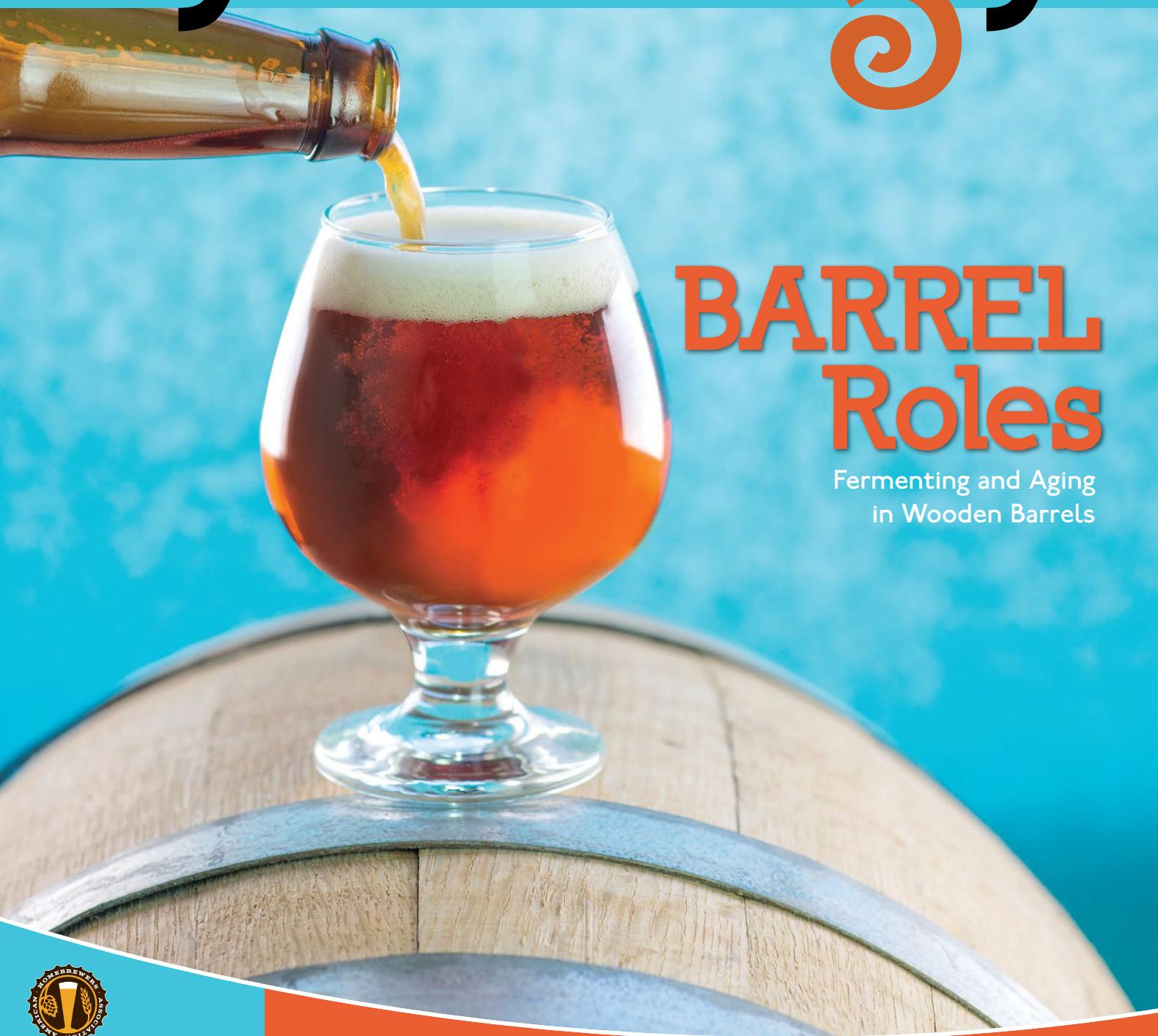


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Inquiring Homebrewers Test Fermented Possibilities

It's early March, and a most bothersome bug is making its presence felt at AHA-HQ. A cacophony of sibilant sneezes, crackling coughs, and emphatic honks meets my ears, and that's just when I've got the place to myself. Get all of us together in a conference room, and it's a medley of microbial malady, my friends. But don't fear: we hand-dip each and every issue of *Zymurgy* in sanitizer before we mail it out to you.

Like beer, microbes are the cause of, and the solution to, many of life's problems. And yet our understanding—no, our *recognition*—of the microscopic world is a recent phenomenon. The original 1516 Reinheitsgebot snubbed yeast because nobody knew such a thing existed (and wouldn't for at least a couple of centuries). The germ theory of disease didn't gain much traction until after John Snow's door-to-door survey of London's cholera-stricken Broad Street in 1854.¹ And we still don't fully understand what the hell's going on in lambic barrels. I suspect elves are at work.

For as much trouble as they might cause our upper respiratory systems, microorganisms play a vital role in virtually everything that makes life worth living: cheese, bread, sauerkraut, and, yes, beer. And the May/June 2016 installment of *Zymurgy*, my first behind the wheel, is a splendid little issue that looks a little more closely at a few things the Reinheitsgebot ignored altogether.

Upon the following pages, our contributors share the ins and outs of working with wooden barrels and offer guidance on brewing with tea. We investigate the secret world of yeasts, both wild and domesticated. And we celebrate—or is that criticize?—the quincentenary of the Reinheitsgebot

itself. These stories challenge us to ponder the question "What makes a beer a beer?" Which is fitting, because few things complement one another quite like a good beer and a good ponder.

Pondering leads, inevitably, to stories, and homebrewers are all storytellers. Every time you ignite a propane burner and live to see another day; throw your weight onto a plastic lid to force it, suitcase-style, onto a weary fermentation bucket; or convert another dark beer denier, you're playing a part in the greatest ale tale of all time. The story of homebrewing—indeed, the story of *Zymurgy* itself—is the story of American craft brewing.

Zymurgy is your magazine: I'm just lucky enough to be the next in a humbling series of caretakers. I encourage you to take an active role in our magazine's continued success. Read it. Brew from it. Contribute to it. Mark it up and dog-ear it (unless you're a digital-only subscriber—the AHA assumes no liability for damaged tablets). We're here for homebrewing, and we're here for you.

With American Craft Beer Week filling the third week of May and Homebrew Con (the new name for the venerable National Homebrewers Conference) following closely on its heels in early June, it's time to celebrate the delicious symbiosis that homebrewers and craft brewers enjoy. So let's get out there, explore, and share our passion for homebrewing with the world. It's thirsty for what we have to offer.

Cheers!

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



¹Interestingly, workers at Broad Street's brewery remained healthy during the outbreak, having been given beer instead of water.



POSTMASTER:
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Boulder, CO 80302.
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A close-up photograph of a complex stainless steel brewing system. It features various pipes, fittings, and components, all made of polished metal. The lighting highlights the metallic surfaces and the intricate details of the machinery.

304

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It's time to revisit malt extract and give it the respect it deserves.

By Dave Carpenter

To read this special, members-only online feature,
go to HomebrewersAssociation.org/mj16

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Find more homebrewing recipes on our website @ HomebrewersAssociation.org/homebrew-recipes



>> GET THERE!

CENTRAL VALLEY BREWFEST

The fourth annual Central Valley Brewfest will take place May 14 at the Stanislaus County Fairgrounds in Turlock, Calif. Nominated for a Modesto Area Music Award (MAMA) for best large event in 2015, the Central Valley Brewfest promises to be an amazing experience in taste, art, and music, with more than 125 beers available to sample. New for 2016 are VIP tickets that offer guests an opportunity to enter the festival an hour early and taste more than 25 beers exclusively available to VIP guests until the main doors open.

In addition to offering a chance to sample beers from the Central Valley and beyond, the event highlights art from a local charity in Stockton. Art Expressions of San Joaquin will feature innovative, creative, and fresh art pieces for purchase. Proceeds help promote and showcase the works of the talented artists who do not have a dedicated storefront in the Central Valley.

For more information, visit cvbrewfest.com.

May 6–7

St. Louis Microfest

St. Louis, MO

stlmicrofest.org

May 7

AHA Big Brew

Worldwide

HomebrewersAssociation.org

May 21

San Francisco International Beer Festival

San Francisco, CA

sfbeerfest.com

May 28–29

Weekend of Spontaneous Fermentation

Opstal-Buggenhout, Belgium
en.bierpallieters.be/weekend

June 3–12

Philly Beer Week

Philadelphia, PA

phillybeerweek.org

June 3–4

SAVORSM: An American Craft Beer & Food Experience

Washington, DC

SavorCraftBeer.com

>> GET THERE!

CENTRAL VALLEY BREWFEST

June 4

Midwest Sour + Wild + Funk Fest

Indianapolis, IN

uplandbeer.com

June 8–12

Mondial de la Bière

Montreal, Quebec

festivalmondialbiere.qc.ca

June 9–11

Homebrew Con (AHA National Homebrewers Conference)

Baltimore, MD

homebrewcon.org

June 17–26

Des Moines Beer Week

Des Moines, IA

dsmbeerweek.beer

June 19–25

Cincinnati Beer Week

Cincinnati, OH

cincinnatibeerweek.com

June 24–26

Portland International Beerpfest

Portland, OR

portland-beerpfest.com

For more craft brewing events, go to CraftBeer.com

>> YOU'VE GOTTA DRINK THIS

DOGFISH HEAD PALO SANTO MARRON



Palo Santo Marron pours dark brown and opaque, with a creamy head and corresponding mouthfeel. From start to finish, you savor the malty, roasty caramel flavor with vanilla overtones. Fifty IBUs of hops offer the perfect complement to this full-bodied, 12 percent ABV brew. The key to the exquisite flavor of Palo Santo is aging in Dogfish Head's two 10,000-gallon tanks made from Paraguayan palo santo wood. Make sure that you savor this delightful ale at cellar temperatures.

Reviewed by Jeff Thomas,
Rehoboth Beach, Del.



If you've had a beer you just have to tell the world about, send your description, in 150 words or fewer, to zymurgy@brewersassociation.org.

>> BREW NEWS

AMERICAN CRAFT BEER WEEK

For the 11th year in a row, the Brewers Association has declared American Craft Beer Week (ACBW), the nationwide celebration of U.S. small and independent craft brewers. The weeklong tribute provides an opportunity for craft brewers to share their diversity, creativity, and passion for the beverage they love with the greater craft beer community. From May 16 to 22, all 50 states, U.S. territories, and Washington, DC will hold ACBW events, including exclusive brewery tours, special craft beer releases, food and beer pairings, and tap takeovers to celebrate the ever-advancing beer culture in the United States.

Celebrated since 2006, ACBW offers craft beer fans a chance to support their local breweries, while beer businesses enjoy opportunities to connect with their customers and other beer lovers. Tens of thousands of beer beginners, beer enthusiasts, and beer geeks toast the week each year, and with more than 4,300 craft breweries now open in the United States—an all-time high—there's more to celebrate in 2016 than ever before.

To find events near you, visit CraftBeer.com/acbw.

>> GREAT PRODUCT

HANDMADE BEER GROWLERS

Sure, you don't need a fancy growler to transport beer from Point A to Point B, but if you're ready to elevate your beer jug from utilitarian urn to enviable art piece, these attractive alternatives have you covered.

Zymurgy reader Barry Cooper of Sweet Home, Ore. alerted us to the custom growlers hand-crafted by artist Teri Sokoloff. "This Christmas I received a fabulous gift," he said. "I think it is the world's most beautiful growler, and it was produced by a local glass artist. When I take it to my club meetings at Heart of the Valley Homebrewers and to local brewpubs to get it filled, it always elicits lots of words of admiration." For more information, and to browse the artist's other growler designs, visit sokoloffglass.com.

And then there's Norfolk Growler in Virginia. Drawing inspiration from the USS Wisconsin BB-64 and old Sailor Jerry tattoos, Norfolk Growler artists create custom ceramic growlers that reflect the area's local naval culture. In the future, the company plans to feature designs from Norfolk-area tattoo artists and illustrators. Incidentally, the growlers hold 64 ounces, which makes the battleship logo even more apropos.

Check out norfolkgrowler.com for more.



>> THE LIST

JAMES BEARD AWARDS

Five craft brewers, a cider maker, and a craft maltster are among the 2016 Restaurant and Chef Award Semifinalists for the James Beard Awards in the Outstanding Wine, Beer, or Spirits Professional category. Brooklyn Brewery brewmaster Garrett Oliver won the category in 2014.

The 2016 semifinalists include:

- **Sam Calagione**
Dogfish Head Craft Brewery
Milton, Del.
- **Wayne Carpenter**
Skagit Valley Malting
Burlington, Wash.
- **Vinnie Cilurzo**
Russian River Brewing Company
Santa Rosa, Calif.
- **Diane Flynt**
Foggy Ridge Cider
Dugspur, Va.
- **Jeppe Jarnit-Bjergsø**
Evil Twin Brewing
Brooklyn, N.Y.
- **Jim Koch**
The Boston Beer Co.
Boston, Mass.
- **Rob Tod**
Allagash Brewing Co.
Portland, Maine



The awards ceremony will be held May 2 in Chicago. For more, go to jamesbeard.org.



>> BEER VACATION: EUROPEAN CRAFT BEER RIVER CRUISE

If cruising the Danube while sipping on beer history is the sort of vacation that floats your boat, TresVous Personalized Travel Services may have just the ticket for you. Guests aboard the European Craft Beer River Cruise meet in Prague, visit two iconic Czech breweries, and then set sail on the *River Princess* in Nuremberg for a week of tours and



tastings. Passengers will visit brewing sites in Regensburg, the Hallertau, Engelhartszell, Passau, and Vienna before disembarking in Budapest. Two experienced hosts share their passion for travel and knowledge of craft beer as guests enjoy a rare look at some of Eastern Europe's oldest and newest breweries.

The journey begins in Prague on October 24. For more information, visit tresvous.com.

Photos courtesy of TresVous Personalized Travel Services

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Suggested usage rates can be as much as 20% of the grain bill without overpowering many styles of beer. Don't be afraid to experiment – it's at home in both ales and lagers! Try 1-5% for depth in Pilsner, Oktoberfest and Bock; 6-10% for complexity in malt-forward beers; and up to 20% for intriguing softness and a slight rye-like character. Expect pale gold to dark copper hues.

Ask your local homebrew store for Briess handcrafted malts. Visit www.BrewingWithBriess.com to download product information and recipes.

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BEER QUOTE

“Most people hate the taste of beer to begin with. It is, however, a prejudice that many people have been able to overcome.”

—Winston Churchill

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By Gary Glass



Homebrew Con Baltimore

The American Homebrewers Association Homebrew Con Baltimore, scheduled for June 9–11, is quickly approaching. Space is filling up for this 38th rendition of the annual National Homebrewers Conference, with more than 2,600 attendees already registered and a total capacity of 4,000. Don't miss out, register today!

Homebrew Con 2016 features 63 different seminars, a keynote address by Dogfish Head Craft Brewery founder Sam Calagione, a Craft Beer Kickoff Party with many local breweries serving their finest, and 84 homebrew club booths at Club Night. The Homebrew Expo will have around 100 exhibitors showing off the latest in homebrewing equipment and ingredients. We'll round things out with the Grand Banquet and Awards Ceremony featuring a meal designed by Brewers Association executive chef Adam Dulye, paired with local craft brews and, of course, the announcement of the winners of the National Homebrew Competition.

National Homebrew Competition

This year's AHA National Homebrew Competition—the world's largest beer competition—saw even more entries than last year, with 8,000 entries submitted. First-round judging will have just wrapped up as this issue hits mailboxes and newsstands.

Based on input from members and discussions between the AHA Governing Committee's Competition Subcommittee and AHA staff, we have changed the criteria for awarding the NHC Homebrew Club Award. Rather than combining points for awards in both the first and final rounds of the competition, only points earned for final round medals will be counted going forward. The goal



**JUNE 9–11
BALTIMORE**

is to emphasize quality over quantity of entries. The new criteria apply starting with the 2016 competition. There is no intention of applying the new criteria to prior competitions; clubs that have already won the award earned their title.

Thanks to all of the judges, stewards, and competition organizers who help make this competition possible. Congratulations to all the first round winners, and good luck in the final round!

Big Brew

Every year on the first Saturday of May, the AHA promotes Big Brew, a celebration of National Homebrew Day. This year Big Brew falls on Saturday, May 7—are you ready to celebrate your love for homebrewing? On Big Brew, homebrewers around the world join in a celebration of our favorite hobby by brewing the same recipes at the same time.



Last year, we set new records for participation in Big Brew, with 484 registered sites, 19,631 gallons brewed, and 11,000 participants from 50 states and 14 countries. Help us make 2016 even bigger.

Big Brew isn't just a fun event, it is a great opportunity for the AHA to promote the hobby of homebrewing. The more sites we have, the better the story and the more likely we are to get media coverage for homebrewing in your community. Even if you just have a gathering of a few friends to brew one of the Big Brew recipes, we want to know (publishing contact info with your site registration is not required). Registering a Big Brew site is free.

Let us know you are joining the fun by registering your site! You can find event details and information on registering for Big Brew, or view registered sites in your area, at HomebrewersAssociation.org.



Scenes from the annual Pacific Northwest Homebrewers Conference.

Pacific Northwest Homebrewers Conference

In early March, I participated in the inaugural Pacific Northwest Homebrewers Conference, a regional event for homebrewers in Oregon, Washington, Idaho, Montana, and British Columbia. The two-day event is modeled after the AHA's Homebrew Con and included 23 seminars, a private beer festival with local craft breweries, and a club brews event where 14 different clubs from the Pacific Northwest served their finest homebrews. AHA Governing Committee candidate and AHA Forum moderator Denny Conn delivered the keynote address.

I was there to represent the AHA and gave a brief presentation on the state of homebrew-



ing in the United States. One thing that I emphasized was something I've brought up in this column: if you find it difficult to brew as frequently as you like, try brewing with extract, which saves time without compromising quality. Helping prove that point, local homebrew shop Bader Beer and Wine Supply had an exhibit booth where they conducted the extract vs. all-grain challenge. The challenge for attendees was to identify which of two nearly identical pale ales was brewed with extract and which was brewed all-grain, and then which was the preferred beer among the two. Fifty-four percent of attendees were able to correctly identify which beer was brewed with which method, meaning 46 percent guessed wrong (i.e. it wasn't easy to tell which was which).

And 54 percent of attendees preferred the extract beer over the all-grain beer.

Though it was a first-year event, the organizers managed to sell it out with just over 300 total attendees. The event was entirely volunteer-run by homebrewers from Oregon and Washington. I was truly impressed by just how well the volunteer crew, led by Jill Marilley of the Greater Everett Brewers League in Washington and Josie Hummert of the Oregon Brew Crew, managed the event; everything seemed to go seamlessly.

The group will be working on plans for future regional conferences, though as I write this they have not yet settled on

Pacific Northwest Homebrewers Conference Pale Ale

EXTRACT RECIPE

INGREDIENTS

for 5 U.S. gallons (18.93 L)

6.6 lb	(3 kg) Pilsner malt extract syrup
0.5 lb	(227 g) 2-row pale malt
1 lb	(0.45 kg) Great Western 50° L Sacchara 50 caramel malt
0.5 lb	(227 g) Great Western 1.5° L DextraPils malt
0.25 lb	(113 g) 20° L crystal malt
0.25 oz	(7 g) Warrior Hops (60 min)
0.5 oz	(14 g) Palisade Hops (20 min)
0.5 oz	(14 g) Palisade Hops (10 min)
1 oz	(28 g) HBC438 Hops (5 min)
1 oz	(28 g) HBC438 Hops (0 min)
2 oz	(57 g) HBC438 Hops (dry hop, day 5)
1 tsp	Irish moss (boil 60 min)
0.75 cup	corn sugar for bottling
Imperial A04 Barbarian Yeast	

DIRECTIONS

Steep crushed malted grain in 3 gallons (11.36 L) of 150° F (66° C) water for 30 minutes. Remove the grain from the hot water with a strainer, then bring wort to a boil. When boiling starts, remove pot from burner and slowly add 1 cup (237 mL) of the liquid malt extract, stirring to dissolve. Return to a boil, then add 0.25 oz (7 g) of Warrior hops and 1 tsp Irish moss and boil for 60 minutes. With 20 minutes remaining, add 0.5 oz Palisade hops. With 10 minutes remaining, add 0.5 oz (14 g) Palisade hops. With 5 minutes remaining, add 1 oz (28 g) HBC438 hops. At the end of the boil turn off the heat, add the remainder of the liquid malt syrup and 1 oz (28 g) HBC438. Strain the hot wort into a fermenter filled with 2 gallons (7.57 L) of cold water and top off to the 5.5-gallon (20.82-L) mark. Add yeast when the temperature of wort is less than 72° F (22° C), and begin fermenting.

After 5 days of fermentation, add 2 oz (57g) HBC438 hops to primary fermenter and let sit for 5–10 days. Rack to secondary fermenter and let sit an additional 5–10 days. Then bottle or keg your beer and enjoy!



the frequency of the event. They will put the event on hold in any year the AHA Homebrew Con comes to the region.

Homebrew Legislation

The AHA is tracking homebrew legislation in three states at this time. In California, Assembly Bill 2172, introduced by Assemblyman Brian Jones of Santee on behalf of the California Homebrewers Association, will, if passed, allow homebrew to be brought into establishments licensed by the Department of Alcoholic Beverage Control (e.g., breweries, bars, and restaurants). A few years ago, ABC issued a statement indicating that its interpretation of the California alcohol code

was that it is illegal for homebrew to be brought onto licensed premises for any purpose. As this bill moves through the legislature, the AHA will notify members in California so that they can encourage state legislators to pass it.

Colorado House Bill 16-1084 clarifies existing homebrew law by making simple changes to some arcane language in the code: "head of family" is changed to "adult," and "family use" is changed to "personal use" for describing who can make homebrew and for what purpose, respectively.

In January, I testified, along with Quirky Homebrew shop owner Greg Radziewicz, before the House Business Affairs and

Labor Committee on behalf of this bill. Governor John Hickenlooper signed the bill into law on March 18th.

In Wyoming, Senate Bill 62, sponsored by Senators Dave Kinskey, Bruce Burns, and Jeff Wasserburger and Representatives Jim Blackburn, Hans Hunt, Tyler Lindholm, Michael Madden, and David Miller, aimed at allowing homebrew to be served at events including competitions and beer festivals, was signed into law on March 7 by Governor Matt Mead.

Until next time, happy homebrewing!

Gary Glass is director of the American Homebrewers Association. 

Pacific Northwest Homebrewers Conference Pale Ale

ALL GRAIN RECIPE

INGREDIENTS

for 5 U.S. gallons (18.93 L)

10 lb	(4.54 kg) 2-row pale malt
1 lb	(0.45 kg) Great Western 50° L Sacchara 50 caramel malt
0.5 lb	(227 g) Great Western 1.5° L DextraPils malt
0.25 lb	(113 g) 20° L crystal malt
0.25 oz	(7 g) Warrior Hops (60 min)
0.5 oz	(14 g) Palisade Hops (20 min)
0.5 oz	(14 g) Palisade Hops (10 min)
1 oz	(28 g) HBC438 Hops (5 min)
1 oz	(28 g) HBC438 Hops (0 min)
2 oz	(57 g) HBC438 Hops (dry hop, day 5)
1 tsp	Irish moss (boil 60 min)
3/4 cup	corn sugar for bottling
Imperial A04 Barbarian Yeast	

DIRECTIONS

Mash grain at 152° F (67° C) for 60 minutes. Raise temperature to mash out at 170° F (77° C), then run off 7 gallons (26.5 L) of wort and begin 60-minute boil. When wort comes to a boil add 0.25 oz (7 g) of Warrior hops and 1 tsp Irish moss. With 20 minutes remaining in the boil add 0.50 oz (14 g) Palisade hops. With 10 minutes remaining add 0.5 oz (14 g) Palisade hops. With 5 minutes remaining add 1 oz (28 g) HBC438 hops. At the end of the boil add 1 oz (28 g) HBC438 hops, then cool wort, transfer to fermenter, and pitch yeast when the temperature of the wort is between 65° and 70° F (18–21° C).

After 5 days of fermentation add 2 oz (57 g) HBC 438 hops to primary fermenter and let sit for 5–10 days. Rack to secondary fermenter and let sit an additional 5–10 days. Then bottle or keg your beer and enjoy!



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BSG Select Ingredients are exclusively distributed to homebrew shops nationwide by BSG HandCraft.

by Our Readers

Bert Grant's Stout

Dear *Zymurgy*,

I've just finished reading *World of Worts* in the November/December issue. This is always a favorite article and one of the last I read (since it's at the end of the magazine). The story of Bert Grant and his Russian imperial stout brings back some great memories for me. I spent the summer of 1993 in Yakima just a few short blocks from the train station converted into a pub.

Each time I went to the pub I would think, "Tonight I'm going to try the stout." Then I would walk in and see the two beer engines, one with Scottish ale and one with IPA. The chance to have some real ale always captured my taste buds. When I moved away at the end of the summer, I had never tried the Russian imperial stout!

The story is even sadder for my wife. She always ordered a glass of wine because she "didn't like beer." We moved from Yakima to Utah, where she could no longer order a glass of wine, so she finally learned to like beer. But she spent a whole summer in Yakima and never tried any of Bert Grant's ales.

