largest lake in the Black Forest. Then cross the tracks and climb up to the highway at Hubertus Gasthaus. Cross over to a trail that takes you up through the woods to the town of Schluchsee.

Schluchsee to the Dürrenbühler Hof

The second half of the loop elevates the hike a notch. Find the Faulmannweg (weg means "path" in German) out of Schluchsee and follow this narrow trail over rocks and tree roots to the intersec-

tion of the Glasweg and Hotzenweg, both indicated with wooden plaques.

Pause here to enjoy the stillness and let your imagination drift back to life in the depths of the Black Forest when hamlets were isolated from larger towns, especially when snow made the paths impassable. A friend whose family has a cabin nearby told me that the historical economies of these hamlets—the intricate tasks of wood carving, cuckoo clock making, and glassblowing—developed out of this isolation and remoteness. It was how families passed the time and eked out an existence during the long winter months.

Once you've collected yourself from your reveries, walk north along the Hotzenweg to the Mühlenweg, then follow this path to the intersection with the Mittelweg long-distance trail just north of the hamlet of Faulenfürst, and cross the quiet country road.

This gently descending stretch back into Rothaus is the most picturesque of the hike, with the Swiss Alps looming in the distance and meadows splotching the landscape with fifty shades of green. Along the way you'll pass through the Dürrenbühler Hof estate with its tiny Chapel of St. Cyriacus built by miners who once searched the area for iron ore. Dürrenbühler Hof is also a starring figure in a tale about the changes growing enterprises can have on local ways of life.

An Old Estate, a Growing Brewery, and a Need for Water

Let's step off the path briefly for a bit of local history. Rothaus had long enjoyed a symbiotic relationship with the Dürrenbühler estate. Rothaus supplied spent grain that fed the animals on the estate. In return, Dürrenbühler provided Rothaus with horses and wagons for the brewery's delivery fleet, along with milk and cheese to nourish the brewers.

But then Rothaus, which had grown ever larger during the nineteenth and early twentieth centuries, needed the estate's water.

Counterclockwise from left:

The pristine Schluchsee near Rothaus; An old beer wagon in front of the coral-colored Rothaus brewery; An electric boat emerging from the morning mist on the Königssee; The diminutive chapel of St. Bartholomä beneath the Watzmann massif; A trail near the Dürrenbühler Hof.



Enter Max Jäger, then-director of Rothaus, who negotiated for the rights to tap the mill pond on the estate. The sticking point: This pond served several of the estate's needs. It provided the mechanical energy that powered the estate's grain mill, its lathe, and its sawmill. The estate's blacksmith and wainwright also drew on the pond to power their shops. Beyond that, the pond served as the estate's water reservoir in case of fire. In short, this little pond was important.

Jäger eventually secured the right to tap the source of the mill pond in 1933. But it was a hard bargain. In exchange, Rothaus had to provide electric generators to run the estate's workshops, along with a transportable motor for the lathe and the various mills. It also had to build a new reservoir for water to fight fires.

Rothaus eventually outgrew the pond and now draws its water from seven wells in the area.

A Nightcap in Rothaus

From these bucolic fields, it's only two kilometers to dinner and beers. Order Rothaus's Hefeweizen. You won't often see it outside of the Black Forest. It deftly weaves together banana custard and allspice flavors with a wheaty, citrus character that gives it a revitalizing edge after a day on the trails.

And while you're at it, go ahead and order that piece of Schwarzwälder Kirschtorte (Black Forest cherry cake). You're right at the source of this world-famous confection, after all.

SOARING PEAKS AND IDYLLIC LAKES: BERCHTESGADEN AND KÖNIGSSEE

Berchtesgadener Land in southeastern Bavaria was once known for its salt. As the salt trade waned in the nineteenth century, interest in the region's spectacular scenery grew. It was a time when Europeans had discovered a new appreciation for nature, and the Bavarian Alps were the ideal balm for the perceived ills of industrialization. Tourists, hikers, and mountaineers arrived in droves, drawn by the sublime landscape of the rugged Watzmann peak. Then, as now, Berchtesgadener Land is a hiker's paradise, one particularly well suited to beer hikers.

To the Königssee

Mist hung like strands of cotton above the valley as we followed the Königsseer Ache stream through the woods toward the Königssee Lake and its namesake village. We boarded a wooden boat and then drifted toward the copper-red cupolas of the diminutive Chapel of St. Bartholomew. As we disembarked, everyone was quiet, seemingly struck by the mystical atmosphere of the mist's slow unveiling of the lake, the chapel, and the angular granite of the Watzmann peak.