The following summer (1994) I drove from Utah to Davis, Calif. for a weekend brewing course taught by Dr. Michael Lewis. In the discussion, Dr. Lewis stated that for good balance, a beer should never have more than 50 IBUs because it would be above anyone's bitterness tolerance threshold. Then he added as an aside, "Except for Bert Grant. Bert Grant drinks hop oil and says, 'Tastes like sugar.'"

The stories of Bert Grant's hoppy beers make me smile. At 60 IBUs, Grant's IPA would be considered tame today, but when I had the good fortune of drinking it

in the early 90s, it was a ground-breaking beer. Thanks, Charlie Papazian, for the article on Bert Grant and the recipe for the Russian imperial stout. I'll surely brew this beer so I can finally try it.

Stephen Magill
Moretown, Vt.

Extract Appreciation

Dear *Zymurgy*,

I found Gary Glass's comments (January/February 2016) related to the latest Q3 shop survey interesting. I agree with him that the appearance of large all-grain homebrewing systems can be intimidating to the newcomer.

Our club here in southern Nevada, SNAFU, always has an extract demonstration when we do brewing demos for National Homebrew Day, Learn to Homebrew Day, and the Boulder City Beer Festival, held every March.

I'm a strong believer that everyone should start brewing with extract to get the procedures down and learn the basic brewing

process along with sanitation procedures. For our demonstrations, I go out with a small, propane-fueled camp stove and my brew pot (my wife frowns on me taking our kitchen stove out to do demonstrations). The purpose of my demonstration is to show how easy brewing beer at home can be.

Usually beside me is one of our other members with a big all-grain system to show just how far you can go in homebrewing. I'm typically finished, with my wort secured in the fermenter, when my fellow all-grain brewer is just starting his boil.

A lot of my fellow homebrewers look down their noses at extract brewing, but even though I now do 3-gallon brew-in-a-bag batches along with extract beers, my best beer was an extract Baltic porter that won a first-place best-of-show ribbon.

Cheers,
Bill Moreland
President, Southern Nevada Ale
Fermenters Union (SNAFU)
Henderson, Nev.

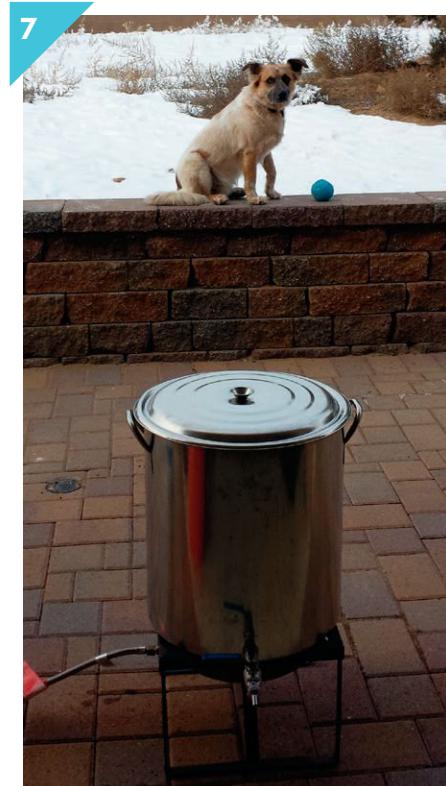
Brew Dogs

Editor's Note: Curious about the proliferation of brew dog/cat/chicken/deer photos and letters in *Dear Zymurgy*? It all started with Diana Davis's article "Brew Dogs" in the September/October 2012 issue of *Zymurgy*. You can find that article in the archives on eZymurgy or on the *Zymurgy* app.

Dear *Zymurgy*,

Here is a picture of our 12-year-old rat terrier Zeke (1). We have only had him since Labor Day 2015, and while I haven't brewed a batch of beer yet, I have made a batch of hard cider with fresh-pressed apples from our local farm stand here in

Brew Dogs



New Hampshire. Zeke was very interested in the cider making process and was generally supervising in the kitchen. I'm sure he will make an exceptional brewing supervisor or brew buddy when the time comes!

Cheers,
Ron Wood
Manchester, N.H.

Dear *Zymurgy*,
This is my brewing partner, Sir Charles (2). He especially loves when Michigan football is playing on a brew day. Go Brew!

Paul Gunnels
Berkley, Mich.

Dear *Zymurgy*,
Here is brew dog Jake (3), at the ready to help out any way he can.

Ian Hurd, Andrew Johnston,
and Sumit Dhar
Evanston, Ill.

Dear *Zymurgy*,
We wanted to share a photo of our first brew day with our daughter Viviana (4). At six weeks old she helped brew a Scottish ale, a pecan Scottish ale, and a chocolate stout—20 gallons in all. She dressed for the occasion in her “assistant brewer” onesie and was joined by “big brother” Porter (4), a retired racing greyhound.

Cheers,
Christy and Dan Agnese
Ithaca Brewers Union 607
Ithaca, N.Y.

Dear *Zymurgy*,
Meet my buddy's brew assistant, Tesla (5) (named after the physicist, not the car). In the picture, she's working hard, helping measure out some grain.

Doug Bellingeri
Abington, Pa.

Dear *Zymurgy*,
Jake (6), a rescued Shar-Pei/yellow Lab mix, has supervised my brew days for many years. He keeps check on the neighborhood and only asks that I pet him now and then. While he has never shown a fondness for anything I brew, he does love the spent grain biscuits Momma makes for him.

Chris P. Frey
Saline, Mich.

Dear *Zymurgy*,
Barley (7) was picked up from the animal shelter here in town last year as a one-year-old. He follows me every time I go in and out while brewing and likes to play catch. He is great for cleaning up spilled grains!

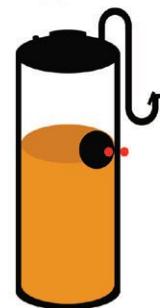
Chris Hjorth
Farmington, N.M.

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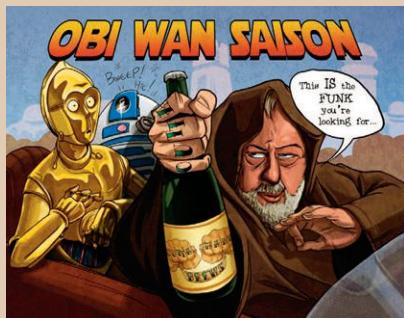
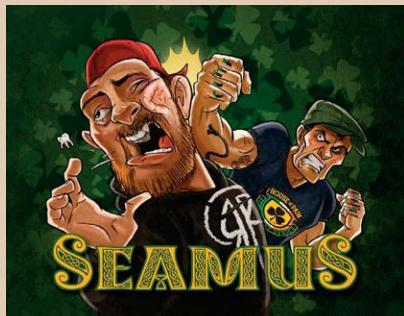
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AT CHECKOUT

READER-SUBMITTED HOMEBREW LABELS



I've brewed with my best friend, Matt, for about the past eight years. We brew at his house and bottle at mine. Our "brewery" is named Outta Hand Brews because we were brewing many 10-percent-ABV beers before they became as common as they are today.

With the help of our friend Alexander, who is an artist, we created a brewery logo based on



tattooed knuckles. We all sit around drinking beers, coming up with recipes, and brainstorming label ideas to go along with them. Then Alex takes our stick figure drawings and turns them into the labels you see here, all of which incorporate our logo.

We brew all-grain on a one-barrel (117 L) system and a custom-made 60-gallon (227 L) mash tun. The rest of our system consists of 55-gallon (208 L) Blichmann units. Below is a photo of Matt with the mash tun and both of us with the boil kettle.

Hope to make it into the magazine. I look forward to seeing all the recipes and brew dog photos in Zymurgy every time I receive it.

Joe Moran

Reading, Pa.



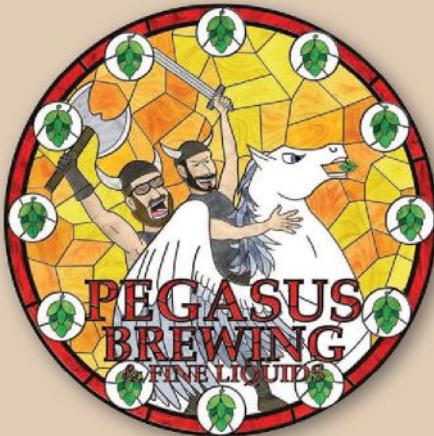


READER-SUBMITTED HOMEBREW LABELS

We are Pegasus Brewing and Fine Liquids, founded by hop heads (we both have Hop Head tattoos) and friends of 20 years. We began brewing in September 2015, brewed a few extract clone recipes to get acquainted with the process, then moved on to all-grain. IPA is our favorite style, but we have also dabbled in hard cider, mead, and



Above: Tom (left) and Patrick Healy
Logo designed by Tony D'Auria



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Tom Marsh Jr. and Patrick Healy
Bridgeport, Conn.

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

Hey homebrewers! If you have a homebrew label that you'd like to submit for the Dear Zymurgy section, send it to magazine art director Jason Smith at jason@brewersassociation.org.



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by Professor Surfeit



When the Count is 3 and 2, How Do You Pitch Lager yeast?

Dear Professor,

A few months ago I received a BrewJacket to conduct in-place lagering without the need for a fermentation chamber. Now I'm ready to do a lager, but I have read and watched a load of material and I'm not sure when to optimally pitch yeast. I recently watched a yeast video starring Jay Montez from Odell Brewing. In the portion regarding lagers, he says that he pitches at 65° F (18° C) for 1 to 2 days, and when fermentation starts, he then lowers the temperature to traditional lagering temps for primary fermentation over the course of 24 hours. Other references say to cool the wort to below 52° F (11° C) then pitch yeast and let it free rise to 52–54° F (11–12° C). Which do you recommend?

Cheers,
Matt Ellis
BADASS Homebrewing Club
Silver Spring, Md.

Hey Matt,

Howdy Do. I agree that there's a lot of information out there and it does get confusing, doesn't it? Everybody has his or her own nuanced system, but you're right about asking, "What the heck...?" I'm going to give you my own homebrewer's perspective after I explain why there may be several methods out there.

Commercial brewers seek to refine the exact characters of their beers, and when they establish those characters, they tweak both their equipment and process to accomplish a desired end: brewing system, fermentation system, brewing technique, packaging, and lots of other things. Any



why they do what they do, but obviously it works. I wouldn't be surprised at all if they haven't experimented with all kinds of regimes of introducing yeast into their wort. After all the "what if..." playing around, they determined that the method you described is the best for what they want in their beer.

So what you want matters. In homebrewing, the possibility of shifts in final beer character due to temperature, ingredients, time, water fluctuation, and variation is just as likely to create nuanced changes in the character of your beer as would pitching regime. But yeast-derived character also depends on what type of beer you want to brew and your own preferences.

If you want to keep it simple, I'd recommend pitching lager yeast at about 70° F (21° C), and when you see signs of visible fermentation atop the brew, get it down to desired temperatures. With my yeast and past success, I aim for about 55° F (12.7° C) for primary fermentation.

The only way to find out what works best is to try both methods. As far as your preferences, what you prefer may vary from style to style. A commercial brewery can justify these kinds of comparative efforts because it can affect sales, stability of beer, customer taste preferences, and so on. As a homebrewer, all your concerns are at another level of concern.

So when the count is full, pitch a fast ball right down the middle and get a strikeout, retire to the dugout, relax, don't worry, and have a homebrew.

Head coach,
The Professor, Hb.D.

More About Prickly Pear Celebrations

Say, Professor,
About those prickly pear spines you've discussed in past issues of *Zymurgy*. You can use a propane torch to get rid of the spines on prickly pear fruit. Just hold the fruit with tongs and barely play the torch over the surface; the spines singe right away without damaging the fruit.

Also, you describe boiling to release the juice. I do that, too. But I've heard people

wondering whether boiling wouldn't tend to produce a haze. It doesn't—interesting reason being that there's no pectin in prickly pear fruit.

Dick Dunn
Very-long-time American Homebrewers Association member
Longmont, Colo.

Right on Dick!

Thanks for the continuing insight (from the 70s when we first met). Great stuff. And I'll



add one more interesting tidbit. I recently interviewed Vinnie and Natalie Cilurzo, co-founders of Russian River Brewing and brewers of Pliny the Elder. Natalie told the story of how Vinnie used to homebrew a lot of self-picked prickly pear cactus beer. Natalie didn't say, but I might imagine that is one of the reasons why she fell in love with Vinnie?

*Spines in beer better than spines in wine,
The Professor, Hb.D.*

More of Prickly the Pear Saga

In the January–February 2016 issue of *Zymurgy*, the professor was mostly correct about how I process the prickly pears. I harvest mine from two secret locations around Halloween, when they are purple and ripe, using tongs to twist them off. I rinse them in a colander, and wearing kitchen gloves, I cut off and discard the top and bottom tips. Next, I slice them into about three half-inch pieces from top to bottom and dry them in an electric food dryer. It usually takes a day, and then I store them in a jar. The prickly pears are then ready to make wine and/or beer. I recently made a prickly pear soda using one ounce per 2-liter pop bottle—it was a little spicy, with a rosé color.

Ralph Bucca
Another very-long-time American Homebrewers Association member
Princess Anne, Md.

*True to form Ralph,
You are a continuing fountain and wealth of information, Ralph. Thanks for your contributions since the early 80s.*

The Professor, Hb.D.

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You're right about potassium sorbate—not a good thing at all for initiating fermentation. Try to find fresh-squeezed juice at stands on country roads. You're unlikely to find apple juice that will ferment and make the best hard cider from the grocery store shelves.

Now about that ascorbic acid. That addition doesn't affect microbiological activity. It's more for inhibiting oxidation (flavor change) and color change. I can't imagine

that they'd be dosing it with amounts that would significantly affect the pH. And as I mention above, sour apples can make some surprisingly great hard cider, I'm told and I've read: much, much better quality than sweet-drinking apple juice.

The Professor, Hb.D.

**Have a question for The Professor?
Send it to professor@brewersassociation.org.**



Ascorbic Acid in Cider

Dear Professor,

I have been trying to prepare hard cider over the past couple years and am having difficulty obtaining cider that contains no preservatives. Now I can only get cider that has been preserved with potassium sorbate or ascorbic acid (vitamin C).

I know that the sorbate will prevent the yeast from doing its work, but I am not sure that vitamin C has the same effect. I asked some of the "beer geeks" at a couple brewing supply shops, and they think that the impact of the vitamin C is a pH problem. They suggest trying to raise the pH to about 4 before pitching the yeast.

I couldn't find this topic in the forum, so I thought to forward the question to you. What should my concern be when my cider supply contains vitamin C as a preservative?

Pete Priniski
Ludington, Mich.

Hiya Pete,

First and before first, I'm no expert of making hard apple cider. But I've read enough to know that aficionados consider tart sour apples to contribute to a much better tasting hard apple cider.

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By Amahl Turczyn

Kuytbier

While there are several ancient beer styles that have been kept alive and are still being brewed today, others have faded from the limelight and are all but forgotten. One such beer, brewed at the end of the Middle Ages, was one of the few of that period that used hops exclusively for bitterness. It enjoyed unprecedented popularity in its time (by some accounts, it was brewed continuously for nearly five centuries) but remains virtually unknown to beer enthusiasts even in our, present day beer renaissance. That beer is kuytbier, and references to its existence, and even its formulation, date back 40 years before Columbus' journey to the New World.

In the early Middle Ages, prior to the now-famous German brewing legislation enacted in 1516, most beer was barley- or wheat-based and bittered with herbs: it was called gruit, or sometimes *gruyt*, *gruth*, or *gruyssbier*. Some historical references claim that kuyt—also called *koyt*, *kuit* (which oddly enough also means “fish eggs” or “spawn” in Dutch), *kewten*, *koite*, or *keute*—was also first brewed with gruit herbs rather than hops. In fact, a popular modern interpretation of the style, Jopen Koyt, is reddish brown in color, derives bitterness from gruit herbs like sweet gale, and runs a hefty 8.5 percent alcohol by volume (ABV). The brewery claims it's made from a Dutch brewing council-regulated statute from 1407.

But while there is certainly historical merit to this claim, most historians agree that kuyt was among the first beers to be brewed exclusively with hops. Modern craft brewers looking to replicate the style—there are relatively few, but hopefully this will change—can now find it in the 2015 Brewers Association (BA) style guidelines.



When the first kuyt was brewed in 15th-century Holland, in Dutch cities like Delft, Gouda, and Haarlem, and even in what is now northern Germany, its sudden popularity caused a bit of controversy. This only increased when it began to find wider markets, with Dutch brewers exporting it to established brewing regions like Brabant and Flanders, and popular demand for it began to outweigh

that of other beers of the time. Some sources claim those two now-Belgian southern provinces of the Netherlands were so outraged by kuyt's popularity that they banned the upstart import; this may even have led to its eventual demise.

Beer bittered exclusively with hops was also being brewed in the city of Cologne as early as 1408. This *hoppebier* or *hoppenbier*

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predated Kolsch, but it must have been very similar to kuyt; in some regions it was made with barley and wheat (though not oats), and the addition of hops stabilized and preserved it better than did gruit's herb additions. In other areas, early hoppenbier actually had a higher proportion of oats to wheat, at a ratio of 80 to 20. Cologne brewers would retain the practice of using hops in their version, flavoring a Pilsner lager and a wheat ale well into the 1900s; they also used hops for the beer that eventually came to be known as Kolsch.

Much of kuyt's popularity came down to ingredients that were fairly easy to come by and that lent themselves quite handily to the (fairly crude by modern standards) brewing process. A typical kuytbier grain bill from 1452 called for three parts wheat, six parts barley, and nine parts oats. The first two grains were already widely used by brewers, but oats, then just as now, were rarely used. However, their inclusion at a generous 50 percent had several advantages.

First, they were relatively cheap: in most areas, oats were considered food for live-

BREWERS ASSOCIATION STYLE GUIDELINES FOR KUYT

Dutch-Style Kuit, Kuyt or Koyt

Dutch-Style Kuit, Kuyt or Koyt is a gold- to copper-colored ale. Chill haze and other haze are allowable. The overall aroma character of this beer is grain emphasized with a grainy-bready accent. Hop aroma is very low to low from noble hops or other traditional European varieties. The distinctive character comes from use of minimum 45% oat malt, minimum 20% wheat malt, and the remainder pale malt. Hop flavor is very low to low from noble or other traditional European varieties. Hop bitterness is medium-low to medium in perceived intensity. Esters may be present at low levels. Very low levels of diacetyl are acceptable. Acidity and sweet corn-like DMS (dimethyl sulfide) should not be perceived. This style of beer was popular in the Netherlands from 1400–1550. Body is low to medium. Original Gravity (Plato) 1.050–1.080 (12.4–19.3) • Apparent Extract/Final Gravity (Plato) 1.006–1.015 (1.5–3.7) • Alcohol by Weight (Volume) 3.8%–6.3% (4.7%–7.9%) • Bitterness (IBU) 25–35 • Color SRM (EBC) 5–12.5 (10–25)

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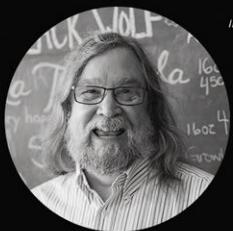


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- **Denny Conn**
Author of *Experimental Homebrewing*



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stock. Barley for brewing was expensive, and wheat, a grain the ruling class preferred to reserve for bread-making, even more so. Oats, indigenous to Europe, were hardy, demanded less fertilizer than other grains, and improved the soil in which they were grown. Second, they added a pleasing body and sweetness to beer, making it seem more substantial and nutritious than beer made from other grains. Third, oats had quite a bit more husk material than barley, so unlike wheat, they aided rather than hindered filtration in the mash.

Sadly, there are few craft breweries today making a version of this historically important beer style. Understandably, most of them are in Holland, among them Witte Klavervier in Zwolle, Huisbrouwerij Klein Duimpje in Hillegom, Ramsesbier in Wagenberg, and Leidsche Bierbrouwerij in Leiden.

In North America, Ashburn, Va.'s Lost Rhino Brewing makes its 5.2 percent ABV, 30 IBU Bommekyn Kuit with Pilsner, wheat, and Virginia malted oats, and hops it with Czech Saaz and Goldings. Portland, Ore.'s Hopworks Urban Brewery brewed a limited-edition collaboration beer with Ramses Snoeij of the Dutch craft brewery Ramsesbier called Go Fly A Kuyt. It was modeled after Ramsesbier's Kuiter but brewed with Oregon ingredients and organic malts.

The Campaign for Netherlands Beer Styles has since declared that the Brewers Association's style guidelines for kuyt are accurate, so a mid-weight, hopped kuyt will be our focus here. Brewing a kuyt at home is well within reach of the average homebrewer, but one of the first challenges will be sourcing malted oats. Oats are making something of a comeback to the brewing world, but they remain somewhat difficult to find.

There is one possible historical reason for their scarcity. Before the 19th century when kuyt was probably the most commonly consumed beer in the Netherlands and surrounding areas, there were oat varieties grown specifically for malting. But as agriculture developed, demand for crops, ploughs, and draft horses increased. Farmers needed oats for their horses and

Kuytus Interruptus

INGREDIENTS

for 5.5 gallons (20.82 L)

4.5 lb	(2.04 kg) malted oats (49.3%)
2.25 lb	(1.02 kg) wheat malt (24.7%)
2.25 lb	(1.02 kg) pale malt (24.7%)
2 oz	(57 g) unmalted spelt (1.4%)
1.5 oz	(42 g) East Kent Golding pellets, 5% a.a. (FWH, 120 min)
1 oz	(28 g) East Kent Golding pellets, 5% a.a. (10 min)
1 oz	(28 g) East Kent Golding pellets, 5% a.a. (dry, 3 days)
Kölsch, Belgian Ardennes, or East Coast Ale yeast (1 L starter)	
Reverse osmosis water treated with 1–2 g/gallon calcium chloride	

Original Gravity: 1.045 (11.25° P)

Final Gravity: 1.010 (2.5° P)

IBUs: 37

SRM: 2.5

ABV: 4.5%

Boil Time: 120 minutes

Assumed Brewhouse Efficiency: 72%

DIRECTIONS

Mash in for a beta-glucan rest at 113° F (45° C) for 20 minutes. Raise mash to 143° F (62° C) and hold 30 minutes. Raise mash again to 161° F (72° C) and hold another 30 minutes. Mash out at 172° F (78° C) for 10 minutes. Sparge and begin boil. Boil time is 120 minutes; add first wort hops just before wort boils. Chill, oxygenate, and run into a sanitized fermenter. Pitch yeast starter at 70° F (21° C). When fermentation is finished, dry hop for three days. Cellar an additional two weeks before serving.

EXTRACT VERSION

Due to the lack of oat malt extract, an extract version is not recommended.

were willing to pay more than brewers could, so oat supplies were diverted from breweries to livestock. No seed banks existed to preserve the specific malting variety, so as kuyt malted oats were used up, methods of re-seeding these varieties were eventually lost.

Barley malt producers eventually began to malt oats again, but thanks in part to the Reinheitsgebot (see page 50 for more), oat beers have been slow to recover from generations of scorn at the hands of brewers. Happily, though, the situation is starting to improve. Today, Thomas Fawcett and Sons from the United Kingdom produces excellent malted oats, which run about 4° L and contribute a golden, nutty-grainy flavor and a thick, oily mouthfeel. Simpsons Golden Naked Oats, a favorite among craft and amateur brewers, are

lovely in quantities of up to 15 percent of a malt bill. But as a huskless form of 10° L crystal malt, they shouldn't be included at the higher percentages needed to brew kuyt.

Oat kernels look much different from malted barley: long and golden, with narrow, striated husks. They're so narrow, in fact, that you may need to adjust your grain mill and run the oat malt through twice. Mills tend to squash the malt kernels flat rather than crush them; this is fine as long as the starchy center is exposed. Husk material is particularly important because it allows the resulting glucan-rich wort to run easily through the lauter. Without it, you'll be quite literally stuck.

When selecting malted oats, make sure to use your nose as well as your eyes; oat

malt's high lipid content makes it particularly prone to spoilage, and rancid oats make poor beer, kuyt or otherwise.

An oat-heavy grain bill needs special treatment in the mash. Oat malt is high in diastatic power—on par with 6-row, in fact—so conversion should not be a problem. However, this is not a beer that can be infusion mashed at a single temperature; doing so will result in a thick, turbid, under-attenuated mess. Fortunately, a group of researchers looking to find a 100 percent malted oat beer that might satisfy sufferers of celiac disease (oats are tolerated much better than wheat or barley by the gluten-sensitive) have developed a mash regime that is well-suited to oat malt.¹ Following their lead, we can produce a relatively clean, clear brew with excellent head retention, full but not cloying mouthfeel, and decent fermentability. Lipids, proteins, and beta-glucans must all be taken into account, as oat malt is rich in all of them.

Doughing in at 113° F (45° C) activates protease, maximizes free amino nitrogen (FAN) and reduces beta-glucan viscosity. Next comes a beta-amylase saccharification rest at 143° F (62° C) to enhance fermentability. Then comes the alpha-amylase optimum temperature of 161° F (72° C) to finish off saccharification. Finally, a quick mash-out at 172° F (78° C) lowers wort viscosity and heats the mash to prepare for sparging. Because of the large temperature range from dough-in to mash-out, it will be challenging to use infusions of water to hit each step accurately: direct heat, steam, or even decoctions work better. Once you get there, however, the wort should be relatively clear (though some remaining turbidity might be unavoidable) and the flow through the lauter tun should move fairly quickly, thanks to all that oat husk material.

There is evidence that hop varieties native to the Netherlands and grown exclusively for kuyt once existed but were lost when kuyt fell out of fashion. Similar varieties that are still available include East Kent Goldings, Hallertau Mittelfrüh, Saaz, Tettnang, and Spalt. Oat-malt-heavy beers often take on a

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fruity character, particularly a berry flavor and aroma, and kuyt tends to be a somewhat grain-, bread- and fruit-scented beer. East Kent Goldings, with their orange marmalade character, complement this rather well. Hop bitterness also takes well to the slick, full oat malt base of the beer, and this recipe just slightly exceeds the BA's upper limit of 35 IBUs, though it isn't quite as hoppy as the 42 IBU Go Fly A Kuyt. The long boil time in conjunction with first-wort hopping tends to create a smooth, clean hop bitterness in the background, and late additions provide bright, floral hop aromatics up front.

As for yeast, White Labs WLP029 German Ale/Kölsch produces a clean, dry kuyt beer with attenuation around 72–78 percent. Some kuyt brewers claim Wyeast 3522 Belgian Ardennes is one of the best strains to use with this style, as it produces delicate fruit esters, subtle spice, and honey notes, all of which complement the bready, grainy, berry-like oat character. It attenuates 72–76 percent. The WLP008 East Coast Ale strain is fairly neutral and attenuates almost as well as Kölsch yeast (70–75 percent). Strong ester or phenol producers like Bavarian wheat beer strains are not recommended; they will overpower the delicacy of the beer, and you'll end up with an oatweizen. Note that a 70° F (21° C) fermentation temperature is called for here; if using a Kölsch yeast, a lower temperature (65° F, 18° C) would be better.

Water should be moderately soft, carbon filtered, preferably reverse osmosis filtered, with 1–2 grams of calcium chloride per gallon to favor the maltiness of the brew. Have fun brewing this ancient, rustic relic, and pay your respect to the humble oat. It's not just for horses.

Resources

1. Klose, Christina, Alexander Mauch, Sascha Wunderlich, Frithjof Thiele, Martin Zarnkow, Fritz Jacob, and Elke K. Arendt. "Brewing with 100% Oat Malt." *Journal of the Institute of Brewing* 117, no. 3 (2011): 411–21.

Amahl Turczyn is associate editor of *Zymurgy*.

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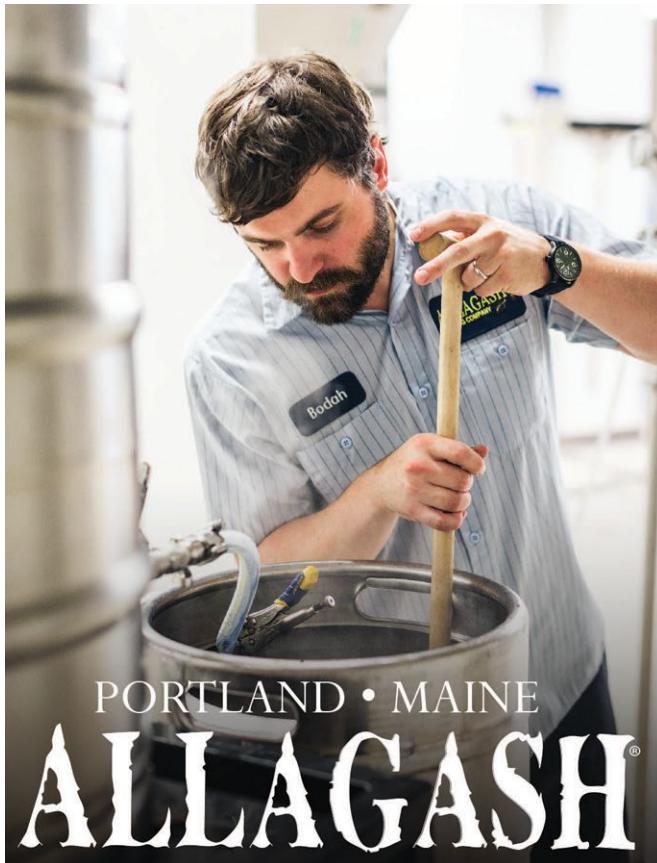


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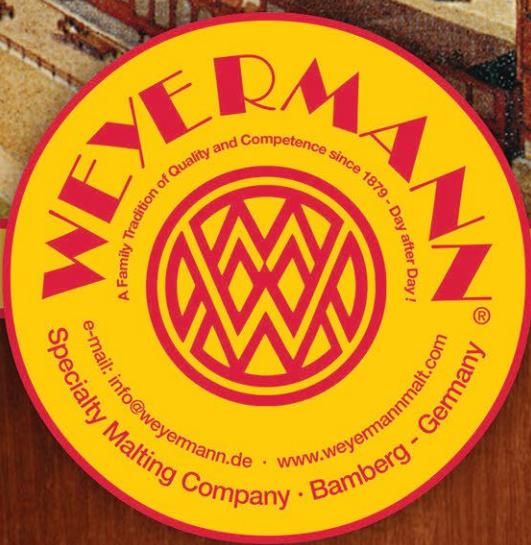
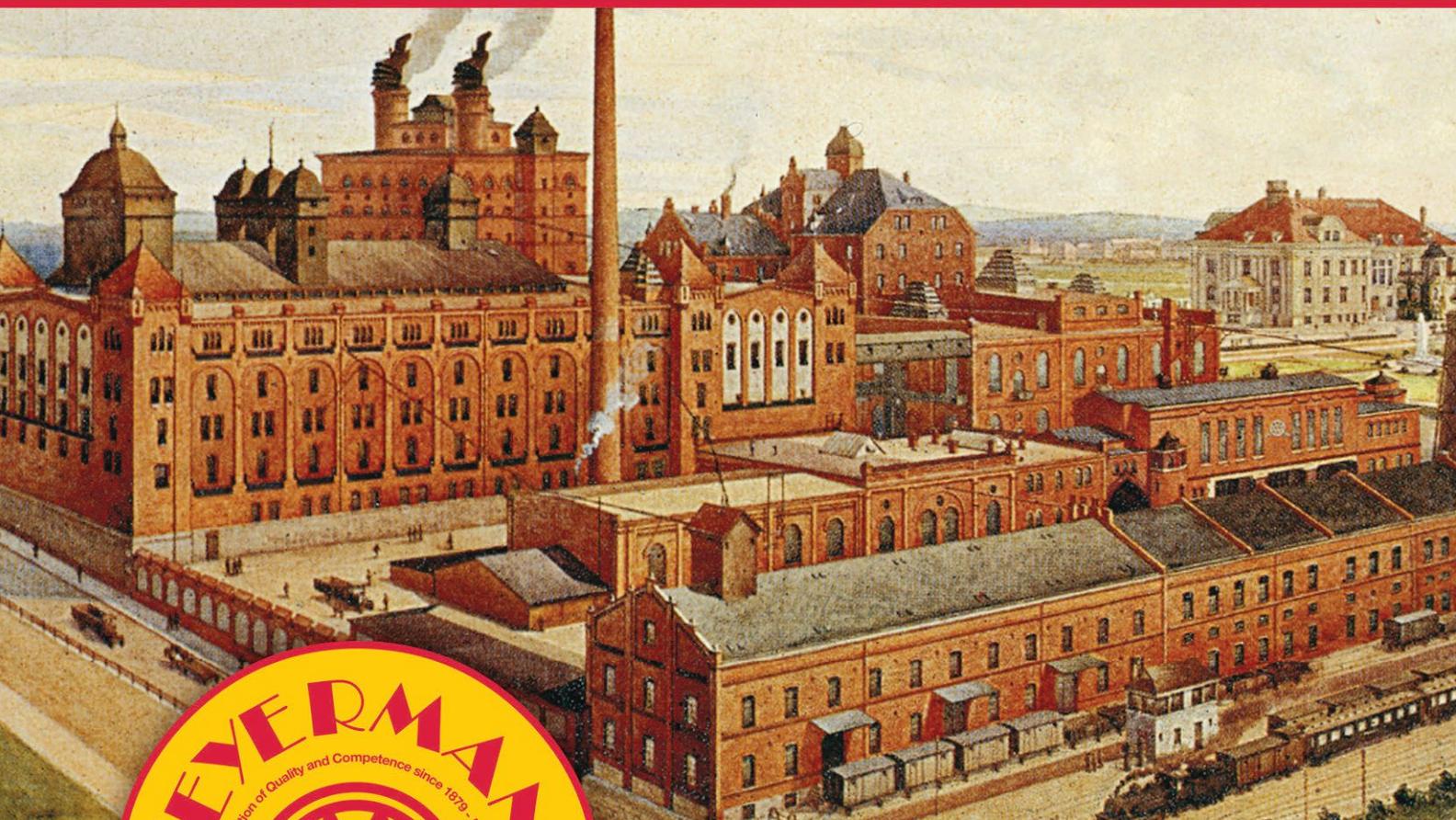
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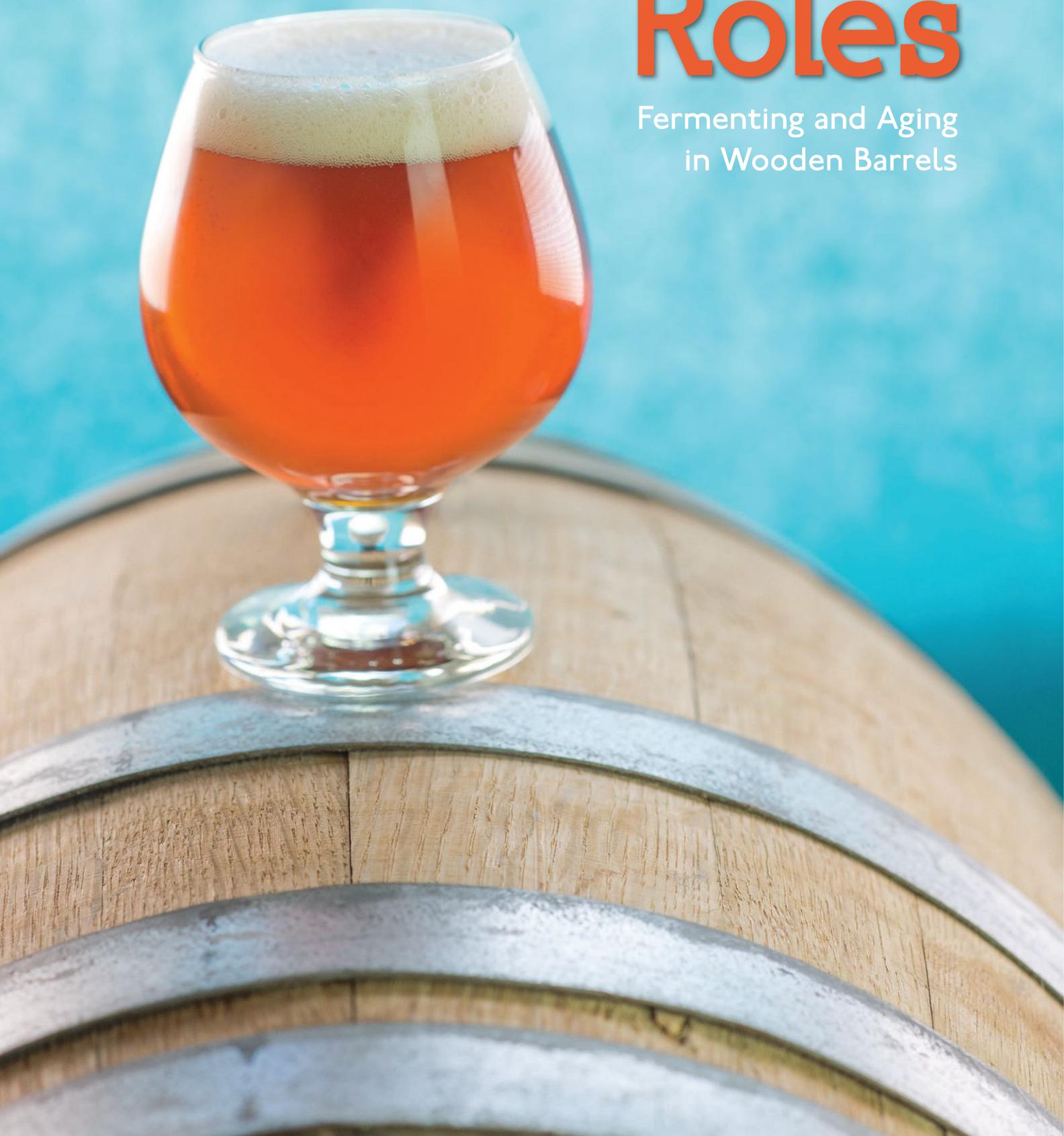


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I'm happy to say that I've built a successful barrel program in my basement. With a little know-how and a lot of patience, so can you.

By Karl Hagglund

I first tasted traditional lambic at a Beer Judge Certification Program (BJCP) training course in Cincinnati in 2005. The beer, a blend from Hanssens Artisanaal, wowed me with its low carbonation, bracing tartness, and fruity complexity. Some attendees didn't finish their small pours, but I was one of the few who asked for seconds.

My interest in sour beer had been piqued, and I was determined to create my own lambic-inspired ales at home. I started thinking about using wooden barrels for fermentation and aging, and seven years later, I'm happy to say that I've built a successful barrel program in my basement. With a little know-how and a lot of patience, so can you.

Sourcing, Preparing, and Maintaining Barrels

When I first got started, small oak barrels of 5 to 10 gallons (19-38 L) were available from homebrew retailers—for a price. But patience paid off, and I eventually found an affordable 10-gallon oak barrel that had been used as part of a display at my local homebrew store. Within a few months, I had purchased two more, and in my current collection of five, I make a variety of wood-aged beers, spirit barrel-aged ales, and barrel-fermented sours.

New barrels are not watertight. Sometimes you can reseal a leaky barrel by filling it with water and allowing the staves to swell, but when I put the garden hose into my first barrel, water flowed out as quickly as



it went in, with leaks visible between multiple staves. Undeterred, I measured the barrel, made a trip to the big box store, and brought home a large plastic tub. I filled the tub with water and submerged the barrel for three or four days, after which time it became watertight once again. If the barrel still leaks at this point, your only remaining recourse is to try tightening its hoops by tapping them toward the barrel's center with a mallet.

Once watertight, barrels need some basic cleaning and sanitation initially and between batches of beer. Once emptied, I rinse the barrel with clean water. Next, I clean the interior using a solution of 2 tablespoons washing soda (sodium carbonate) per gallon of warm water (0.5 ml per liter), followed by

another rinse with warm water. After this, if I don't have another beer going straight into the barrel, I fill it with a mixture of water and a weak, food-grade acid, approximately 6 ounces (170 g) of citric acid powder in 10 gallons (38 L) of water, plus 2 to 4 tablespoons of potassium metabisulfite per gallon (0.5 to 1.0 ml per liter) to keep contaminants at bay. I find that this treatment keeps barrels in good condition.

I use this cleaning and sanitation regimen even when using an oak barrel as a primary fermenter. Although I frequently re-pitch fresh wort on top of a yeast cake for my standard beers, I have found that doing so in a wooden barrel can lead to head retention issues as soon as the second batch. It is therefore best to clean the barrel between batches when fermenting in wood.

Adding Oak Barrel Character to Clean Beers

When I first started working with barrels, the extreme beer movement was well underway, and imperial and double IPAs had become commonplace. So, despite the pressures of the hop crisis at the time, I decided that an imperial IPA would be a good candidate for my first barrel-aging project. I started tasting it after two weeks in the wood, and two weeks later (one month total), it was ready for packaging.

Around the same time, I filled a second barrel with a lower-gravity oatmeal stout and left it for about six weeks. I entered both beers in homebrew competitions and was anxious for feedback. Both performed well, earning first-place awards at the Schooner Homebrew Competition and Ohio Brew Week in 2008.

Significantly, the judges used the term "bourbon" and "bourbon barrel" extensively in their comments. I was even advised to put less bourbon in future batches of the beer. I thus discovered that the character of a new oak barrel is similar to that of bourbon, which makes sense since bourbon must, by law, be aged in new oak barrels. The beers tasted great, scored well in competitions, and helped draw some of the strongest oak character out of the barrels.

I noticed lower levels of oak with each subsequent batch, and more aging time

Barrel-Aged Imperial India Pale Ale

INGREDIENTS

for 11 gallons (41.64 L)

21.25 lb	(9.64 kg) 2-row pale malt (61.1%)
3 lb	(1.36 kg) Maris Otter pale malt (23%)
1 lb	(0.45 kg) wheat malt (2.9%)
1 lb	(0.45 kg) 80° L crystal malt (2.9%)
0.5 lb	(227 g) 20° L crystal malt (1.4%)
3 lb	(1.36 kg) cane sugar, boil 15 min. (8.6%)
3 oz	(85 g) Yakima Magnum, 13.1% a.a. (60 min)
0.5 oz	(14 g) Columbus 14.2% a.a. (30 min)
0.5 oz	(14 g) New Zealand Cascade 8.5% a.a. (30 min)
1 oz	(28 g) Centennial 10.5% a.a. (30 min)
0.5 oz	(14 g) Columbus 14.2% a.a. (15 min)
0.5 oz	(14 g) New Zealand Cascade 8.5% a.a. (15 min)
1 oz	(28 g) Centennial 10.5% a.a. (15 min)
0.5 oz	(14 g) New Zealand Cascade 8.5% a.a. (0 min)
0.5 oz	(14 g) Columbus 14.2% a.a. (0 min)
1 oz	(28 g) Centennial 10.5% a.a. (0 min)
0.5 oz	(14 g) New Zealand Cascade 8.5% a.a. (dry hop)
0.5 oz	(14 g) Columbus 14.2% a.a. (dry hop)
1 oz	(28 g) Centennial 10.5% a.a. (dry hop)

American Ale/California Ale/Chico yeast

Original Gravity: 1.086

IBUs: about 100

SRM: 8

ABV: 9.6

Boil Time: 90 minutes

Total Efficiency: 83%

DIRECTIONS

Single infusion mash at 150° F (66° C). Sparge using 170° F (77° C) water to collect approximately 14 gallons (53 L) in the kettle. Collect 11-12 gallons (41.64-45.42 L) after a 90-minute boil, adding cane sugar 15 minutes before flameout. Ferment at optimum temperature for chosen strain until yeast drops. Carefully rack into clean, medium-toast American oak barrel. Allow two weeks aging and then begin tasting either weekly or bi-weekly until desired level of oak is achieved. Keg or bottle as usual.

PARTIAL MASH VERSION

Substitute 20.5 lb extra pale malt extract syrup for 2-row and Maris Otter malts. Mash wheat malt with caramel malts at 155° F (68° C) for 45 minutes. Drain, rinse grains, and dissolve extract thoroughly with reverse osmosis or distilled water. Top up to desired boil volume and boil 60 minutes, adding hops as directed; add cane sugar 15 minutes before the end of the boil. Color of extract version may be darker than all-grain depending upon kettle caramelization.

was needed to pick up significant wood character. On average, each new oak barrel yielded about three batches of clean, wood-aged beer before it started to lend noticeable tartness to the beer it held, a sign that wild yeasts and souring bacteria had taken hold. Thus, after several rounds of aging and cleaning, the barrels became more suitable for long-term aging of lambic-style ales than for clean beers.

Fermenting Belgian-Style Sour Ales

Traditional lambic is aged for at least one year, but some examples can spend as long as three years in the barrel before bottling. The time and patience involved in making these styles are tremendous, and long fermentations in wood have issues not typically seen with clean-fermented beers. I have had to adapt my barrel aging

techniques to adjust for extended fermentations, the unpredictability of sour beers, and issues like evaporation.

My technique for fermenting sour beers is a two-stage process. I start with a clean-fermenting, relatively neutral Belgian yeast strain like Wyeast 3942 Belgian Wheat for one or two weeks. Then, after primary fermentation, I rack the beer off the yeast cake and into a wooden barrel for the long, bacterial secondary fermentation. During these ensuing months, barrels tend to lose volume to evaporation, so I have found it useful to brew a smaller batch of “makeup beer” for topping them up as necessary.

I created my first batch of Flanders-red-style ale quickly and without a hitch. My recipe was specifically designed to provide yeasts and bacteria with a variety of longer-chain sugars during fermentation, while still leaving a distinctive background sweetness. In under a year, my Flanders-inspired beer had all of the tart “cherry pie” and vanilla aromas expected of the style.



Pear brandy barrel.

My second attempt went straight into the barrel following the first, and things didn't go quite as smoothly. It went through a phase in which buttery diacetyl was clearly present, and it was then that I learned that blends of yeast and bacteria can get out of balance. Cultures that contain Pediococcus can develop appreciable diacetyl, which is eventually broken down by Brettanomyces. But it takes time.

I now clean and sanitize my barrel completely before starting a new batch of Flanders-red-style ale. This better maintains the balance of microbes provided by the yeast supplier.

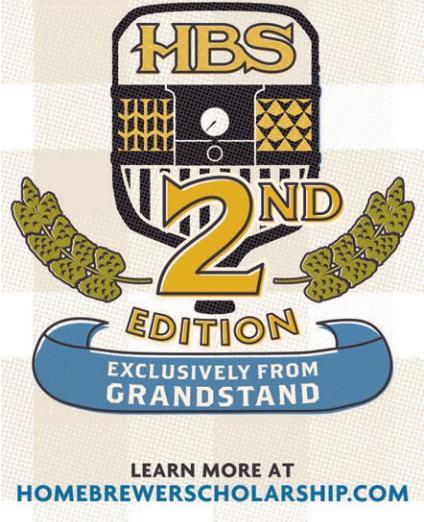
Aging in Spirits Barrels

The most recent additions to my barrel collection are 8- and 10-gallon (30 and 38 L) brandy barrels that I obtained from a local craft distillery. I have used the larger of the two for post-fermentation aging. The first couple of batches came out clean and displayed a distinct brandy character, but that faded soon thereafter.

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Base Lambic-Style Ale

INGREDIENTS

for 11 gallons (41.64 L)

15 lb	(6.8 kg) Pilsner malt (68.2%)
7 lb	(3.18 kg) white bulgur wheat (31.2%)
3.2 oz	(92 g) aged hops (60 min)
	Wyeast 3942 Belgian Wheat yeast (primary)
	Wyeast 3278 Lambic Blend (barrel)

Original Gravity: 1.050

IBUs: 0

SRM: 3.5

Boil Time: 60 minutes

Total Efficiency: 68%

DIRECTIONS

Mash in Pilsner malt only at 130° F (54° C). While this is mashing, bring approximately 8-10 quarts (7.6-9.5 L) water to a boil and add the bulgur wheat. Boil for 10 minutes, stirring, and then add to the Pilsner malt to bring the main mash temperature up to 155° F (68° C) and hold for 60 minutes. Mash out with 170° F (77° C) water to a kettle volume of 13 gallons (49.21 L) and bring to a boil. Add aged hops, boiling for 60 minutes. Complete primary fermentation in "clean" fermenter using the Wyeast Belgian Wheat yeast. After one week, rack to wooden barrel, adding the Lambic Blend. Age at least one year.

EXTRACT VERSION

Note: An extract version of lambic has a few caveats, the most critical of which is that there is no extract equivalent of unmalted wheat. We can use malted wheat extract, however, and try to compensate for the raw wheat with further additions. (Wheat malt extracts are typically blends: 35% barley malt and 65% wheat malt. So half Pilsner extract and half wheat malt extract blend should result in roughly 35% wheat.) The reason lambic brewers include unmalted wheat in the mash is to produce dextrins, complex sugars and starches to augment converted starches from the Pilsner malt's amylase; the extra raw wheat residues provide food for souring bacteria when the yeast has finished scavenging simple sugars. We can partially compensate by using dextrin malt, or Steve Piatz's trick of adding a small percentage of maltodextrin. That isn't a complete substitute for raw wheat in the mash though, as it doesn't provide soluble starch. So, adding 2 oz (57 g) cornstarch or wheat flour to the wort pre-boil can provide food for souring bacteria in the lambic blend (particularly for *Pediococcus*) during the long barrel-aging period. The second caveat, color, is typical of extract conversions. The use of Pilsner extract helps a bit, but your extract lambic may be darker than the all-grain version.

That said, here's the conversion.

Substitute 7.5 lb (3.4 kg) Pilsner malt extract syrup and 7.5 lb (3.4 kg) wheat malt extract syrup for the Pilsner malt and bulgur wheat. Add 8 oz (227 g) maltodextrin and 2 oz (57 g) wheat flour (optional), dilute with reverse osmosis or distilled water to desired boil volume and proceed with boil as above.

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Flanders Red Ale

(Based on Brian St. Clair's recipe)

INGREDIENTS

for 11 gallons (41.64 L)

10 lb	(4.54 kg) Vienna malt (49.6%)
3 lb	(1.36 kg) flaked corn (14.9%)
2 lb	(0.9 kg) caramel Vienna malt (9.9%)
2 lb	(0.9 kg) dextrin malt (9.9%)
2 lb	(0.9 kg) Munich malt (9.9%)
1 lb	(0.45 kg) Special B malt (5%)
2.9 oz	(82 g) Weyermann Carafera Special (0.9%)
2 oz	(57 g) Saphir 3.5% a.a. (60 min)

Wyeast 3942 Belgian Wheat yeast (primary)

Wyeast 3763 Roeselare Blend (barrel)

Original Gravity: 1.054

IBUs: 15

SRM: 16

Boil Time: 60 minutes

Total Efficiency: 83%

DIRECTIONS

Single infusion mash at 150° F (66° C). Sparge with 170° F (77° C) water to collect 13 gallons (49.2 L) in the brew kettle. Boil 60 minutes, chill, and rack to "clean" fermenter for one week. After primary, rack to barrel and age one year or until the style's distinct character develops.