With lunch still a few hours away, we hiked up a path leading to the Eiskapelle (ice chapel), the last ice-blue remnants of a glacier that once reached all the way down to the Königssee. It's lonely up there, the forlorn glacier surrounded by a spare landscape of gravel and boulders.

By the time we made the full descent, it was just in time for lunch at the Gaststätte St. Bartholomä beer garden, ringed on all sides by majestic scenery. The chiseled Watzmann juts up above the lake, and, St. Bartholomew's domes gleam in the sunshine.



Back to Berchtesgaden

We could have stayed there all afternoon, but there was more trail ahead of us. We caught the next sailing of boats on the Königssee. Just beyond the village on the eastern lakeshore is the Malerwinkel (Painter's Corner), which affords breathtaking views of the narrow, fjord-like lake carved into the mountains.

After watching another round of boats come and go at the lakeside Biergarten am Königssee, we returned to Berchtesgaden in the same direction we came. The footpath was once the railway bed for the Royal Bavarian State Railway line, terminating in Königssee. Completed in 1909, the extension from Berchtesgaden to Königssee was part of a direct line from Salzburg.

The Legend of King Watzmann

Near Berchtesgaden we came upon the Nasse Wand rock wall, a picturesque site favored by

artists who come to paint the Watzmann. A tavern once stood here, a place where artists and tourists gathered over beers to hear legends about cruel King Watzmann.

Locals refer to the Watzmann mountain group as a “family.” Two hornlike peaks, the Watzmann itself and the smaller Kleine Watzmann (the queen), frame tines representing Watzmann’s children.

Ludwig Bechstein (1801–1860), chronicler of German legends, narrates the story as follows. It is not for the faint of heart.

There once ruled a king in these lands named Watzmann, a cruel tyrant who knew naught of love and mercy. Hunting was his only passion. He pursued the timid game, trampling the fields and hopes of the peasants, his malevolent wife and devious children in tow.

One day the hunting troop came upon a shepherd's cottage. In front sat the shepherd's wife cradling their slumbering child. Their faithful dog lay next to her. In an instant the king's pack fell upon the family's dog and dragged the frightened mother and child to the ground.

Awakened by the cries of his wife, the shepherd jumped out of the hut and killed one of the king's dogs. Enraged, the cruel king set his dogs on the shepherd, who had just raised up his fainting wife. With a look of despair and a terrible curse to the heavens, the shepherd expired.

Even God's patience has its limits. There arose a roar of thunder in the heights and a howling in the depths, and the spirit of vengeance possessed the king's dogs. The pack attacked the king and his queen and his children, plunging them into the abyss. Turned to

stone and risen up as rock-cold mountains, Watzmann and his clan stand forever frozen as examples of the fate that awaits cruel deeds. (Condensed and translated by F. D. Hofer.)

Well, then.

A Chapel with a View and Local Libations

Just a stone's throw from the Nasse Wand and past chalets into Berchtesgaden, follow the gentle climb north from the Schlossplatz to the Kirchlein chapel atop the Lockstein. The sky was taking on its twilight cast of orange and violet, and the old town of Berchtesgaden spread out before us, with the jagged peaks of the Watzmann etched against the sky.

We meandered back into the Altstadt for dinner and beers at Bräustüberl Bankhammer, right near Hofbrauhaus Berchtesgaden. Their dunkel, with its pecan nuttiness and notes of pumpernickel bread and chocolate, pairs fabulously with the Bierochse (beer ox).

A BEER GARDEN AMBLE IN SOUTHERN MUNICH

Munich. Beer gardens. Beer hiking. Three things I can't get enough of. Put them all together and you get a 15-kilometer stroll along the Isar River that takes you through woods and hamlets to some of Munich's most beloved beer gardens. Just as enjoyable as the beer gardens are the stories and legends attached to them.

Brückenkopf

Only a half-hour by tram from the center of town, Grünwald feels like a village, one presided over by a medieval castle.

Counterclockwise from left:

Ochsenbraten in Dunkler Biersauce; Twilight descending over Berchtesgaden; A field near the Dürrenbühler Hof; The lively tavern and restaurant at Bräustüberl Bankhammer; The Liberalitas Bavariae statue.



It's a short walk from the Tram 25 terminus past the old castle and across the bridge to the first stop on this urban beer garden ramble, the Brückewirt.

Built in the 1840s, the one-time estate served as a staging ground for the transport of stone hewed from a nearby quarry. The estate housed the quarry workers as well before becoming an inn with a fashionable beer garden around the turn of the twentieth century. Set idyllically in the woods along the Isar, the Brückewirt is also one of the docking points for the log rafts (*Flöße*) that float by with their cargo of oompah bands and revelers.

The Flöße (Log Rafts)

River rafting on the Isar has a long history. As early as the Middle Ages, lumberjacks felled trees along the upper reaches of the Isar, bound the logs together, and floated the bounty of the forests downriver to the mills of Munich. The rafts also carried building materials and goods that had arrived across the Alps from Italy. Someone needed to steer these rafts safely to market, and the ones who did took advantage of the languid journey downriver by singing songs and drinking beer (what else?) along the way.

Trains eventually supplanted the need for river transport. But it was these same trainlines that kept the rafting tradition alive. Instead of cargo, the raftsmen began to carry people. By the late nineteenth century, log rafting on the Isar had become a popular weekend leisure pursuit, an escape from the city made possible by trains.

Waldwirtschaft

It's easy to be lulled by the landscape of the Isar valley along this 4-kilometer stretch between the Brückewirt and the Waldwirtschaft, but keep a lookout for the sign that directs you up the steep embankment to the beer garden above.



Just beyond the gate you'll find a Liberalitas Bavariae statue standing sentry with her lion near the entrance to the beer garden. Pass the bandstand where jazz musicians regularly perform and find a spot at the edge of the beer garden for sweeping vistas across the Isar valley.

An impressive enough beer garden in its own right, the Waldwirtschaft is also famous for the role it played in the "beer garden revolution" of 1995. (For more, see "Finding Your Place in the Shade" in the March/April 2024 issue of Zymurgy).

Menterschwaige

The short walk from the Waldwirtschaft to the Menterschwaige takes you down a path toward the foot bridge spanning the Isar, and then to a wooded trail along the embankment high above.

A Swiss-style hut stands just off to the side of the beer garden on the grounds of this estate of the Wittelsbach dynasty. Once the location of the royal blacksmith, this unassuming hut was where King Ludwig I (whose marriage celebration occasioned the first Oktoberfest) allegedly met Lola Montez for their nightly trysts. Local historians have debunked the story about the love nest at the Menterschwaige, but the legend still echoes through the beer garden, adding a little extra spice to everything. Be sure to check out all the rustic cow bells on display at the stands where you order your beer and food.

Once you've replenished your energy reserves with a scrumptious

Krustenbraten (crisped pork roast), retrace your steps across the bridge and continue north along the Isar to Hinterbrühl, a rustic inn and beer garden that will make you feel like you're miles from the big city.



Brew
This!



HANS & FRANZ FESTBIER

Recipe by Franz D. Hofer

Landbier Märzen is still king of the Oktoberfest hill in North America, but an increasing number of brewers, professional and amateur alike, are turning to the silky, honeyed, and eminently drinkable festbier found on the Oktoberfest *Wiesen* in Munich.

Known colloquially as *wiesebier*, festbier is a crystal-clear beer the color of liquid gold. It's smooth and elegant like a helles, but packs the punch of a pale bock, like a goat's horns wrapped in velvet. A subtle note of honey suffuses festbier, intertwining with hop and malt fragrances that recall freshly mown hay and alpine meadows.

| | |
|--------------------------|----------------|
| Batch volume: | 5 gallons |
| Original Gravity: | 1.055 [13.6°P] |
| Final Gravity: | 1.010 [2.6°P] |
| Efficiency: | 78% |
| Bitterness: | 28 IBU |
| Color: | 6 SRM |
| Alcohol: | 6% by volume |

You could also do what brewers at both Kansas City Bier Company and Chuckanut Brewery in Washington state do: Use Vienna malt in place of Munich malt. You could also up the ratio of Pils to Munich/Vienna to as high as 50/50. If you don't decoct, Carahell or melanoidin malt [2-3% of the grain bill] will give you an added malty dimension.

MALTS

8 lb. (3.6 kg) German Pilsner malt [1.6° L]
3.5 lb. (1.6 kg) Munich I malt [6° L]

HOPS

0.9 oz. (26 g) Hallertauer Mittelfrüh,
4.4% a.a. @ 60 min
0.75 oz. (21 g) Hallertauer Mittelfrüh,
4.4% a.a. @ 30 min
0.50 oz. (14 g) Hallertauer Mittelfrüh,
4.4% a.a. @ 10 min

Hallertauer, Perle, Spalter, Tettnanger—all are fair game in a festbier. You want a beer that's got more background bitterness than a Helles but less than a Pils. You also want a fine floral-spicy hop aroma that doesn't overpower the malt.

OTHER INGREDIENTS

yeast nutrient @ 10 min
Irish moss or desired clarifying agent @ 10 min

YEAST

White Labs WLP830 German Lager Yeast or
Wyeast 2124 Bohemian Lager Yeast. Make an ample starter and aerate the wort before pitching.