PARTIAL EXTRACT VERSION

Note: This partial extract version still requires that you mash nearly 10 lb (4.54 kg) of grain. Make sure you have the mash capacity and are willing to do a mini-lauter as well as a one-hour mini-mash before attempting this recipe!

Substitute 7 lb (3.18 kg) CBW Goldpils Vienna malt extract syrup for Vienna malt and 1.7 lb (318 g) Munich malt extract syrup for Munich malt. Mash flaked corn, caramel Vienna, dextrin malt, Special B, and Carafera with 1.75 lb (0.79 kg) pale 6-row malt at 155° F (68° F) for one hour. Drain, lauter with 170° F (77° C) reverse osmosis or distilled water to desired boil volume, dissolve extracts completely, and proceed as above.

Through careful cleaning and preparation, I have been able to re-use my barrels continuously. I encourage you to give it a try!

The third batch exhibited some distinct tartness after the first couple of months.

My smaller spirits barrel is made of chestnut and had been used to age a pear brandy for more than two years before I acquired it. The character of the wood is nuttier than oak and does not have oak's signature vanilla notes. While the wood and spirits are clearly present in the light blond ale I am currently aging, the chestnut barrel lends soft, nutty overtones and a clear pear character. I am pleased at how the light, nutty barrel character has developed in this beer during its first couple of months of aging.

My limited experience with spirits barrels suggests that they can be used initially for strong beer with good results. Aging does not necessarily have to last more than one or two months at first because the barrel imparts oak and spirits character rather quickly. A second batch can again pick up good oak character with minimal development of sour characteristics. Non-oak barrels like chestnut have distinctive characteristics and may be more amenable to lighter styles of beer and different lengths of aging.

ent from fermenting in any other vessel. However, relative to its volume, a 10-gallon (38 L) barrel has more surface area in contact with its contents than does a large foudre, which means that oak character develops more quickly in a small barrel than it does in a large one. So when using a small barrel, it's a good idea to sample your beer frequently to prevent over-oaking it.

That said, I have learned that I don't need to taste samples from my sour barrels that often. Some go months between tastings. When I do taste, I don't worry about damaging the pellicle that forms on top of the beer. In a bar-

Tips for Using Barrels in Your Home Brewery

Fermenting 10 to 12 gallons (30-45.4 L) of beer in oak is not all that differ-

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rel, you don't really see it unless you're looking, and it usually closes up after you remove the thief or siphon hose. I do, however, keep an eye on the liquid level and try to top up with fresh beer whenever possible to prevent excessive oxidation. When I taste my beers and realize that they have reached the point I want, it is time to package.

Fruit additions

Having tried syrups, concentrated juices, and fresh and frozen fruit, I can say unequivocally that I am not a fan of syrups. These tend to produce an almost medicinal character and don't deliver the same richness as either whole fruit or concentrated fruit juice. I have learned that the more fruit you add, the richer the flavor and color will be in the finished product. My two most recent successful batches included two pounds per gallon (240 g per L) of whole, un-pitted sour cherries and one-half gallon (1.9 L) of concentrated raspberry juice in a 10-gallon (38-L) batch.

Packaging

I have kegged and bottle-conditioned my sour ales, and I believe that re-fermentation in the bottle produces a superior beer. My experience has shown me that some of the distinctive "barnyard" and "horsey" characteristics of the famous gueuze and lambic beers seem to develop during bottle re-fermentation. After noticing this, I switched to bottling all of my Belgian-style sour beers.

Summary

My barrel experiments have occupied much of the last seven years and have proven quite rewarding. I continue working on a variety of wood-aged and sour ferments using oak barrels, and through careful cleaning and preparation, I have been able to re-use my barrels continuously. Looking ahead, I am always keeping my eyes open for another bargain, and I hope to continue expanding my basement barrel program in the years to come. I encourage you to give it a try!

Karl Hagglund is an avid homebrewer from Mundelein, Ill. He has been using small barrels for fermentation since 2008.

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CAN ALE YEAST YIELD GREAT MEAD?





A tasting panel of six meadmakers and judges from San Diego and the greater Southern California region evaluated each of the meads.

By Billy Beltz

Growing numbers of people are discovering mead, an ancient beverage that creative commercial and home meadmakers continue to reinvent today. But unlike beer brewers and winemakers, who benefit from a wealth of documented research, meadmakers often encounter large gaps in the data concerning ingredient selection and other factors.

To compensate, meadmakers explore the boundaries of traditional methods through experimentation, a process that can be as frustrating as it is exciting.

Yeast selection is a great example. It is common for meadmakers to rely almost exclusively on wine yeasts for fermentation, but recent experiments by commercial and home meadmakers have demon-

strated that ale yeasts can provide unique aroma and flavor profiles with shorter aging requirements. Unfortunately, the results of these ale yeast trials have been insufficiently documented.

Thus, I designed an experiment to investigate relationships between mead must and ale yeast, and to document the results for the benefit of other mead enthusiasts.

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Author Billy Beltz pours samples of mead made with various ale yeasts.

Project Goals

The purposes of this experiment were to evaluate the advantages and disadvantages of using various ale yeasts to ferment mead, and to offer data to meadmakers who might be considering ale yeast. My experiment included one wine strain as a point of comparison, but my intent was not to compare the relative merits of meads fermented with ale yeasts and wine yeasts. And although mead made with ale yeast might benefit from comparatively less aging time, I specifically wanted to evaluate young examples.

I also wanted to determine how each yeast strain would perform with more than one varietal of honey. Thus, I made two batches of mead must: one with orange blossom honey and another with desert wildflower honey from floral sources like sage, buckwheat, and alfalfa. Both honey varietals were sourced in San Diego. Due to space limitations, the meads were fermented in two sequential batches, each with one kind of honey and nine different yeasts.

Yeast Selection

I had previously experimented with different ale yeasts for mead and attained a wide range of aroma and flavor profiles. The yeasts that delivered the most consistent results were included in this experiment. Additionally, efforts by Bray Denard, PhD, had produced useful data on the use of Wyeast 1388 for mead, so I included that strain as well. The full list of yeast strains included:

- White Labs WLP001: California Ale Yeast
- White Labs WLP002: English Ale Yeast
- White Labs WLP004: Irish Ale Yeast
- White Labs WLP007: Dry English Ale Yeast

- White Labs WLP545: Belgian Strong Ale Yeast
- Wyeast 1388: Belgian Strong Ale
- White Labs WLP028: Edinburgh Scottish Ale Yeast
- White Labs WLP500: Monastery Ale Yeast
- Wyeast 3711: French Saison
- White Labs WLP041: Pacific Ale Yeast
- White Labs WLP300: Hefeweizen Ale Yeast

Lalvin 71B-1122, a popular dry wine yeast among commercial and home mead-

makers, served as the control yeast. Apart from this strain, all of the yeasts were liquid cultures.

Must Preparation and Fermentation

The orange blossom mead was prepared seven weeks before the desert wildflower batch, but must preparation and fermentation were otherwise identical for both. For each batch, I mixed honey with bottled spring water in two 5-gallon (19 L) glass carboys to yield 9 gallons (34 L) of must with uni-



Table 1: Gravity Readings

Yeast Strain	Starting Gravity (Orange Blossom)	Final Gravity	Starting Gravity (Wildflower)	Final Gravity
WLP001	1.095	1.002	1.105	1.006
WLP002	1.095	0.998	1.105	1.005
WLP004	1.095	1.000	1.105	1.008
WLP007	1.095	0.996	1.105	1.003
WLP545	1.095	0.998	1.105	1.002
Wyeast 1388	1.095	0.999	1.105	1.006
WLP028	1.095	0.996	N/A	N/A
WLP500	1.095	0.995	N/A	N/A
Wyeast 3711	1.095	0.996	N/A	N/A
WLP041	N/A	N/A	1.105	1.006
WLP300	N/A	N/A	1.105	1.002
 Lalvin 71B	N/A	N/A	1.105	1.004

form specific gravity. The resulting must was then divided among nine 1-gallon (3.8 L) carboys before the different yeasts were pitched in each one. Doing this for each honey varietal provided 18 total meads for evaluation.

The first batch, the orange blossom honey mead, was fermented with nine different ale yeasts. I selected six of those yeasts for the desert wildflower mead, as well as two additional ale strains and the wine yeast. Starters are usually recommended for liquid yeasts to ensure healthy yeast populations and correct pitching rates, but that would have been impractical for this experiment. Thus, yeasts were pitched directly from packets and vials into the musts.

I used a staggered nutrient addition (SNA) regimen that involved a mix of Fermaid O, Fermaid K, and diammonium phos-

phate (DAP) totaling 350 parts per million of yeast-assimilable nitrogen (YAN). The nutrients were added in four stages: prior to pitching yeast, 24 hours after pitching, 48 hours after pitching, and 72 hours after pitching.

All meads were fermented in a temperature-controlled chest freezer set at a constant 66 to 68° F (19 to 20° C). Mead requires regular degassing during the first part of fermentation in order to release CO₂ trapped in the must, so I vigorously aerated each sample by shaking the carboys twice a day for the first five days. Also, as is common practice among meadmakers, I did not add water to the airlocks until after the final nutrient addition on day four. All meads completed fermentation in 14 to 21 days. Starting and final gravities are listed in Table 1.

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Table 2:
Tasting Notes

Yeast Strain	Petar Bakulic
WLP001	<p>OB: Honey aroma is distinct, floral, fruity, citric, slight petrol character. Floral honey flavor in the finish.</p> <p>WF: Raw honey in the nose. Some fruity character, quince and citrus. Unfermented honey flavor; not hot, more balanced than some others.</p>
WLP002	<p>OB: Yeasty and somewhat astringent, honey and flowers in the nose, honey character on retro-nasal.</p> <p>WF: Floral notes, honey aroma, yeasty and fruity like apple, pear, and peach. Smooth with less alcohol bite than others. Balanced, develops well along the palate.</p> <p>Favorite (WF)</p>
WLP004	<p>OB: Yeasty, estery, petrol, chalk, alcoholic. Citrus, sandalwood, dry, thin, bready, musty.</p> <p>WF: Soft floral notes, apple and quince, estery, some tropical notes. Citric flavor, honey character is distinct. Good balance.</p> <p>Least Favorite (OB)</p>
WLP007	<p>OB: Faint floral notes, honey aroma, alcohol, mineral, somewhat hot. No sweetness of note, some acid.</p> <p>WF: Honey aroma pronounced, floral character, apple, fruity, sweet aroma profile. Candy. Round mouthfeel, warming.</p> <p>Least Favorite (WF)</p>
WLP545	<p>OB: Fruit aroma, honey, floral, yeasty, bready, a little hot, some astringency. More full and round than others.</p> <p>WF: Floral, fruity aroma, yeasty, some acrid yeast notes. Somewhat hot. Honey flavor is distinct, semi-dry with medium body, lingering finish.</p> <p>Favorite (OB)</p>

Figure 1: Orange Blossom Honey Test

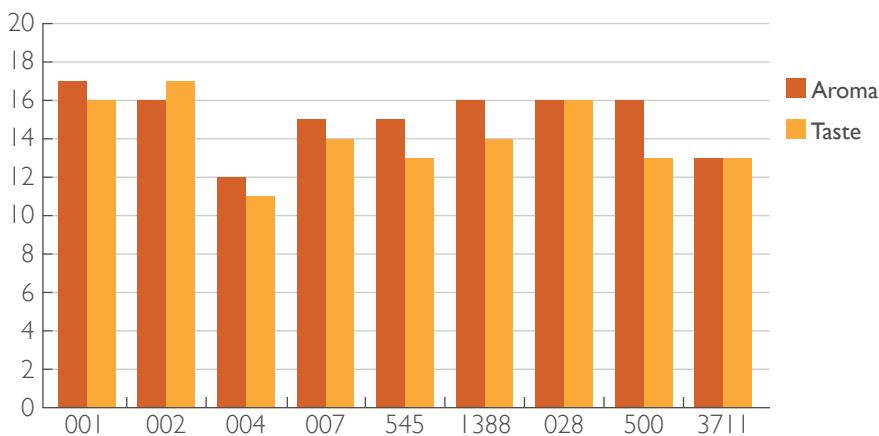
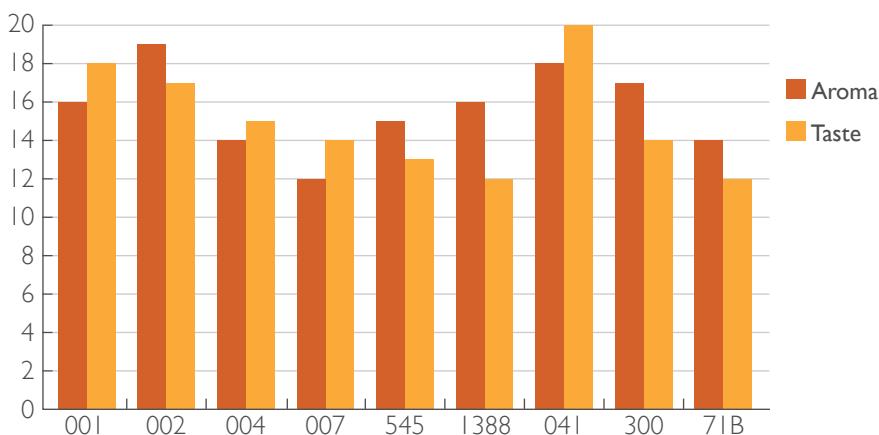


Figure 2: Desert Wildflower Honey Test



Sensory Evaluation

A tasting panel of six meadmakers and judges from San Diego and the greater Southern California region evaluated each of the meads:

- **Petar Bakulic** (a.k.a. Oskaar from the GotMead forum and podcast), president of the Mazer Cup International and a Beer Judge Certification Program (BJCP) Mead Judge with sensory training.
- **Frank Golbeck**, CEO and head meadmaker at Golden Coast Mead and

BJCP Certified Mead Judge.

- **Mary Anne Bixby**, mead judge and longtime host of National Mead Day in San Diego.
- **Greg Lorton**, BJCP Certified Mead Judge, BJCP National beer judge, and meadmaker of 25 years.
- **Michael Hawkins**, BJCP Certified Mead Judge and home mead- and cidersmaker.
- **Eric Holden**, BJCP Certified Mead Judge, BJCP National beer judge, and multiple medal winner at the National Homebrew Competition.

**Frank Golbeck****Mary Anne Bixby****Greg Lorton****Michael Hawkins****Eric Holden**

<p>OB: Bubblegum to Concord grape in nose. Crisp and refreshing.</p> <p>WF: Nice nose. Rich honey. Nice body. A bit hot on the upper palate but nice. Creamy.</p> <p>Favorite (OB)</p>	<p>OB: Nice orange blossom aroma. Smooth mouthfeel and nice finish.</p> <p>WF: Raw honey aroma, slight chocolate in the taste. Smooth mouthfeel.</p> <p>Favorite (OB)</p> <p>Favorite (WF)</p>	<p>OB: Alcohol and orange blossom in aroma. Low fusels, smoother than some of the others.</p> <p>WF: Honey sweet aroma. Mild flavor, low acidity and tannins. Low fusels.</p> <p>Favorite (OB)</p> <p>Favorite (WF)</p>	<p>OB: Very light rubber/chemical aroma, much less orange blossom character, low heat with smooth finish.</p> <p>WF: Nice honey aroma, slight fruity esters, plum. Low alcohol present, smooth and light finish.</p>	<p>OB: Fruity esters mix with underlying honey varietal. Alcohol burns the nose. Apple and blueberry notes.</p> <p>WF: Raw honey aroma and some woody sage notes. Very smooth, no alcohol hotness.</p>
<p>OB: More citrus and honey in aroma than others. Nice balance with honey, citrus and acidity. Finish lingers.</p> <p>WF: Lots of honey in the nose. Intense honey and great body. A bit sweet but still clean in finish.</p> <p>Favorite (WF)</p>	<p>OB: Seems sweeter than others. Some honey aroma, very slight metallic taste.</p> <p>WF: Tangerine aroma, slight raw honey flavor, slight harshness.</p>	<p>OB: Lots of esters, orange blossom honey aroma. Mellow, lacking tartness, almost insipid. Some fusels in finish.</p> <p>WF: Medium honey aroma, low alcohol in nose. Alcohol evident in finish; tart finish.</p>	<p>OB: Mild honey character, low phenolics, fruity esters which balance slight sweetness. Low alcohol on finish.</p> <p>WF: Raw honey aroma, sweet, fruity esters. Sweetness is balanced nicely with light astringency and a touch of acid in finish.</p> <p>Favorite (OB)</p> <p>Favorite (WF)</p>	<p>OB: Big Honeycrisp apple notes. Orange blossom mingles with the esters, very smooth. Alcohol is not unpleasant.</p> <p>WF: Raw floral honey notes that are balanced with some alcohol. Sweetness noticeable in flavor.</p> <p>Favorite (OB)</p>
<p>OB: Bubblegum in nose. Medicinal.</p> <p>WF: A bit musty in the nose. Woody, disjointed. Upper palate/retro-nasal is sub-optimal. Rubbery.</p>	<p>OB: Citrus aroma that dissipates after standing.</p> <p>WF: Some sulfur in aroma. Taste is not very distinct.</p>	<p>OB: Alcohol in aroma. Slight rubbery flavor. Dry side of semi-sweet.</p> <p>WF: Mild, honey-sweet aroma. Relatively lighter body. Low tartness and acidity.</p> <p>Least Favorite (WF)</p>	<p>OB: Medium-high orange blossom character, some chemical aroma. Low acidity with slight tartness and a bit hot.</p> <p>WF: Light honey aroma on the raw side, low heat with a slight vegetal character and medium acidity in finish.</p> <p>Least Favorite (OB)</p>	<p>OB: Good orange blossom notes. Clean, very little yeast-derived character. Hot alcohol.</p> <p>WF: Floral and fruity esters of cherries and blueberries. Alcohol is noticeable but not hot. Some acidity not seen in other examples.</p> <p>Least Favorite (OB)</p> <p>Favorite (WF)</p>
<p>OB: Lightest nose but orange blossom comes through. Citrus and acid, minimal honey on finish. Alcohol is noticeable.</p> <p>WF: Nose has lots of wildflower. A bit of plastic. Apple, then honey. A bit of unfermented honey in the finish.</p>	<p>OB: Moderate honey aroma. Slightly acidic.</p> <p>WF: Pronounced raw honey aroma, also in taste.</p> <p>Least Favorite (WF)</p>	<p>OB: Medium orange blossom honey aroma. Dry, low acidity, creamy flavor.</p> <p>WF: Apple, caramel/honey aroma. Raw honey lingering in flavor. Slight prickly CO₂, alcohol in the finish.</p>	<p>OB: Medium chemical/petrol aroma, light acidity with medium phenolics, lingering heat. Slightly sour in finish.</p> <p>WF: High, raw honey aroma, apples, low phenolics. Mild sweetness balances the alcohol, finished with a hint of fruit.</p>	<p>OB: Smooth orange blossom with a lemony note. Lemon character more noticeable in flavor. Alcohol is noticeable but not hot.</p> <p>WF: Raw floral honey, sweetness is noticeable. Big honey notes, roses and cherries.</p>
<p>OB: Bubblegum aroma. Mouthfeel has an acidity and astringency that's out of balance.</p> <p>WF: Fair amount of unfermented honey in the nose. Flavor is a bit vegetal in the finish.</p> <p>Least Favorite (OB)</p> <p>Least Favorite (WF)</p>	<p>OB: Very little honey aroma compared to others. Astringency in finish.</p> <p>WF: Slightly soapy.</p> <p>Least Favorite (OB)</p>	<p>OB: Not much aroma, some apple notes. Tart, dry, slight astringency.</p> <p>WF: Raw honey in aroma. Citrusy tartness. Dry, mild acidity. Mild aroma and flavor. Some fusel heat.</p> <p>Least Favorite (OB)</p>	<p>OB: Light floral notes, good representation of orange blossom honey. Short finish with some acidity and low astringency.</p> <p>WF: Some chemical/rubber notes in aroma. Medium-high amount of alcohol present, chalky, harsh finish.</p> <p>Least Favorite (WF)</p>	<p>OB: Smooth orange blossom aroma with buttery notes. More acidic than others. Dry, almost astringent.</p> <p>WF: Much drier than some others; bready/yeasty character. Woody sage notes in aroma and flavor.</p>

Continued >>



The tasting panel gathered at Golden Coast Mead in Oceanside, Calif. on November 5. The judges were provided with three flights of six meads.

- **Flight 1** consisted of orange blossom meads fermented with yeasts WLP001, WLP002, WLP004, WLP007, WLP545, and Wyeast 1388.
- **Flight 2** consisted of wildflower meads made with the same yeast strains as the first flight.
- **Flight 3** consisted of three orange blossom meads made with WLP028, WLP500, and Wyeast 3711, plus three wildflower meads made with WLP041, WLP300, and Lalvin 71B.

The judges were served blind samples in random order and asked to evaluate aroma and flavor on a scale of 1 to 4, representing poor, fair, good, and excellent examples. The judges were also asked to write tasting notes for each mead and to select their favorite and least favorite meads from the first two flights.

The Results

The tasting panel's evaluations demonstrated how a yeast strain can influence finished mead. Each yeast produced aroma and flavor profiles that were clearly distinguishable from the others. While certain ale yeasts offered fruity esters that seemed to enhance perceived sweetness, others seemed to emphasize an acidic tartness that produced a drier mouthfeel. Some yeast strains dramatically affected aroma and taste, while others were more neutral and showcased the honey varietal.

Figures 1 and 2 illustrate the aroma and taste results for meads made from orange blossom honey and wildflower honey, respectively. The individual scores from each judge were added together, resulting

Table 2:
Tasting Notes

Continued



Yeast Strain	Petar Bakulic
Wyeast 1388	OB: Floral aroma, yeast esters, citrus, honey aroma, some petrol. Hot from alcohol, honey flavor is discernable. WF: Candy, apple, pear, white flowers, some alcohol in aroma. Flavor of honey, fruit, citrus, stone fruit, some alcohol heat.
WLP028	OB: Aroma with floral, fruity, honey, citrus notes. Flavor includes honey, citrus, alcohol, yeasty, woody.
WLP500	OB: Some yeasty funk, woody, honey, alcohol, fruity acidity in aroma. Some citrus, heat, phenols, vitamin C in flavor. A bit papery.
Wyeast 3711	OB: Aromas of yeast, bread, honey, alcohol. Flavor includes honey, citrus, spice, fruit, woody notes.
WLP041	WF: Citrus fruit, sugary, candy, caramel, butterscotch in aroma. Flavor is semi-sweet, fruity, hard candy, stone fruit, and pear. Good.
WLP300	WF: Fruity, floral notes of pear and apple. Flavors of honey and citrus with warming finish.
Lalvin 71B	WF: Some sweet notes in aroma including apple, citrus and some yeast. Flavor is warm, dry, yeasty, woody, tobacco, citrus, astringent.

in total scores for both aroma and flavor for each yeast strain.

The panel had mixed opinions with respect to favorite and least favorite strains. In fact, as shown in Table 2, one



Frank Golbeck



Mary Anne Bixby



Greg Lorton



Michael Hawkins



Eric Holden

OB: Bubblegum, citrus aroma. Nice balance between dry and fruity. WF: Some melon in the nose. Bright foretaste. Drier body. Nice finish.	OB: Lighter aroma than some others. Slight astringency in finish. WF: Moderate honey aroma, some fusels, slightly acidic.	OB: Slightly tart aroma. Orange blossom honey evident. Yeasty flavor, alcohol in flavor, some fusels. WF: Spicy apple aroma, some cinnamon. Vegetal in flavor, tart, mild CO ₂ . Liked aroma, didn't care for flavor.	OB: Light orange blossom aroma, some Concord grape, light phenolic aroma. Some sweetness present, slight spice and pepper flavors. WF: Low honey aroma with a touch of menthol, apple, fruit, cinnamon. Mild alcohol balances well with acidity. Drier finish.	OB: Fewer orange blossom notes. Spicy character of light clove and peppercorn. Some alcohol. WF: Citrus notes, hot alcohols are quite noticeable. Flavor has a bready/yeasty note. Least Favorite (WF)
OB: Nice. Light. Many flowers.	OB: Butterscotch aroma. Slightly hot in finish.	OB: Lots of orange blossom aroma. Flavor is moderately tart, some fusels, dry.	OB: Some chemical aroma with light raw honey. Medium tartness, sharp alcohol in finish.	OB: Orange blossom notes are big, alcohol is hot but not unpleasant. Some fruity esters with hint of blueberry.
OB: Great nose. Beautiful first notes. Refreshing.	OB: Tartness and some fusels in the nose. Not a fan of the flavor.	OB: Mild, neutral honey aroma. Mild flavors, some fusels in the finish.	OB: Low honey aroma, high phenols, dry/acidic flavor with medium high alcohol finish.	OB: Citrus notes with tropical fruit, banana, and mango.
OB: Malty. Chimay-like.	OB: Very mild aroma. Good taste but uninteresting.	OB: Can perceive a tartness in aroma. Flavor is mild, some alcohol heat.	OB: Slight citrus notes and light fruit in aroma, mild spice and phenols, warm finish.	OB: Orange blossom notes are low, has almost a graham cracker character; hot.
WF: Rich honey. Creamy. Fuller body. A bit tropical.	WF: Apple aroma. Perfumy, floral taste.	WF: Sweet honey aroma, more moderate honey flavor, tartness balances well, slight heat in finish.	WF: Pear, passionfruit, tropical, peach, pineapple. Smooth finish, well balanced, low heat.	WF: Very clean floral character, woody and earthy. On the sweet side. Alcohol is well balanced.
WF: Light honey in nose. Fuller body. Nice phenolics on finish. Honey well expressed.	WF: Fruity nose with hints of melon. Apple cider in taste.	WF: Fruity apple esters, mild honey flavor; some alcohol heat.	WF: Light fruity esters, yeasty character. Light acidity, marmalade and apple. Smooth finish with hint of spice.	WF: Fruity, wine-like character. Hot with some astringency.
WF: Lemon. A bit hot/rubbery. Not as integrated.	WF: Slight toast in the aroma, some fruitiness. Cinnamon in the taste.	WF: Sulfur, rubbery aroma, mild honey flavor with dry finish and noticeable fusels.	WF: Slight honey aroma, woody, mousy, straw. Slightly acidic flavor, medium alcohol finish.	WF: Woody, almost grassy character, some pineapple notes. Alcohol is noticeable and on the hot side.

judge preferred two strains that another rated unfavorably. Honey varietal also played a major role, as evidenced by one judge who named the same yeast strain a favorite for one batch and least favorite for another.

The data did, however, uncover some unifying themes. WLP001 and WLP002 received more positive evaluations than the other strains, each selected as a favorite five times. WLP004 and WLP545 received the most negative evaluations

of the group, and several judges called these their least favorite. WLP041, used only for the wildflower batch and therefore not considered in the favorite/least favorite evaluation, received the highest total score. Interestingly, 71B, the widely



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used wine yeast, scored comparably to the lowest-scoring ale yeasts.

As with any comparison of yeasts, imposing identical fermentation processes on all strains equally means that not every yeast is allowed to work under its own optimal conditions. Some cultures, for example, prefer more nutrients than others, and some strains produce more off-flavors at higher temperatures. Repeating the experiment under individually tailored conditions for each strain may yield different results.

Since this tasting intentionally focused on young meads, the comparison between the wine yeast and the ale yeasts could be deceiving. These meads will mature, and their aromas and flavors will continue to evolve with age. It's therefore possible that sensory differences will lessen with time.

Additional experimentation and publication of results are necessary to truly compare ale yeasts with wine yeasts for mead. But despite the limitations of this experiment, I hope that meadmakers find the results valuable when considering fermentation with ale yeast.

Billy Beltz is an award-winning meadmaker, BJCP Certified Mead Judge, and proud member of the QUAFF Homebrew Club in San Diego. He recently won two medals at the 2016 Mazer Cup International for meads fermented with ale yeasts. He would like to thank White Labs for generously providing yeast samples, Golden Coast Mead for hosting the tasting panel, The Homebrewer shop in San Diego for equipment (and moral) support, and his lovely fiancée Suzanna for allowing an army of 1-gallon carboys of mead to take over the house for several months.

The image shows a young man with short brown hair, smiling broadly. He is wearing a light blue denim shirt over a white t-shirt. He is holding a clear glass filled with a golden-colored beer with a thick white head. In the background, there are large stainless steel brewing tanks with circular ports. The overall atmosphere is professional and positive, suggesting a successful career in the brewing industry.

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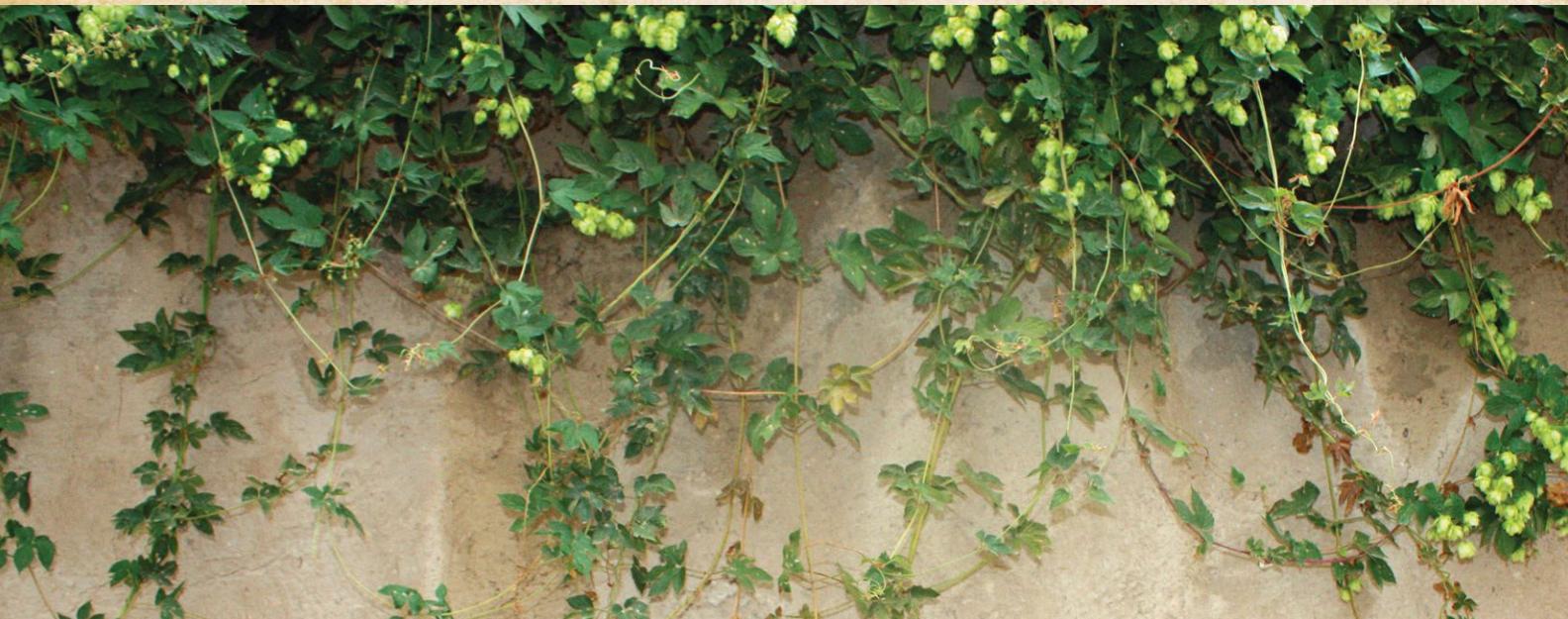
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The image shows a close-up of a glass filled with a golden-colored beer. The beer has a very thick, white head of foam on top. The glass is set against a dark, blurred background that suggests a bar or brewery environment.

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The Reinheitsgebot

Is it still Relevant?

*A Re-Evaluation of the German Beer
Purity Law on its 500th Anniversary*

By Horst Dornbusch

To brewers and beer enthusiasts the world over, the Reinheitsgebot (or German Beer Purity Law as it is known to English speakers) conjures up images of fastidious, obsessively hygiene-conscious Germans brewing beer according to rigid dictates of cleanliness and quality. Hailed as an indispensable guardian of beer quality, it is widely regarded as the world's oldest food safety and consumer protection legislation. Many beer drinkers, especially those in Germany, consider beers brewed in accordance with Reinheitsgebot to be the best in the world.

Commercial brewers in Germany are bound by law to make beer in strict adherence with the Reinheitsgebot, and even

some homebrewers, though unburdened by such restrictions, are proud to brew "according to the German Purity Law of 1516." On this, the 500th anniversary of the Reinheitsgebot, it is perhaps time to re-evaluate its relevancy, especially in light of today's spectacular rise of a global and highly innovative craft beer movement.

How exactly did a brief, 31-word passage in an obscure proclamation, crafted at the height of the Renaissance, acquire almost mythical status in Germany and beyond? And how did it metamorphose into the powerful federal law that regulates German brewers to this day?

The Origins of the Purity Law

Before the emergence of microbiology in the 19th century, managing beer quality

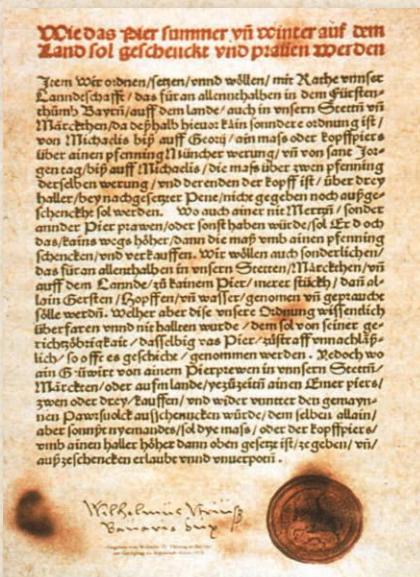
had always been a challenge for brewers, especially during the hot days of summer. Beer was commonly infected, but nobody knew why, a conundrum that tempted brewers to "improve" their libations and cover up off-flavors with all sorts of additives. These seasonings included strong-tasting botanicals like tree bark, rushes, and poisonous mushrooms, as well as hallucinogens like mandrake root. Some brewers even resorted to pith, soot, chalk, and oxen bile. In areas where beer drinking was an important part of the local culture, and thus of the people's diet, rulers proclaimed often misguided regulations that they believed would protect beer quality and the health of their subjects.

Among the earliest such interventions was a regulation known as *Justitia Civitatis*

We wish especially that, henceforth and everywhere,
in our towns, markets, and in the countryside,
shall be employed and used onto no beer more pieces
than alone barley, hops, and water.

Augustensis, a civil code of Augsburg, Bavaria, issued in 1156 by Holy Roman Emperor Frederick "Barbarossa." Frederick decreed that a "brewer who makes bad beer...shall be punished [and] his beer shall be destroyed or distributed at no charge among the poor." Likewise, in 1293, the city council of Nuremberg issued an ordinance insisting that only barley be used in beers brewed within the city walls. In Regensburg, where the Romans had already brewed beer some 1,000 years earlier, brewers also found it difficult to resist lowering standards in the name of profit. Thus, in 1453, the town's physician, Konrad Megenwart, who also doubled as the official beer inspector, forbade brewers within the city walls to use "seeds, spices, or rushes" as beer flavorings.

Regulating brewers and their craft was equally concerning for the 12-member Munich city council. In 1363, the council assumed the duty of overseeing all beer production, and in 1447, it issued an ordinance demanding that brewers use only barley, hops, and water in their beers. Forty years later, Bavarian Duke Albrecht IV forced all brewers in the city of Munich to take a public oath of faithful allegiance to the 1447 ordinance, and in 1493, one of Albrecht's successors, Duke Georg the Rich, extended the oath of allegiance to the central Bavarian duchy of Landshut. Clearly, a regulatory cleanup of the people's drink was afoot in Bavaria. The Munich regulations in particular are an unmistakable forerunner of the later, all-Bavarian beer regulation upon which today's Reinheitsgebot is based.



The original 1516 Reinheitsgebot document

A Bavarian Duke's Decree Becomes Modern German Law

Today's Purity Law ultimately derives from a feudal edict proclaimed by Bavarian Duke Wilhelm IV at a meeting of the Assembly of Estates in Ingolstadt on April 23, 1516. In the quaint and stilted legal language of 16th century Germany—imitated here in English—the key passage of the original decree reads: "We wish especially that, henceforth and everywhere, in our towns, markets, and in the countryside, shall be employed and used onto no beer more pieces than alone barley, hops, and water."¹ The entire document is 315 words long, but only 31 of them deal with beer ingredients. The rest of the edict discusses beer price controls and penalties for violators.

Note that the original text makes no mention of yeast, malt, purity, or differences between ales and lagers—these are later additions. Yeast was not part of the 1516 edict because an understanding of fermentation agents would not emerge until well after 1676, the year that Dutch scientist Antonie van Leeuwenhoek developed the first useable microscope. Most beer historians agree that beer "purity" was probably not the duke's key motivator for the barley-hops-and-water-only edict. Instead, his main desire was likely to reserve wheat—considered a more valuable grain than barley—for baking. There were frequent harvest failures in Bavaria at the time, and preventing Bavarians from drinking their wheat, the ruler reasoned, was the best way to encourage them to store it for food and ameliorate famines.

First applicable only to feudal Bavaria, Wilhelm's regulation of 1516 became variously known as the *Substitutionsverbot* (substitution prohibition) or *Surrogatsverbot* (surrogate prohibition), and it has remained in force in Bavaria ever since. The substitution prohibition alone, however, failed to ensure "pure"—that is, non-infected—beer, especially in the summer, as Wilhelm IV's son, Duke Albrecht V, quickly realized.

Thus, in 1553, Albrecht solved the problem in draconian fashion: he simply outlawed brewing altogether from April 23—the anniversary date of his father's 1516 decree—to September 29. Even today, the effect of Albrecht's summer brewing prohibition is much underestimated. It ensured that Bavarian beers, henceforth, would be mostly clean-fermented, "pure,"



Craft beers brewed both within and without the German Beer Purity Law continue to gain popularity in Germany. There is even a glossy German *Craft Magazin für Bierkultur* on the market.

lagers, because ale yeasts remained dormant during the cold winter months in the foothills of the Alps. Thus, it was this new, all-barley-based Bavarian winter brew that, in an age without an understanding of microbes, began to set the standards for beer quality in Germany.

By the 19th century, several pioneers in modern microbiology, such as Ferdinand Julius Cohn, Louis Pasteur, and Robert Koch, unraveled the mysteries of yeast fermentation. Their discoveries allowed brewers to understand why Bavarian beers were of such high quality. In addition, Carl von Linde, a German engineer, pioneered refrigeration in 1873, making it possible to produce beer at lager temperatures year-round.

The effects of the Bavarian *Substitutionsverbot* now seemed inescapable. The region of Baden adopted the Bavarian regulations in 1896, and adjacent Württemberg followed in 1900. In 1906, the regulation became law for the entire Second German Reich. Next, after the collapse of Imperial Germany at the end of World War I, a national assembly convened in Weimar, on August 11, 1919, to write a constitution for the new Weimar Republic. Bavaria, however, declared that it would not join the republic unless its beer regulations were again adopted for the whole of Germany.



Signs of an emerging alternative beer culture in Germany at the 2014 Munich Braukunst Live festival



The assembly yielded to the Bavarian “extortion,” as some northern Germans labeled the demand, and put the Bavarian provisions into the tax code, where they remained throughout the Third Reich and through to the current Federal Republic.

Marketing Implications

Even before the defeat of Kaiser Wilhelm II on Armistice Day, November 11, 1918, a wondrous and serendipitous thing had happened in the

Bavarian State Parliament that would launch the evolution of the Bavarian *Substitutionsverbot* from hard-nosed beer ingredients regulation to national mythology. On March 4, 1918, during an impassioned debate about beer taxation, an obscure representative by the

name of Hans Rauch rose to defend the Bavarian Substitutionsverbot by calling it the *Reinheitsgebot*.

The new name turned out to be a stroke of marketing genius. It stuck immediately and has since been used effectively to instill national and even international devotion to its most superficial reading, "Brewed according to the German Beer Purity Law of 1516." This anachronistic slogan now adorns every German beer label, even though the 1516 edict was not

German but Bavarian, and its 31 words relating to beer ingredients bear only faint resemblance to the complex provisions of the modern Purity Law text.

The most significant challenge to the German Beer Purity Law came in 1987, when the European Court ruled that Germany could not keep non-Reinheitsgebot beers from entering its markets from abroad. To do so would have violated the free-trade provisions of the European Union, though Germany was still free to

enforce the Purity Law on beers produced within its own borders. Nonetheless, German courts re-interpreted the Purity Law in 2005 to allow the sale of commercially-made beer with non-Reinheitsgebot ingredients, as long as the word *beer* did not appear on the label.

Defenders of this narrow definition proudly claimed that it elevated German beer to a level of quality above all others. Opponents considered the regulation excessively parochial, even xenophobic, because it prevented such classic styles as lambic, milk stout, many abbey ales, and all herb- or fruit-flavored beers from being sold as beer. Homebrewers, of course, had made such beers for decades, but the 2005 concession to permit the brewing of "non-beer-labeled" products opened the door to a much wider variety of commercial craft beers, many of which succeeded in painstakingly avoiding the word *beer* in their names, replacing it with such euphemisms as "fermented malt drink."

Modern Implications

In its current incarnation, the 1516 edict is on the books in Germany under the strangely humble and unassuming title of Preliminary Beer Law of 1993 (*Vorläufiges Biergesetz von 1993*), adapted from a law previously passed in 1952. Only small amendments have been added since then. You can find the law in Part 1 of the *Bundesgesetzbuch* (German Federal Law Gazette), section 1, no. 12, pages 149 to 152. Imagine calling a five-centuries-old, venerable pillar of German brewing law preliminary!

Building on the simplicity of the original ducal edict, the most famous—and most frequently cited—provision of the modern Reinheitsgebot dictates that beer be made only with water, malt, hops, and yeast. Yet, there is much more to the current Purity Law than just these specifications. A detailed reading of the law shows just how far it has expanded beyond the raw material restrictions of five centuries ago.

Today's law includes a broad, complex, and sweeping set of regulations that are now part of the German Federal Tax Code (*Bundessteuergesetz*). It reaches

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The Reinheitsgebot doesn't bother me. I just brew what I want right past the law. I call my beers by their style designations and simply leave the word 'beer' off the label.

—German craft brewer

deep into many everyday—even trivial—brewhouse techniques, cellar processes, and recipe design options. And it does so in a manner that few home- and craft brewers would be willing to accept. Yet, in Germany, government interference with a commercial brewery's operations is considered the norm, simply because it's the law. Detractors of the Purity Law mostly emphasize its constraints on innovation and creativity, while supporters point to the law's role in the creation and preservation of a long and unique brewing tradition that ensures beer quality.

The current law, unlike the original 1516 edict, forbids the use of all unmalted grains, including raw barley, raw wheat, rolled oats, roasted barley, flaked cereals, and torrefied cereals. Advocates of the Purity Law insist that this provision keeps substandard brews made from rice and corn off the market, thus preserving beer quality and value for the consumer. Detractors point out that the law prevents marketing such styles as witbier and oatmeal stout as beer in Germany.

Today, only ales—not lagers!—may be brewed with the addition of invert

syrup, as well as coloring agents derived from invert syrup, except in Bavaria and Baden-Württemberg, where no sugar products may be used whatsoever. However, coloring extracts derived from mashed, roasted barley malt are permitted in both ales and lagers in all of Germany. Defenders of the Purity Law make the same arguments about sugar products that they do about raw grains: sugar-derived alcohol cheapens real beer. However, this provision also keeps many glorious Belgian-style abbey ales, for instance, from being marketed as beer in Germany.

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Wheat beers labeled as hefeweizen, weissbier, dunkelweizen, weizenbock, or similar may not be sold as beer unless their grain bills contain at least 50 percent wheat malt. Advocates point to the truth-in-labeling advantage of this provision; detractors consider this an infringement of the sort of brewing freedom otherwise only enjoyed by homebrewers.

Also verboten under the *Vorläufiges Biergesetz* is the lager fermentation of beers containing even a small portion

of wheat or oats. This also applies to bona fide wheat beers with more than 50 percent wheat malt in the mash. Yet, strangely, a true hefeweizen/weissbier may be legally inoculated with up to 15 percent (but no more) lager wort for carbonation. The defense: the rule preserves the distinctiveness of Germany's classic wheat beer styles. The indictment: what's wrong with a brewer offering the consumer a partially or mostly wheat-based lager? Homebrewers, of course, already know that such brews can be yummy!

In addition to ingredients that *must* be used in beer making, German law also regulates what *must not* be used. Defenders of the law claim that this not only precludes the use of adjuncts such as rice and corn, but also ensures that German beers do not contain certain chemical preservatives, flavor enhancers, foam stabilizers, shelf life extenders, sugars, and sweeteners. Opponents maintain that such issues are already covered by general German food safety legislation. Homebrewers, on the other hand, tend not to use chemical additives but also know that a Classic American Pilsner, with an addition of corn in the grist, can be a glorious thing.

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The Current Debate

There is no denying that the rigid strictures of the Purity Law—imposed upon the beer-making process and backed by the power of the mighty German state—have spawned a distinct beer culture, especially during the past century. Beer experts usually characterize that culture in terms of top-quality blond lagers that are unmatched in their delicacy and deliciousness. At the time of this writing (January 2016), the German Brewers' Federation (*Deutscher Brauer-Bund*) had even applied to the cultural agency of the United Nations, UNESCO, for recognition of the Reinheitsgebot as an Intangible Cultural Heritage item, next to such already recognized cultural treasures as Argentinian tango, Iranian carpet weaving, and French gastronomy.

Blond lagers have held roughly two-thirds of the German beer market for decades, and virtually every one of the country's approximately 1,300 breweries makes one. Though there are subtle distinctions from one brewery's example to the next, the sensory profiles of blond German lagers are, at least for the ordinary consumer, rather similar, a fact that well-traveled beer connoisseurs cite as a drawback of the Purity Law.

For decades now, a lack of true variety in German beer has stood in stark contrast to, for instance, the vast range of beer flavors available in neighboring Belgium as well as those offered by spirited and experimental home- and craft brew-

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ers around the world. Instead, German brewers—and, for that matter, most of the world's large industrial beer makers—have produced beer boredom, albeit boredom brewed with great technical competence, the reaction against which has fueled the rise of both the home- and the craft-brew movements.

Home- and craft brewers, with their dedication to boundless brew freedom and innovation, are now demonstrating to the world how exciting beer can be. In Germany, this divides brewers and consumers into two camps. On one side are those who consider the Purity Law an Orwellian overreach and atavistic relic from Europe's feudal age, which no longer fits into a functioning democracy based on free enterprise. On the other are those, especially Germans with official brew-industry functions, who hold that the Purity Law is an essential bastion in the defense of a venerable and hallowed beer culture, worthy to be preserved at all cost against the onslaught of cheap beer. This latter faction also points out

that many beer styles German brewers have eschewed in the past, such as porter, pale ale, and IPA, can be made within the confines of the Purity Law, which is, of course, true.

History shows us that social change is inevitable and tends to leave people with two choices: adapt or perish. Thus, it remains to be seen if the Purity Law, with its disconnect between the simple original wording of the 1516 edict and today's detailed and intrusive regulations, will maintain its hold on both the practice and the psyche of German beer makers and drinkers. Or will a new and growing generation of German craft brewers simply ignore the Purity Law?

One German craft brewer recently told me, "The Reinheitsgebot doesn't bother me. I just brew what I want right past the law. I call my beers by their style designations and simply leave the word beer off the label." Will German legislators finally find a forward-looking consensus to adapt their Preliminary Beer

Law of 1993 and bring it closer to the realities of the 21st century? No matter the outcome, it seems certain that the glorious German brewing tradition will not fade into oblivion, but will survive and evolve in one way or another, among homebrewers and professional brewers alike.

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Horst Dornbusch is a consultant in the international brewing industry, an international beer judge, and the author of several books on beer, including *PROST! The Story of German Beer* (1997), *Altbier* (1998), *Bavarian Helles* (2000), and *Beer Styles from Around the World* (2015). He is also the associate editor of *The Oxford Companion to Beer* (2010). ☺

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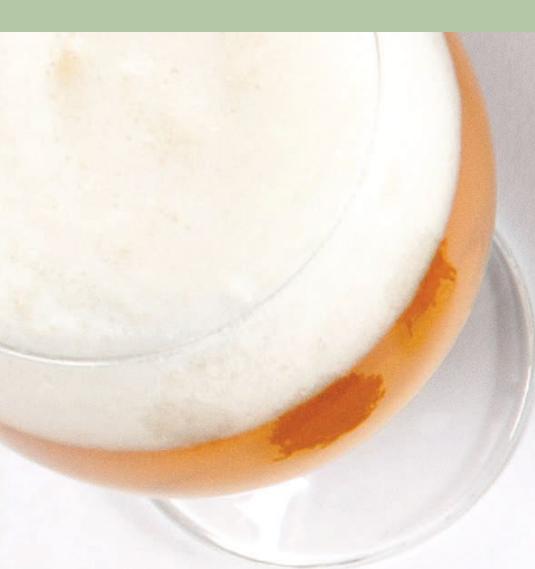
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BREWING *with* TEA

Ask any homebrewer to come up with a three-letter word for “brewed beverage” (a common crossword clue), and I’ll bet the response is always A-L-E. But more often than not, the correct answer is T-E-A.

Tea is the second-most-widely consumed beverage in the world after water, but it’s not a drink that crosses paths with the beer world very often. Beer made with that other commonly brewed beverage, coffee, is far more readily available. But tea offers great potential to homebrewers, particularly if we extend the definition beyond the traditional, and even more so if we venture beyond barley-based drinks.

By Mary Izett

By standard definition, tea is a beverage brewed from the leaves of the *Camellia sinensis* shrub. The type of tea, from white to green to black, is determined by how the leaves are processed after picking. Different types of tea vary not just in aroma, flavor, and color, but also in caffeine content and levels of other compounds like tannins. But such teas merely represent the tip of the iceberg for brewers.

Walk into any modern tea store or down the tea aisle of your local grocery, and you might be amazed at the variety of flavors available. Tea leaves readily absorb and maintain aromas, and many tea blends have been specifically developed



Concentrated batches of herbal tea made by the author.

to take advantage of this. Examples range from the traditional Earl Grey, a black tea infused with the oil of bergamot citrus, to green tea flavored with peach, strawberry, pomegranate, and mango.