WATER

Soften your water with your usual procedure or prepare 10 gallons reverse-osmosis water treated with ½ tsp lactic acid for mash acidification. Alternatively, add acidulated malt [Sauermalz] to the mash tun [5 percent of the grain bill]. Add ½ tsp gypsum [approx. 2 g], ½ tsp Epsom salt [approx. 2 g], and 1.5 tsp calcium chloride [approx. 5 g].

BREWING NOTES

Mash in for a short 10-minute protein rest around 137°F (58°C). Use hot water, heat, or decoction to raise the mash temperature for a beta amylase/maltose rest at 144°F (62°C) for 40 minutes to favor fermentability, followed by a 20-minute alpha amylase/dextrin rest at 162°F (72°C). Check for starch conversion before mashing out at 169°F (76°C) for 10 minutes.

You can also perform a single-infusion mash @ 151°F (66°C) for an hour or until conversion is complete. Whichever mash regimen you choose, keep in mind that Festbier needs to be drinkable by the Maß (liter).

Sparge to collect 6.75 gallons of wort. Boil for 75 minutes, cool, pitch your yeast, and aerate well. Ferment between 46 and 48°F (8–10°C) until primary fermentation is finished [7–9 days], then lager for 4 weeks around 32°F (0°C). Fine or filter your beer if it hasn't dropped bright, and carbonate to 2.4–2.5 volumes of CO₂.

Put on your lederhosen and serve your festbier in your favorite German beer mug. Don't forget the pretzels and bratwurst!

I would like to thank Chaz Lakip (Chuckanut) and Carlton Graham (Kansas City Bier Co.) for sharing their expertise on brewing festbier.

Hinterbrühl

Even though this chalet-style inn is surrounded by woods, it's the water features that'll draw your attention. The beer garden affords a view of the Hinterbrühler See, an artificial lake that was created at the beginning of the twentieth century as part of the extension of the Isar waterworks canal and the construction of the Ländkanal. This canal flows right past the terrace in front of the inn, which soon became a magnet for the Isar raftsmen.

Hinterbrühl's history shares something in common with that of the Brückenwirt upstream. Both were waystations for the raftsmen who floated their log booms downstream from the forests of Upper Bavaria. The *Flöße* still float by, but instead of lumberjacks, they carry revelers holding aloft frothy mugs of beer.

Zum Flaucher

Zum Flaucher is a convivial beer garden in the woods. To get there, head north from Hinterbrühl, then follow the Isar Canal past a yellow nineteenth-century hydroelectric plant that looks like a villa stretched across the water. Soon you'll come to a footbridge across the canal. Cross it, continue straight on through the woods, and you'll end up at Zum Flaucher.

Back in 1871, Johann Flaucher opened an inn and beer garden in what was once part of a Wittelsbach hunting preserve. Today "Flaucher" names both this ample stretch of one-time hunting preserve along the Isar, and the beer garden situated within its expanse of woodlands and meadows. With its proximity to the center of town, the parkland is a popular destination for picnics and grill parties. The secluded beer garden is a favorite haunt of cyclists, walkers, joggers, and families with kids.

Once you're done with your beer, it's just shy of a kilometer to the U3 subway line and the big city beyond.

WORDS OF WISDOM

It's worth repeating a few of the words with which I ended part one of "Beer Hiking Bavaria" (*Zymurgy* May/June 2024). Know your limits, because it's you and only you that'll get you to the next place. And stay hydrated.

Happy hiking!

Franz D. Hofer is a cultural historian, beer judge, and author of the Tempest in a Tankard blog. When not brewing, teaching, or writing, Franz enjoys hiking and cycling—preferably when there's beer involved along the way.

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Brewing Kuit

Looking Beyond Hops

By Dr. Kristen Boucher

Brewing is an art that connects us to our past, allowing us to explore the aromas, flavors, and ingredients of bygone eras. I got to experience such a journey by delving into the rich history of Dutch *kuit*, a traditional beer style that has been revived by passionate brewers seeking to recreate its unique characteristics. Travel back in time with me as I discover the origins of *kuit* and try my hand at brewing this historical ale.

Speaking of Kuit, What's Gruit?