Now, if we broaden the definition of tea to include any beverage made from steeping herbs, spices, or other plants, we open a whole new world for homebrewers. So-called tisanes or infusions include everything from common chamomile to its tangy sister jamaica (also known as hibiscus), herbal-floral rooibos, nutty roasted barley, and a whole crop of other plants. And then there are countless blended or flavored herbal teas. The varieties that tea companies have dreamt up are mind-blowing—and delicious.

Beer

When I tasted Smuttynose Chai Porter for the first time at a beer festival in 2006, I was hooked. The brew captured the spicy sweetness of chai tea perfectly, layering it on top of a complementary porter base.

Unfortunately, this beer is a rare sighting and I had to make my own if I wanted my fill. Thus, the first beverage that I brewed with tea was a clone of this lovely libation.

I made my first attempt with a widely available brand of chai, which I added towards the end of the boil. It was drinkable but needed some improvement. Traditional black and green teas can be difficult to use in beer because they contain tannins and other bitter compounds that can render your beer harsh and unpalatable. So I brewed the next batch using only the herbs and spices that flavor chai tea, omitting the tea itself. Bingo: I got the aroma and flavor I craved without the harsh undertones. This is one way to gain the aromas and flavors of a traditional flavored tea without introducing the bitterness of the tea itself. I like to add heartier herbs and spices towards the end of the boil or at flameout, and more delicate, ephemeral plants after fermentation, either during conditioning or at packaging.

One of my favorite ways to use herbal teas in my beer is to add them at packaging.

Another way to capture a flavored tea is to seek out its herbal counterpart. Earl Grey tea can be painfully phenolic when used in beer, and bergamot can be difficult to find, but there are rooibos-based Earl Greys that work beautifully. One of my favorite ways to use herbal teas in my beer is to add them at packaging, either in the bottling bucket or keg. I like to make a 5-gallon (19-liter) batch of my favorite pale ale recipe and split it into either two 2.5-gallon (9.5-liter) kegs or three 1.75-gallon (6.6-liter) kegs, flavoring each with a different herbal tea flavor. I simply make a concentrated batch of herbal tea and add it to each keg while filling, taking care to avoid splashing. This creates a dry, quaffable ale with hints of fruit and spice and a slight perceived sweetness. Match the tea flavor to your malt bill: I love fruity blends in pale ales and nutty, spicy, earthy blends in brown and dark ales.

Short Meads

I make a lot of “short meads”: session-strength meads that ferment quickly. Short meads are fresh, lively, carbon-

I like to add heartier herbs and spices towards the end of the boil or at flameout.



Herbal Tea Pale Ale brewed by the author.

ated drinks that gain the majority of their aroma and flavor not from honey but from the flavorings you add to them. They're a snap to make with flavored teas of all

kinds. Have 20 to 30 minutes free before you head to work or bed? You can make a short mead or two, no problem. And with fermentation times of just one to two

weeks, they're quick turnarounds.

Traditional teas work well in short meads. Tannins and other compounds

Herbal Tea Pale Ale

INGREDIENTS

for 5.5 U.S. gallons (20.8 L)

7.7 lb (3.5 kg) two-row pale malt (91.8%)
11 oz (312 g) Carahell malt (8.2%)
1.1 oz (31 g) Mount Hood pellets, 5.5% a.a. (60 min)
American ale yeast (1 packet)
4 bags of herbal tea per gallon of beer
De-chlorinated water

Original Gravity: 1.042 (10.5° P)
Finishing Gravity: 1.009 (2.25° P)
IBUs: 20
SRM: 3.5
ABV: 4.3%
Boil Time: 60 minutes
Assumed Brewhouse Efficiency: 75%

DIRECTIONS

Tea varieties that work with this malt bill include tropical fruits like mango and passion fruit, citrus blends, and delicate fruits like blueberry, strawberry, and peach. Mash at 153° F (67° C) for 60 minutes, collect runoff, add hops, and boil. Ferment at 68° F (20° C) for 7–10 days or until final gravity is reached. Prepare teas by adding 1/2 cup (118 mL) boiled water per 4 tea bags and steeping for 15–20 minutes. Add tea to bottling bucket or keg. Adjust amount of tea up or down for more or less flavor.

PARTIAL EXTRACT VERSION

Substitute 5.62 lb (2.55 kg) light malt extract syrup for pale two-row. Steep Carahell malt in de-chlorinated, 158° F (70° C) water for one hour. Drain and rinse grains with hot de-chlorinated water to desired boil volume and dissolve extract completely. Bring to a boil, add hops, and proceed as above.

Chai-Barley Tea Brew

INGREDIENTS

for 1 U.S. gallon (3.8 L)

15 oz	(425 g) sugar (organic white recommended)
3 bags	roasted barley tea
2 bags	chai black tea
1/16 tsp	(0.3 g) beer yeast nutrient
1 packet	Champagne yeast
	De-chlorinated water

add balance to the honey sweetness, similar to the role that hops play in beer. Herbal teas work equally well, adding body and depth in addition to flavor. Short mead requires a different mindset than traditional mead or beer. Because the honey ferments completely, short mead is chilled and packaged before fermentation finishes and should be enjoyed fresh. I keg or bottle in amber PET bottles at between 1.006 and 1.010 specific gravity and keep refrigerated to minimize risks of over-carbonation and bottle bombs. Because these beverages are so fast and easy to make, my typical batch size is 1 or 2 gallons (3.8 or 7.6 L).

I have yet to find a tea that doesn't work in short mead, but a few stand out as particularly nice. Coconut teas are spectacular, whether herbal or traditional; they add perceived body and implied sweetness, and coconut really jives with honey. Fruit and spice blends of all

kinds work, too. Green, white, and black teas are all great additions that lend balance to fruit-based short meads. I like to brew a tea, add honey, and ferment, but you can also add tea during fermentation, after fermentation, and at packaging. Champagne yeast is my go-to for short meads, but American, English, and saison yeasts may be used as well.

Sugar-Based Brews

I had been experimenting with tea in beers and short meads for a while when I came across a fermented sweet tea recipe while doing research for my book, *Speed Brewing*. It sounded kind of crazy to me at the time: a 100 percent sugar-based fermented beverage? But after making a few batches, I was in love. This is the dead-easiest alcoholic beverage you can make and it allows the tea to shine. It's especially good for delicate teas or tea blends that you enjoy so much on their own that honey or malt

would interfere rather than complement. And this is the beverage to brew when you only have 10 minutes to spare and a week to ferment.

As in short meads, I like black, white, or green teas to add balance to sugar-based ferments—rhubarb-strawberry black tea, ginger-pear white tea, and lemon mate tea are all favorites. But I recently discovered another secret weapon for tea-based beverages: roasted barley tea. Common in China, Japan, and Korea, it adds a nutty, grainy, complex aroma and flavor. It's a wonderful tea to blend with. Like short meads, sugar brews are best before they reach their final gravity, so amber PET bottles or kegs are recommended. Champagne yeast works best in these recipes.

Herbal and spiced tea blends can make wonderful additions to beer, but they're great excuses to delve into honey- and sugar-based fermentations, too. A small,

Mango Black Tea Short Mead

INGREDIENTS

for 1 U.S. gallon (3.8 L)

1.25 lb	(567 g) honey
1.13 oz	(32 g) freeze-dried mango, or substitute
	3.3 oz (94 g)
	frozen mango
2 bags	black tea
1/16 tsp	(0.3 g) beer yeast nutrient
1 packet	Champagne yeast
	De-chlorinated water

Original Gravity: 1.044 (11° P)

Finishing Gravity: 1.006–1.010 (1.5–2.5° P)

ABV: 4.5–5.1%

DIRECTIONS

Bring water to a boil. Add enough water to cover mango, tea, and nutrients in a heat-resistant vessel. Steep for 10 minutes. Dissolve honey into mixture and top off with de-chlorinated water to 1 gallon (3.8 L). Stir or shake to mix, and ferment at 68° F (20° C) for 7 to 14 days or until desired gravity is reached. Chill overnight (as close to freezing as possible) and package in a keg or PET bottles. If bottling, keep bottles at room temperature until they feel taut to the touch, then chill and enjoy. Drink fresh.

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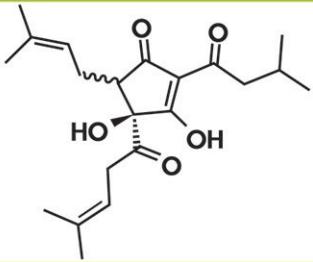
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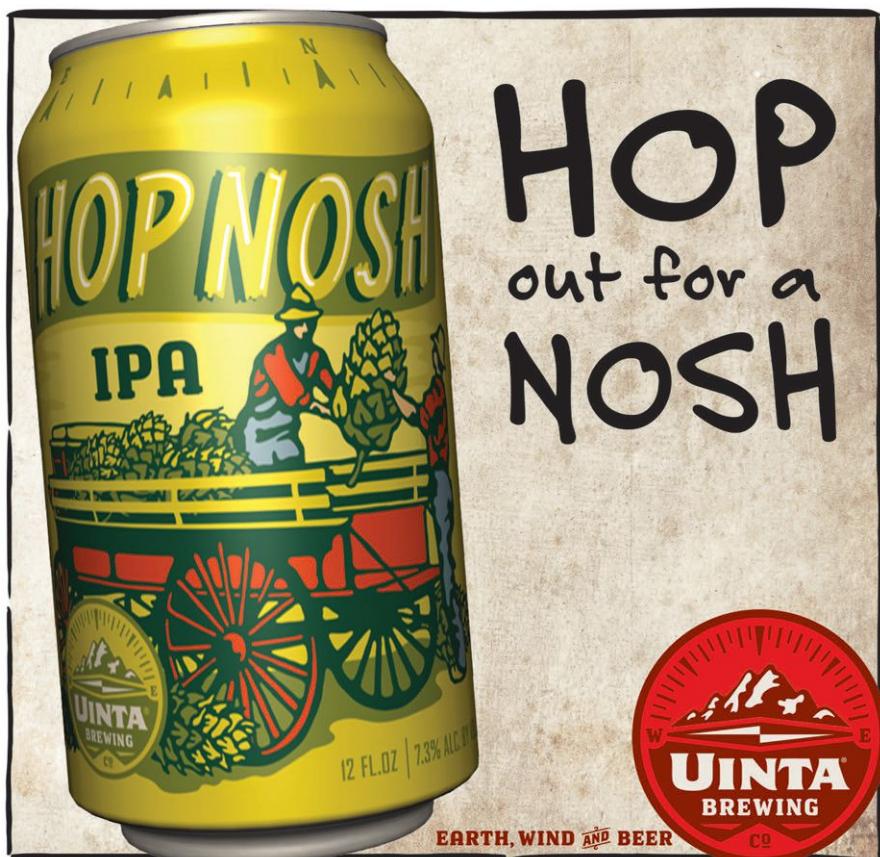
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fast batch of short mead or sugar-based brew is a great alternative to enjoy between batches of beer, when you're pressed for time, or if you just want something different to pour at a party. And they're perfect vehicles for fun and intriguing blends of tea.

So, the next time you are in the mood to brew something quick and different, remember that there's a whole world of flavored, spiced, herbal, green, black, and white teas out there. Try one today and put a fresh new twist on your next fermented beverage.

Mary Izett is a passionate home-brewer specializing in fast and alternative fermented beverages. She is the author of *Speed Brewing*; co-host of *Fuhmentaboudit!*, a live weekly podcast on all things fermentable (Heritage Radio Network); and a BJCP National ranked beer judge. She is also president of Cuzett Libations, a gypsy brewing company in Brooklyn, N.Y.



BOIL KETTLE

BATCH SPARGE
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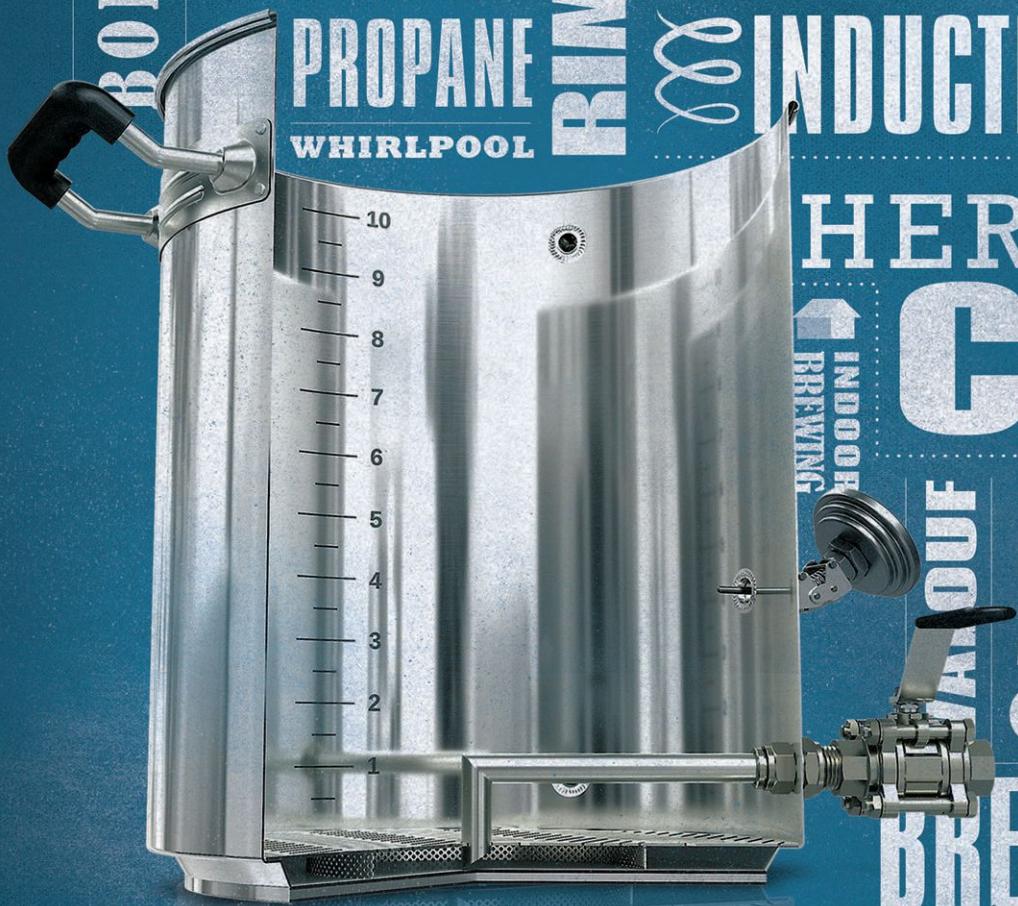


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by Amahl Turczyn

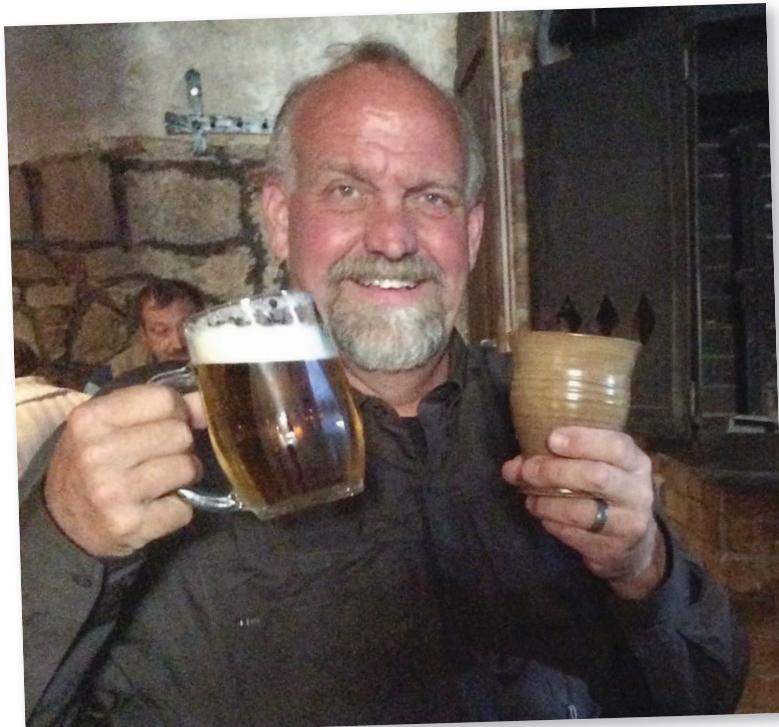
The Domras Cup

Hosted by the Savannah Brewers League, the 18th annual Domras Cup competition was judged February 6. What makes this competition unique is that it's one of the longest, continuously run mead-only competitions in the world. Organizer Mike Tripka reported a 40-percent increase in entries this year, for a total of 140 from all across the country.

The Domras Cup began in 1999 as a small, club-only competition between several serious local meadmakers. It was fittingly named in honor of Chuck Domras, a gregarious club member who was quite fond of making and imbibing mead; Domras passed away earlier that year. It quickly became a regional competition where meadmakers from coastal Georgia and South Carolina entered their best efforts in hopes of having their names etched on the famous cup.

The Savannah Brewers League (SBL) continues to search for ways to improve the event and its judging. In 2012, the club completed a mead judge exam with a dozen new certified mead judges in the Southeast, in order to ensure the event had judges of certified rank at each table. For 2016, the Domras Cup is now part of the Southeastern Homebrew Association Competition Series and the newly formed East Coast Mead Competition Series. The event is the second leg of the latter series, which is comprised of three mead competitions in total: Valhalla: The Mead-ing of Life, Domras, and Mead Free or Die. Entrants collecting the most points from these three competitions win the title of East Coast Meadmaker of the Year, with a cup to go along with the title, and 5 gallons (19 L) of honey courtesy of Dutch Gold Honey.

Tripka also makes sure the event is a fun one to attend for entrants and judges



Best of Show honors at this year's Domras Cup went to Scot Schaar of Davenport, Iowa with his fruit and spice mead, A Common Disaster.

alike. "One of the highlights of the competition is the Judge/Steward After Party," he explained, "featuring homebrew (of course), lowcountry boil (a combination of potatoes, corn on the cob, sausage, shrimp, crab, and/or crawfish), pulled pork, and a May River Oyster Roast. No one leaves hungry."

SBL also uses the Domras Cup to provide support to its community. This year the event was a fundraiser for Ronald McDonald House (RMDH) of Savannah. Entry fees and proceeds from the Judge's Raffle and Auction were donated to the RMDH. The club looks to continue with this civic responsibility for future events.

Said Tripka, "We look forward to making next year's competition an even better affair and raising more money for our charity."

Best of Show honors at this year's Domras Cup went to Scot Schaar of Davenport, Iowa with his fruit and spice mead, A Common Disaster. Schaar is a member of the Rivers Edge Fermentation Society (REFS) and the Saint Paul Homebrewers Club. He started homebrewing in 2001 and made his first mead with his wife Karen, in 2002. "It was a wildflower honey melomel with raspberries," Schaar recalled. "We bottled way too soon, so we had to open the bottles in the sink and wait for the gushing to stop. But the flavor

A Common Disaster

Pineapple Melomel with Chipotle Peppers
Fruit and Spice Mead
Best of Show, Domras Cup

Recipe by Scot Schaar

INGREDIENTS

for 4.5-5 U.S. gallons (17-19 L)

18 lb	(3.9 kg) mesquite honey
4	pineapples sliced into ½" sections (primary)
½ tsp	DAP
¼ tsp	Fermaid K (at 2, 4, 6, and 8 days)
4	chipotle peppers (secondary)
Lalvin 71B-1122 yeast, rehydrated with GoFerm	
Super-Kleer KC fining	

Original Gravity: 1.120

Finishing Gravity: 1.020

DIRECTIONS

Batch size is a range; try to hit target gravity rather than target volume. No-heat method. Ferment at 68–70° F (20–21° C). Add nutrients at stated intervals, removing CO₂ using a degassing wand and electric drill.

was good enough to encourage us to keep making mead."

Fortunately, after the couple attended the National Homebrewers Conference in Minneapolis in 2010, they had a chance to rub elbows with some of the giants of the amateur meadmaking world. "Our meads greatly improved after attending that NHC," he said. "Not only did we attend every mead seminar, we became friends with former Meadmakers of the Year Curt Stock, Steve Fletty, Thomas Eibner, and Steve Piatz, along with many other accomplished meadmakers. Our association with meadmakers in the St. Paul area has a huge influence on our own meadmaking. I still bounce ideas off of that group, and their brutal honesty has been a great source of help and inspiration. The first time I won a mead medal at Minnesota MashOut is still a great memory of mine."

Judging has also been a great teacher for the duo, and the exchange of ideas between the two of them, along with experience teaching others, has elevated their meadmaking success. "Karen and I are both BJCP mead and beer judges," Schaar related. "We have hosted classes for prospective mead and beer judges, which has been a great learning tool for us as well. With numerous mead best of show victories of her own, Karen is also a great sounding board for new ideas." Schaar's adventurous spirit and experimentation continue to find expression in his meads. "My recent meads have taken a more 'culinary' approach. I've been working on combining fruits, spices, herbs, and even flowers," he says.

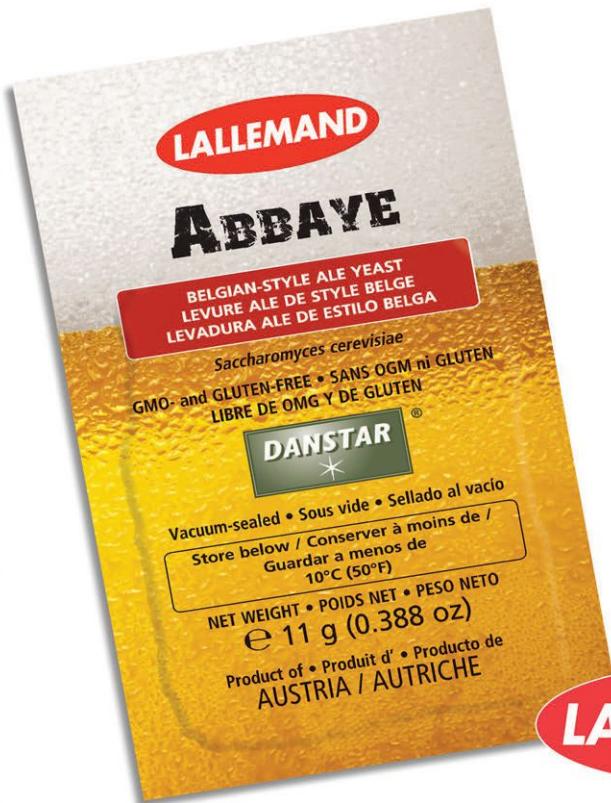
Among his competitive awards are medals from AHA-sanctioned and NHC mead competitions, the Mazer Cup (gold and silver), Mead Free or Die, the Texas Mead Cup, the Arizona Mead Cup, the Michigan Mead Cup, and Vahalla: The Mead-ing of Life. More recently, Schaar's meads took best of show at the Kansas City Bier Meisters' annual competition, and at the Midwinter Homebrew Competition in Milwaukee.

Amahl Turczyn is associate editor of *Zymurgy*.