Kuit is an ancient, traditional Dutch beer style that predates the use of hops. Historically, a variety of plants were used in Dutch beers before the adoption of hops. Herb, root, and spice mixtures called *gruit* imparted bitterness and flavor to beers before hops came into general use. Some *gruit* herbs even had medicinal and psychoactive side effects. Many sources maintain that the standard *gruit* blend used in the region now known as the Netherlands,



Belgium, and parts of Germany contained yarrow (*Achillea millefolium*), sweet gale (*Myrica gale*), and marsh rosemary (*Ledum palustre*). However, brewers used over 64 different plants to create their own gruit blends, including mugwort, wormwood, nettles, ivy, and horehound. Bitter botanicals were favored because they balanced the sweetness of malt, usually had antibacterial properties to better preserve the beer, and often contributed their own intoxicating effects to the brew.

Botanicals Beyond Hops

Hops are used in beermaking today not only because of the bitterness and flavor they impart, but also because of their anti-septic properties. Many herbs used in gruit were also antiseptic, allowing beer to be stored in cellars rather than needing to be consumed immediately.

The different plants used in various gruit recipes had other properties as well. Some kept the drinker awake and gave them an energy boost. Others, such as sage, were thought to ward off black magic and even lead to salvation. Some herbs acted as anti-depressants. Several provided euphoric feelings similar to those of narcotics.

Herbs and spices such as wormwood and anise contain thujones, which are chemicals that act on the same brain receptors that THC does and provide a mild drug-

like effect. Yarrow is believed to be an aphrodisiac and has also been used to heal wounds, like in the legend of Achilles.

Hops Climb Into Ascendancy

In what is now Europe, a government monopoly on gruit throughout the Middle Ages forced brewers to buy their mixtures from licensed entities, which were usually churches. These botanicals were taxed, and only those appointed by a duke or count could sell their gruit. But then around 1300, hops started to become a popular beer additive in Germany, and their use quickly spread. Not only did the beer taste fresher, but brewers could also circumvent paying for the highly priced gruit herbs by using hops instead. The final straw was the enforcement of the German Beer Purity Law, which strongly dissuaded brewers from using bittering ingredients other than hops. With that, gruit was on the road to being forgotten as a key element of beer production.

A Brew Day with New Challenges

As one of many brewers who don't want to forget what gruit-imbued beers used to taste like, I embarked on a personal mission to brew a traditional kuit of my own. I used 46 percent steel-cut oats, 22 percent Belgian white wheat, and 32 percent "wind malt," which is a long-forgotten style of

Belgian pale malt made by allowing it to air-dry in the lofts of barns. Mecca Grade Estate Malt, a craft malting company in Madras, Ore. revived this tradition with Gateway malt, an undermodified malt that the company describes as "bursting with the aroma of fresh-cut hay." Gateway is perfectly suited for decoctions and step mashing, and is an important ingredient when brewing many historic styles of beer.



Left: Awards won for the kuit; **Top Right:** Kristen preparing the gruit tincture.



Photos © Getty Images; Courtesy of Kristen Boucher





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Brewing a kuit is no small feat, as I discovered during my brew day. The unconventional grain bill, with its high proportion of oats and wheat, posed a unique challenge to mashing and sparging. The high viscosity of the mash from beta glucans made it difficult to circulate the wort and extract the sugars effectively. However, with perseverance and careful attention, I was able to overcome these obstacles, determined to stay true to the historical brewing process.

Dialing in the Water Profile

To further enhance the authenticity of the kuit, I paid meticulous attention to the treatment of my 22 gallons of water. Drawing inspiration from historical accounts of the water used to produce Kölsch in Cologne, which is approximately 150 miles from the Netherlands, I aimed to match that specific water composition. The goal was to achieve a calcium level of 50–100 ppm, a magnesium level of 0–30 ppm, a CaCO₃ level of 0–80 ppm, a sulfate level of 0–50 ppm, a chloride level of 0–100 ppm, a sodium level of less than 100 ppm, and a residual alkalinity level of -30 to 0 ppm.



Recipe courtesy of Kristen Boucher

Batch volume: 15.5 gallons [58.7 L]

Original gravity: 1.048 [12°P]

Final Gravity: 1.010 [2.5°P]

Bitterness: 25 IBU (estimated equivalent)

Color: 3 SRM

Alcohol: 5% by volume

Ingredients

13 lb. [5.9 kg] steel cut oats

9 lb. [4.08 kg] Mecca Grade Gateway pale malt

6 lb. [2.72 kg] Belgian white wheat malt

Herbs

Mugwort, wild heather, yarrow, rosemary, and chamomile, in a tincture, added in secondary to taste

Yeast

SafAle K-97 German Ale Dry Yeast



Water

Calcium 50–100 ppm, magnesium 0–30 ppm, CaCO₃ 0–80 ppm, sulfate 0–50 ppm, chloride 0–100 ppm, sodium <100 ppm, and residual alkalinity -30 to 0 ppm.

To target this water profile, treat reverse osmosis water with:

6 g. gypsum

9 g. calcium chloride

2 g. Epsom salt

2 g. calcium hydroxide

3 g. canning salt

Brewing Notes

Cook the steel cut oats separately beforehand to gelatinize them. Start mashing with a protein rest of 122°F–131°F (50°C–55°C) followed by a high saccharification rest at 154°F–158°F (68°C–70°C). Mash out by raising the mash temperature to around 168°F (76°C). Ferment according to the yeast packet directions. When finished, rack the beer to secondary. Make a tea of the herbs and add this gruit tincture to taste during secondary fermentation. Package, condition, and enjoy.



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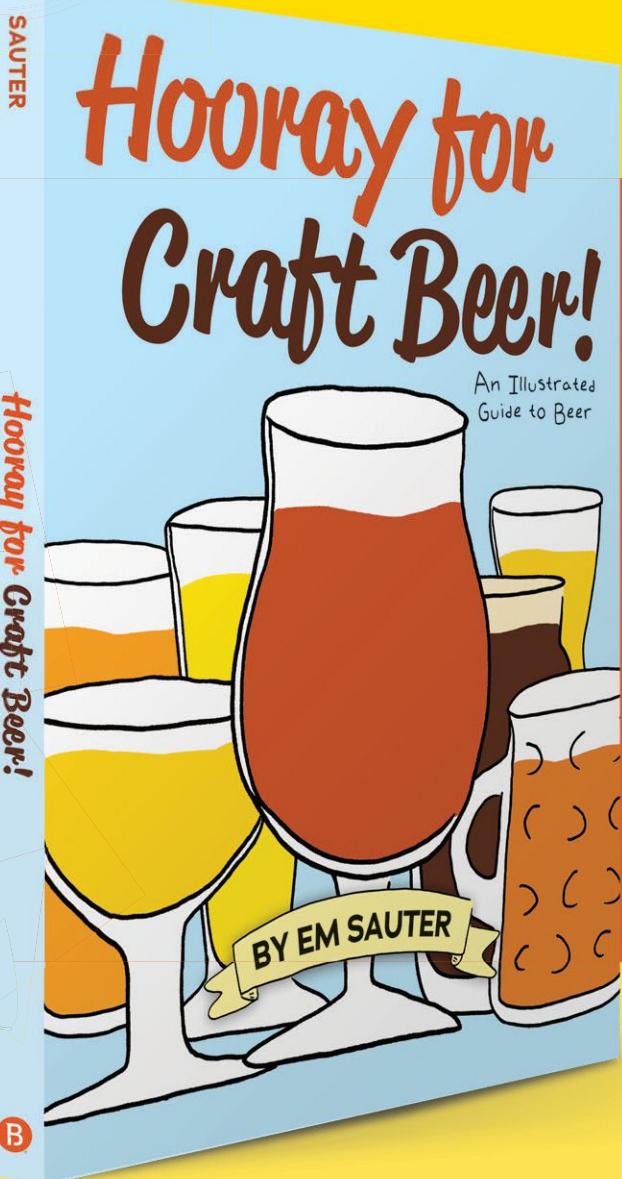
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To achieve this water profile, I treated reverse osmosis water with a carefully calculated combination of minerals that included 6 grams of gypsum, 9 grams of calcium chloride, 2 grams of Epsom salt, 2 grams of calcium hydroxide, and 3 grams of canning salt. I wanted to accentuate the soft body of the oats used in the kuit by adjusting the calcium-to-sulfate ratio to 0.7.

Cook Those Oats!

In addition to the step mashes, I employed a separate cereal mash to extract the fermentable sugars from the steel-cut oats. This involved cooking the oats separately before adding them to the main mash. The separate cereal mash gelatinized starches in the oats, allowing for maximum conversion of starches to sugars once malt enzymes were introduced. This traditional technique ensured that the kuit would possess the characteristic creamy and smooth mouthfeel associated with the style.

Stepping Up the Mashing Techniques

I used a step mash to control enzymatic activity during the mashing process and extract specific characteristics from the undermodified Gateway grains. Since many historic beer styles commonly had only undermodified malts to work with, step mashing aided in the conversion process. I started with a protein rest of 122°F to 131°F (50°C to 55°C) followed by a high saccharification rest at 154°F to 158°F (68°C to 70°C). This encouraged the production of less fermentable sugars, resulting in a sweeter beer with more body. Finally, I mashed out by raising the mash temperature to around 168°F (76°C) to denature the enzymes and lower viscosity to aid in the remainder of the lautering.