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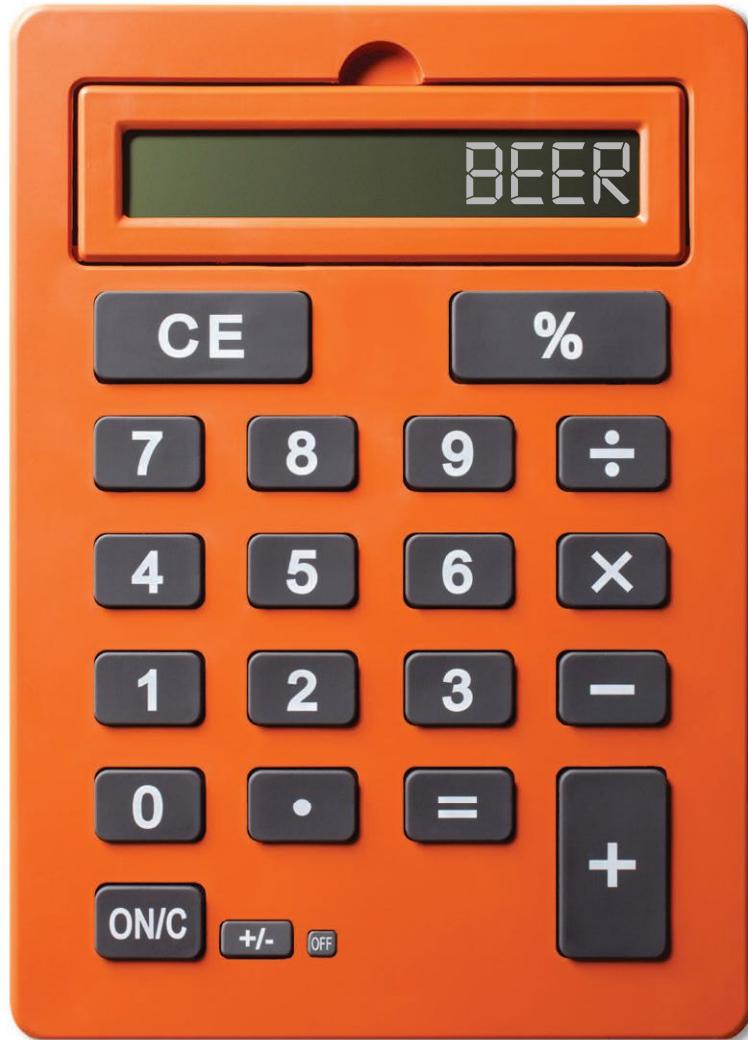


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KUDOS—BEST OF SHOW

AHA/BJCP Sanctioned Competition Program

August 2015

Dominion Cup, 566 entries—Richard Hogg, Hawley, PA

Oregon State Fair Homebrew Competition, 279 entries—Justin Bradley, Eugene, OR

October 2015

Cafe Au Ale, 2 entries—John Orcutt, Sacramento, CA

Dixie Cup, 785 entries—Keith and Pam Bradley, Austin, TX

South African National Craft Brewer Championship, 155 entries—Michael Howes, Cape Town, RSA

National Organic Brewing Challenge, 200 entries—James Lombard

December 2015

Bear Roots Intermediate Pro-Am Home Brew Competition, 27 entries—Sean Daniels, Vista, CA

Seokyoung Competition of Korean Homebrewers Society, 11 entries—Steven & Youngho Chang, Seoul, Korea

January 2016

Big Beers, Belgians & Barleywines Homebrew Competition, 293 entries—Eric Gould and Phil Whited, Castle Rock, CO

Belle City Winter Warmer, 63 entries—John Skantz, Racine, WI

IRON MASH 2016, 23 entries—Jamison Kirmser, Brad Berven, Steve Wesstrom, Fort Worth, TX

Mardi Gras Casino 3rd Annual Homebrew Competition, 10 entries—Chris Walker, Chris Hanel and Chuck Olczak, Ft. Lauderdale, FL

Heart of Dixie Open, 127 entries—Rodney Kibzey, Portland, OR

Winterbrew 2016, 174 entries—Kevin Dibble, Clayton, NY

Hammond River Brewing 2nd Annual Homebrew Competition, 7 entries—Keith Forbes & Mike Orr, Halifax, NS

2016 Doug King Memorial Homebrew Competition, 135 entries—Ward G. Walkup, Pasadena, CA

GTA BREWS, 67 entries—Ron McReavy, Toronto, ON

Stout Bout, 69 entries—Greg Chase, Portland, OR

Champion of the Pint, 288 entries—Jerry Mitchell, O'Fallon, MO

Groundhogs Day Homebrew Competition, 101 entries—Nathan Bourgoine

February 2016

Gulf Beach Brew-Off, 14 entries—Jon Hernandez, Pensacola, FL

Winter Dabbler Home Brew Contest, 41 entries—Michael Klassen, Little Falls, MN

Domras Cup Mead Competition, 135 entries—Scot Schaar, Davenport, IA

Great Northern Brew Ha Ha, 335 entries—Mike Beuning, St. Cloud, MN

All American Homebrew Competition, 315 entries—Tim Lawson, Cincinnati, OH

9th Annual Virginia Beer Blitz, 370 entries—Scott Neeley, Pittsburg, PA

KCBM 33rd Annual Competition, 543 entries—Brad Ebinger, Kansas City, MO

2016 Midwinter Homebrew Competition, 690 entries—Jeff Landers

Thirsty Boy Homebrew Competition, 57 entries—Mike Rozena, Sparks, NV

4th Annual Febraway Homebrew Fest, 28 entries—Guy Kilmer, Fort Myers, FL

Bluff City Brewers & Connoisseurs Extravaganza, 301 entries—Christopher Allen, Nashville, TN

El Dorado County Fair 68 entries—Mike Conrad, Placerville, CA

Napa Homebrewers Classic, 145 entries—John Brunet

27th Annual Reggale and Dredhop, 308 entries—Derrick Flippin, Rural Hall, NC

2016 Newcastle Regional Show Brewers Championship, 105 entries—Troy Rowbottom

El Barrilito de Oro, 60 entries—Chris Couper, Boquete, Panama

Romancing the Beer, 293 entries—Andrew Carter, Thousand Oaks, CA

IBU Open, 228 entries—Brad Penar, Des Moines, IA

Winter's Warmers, 64 entries—Jeff Kirkner

Coal Country Brewers Cup, 40 entries—Jack Tribble, Elkins, WV

2016 Cham-beers-burg Homebrew Competition, 20 entries—Chris Hallum, Chambersburg, PA

ON THE WEB



For an up-to-date calendar of AHA and BJCP events go to the Events section of HomebrewersAssociation.org

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**AHA/BJCP SANCTIONED
COMPETITION PROGRAM CALENDAR**

For complete calendar, competition and judging information go to
HomebrewersAssociation.org/pages/competitions



May 5

VanBrewer Awards

Vancouver, BC. Entry Deadline: 5/2/2016

May 6

Derby City BrewFest Bourbon Barrel Competition

Louisville, KY. Entry Deadline: 3/1/2016.
derbycitybrewfest.com

May 7

Alameda County Fair Homebrew Competition (BABO)

Pleasanton, CA. Entry Deadline: 4/14/2016.
beercomps.org/babo/

May 7

Great Basin Brew-off 2016

Reno, NV. Entry Deadline: 4/23/2016.
washoezz.net

May 7

20th Annual BEER Brew-Off

Bay Shore, NY. Entry Deadline: 4/29/2016.
beerhbc.org/NewSite/

May 7

Lunar Rendezbrew 23

Seabrook, TX. Entry Deadline: 3/17/2016.
mashtronauts.com

May 7

Ipswich Home Brew Competition

Booval, Queensland; Australia. Entry Deadline: 5/3/2016.
ipswichbrewco.com.au

May 7

MCAB XVIII Championship

Milwaukee, WI. Entry Deadline: 4/30/2016.
mcabchampionship.com

May 8

Jackalope Brewing Co. Presents "Let's Get Weird"

Nashville, TN. Entry Deadline: 5/1/2016.
kristen626.wix.com/jackalopebrew

May 11

Home Brew League: Perrin Brewing Challenge

Grand Rapids, MI. Entry Deadline: 5/7/2016.
coldbreakbrewing.com/pages/home-brew-league/

May 12

BrewMaui Annual Home Brew Contest

Maui, HI. Entry Deadline: 5/10/2016.
brewmaui.com

May 13

Duelo Cerveceros De Occidente

Guadalajara, Mexico.

May 13

Wisconsin State Fair Amateur Homebrew Competition

West Allis, WI. Entry Deadline: 4/13/2016.
wistatefair.com/competitions/winebeer/

May 14

BUZZ OFF 22

Downington, PA. Entry Deadline: 4/29/2016.
sites.google.com/site/buzzhomebrewclub/buzzoff/

May 14

4th Annual Heart of Cascadia - The Colors of IPA!

Portland, OR. Entry Deadline: 5/6/2016.
hoc2016.oregonbrewcrew.org

May 14

Boston Homebrew Competition

Boston, MA. Entry Deadline: 4/29/2016.
bhc.wort.org

May 14

Brewnosers' Homebrew Competition 2016

Halifax, NS. Entry Deadline: 5/7/2016.
brewnosers.org

May 14

Upland Brewing Company UpCup

Bloomington, IN. Entry Deadline: 5/7/2016.
uplandbeer.com/event/upcup-homebrewing-competition/

May 14

2016 Grumpy Troll Challenge

Mt. Horeb, WI. Entry Deadline: 5/8/2016.
mhtg.brewcompetition.com

May 14

Wort Transformation Challenge

La Vista, NE. Entry Deadline: 2/6/2016.
nebraskabrewingco.com

May 15

Singapore HomeBrew Charity Cup

Singapore. Entry Deadline: 5/1/2016.

May 15

Battle of the Bubbles VI

Frederick, MD. Entry Deadline: 5/6/2016.
bob.brewcomp.com

May 19

California State Fair Homebrew Competition

Sacramento, CA. Entry Deadline: 5/6/2016.
northerncalbrewers.com

May 21

The 2016 Hogtown Brew-Off

Gainesville, FL. Entry Deadline: 5/7/2016.
hogtownbrewers.org/brewoff/

May 21

4th Annual Hop Blossom Homebrew Competition

Winchester, VA. Entry Deadline: 5/6/2016.
shenbrew.org/hop_blossom_16/

May 21

OC Fair Homebrew Competition

Costa Mesa, CA. Entry Deadline: 4/29/2016.
ocfair.com/competitions/

May 21

Carolina BrewMasters US Open

Charlotte, NC. Entry Deadline: 5/13/2016.
usopen.carolinabrewmasters.com

May 21

WAZE Homebrew Competition

Latrobe, PA. Entry Deadline: 5/14/2016.
sites.google.com/site/wazebrew/waze-homebrew-competition-2016/

May 21

Spring Out to Sunset Homebrew Competition

Valparaiso, IN.
porterco.org/index.aspx?nid=195

May 21

5th Annual RiverRoots Brew-Off

Madison, IN. Entry Deadline: 5/10/2016.
riverroots.org

May 21

2016 Door County Homebrew Championship

Bailey's Harbor, WI. Entry Deadline: 5/13/2016.
doorcountyhomebrewers.com

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**May 21****34th Oregon Homebrew Festival**Corvallis, OR. Entry Deadline: 5/6/2016.
hotv.org**May 21****Marin County Fair****Homebrew Competition 2016**San Rafael, CA. Entry Deadline: 5/7/2016.
marinmashers.com**May 21****Brew Masters Competition**Escanaba, MI. Entry Deadline: 5/14/2016.
czartcf.blogspot.com**May 22****21st Annual Big Batch Brew Bash**Houston, TX. Entry Deadline: 5/13/2016.
thekgb.org**May 25****Shanghai 2016 National Homebrew Competition**

Shanghai, China. Entry Deadline: 5/15/2016.

May 26**XI Concurso Nacional das ACervAs**

Rio de Janeiro, Brazil.

May 27**Great Alaskan Craft Beer and Homebrew Festival**Haines, AK. Entry Deadline: 5/23/2016.
sealfair.org/beer-fest/**May 28****Manitoba Pros versus Schmoes**

Winnipeg, MB; Canada. Entry Deadline: 5/21/2016.

May 28**Jebbs Slovenian Challenge**

Swords, Dublin; Ireland. Entry Deadline: 5/14/2016.

nationalhomebrewclub.ie/forum/index.php/topic,151370.html**May 28****Hogtoberfest Home Brew Competition**Punxsutawney, PA. Entry Deadline: 5/20/2016.
groundhog.org/things-to-do/hogtoberfest/**May 29****San Diego County Fair Homebrew Competition**Del Mar, CA. Entry Deadline: 5/6/2016.
sdfair.com**June 4****22nd Annual 8 Seconds of Froth**Cheyenne, WY. Entry Deadline: 5/21/2016.
highplainsdrafters.com/8-seconds-of-froth/**June 4****Ohio State Fair Homebrew Competition**Columbus, OH. Entry Deadline: 5/17/2016.
ohiostatefair.com**June 4****Ballast Point Original Gravity Homebrew Competition**San Diego, CA. Entry Deadline: 5/25/2016.
ballastpoint.com/og20/**June 5****The Gulf Coast Brewers League Summer Homebrew Competition**

Biloxi, MS.

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AHA/BJCP SANCTIONED COMPETITION PROGRAM CALENDAR



June 9
California State Fair
Commercial Craft Beer Competition
 West Sacramento, CA. Entry Deadline: 5/20/2016.
northerncabrewers.com

June 9
AHA National Homebrew Competition Final Round
 Baltimore, MD. Entry Deadline: 5/25/2016.
HomebrewersAssociation.org

June 11
The Beer Project
 St. Petersburg, FL. Entry Deadline: 5/13/2016.
mfastpete.org/event/beer-project-beer-art-lounge-3/

June 11
The Homebrew Festival
 Market Bosworth, Warwickshire; United Kingdom.
thehomebrewfestival.co.uk

June 11
Alamo City Cerveza Fest
 San Antonio, TX. Entry Deadline: 5/3/2016.
bexarbrewers.org

June 11
South Beer Cup VI
 Curitiba, Paraná; Brazil. Entry Deadline: 5/25/2016.
southbeercup.com/sbc/

June 11
Bluegrass Cup
 Lexington, KY.
bluegrass-cup.bockbrew.com

June 11
2nd Annual Nashua River Brewers Festival Homebrew Competition
 Fitchburg, MA. Entry Deadline: 6/2/2016.
foambrewclub.com

June 11
Walk on the Wildside
 Tampa, FL.

June 15
Home Brew League: The Mitten Challenge
 Grand Rapids, MI. Entry Deadline: 6/11/2016.
coldbreakbrewing.com/pages/home-brew-league/

June 16
Because Beer Homebrew Competition
 Hamilton, ON. Entry Deadline: 6/10/2016.

June 18
Minicerveceria's BrewMasters
 Santiago, Chile. Entry Deadline: 6/11/2016.
minicerveceria.cl/sitio/index.php

June 18
King of the Mountain
 Willoughby, OH. Entry Deadline: 6/3/2016.
lmhba.com/king-of-the-mountain/

June 22
Red River Valley Fair
 West Fargo, ND. Entry Deadline: 6/17/2016.
redrivervalleyfair.com

June 25
If It Ain't Beer, Enter It Here
 Murrieta, CA. Entry Deadline: 6/11/2016.
ifitaintbeer.temeculahomebrewers.com

June 25
Summer Sizzler
 Greenville, NC. Entry Deadline: 6/10/2016.
downeastalers.com

July 8
Indiana State Fair Brewers' Cup Competition
 Indianapolis, IN. Entry Deadline: 6/24/2016.
indianastatefair.com

July 9
Copper Hills Brewfest
 Yerington, NV. Entry Deadline: 6/27/2016.
yeringtonbrewfest.org

July 9
Amador County Fair Home Brew Competition
 Plymouth, CA. Entry Deadline: 6/25/2016.
brewangels.com

July 9
5th Annual Merrimack Valley Homebrew Competition
 Lowell, MA. Entry Deadline: 6/25/2016.
mvhbc.com/competition/

July 9
Lane County Fair
 Eugene, OR. Entry Deadline: 7/11/2016.
atthefair.com/Exhibits-openshow/

July 16
Deer River BBQ & Brew Fest
 Deer River, MN. Entry Deadline: 7/15/2016.
deerriver.org/events/event.php?number=116

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AHA/BJCP SANCTIONED COMPETITION PROGRAM CALENDAR



July 16

E.T. Barnette Homebrew Competition

Fox, AK. Entry Deadline: 7/13/2016.

mosquitobytes.com/Den/Beer/Events/Events.html

July 23

Gillette Mainstreet Brewfest

Gillette, WY. Entry Deadline: 7/23/2016.

gillettemainstreet.us

July 23

For What It's Worth

Bloomington, IL. Entry Deadline: 7/8/2016.

forwhatitsworth.com

July 23

Gillette Mainstreet

Homebrew Competition

Gillette, WY. Entry Deadline: 7/15/2016.

facebook.com/groups/gillettebrewersguild/

July 23

Arvada on Tap

Arvada, CO.

visitarvada.org/events/arvada-on-tap/home-brew/

July 23

Crystal Coast Brew Off

New Bern, NC.

atfhomebrewclub.com

July 30

Hail the Ale

Manhattan, KS. Entry Deadline: 7/15/2016.

rhythmandbrewsmhk.org

July 30

2016 Michigan Beer Cup

Auburn Hills, MI. Entry Deadline: 7/9/2016.

michiganbeercup.com

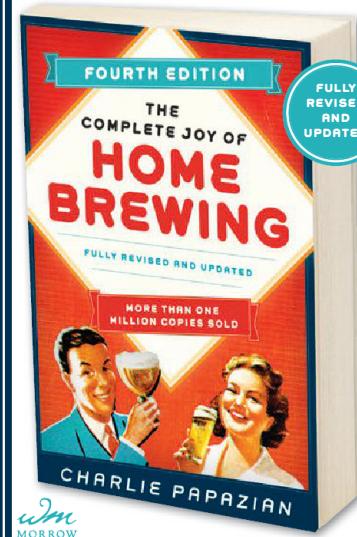
July 30

2016 German Fest Stein Challenge

West Allis, WI. Entry Deadline: 7/18/2016.

steinchallenge.com




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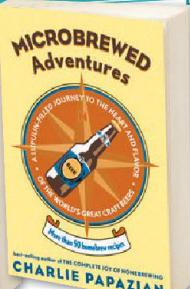
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by Kara Osburn, Nur Nisaa Ahmad, and Matthew L. Bochman

The Wild, Wild World of Wild Yeast

Editor's Note: This is the eighth published experiment from the AHA's Research & Education Fund (REF). For more on the REF and to see other completed projects, go to HomebrewersAssociation.org/community/research-and-education-fund. The data and observations presented in this report were derived from only one experiment and therefore should not be considered conclusive.



It has been said that brewers make wort, but yeast makes beer. And it's true: microscopic yeast cells eat wort sugars and create the ethanol, carbon dioxide, and aromatic compounds that comprise our favorite intoxicating, effervescent beverage. That said, yeast tends to be the forgotten ingredient in beer: it was even left out of the original Reinheitsgebot (For more on the Reinheitsgebot, see page 50).

For years, home- and craft brewers have experimented with new hop varieties, vintage and heirloom barley breeds, spices, and even water chemistry, but identification and use of novel yeasts in beer brewing has lagged behind that of these other ingredients.^{1,2,3,4} But in beers that aren't heavily hopped (despite the current IPA craze, such things do exist), yeast can contribute more than half the flavor profile of the finished product. True, there are strains like White Labs WLP001 California Ale Yeast that have neutral flavor profiles and add little more than alcohol and bubbles to your beer. However, there are others that provide the banana

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aromatics (isoamyl acetate) in hefeweizen or the hint of butterscotch (diacetyl) in some English ales, just to name a couple.

As lovers of yeast and the things that yeasts do, my students and I wanted to answer the question, “What other flavors are out there?” There are an estimated 150,000 species of yeast on Earth, but only about one percent of them have been described.⁵ Of these, members of the genus *Saccharomyces*, especially *S. cerevisiae* (ale yeast) and the *S. cerevisiae/S. eubayanus* hybrid *S. pastorianus* (lager yeast),



dominate European and American beer brewing industries.^{6,7} However, pre-industrial brewing often relied upon spontaneous fermentation, which was performed by various yeasts and other microbes native to particular regions.⁸

Have we lost classic beer aromas and flavors by limiting ourselves to species of *Saccharomyces*? What other yeast-borne tastes and smells are waiting to be discovered among wild yeasts? We decided to go yeast hunting to find out. The research presented here sought to bridge the gap between the science of isolating wild yeasts (yeast hunting) and their eventual use in brewing. As biochemists and molecular biologists, we aimed to leverage our wet-lab skills to develop an effective wild yeast isolation and selection procedure, as well as to identify species with desirable brewing characteristics: ethanol tolerance; evolutionary relatedness to *Saccharomyces cerevisiae*; production of pleasant aromatics; metabolism of maltose; flocculation; attenuation; and flavor.

For the sake of brevity, we have intentionally omitted a detailed discussion of our experimental methods. But citizen scientists interested in the full details of our approach are encouraged to consult our AHA REF write-up, available online at HomebrewersAssociation.org.

Rich sources of ethanol-tolerant wild yeasts

In his AHA REF project, Lentz (2014) isolated multiple yeasts from fruits and barley using malt yeast peptone glucose (MYPG) broth, a rich medium that permits the growth of essentially all aerobic yeast and bacteria. After purifying the yeasts of all other organisms, he tested them for ethanol tolerance, which is a necessary attribute of any beer yeast.

We used a different tactic for our experiment by employing a rich medium containing 5 percent ethanol to immediately isolate only ethanol-tolerant yeasts. The average craft beer contains less than 6 percent alcohol by volume, so using this selection, we ensured that every organism that we isolated could at least survive in an ethanol concentration commonly

TABLE I:
Various Isolated Yeasts, Their Sources, and Their Aroma Profiles
When Grown In Liquid Culture

Strain	Genus and species	Source	Aroma
YH1	<i>Hanseniospora uvarum</i>	Serviceberry	Mild rubbing alcohol
YH2	<i>Hanseniospora uvarum</i>	Serviceberry	Yeasty
YH5	<i>Starmerella bombicola</i>	Dandelion blossom	Neutral to mildly musty
YH6	<i>Cryptococcus albidus</i>	Dandelion blossom	Yeasty
YH9	<i>Metchnikowia fructicola</i>	Serviceberry	Maple syrup
YH14	<i>Candida carpophila</i>	Dogwood bark	Feet
YH18	<i>Lachancea kluyveri</i>	Honey locust bark	Neutral to mild floral
YH19	<i>Torulaspora delbrueckii</i>	Weeping cherry bark	Strong floral, nearly astringent
YH23	<i>Kluyveromyces lactis</i>	Honey locust bark	Mild floral
YH25	<i>Lachancea fermentati</i>	Red oak bark	Floral
YH35	<i>Saccharomyces paradoxus</i>	Red oak bark	Neutral
YH44	<i>Saccharomyces cerevisiae</i>	Shagbark hickory bark	Yeasty
YH123	<i>Saccharomyces cerevisiae</i>	White oak bark	Sweet, floral
YH138	<i>Debaromyces hansenii</i>	Soil	Light floral
YH156	<i>Schizosaccharomyces japonicas</i>	Oak bark	Mesquite smoke
YH169	<i>Brettanomyces bruxellensis</i>	Wild fermented beer	Neutral
YH178	<i>Torulaspora delbrueckii</i>	Honey bee	Fruity/citrus
YH196	<i>Saccharomyces cerevisiae</i>	Pawpaw fruit	Earthy

FIGURE I:
Evolutionary Relationships among Wild Strains
and Four Commercially Available Brewer's Yeasts

(A) Representative DNA sequences from the indicated strains were aligned, and the evolutionary relationships among them were determined. The closer two strains cluster on the tree, the closer their relationship. The commercially available strains are from White Labs (WLP001, WLP300, and WLP715) and Wyeast (WY2007). (B) Enlarged and annotated "Saccharomyces species" portion of the tree from (A). The genus abbreviations *S.*, *T.*, and *W.* stand for *Saccharomyces*, *Torulaspora*, and *Wickerhamomyces*, respectively.

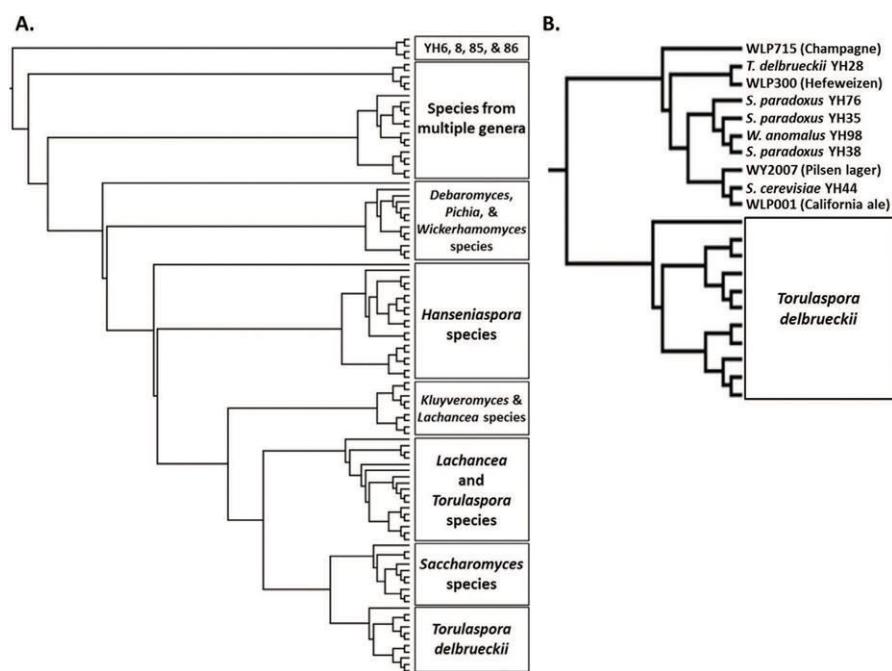
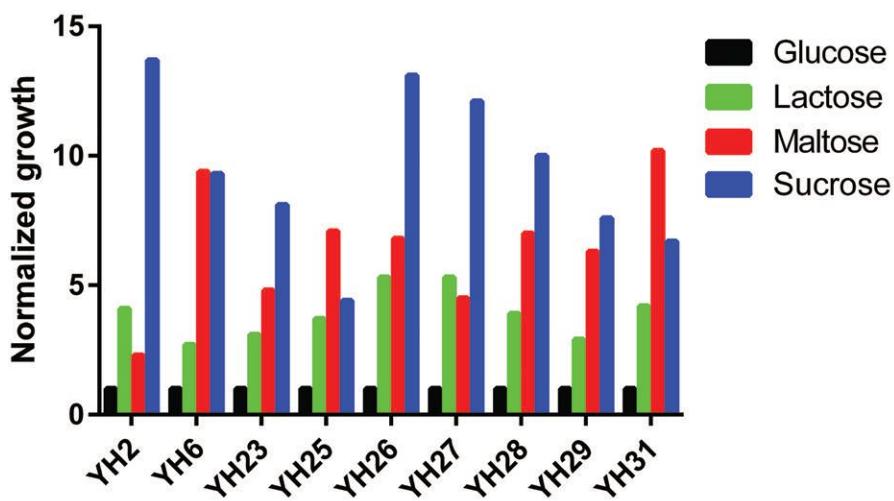
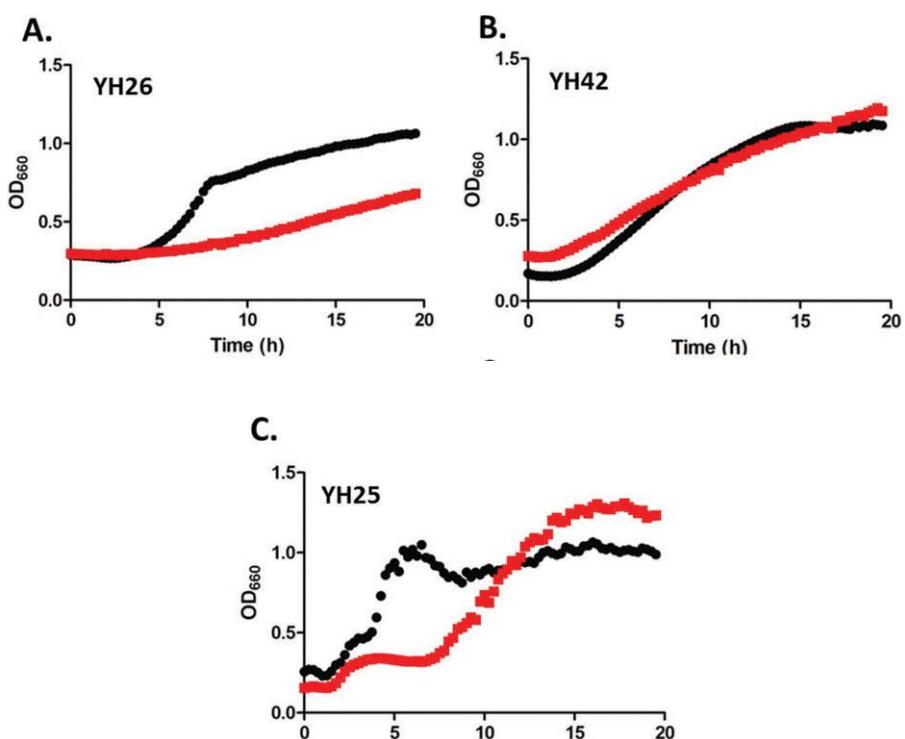


FIGURE 2:**Relative Yeast Growth in the Presence Of Various Sugars**

The indicated yeast strains were grown in a rich medium containing a single sugar (glucose, lactose, maltose, or sucrose), and their growth was normalized to that in a glucose-containing medium. Values greater than one indicate better growth.