My Own Gruit Blend

I opted to incorporate mugwort, wild heather flowers, yarrow, rosemary, and chamomile into my brew, adding a complex

herbal character to the beer. I made this custom gruit blend by steeping the botanicals like a tea. Then small amounts were added during secondary fermentation to provide balanced layers of flavor.

The Sweet Taste of History

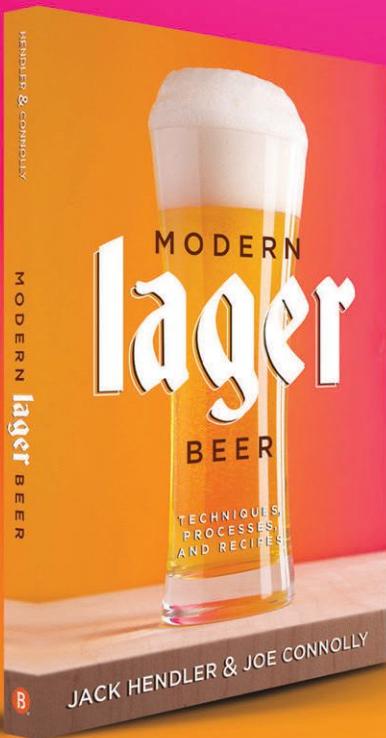
After a lengthy brewing process and a long wait for fermentation to finish, I finally got to taste the fruits of my labor. I like to think that my kuit embodied the essence of the historical beer style, with its slightly sweet and malty taste, accompanied by a velvety smooth mouthfeel. The unique combination of oats, wheat, and barley, and the distinctive flavors imparted by the alternative bittering and spicing ingredients made this a truly authentic, one-of-a-kind brew.

Brewing a beer using different kinds of plants for flavor and bitterness is not just about creating a delicious beer; it is a journey into the past, a celebration of history, and a connection to our brewing ancestors. With the revival of this forgotten beer style, brewers are preserving the cultural heritage of the Netherlands and allowing beer enthusiasts to savor a taste of history.

Dr. Kristen Boucher is the former co-owner of a nanobrewery in Georgia. She sold the brewery, returned to homebrewing, and is now an avid, competitive homebrewer and BJCP-certified judge.



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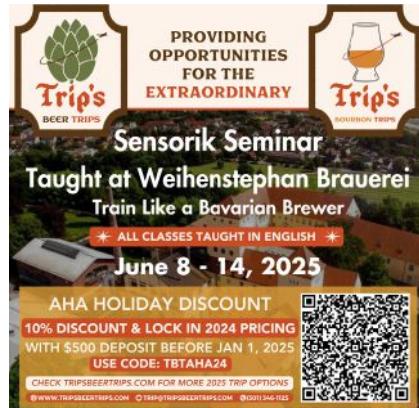
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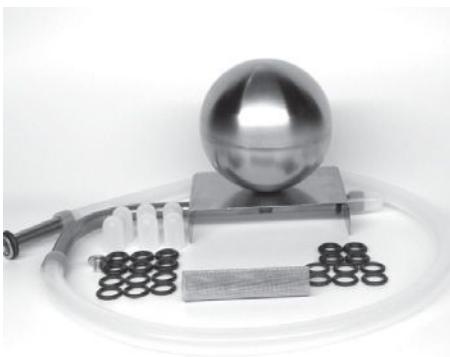
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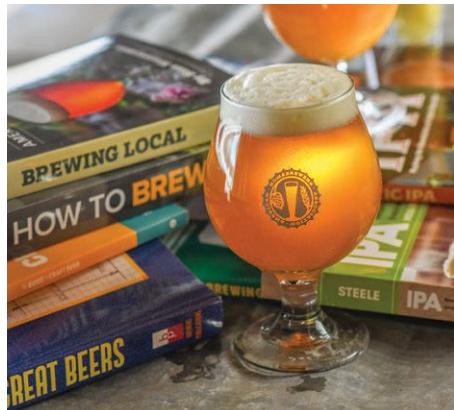
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Relax, Don't Worry, Have a *Homebrew!*



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.

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 (66–67.2°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.

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

Brew Lingo

Every field has specialized language, and homebrewing is no different. Here are 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 – U.S. beer barrel (31 U.S. 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 bitterness 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 (wort/beer density)

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

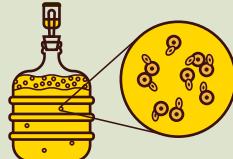
SMM – S-methyl methionine, precursor to dimethyl sulfide (DMS)

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. (28 g) of dextrose (corn sugar) per gallon of beer (7.5 g/L) for a good, all-purpose level of CO₂.
- 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 CO₂ 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



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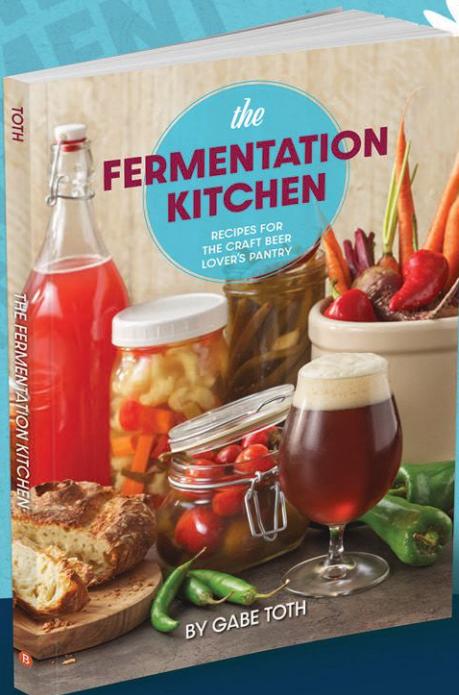


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One Size Fits All?

Have you ever gone to one of those ooh-la-la fancy, expensive restaurants that serves minuscule portions of food on very large plates? Don't sneeze, it'll fly across the room. Clara Peller had it right when she asked, "where's the beef?" How about those gigantic trucks driven by very small youngsters, perhaps to compensate for certain shortcomings? You take your life in your hands when they're in a hurry, and these massive road hogs always seem to be. On the other hand, I hesitate to pass a Smart car at any rate of speed faster than a meander, just in case the breeze spins them out into a ditch.

I bet the marketing genius who came up with the phrase "one size fits all" got a major bonus, but it would be a pretty boring world if one size did indeed fit all, especially in the wonderful world of homebrewing. Just like there are different styles to fit everyone's personal taste, homebrew batch sizes can vary widely too. Back when I first got into homebrewing many, many years ago, it seemed like the go-to batch size was five gallons. All the beginning brew equipment kits and recipes were based on five-gallon batches. More recently, I switched to a three-gallon batch size, which better fits my needs. Since then, I've begun to wonder whether five gallons is still the hobby's standard.

So, I went to the one place I knew I could get information of the utmost veracity, that I could stake my reputation on: the worldwide web. I posted queries

about what size batches everyone brewed. Included in my search were the 10 discussion groups and forums that I regularly frequent: Brewer's Friend, Jim's Beer Kit, The Homebrew Forum U.K., Homebrew Talk, the AHA Forum, my local homebrew club's website (MASH Fort Wayne), Fueled By Hops, Home Brew Network, All-Grain Brewers, and Simple Homebrew Group.

I ended up with 273 relevant replies. Eighty-one respondents reported brewing batches larger than five gallons, including a few claiming batch sizes you'd expect from a nanobrewery. Forty-six respondents said they vary their output between five-gallon batches and smaller batches. Forty-two said they brew strictly five-gallon batches. Twenty-eight reported brewing a different batch size each time they brewed. Seventy-six reported only brewing less than five gallons, many of them sticking to a one-gallon batch size. Across all 273 respondents, the total number of gallons brewed was 2,307.5, averaging a per-person batch size of 8.45 gallons.

Several respondents stated what influenced their chosen batch size: these reasons included brewing to a certain style, trying to hit a specific gravity, and simply experimentation. Eight respondents said that their batch size was determined by the volume of their fermentation vessels, and seven more were restricted to the size of their boiling kettle or mash tun. Two matched their batch

size to their kegging or bottling capacity.

Twenty-eight of the respondents switched to different-size batches from the ones they started brewing with. Some of these reported brewing smaller batches when they switched to kegging, or reducing their consumption as they aged. One reduced his volume after moving, since he had fewer people around to help him drink his beer. Three reduced their volume because it enabled them to brew more often and/or produce a greater variety of beers, and two did so because they had less of a desire to brew.

With batch sizes varying from one to 210 gallons, my research convinced me that in the world of homebrewing, it's most definitely not "one size fits all," and I think that's the way it should be. So brew whatever size fits your needs, desires, and abilities. Beyond tinkering with a single recipe, or trying to brew every style, adjusting your batch size is just another interesting way to learn more about the brewing process and discover different ways to enjoy the hobby. My needs are still met by a three-gallon batch size, but here's a handy tip for scaling my Basic Best Bitter recipe to your preferred batch size:

For a one-gallon batch, multiply the ingredients by 0.33; for five gallons, multiply by 1.66; for 10 gallons, multiply by 3.33, and so on.

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

RECIPE

See page 8 for Ruch's Basic Best Bitter recipe.



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