**FIGURE 3:****Growth Kinetics of Strains in Glucose- and Maltose-Containing Media**

The indicated strains were grown overnight in media containing either glucose (black) or maltose (red). Growth was then monitored for about 20 hours and is plotted as the optical density at 660 nm (OD_{660}) vs. time.



HAVE WE LOST CLASSIC BEER AROMAS AND FLAVORS BY LIMITING OURSELVES TO SPECIES OF SACCHAROMYCES?

found in beer.⁹ Including ethanol in the selection medium also eliminated the growth of nearly all other organisms (i.e., bacteria and filamentous fungi), which generally have lower alcohol tolerances than *S. cerevisiae* and related yeasts.

Like bacteria, yeasts are ubiquitous in nearly all environments. Unfortunately, relatively few are suitable for beer brewing, making yeast hunting a true “needle in the haystack” proposition. One might naively assume that natural sources of concentrated sugar, such as fruits and berries, would be the best sources of brew-worthy yeasts. Indeed, an earlier AHA Research and Education Fund (REF) project concerned the isolation and initial characterization of wild yeasts and largely focused on fruit.⁴ However, levels of *S. cerevisiae* and related brewing species on such substrates are much lower than those of other yeasts: just one of every 1,000 grapes harbors *S. cerevisiae*, and those that do carry it host 100 to 1,000 times as many cells from other yeast species.¹⁰ Instead, research demonstrates that tree bark, especially from oak, is a natural reservoir of *Saccharomyces* species.^{11,12}

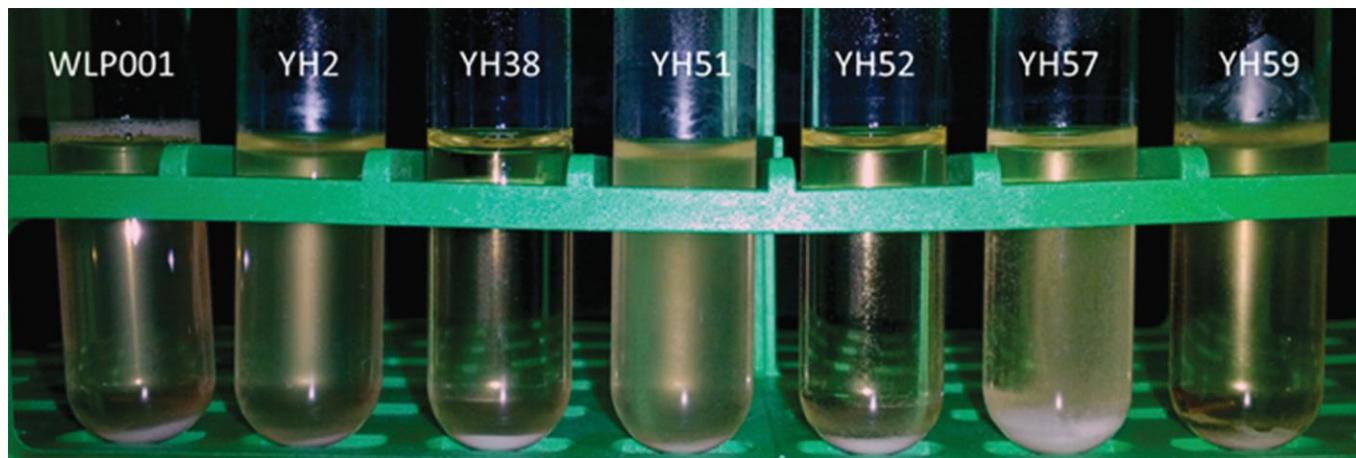
We began yeast hunting locally in Bloomington, Ind. to isolate and characterize new strains for brewing but also extended our search to nearby states (West Virginia, Pennsylvania, Ohio, New Jersey, and New York). Because yeasts are found everywhere from the Antarctic to the ocean floor, we took an unbiased approach when screening environmental samples for yeast.^{13,14} Table 1 shows a random assortment of strains that we identified and the sources from which they were isolated.

During this ongoing experiment, we have successfully isolated 200 different strains

FIGURE 4:**Qualitative Flocculation Assessment**

The indicated strains were inoculated into rich medium, incubated at 86° F (30° C) with aeration for four hours, and then incubated without aeration (i.e., vertically in a test tube rack) at 86° F (30° C) for two days. Good flocculation was evident by the clarity of the culture, with strains less able to flocculate resulting in increasingly turbid media. Flocculation behavior from best to worst was as follows:

1. YH52
2. YH38
3. WLP001 and YH59
4. YH2
5. YH57
6. YH51



from multiple types of tree bark, soil, flowers, fruits, berries, vegetables, and contaminated beer (Table 1). Of these, nearly two thirds were isolated from tree bark. Therefore, based on our success rate of the number of ethanol-tolerant yeasts isolated per sample, we would advise other yeast hunters to focus their collection efforts on tree bark, which unlike local fruits/berries/vegetables is also readily available year-round. While we did find potentially brew-worthy yeasts on all types of samples, repeated sampling was sometimes necessary to hit pay dirt.

Diversity of yeasts identified

Our collection of 200 wild yeasts features multiple strains from more than 30 species. This includes 14 wild *S. cerevisiae* strains, eight isolates of *Saccharomyces paradoxus* (the closest known relative of *S. cerevisiae*), three *Brettanomyces bruxellensis* strains, and six species commonly associated with African millet beer production, *Schizosaccharomyces pombe*. What about

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the other 169 strains? Well, nearly all of them belong to the Saccharomycetaceae family. As such, they are “cousins” of *S. cerevisiae* on the evolutionary tree and thus more likely to have desirable brewing characteristics than more distantly related fungi.

Interestingly, as shown in Figure 1, several strains were more closely related to commercial strains like White Labs WLP001 than the commercial strains

were to each other. Unsurprisingly, this included the wild *S. cerevisiae* and *S. paradoxus* strains mentioned above, as well as strains of *Torulaspora delbrueckii* (YH28) and *Wickerhamomyces anomalus* (YH98). Notably, the YH98 strain was isolated from contaminated wort from our collaborators at Flat 12 Bierwerks in Indianapolis, Ind., suggesting that it may be a hybrid with their usual workhorse Wyeast 1056 (WY1056) ale yeast.

**Brewing characteristics
of the wild yeasts**

It was relatively simple to select for and single-colony-purify the wild yeasts. With practice, a motivated person could easily accumulate a collection containing hundreds of isolates. The real problem was trying to winnow the collection down to those most likely to make flavorful beer (or another fermented beverage). Identifying the yeasts at the species level eliminated a small number of strains known to be pathogens (e.g., *Candida* species like YH14), but this represented a small minority of the total.

TABLE 2:
Normalized Growth of Selected Strains in Media Containing Various Concentrations of Ethanol

Strain	No ethanol	5% ABV	10% ABV	15% ABV
YH2	1.0	0.646 ●	0.479 ●	0.090 ●
YH5	1.0	0.954 ●	0.938 ●	0.246 ●
YH6	1.0	0.300 ●	0.200 ●	0.171 ●
YH7	1.0	0.909 ●	0.273 ●	0.227 ●
YH9	1.0	1.288 ●	0.373 ●	0.254 ●
YH12	1.0	0.831 ●	0.197 ●	0.211 ●
YH15	1.0	0.625 ●	0.798 ●	0.269 ●
YH16	1.0	0.617 ●	0.798 ●	0.670 ●
YH17	1.0	0.838 ●	0.959 ●	0.378 ●
YH18	1.0	0.558 ●	0.690 ●	0.407 ●
YH21	1.0	1.000 ●	1.000 ●	0.900 ●
YH23	1.0	1.011 ●	0.705 ●	0.682 ●
YH24	1.0	1.551 ●	1.551 ●	1.449 ●
YH25	1.0	0.635 ●	0.702 ●	0.721 ●
YH26	1.0	0.405 ●	0.460 ●	0.423 ●
YH27	1.0	0.519 ●	0.549 ●	0.451 ●
YH28	1.0	0.554 ●	0.574 ●	0.541 ●
YH29	1.0	1.180 ●	1.164 ●	0.689 ●
YH30	1.0	0.765 ●	0.696 ●	0.225 ●
YH31	1.0	0.832 ●	0.802 ●	0.822 ●

● Poor ethanol tolerance
● Medium ethanol tolerance
● High ethanol tolerance

● Ethanol promotes growth
● Extremely ethanol tolerant

A better culling point was to first grow the isolated strains in liquid media and subject them to the “sniff test.” In other words, we simply smelled the cultures as a primitive but effective first-pass sensory analysis. The growth medium we used had a neutral odor profile, like a blonde wort with low IBUs, so anything above background was due to aromatics produced by the yeast cells. As shown in Table 1, some strains produced astringent odors reminiscent of rubbing alcohol (e.g., YH1) or sweaty feet (YH14). These were eliminated from further testing.

We next measured the ability of the yeast to grow in different sugars. The most concentrated sugar in wort is maltose, so minimally we assayed for good growth in maltose-containing media.¹⁵ However, wort also typically contains high concentrations of sucrose, fructose, glucose, and more complex sugars, in addition to adjuncts in specialty beers like lactose in milk stout. Therefore, we tested yeast growth in the presence of a variety of sugars (see Figure 2 for examples). All strains grew well in the presence of maltose, with some displaying large preferences for maltose over glucose. For example, YH6 and YH31 grew about 10-fold better in the presence of maltose compared to glucose (Figure 2), suggesting that they would happily ferment your wort.

Ideally, a brewing strain also rapidly converts maltose and other wort sugars to ethanol and carbon dioxide. The faster that the “food” in the wort is consumed, the faster the pH drops due to yeast metabolism, and the faster ethanol is produced, the less chance there is for a contaminating organism to ruin a fermentation. Thus, we also measured the kinetics of yeast growth in medium containing glucose vs. maltose (Figure 3).

Many strains behaved similarly to YH26 (Figure 3A), which grew well in the presence of both glucose and maltose but displayed a long lag time in the maltose medium. This indicates that such strains would be slow fermenters. However, other strains like YH42 were equivalently vigor-

TABLE 3:
Fermentation and Sensory Analyses

Strain	Original gravity	Final gravity	Attenuation	Lag time	Sensory notes
Wyeast 1056	1.040 (10.0° P)	1.006 (1.5° P)	85%	12 h	Clean, neutral flavor
Wyeast 1056	1.055 (13.5° P)	1.011 (2.7° P)	80%	12 h	Clean, neutral flavor
YH2	1.040 (10.0° P)	1.022 (5.5° P)	45%	36 h	Tart, spicy flavor
YH38	1.040 (10.0° P)	1.024 (6° P)	40%	≤9 h	Vegetal, dirty
YH39	1.055 (13.5° P)	1.044 (11° P)	19%	12 h	Belgian- & saison-like, spicy
YH44	1.055 (13.5° P)	1.036 (9° P)	33%	12 h	Clean, neutral flavor
YH45	1.055 (13.5° P)	1.044 (11° P)	19%	12 h	Neutral
YH51	1.040 (10.0° P)	1.024 (6° P)	40%	24 h	Tart
YH52	1.040 (10.0° P)	1.014 (3.5° P)	63%	12 h	Belgian phenolic, bubblegum
YH52	1.055 (13.5° P)	1.044 (11° P)	19%	12 h	Belgian-like, spicy
YH57	1.040 (10.0° P)	1.016 (4° P)	58%	≤9 h	Strong diacetyl, rounded
YH59	1.040 (10.0° P)	1.012 (3° P)	68%	24 h	Fairly clean, slightly tart
YH59	1.055 (13.5° P)	1.040 (10° P)	26%	12 h	English-like, malty, spicy
YH79	1.055 (13.5° P)	1.024 (6° P)	65%	12 h	Sour, soft, clean

ous in both glucose and maltose medium (Figure 3B). This is essentially the same growth pattern displayed by commercially available strains like WLP001 (data not shown), suggesting that these yeasts would quickly ferment wort to outcompete spoilage organisms.

Notably, these kinetic experiments were an important complement to those used to generate the data in Table 2, which only measured the endpoint. For instance, one might assume that strains such as YH6, 25, and 31, which grew to 9.4-, 7.1-, and 10.2-fold higher

density, respectively, in maltose medium compared to glucose, would perform well during fermentation. However, as shown in Figure 3C for YH25, this strain does grow to higher density in the presence of maltose but displays a much longer lag time during which spoilage could occur.

Next, flocculation was assessed by growing the cultures in stationary tubes, and qualitatively judged by visually inspecting the turbidity of the cultures (Figure 4). Compared to WLP001, we isolated strains with better flocculation characteristics

(e.g., YH38 and YH52), similar levels of flocculation (e.g., YH59), and less ability to flocculate (e.g., YH2, YH51, and YH57, which were on par with hefeweizen yeast flocculation).

Ethanol tolerance of the wild yeasts

As stated earlier, the average craft beer contains less than 6 percent ABV (Nelson 2014), and all of the strains in our collection can tolerate at least 5 percent ABV. Craft and homebrewers are known for pushing boundaries, though, so we also tested growth of our strains in media containing higher concentrations of ethanol and compared that to growth in media lacking ethanol (representative data shown in Table 2).

We found that some strains like YH6 were barely ethanol tolerant, with even 5 percent ABV decreasing growth by 70 percent. However, most strains displayed at most a 50 percent decrease in growth in the presence of 5 percent ABV, and many similarly tolerated 10 percent ABV (e.g., YH30). Some strains like YH9 and YH29 even grew better in the presence of low concentrations of ethanol compared to media without ethanol. Rare isolates such as YH24, a strain of *Kluyveromyces marxianus*, not only tolerated up to 15 percent ABV but grew better than in media lacking ethanol altogether. We conclude that one could modify our selection procedure to specifically hunt for extremely ethanol-tolerant yeasts suitable for high-gravity fermentation.

Trial brewing

“The proof of the pudding is in the eating,” and the usefulness of the yeast is only fully obvious in the brewing. After collecting species data and determining a handful of brewing characteristics in the lab, we triaged the initial collection of 100 down to the 10 best candidates and put those yeasts to the ultimate test by brewing with them. We did this in collaboration with the mad scientist brewers at Flat 12 Bierwerks in Indianapolis, Ind. To summarize the process, we started from single colonies of the yeast indicated in Table 3 and propagated them in liquid culture to generate 100 billion cells, which Flat

12 then pitched into 5-gallon (18.93 L) batches of wort. As a control, we cultured and pitched Wyeast 1056 in the same manner.

Two rounds of these brewing experiments were performed using porter wort with an original gravity (OG) of 1.040 (10° P) in September 2014 and 1.055 (13.5° P) in January 2015 (Table 3, white and shaded, respectively). In two cases (YH52 and YH59, *T. delbrueckii* and *Kluyveromyces lactis*), strains that performed well in the first experiment were tested again in the second. In both cases, the sensory analysis was performed by BJCP-certified judges at the brewery. Public tastings were also held at Flat 12 Bierwerks during an event called Defining “Drink Local” (indybeernews.com/blog/defining-drink-local/) and at the 7th Annual Brewers of Indiana Guild Winterfest. Anecdotal reports indicate that the public generally agreed with the BJCP judges concerning the flavors and aromas of the beers, though the average drinker tended to like the sweetness of the poorly attenuated beers better than did their professional counterparts.

As can be seen in Table 3, none of the experimental strains performed overall as well as WY1056, which had a short lag time, attenuated well, and produced a clean, neutral flavor profile. However, the *S. paradoxus* strain YH38 and *Lachancea thermotolerans* strain YH57 displayed a considerably shorter lag time than WY1056, three strains yielded at least 63 percent attenuation (*T. delbrueckii* YH52, *K. lactis* YH59, and *L. thermotolerans* YH79), and many resulted in neutral or pleasing flavor profiles. This suggests that repeated brewing with one or more of these strains could adapt them to better performance in wort. Central State Brewing in Indianapolis took this approach with their house *Brettanomyces bruxellensis* strain, which mutated over a year of culturing and brewing into a quick-attenuating yeast with an excellent flavor profile that can be tweaked depending on the beer style and fermentation conditions used (see centralstatebrewing.com/blog/ for more details).

Overall, the wild *Saccharomyces* strains YH38 and YH44 produced perhaps the least interesting beers. The general favorite and biggest surprise was *L. thermotolerans* YH79, which attenuated well compared to the other wild strains, had a lag time similar to WY1056, and actually soured the porter. Those familiar with sour beers like Belgian lambics and American wild ales know that souring is generally due to the combination of many organisms, including multiple species of yeast and *Lactobacillus* bacteria.¹⁶ Having a pure culture of a single yeast species that can sour beer is easier than trying to wrangle multiple microbes, and we are following up on YH79 in ongoing experiments.

Conclusions

Did we find a million-dollar yeast? Well, let's just say that White Labs hasn't come begging to be our distributor yet. That said, we were able to develop a simple protocol to isolate ethanol-tolerant yeasts from rich natural reservoirs, cull the herd down to the best brewing prospects, and make drinkable (and often delicious) beer. This was somewhat easier for us to do in a lab setting than it would be for the average homebrewer or even craft brewer, but homebrewers are all scientists themselves.

The performance characteristics of our favored yeast strains might be improved through selective isolation in successive generations. Strains of brewer's yeast are ultimately chosen from those cells that efficiently ferment wort and create appealing aromas and flavors along the way. Wild yeasts are more likely to do this when they are isolated from malt-based media since yeasts adapt to their preferred substrates. As this process is repeated, it's possible that some of our strains will improve beyond what we observed in this first series of experiments.

We hope that others are inspired to find their own ultra-local wild strains to brew with, and we're going to continue to characterize the isolates in our collection. Prost!

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malt
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stops or is arrested before reaching dryness. The character differs from Applewine in that the ice cider process increases not only sugar (hence alcohol) but acidity and all fruit flavor components proportionately. No additives are permitted in this style; in particular, sweeteners may not be used to increase gravity. This style originated in Quebec in the 1990s.” (For more on producing ice cider, see “Frozen” in the November/December 2014 issue of *Zymurgy*.)

Iceman is 10 percent alcohol by volume and is made from a blend of apple varieties including Braeburn, Fuji, Granny Smith, and Gala, all grown in Italy at the base of the Alps.

Next up is Orange Spice Mead from Prairie Rose Meadery in Fargo, N.D. Prairie Rose was started by Susan Ruud and her husband, John, in May 2015. The duo won the gold medal in the Traditional Mead category in the 2013 National Homebrew Competition, and Susan is a member of the AHA governing committee.

Shifting gears this issue, we sent our judges two distinct styles: a cider and a mead, utilizing the 2015 Style Guidelines for their review.

Angry Orchard Iceman, part of the Cider House Collection, uses the process of freezing the juice from culinary and bittersweet apples to produce a rich, complex cider with a crisp apple taste and notes of caramel and toffee. Oak aging lends vanilla character. Iceman was judged under the C2D Ice Cider guidelines, which state: “This is a cider style in which the juice is concentrated before fermentation either by freezing fruit before pressing or freezing juice and removing water. Fermentation

Orange Spice Mead, which uses blood oranges and includes a cinnamon, nutmeg, and clove blend, was judged under M3A Fruit and Spice, which states simply, “Fruit and spice mead is a mead containing one or more fruits and one or more spices.”

For Orange Spice Mead, the fruit and honey are fermented together along with

OUR EXPERT PANEL David Houseman, a Grand Master V level judge and competition director for the BJCP from Chester Springs, Pa.; Beth Zangari, a Grand Master II level judge from Placerville, Calif. and founding member of Hangtown Association of Zymurgy Enthusiasts (H.A.Z.E.); Scott Bickham, a Grand Master III judge from Corning, N.Y., who has been exam director or associate exam director for the BJCP since 1995; and Gordon Strong, a Grand Master IX judge, principal author of the BJCP Style Guidelines, and president of the BJCP board who lives in Beavercreek, Ohio.



Angry Orchard
angryorchard.com

Prairie Rose Meadery
prairierosemeadery.com

BJCP Style Guidelines
bjcp.org

Commercial Calibration Index
HomebrewersAssociation.org/pages/zymurgy/commercial-calibration

staggered nutrient additions and wine yeast. When fermentation is complete, spices are added until they are at appropriate levels. The final product is then filtered. Ruud recommends pairing the mead with chicken or pork dishes, or with a rich milk chocolate dessert. “It’s also wonderful as a night cap,” she says.

THE SCORES



Iceman Cider—Angry Orchard, Walden, N.Y.
BJCP Category: C2D, Ice Cider



DAVE HOUSEMAN

THE JUDGES' SCORES FOR ICEMAN CIDER



BETH ZANGARI



SCOTT BICKHAM



GORDON STRONG

Bouquet/Aroma: Bright, intense apple aroma with noticeable alcohol (ethanol) notes that are not hot or harsh. No sulfur or off-aromas. A well-balanced and inviting aroma. (8/10)

Appearance: Brilliant clarity. Dark gold with an orange tint; nearly light amber. No carbonation; a still cider, even though that was not stated on the bottle. That's OK, although this is packaged in a Champagne bottle, so the expectation was a carbonated cider. (6/6)

Flavor: Very fruity with intense apple character, almost like concentrated apple juice or a very sweet and juicy apple. Sweet, but with balancing acidity that brightens up the ice cider so that it is not at all cloying. Some light tannins in the aftertaste add to complexity. Full body. There's a good deal of alcohol but it's a soft ethanol—not harsh or hot—that blends well with the rest of the cider. Well-balanced. The aftertaste suggests an addition of brown sugar, even if none was used. Fruiteness also suggests raisins or another concentrated fruit. Angry Orchard says this cider is oak aged; I don't perceive any oaky or vanilla notes, but the caramel and raisin character may well have been from oak aging. (22/24)

Overall Impression: The balance of fruitiness, sweetness, acidity, alcohol, and tannin is enjoyable. Right on target with the style guidelines. Carbonation would have lightened mouthfeel and added to the liveliness of the product; the sweetness would have stood up to the additional acidity. It's a cold night, there's a fire in our fireplace, and this ice cider goes well with the brie and crusty bread we are having for dinner. (9/10)

Total Score: (45/50)

Bouquet/Aroma: A yeasty bread dough note emerges behind ripe, floral, fruity apple aromas reminiscent of both apple blossoms and applesauce. Yeast fades quickly, allowing apple sweetness to take over. White pepper, a soft lactic acidity, and earthy, woody accents play in the background, behind the dominant apple character. (9/10)

Appearance: Deep, burnished red-gold color with brilliant clarity. A profusion of tiny bubbles rises quickly at first before dissipating to a mist roused only with agitation. Second pour forms a half inch of loose white foam that quickly dissipates. (6/6)

Flavor: Full-bodied and sweet behind fruity apple flavors. Firm lactic and malic acidity balance the presentation. A hint of almost dusty woodiness emerges after a pleasant lingering sweetness, providing a crisp bite to the finish. (20/24)

Overall Impression: The bottle is corked and caged, which led me to expect an effervescent beverage. Instead the contents presented with a soft, nearly pétillant texture. The description on the bottle mentions oak aging, but oak wood was not a significant component of the overall profile.

The strong, ripe fruit sweetness and acidity with hints of damp wood remind me of fruit bins stored after harvest, slightly dusty but infused with the ripe, fruity sweetness of late autumn afternoons. Full fruit, full body, and sweetness mask a rather significant alcohol level, making this a bottle to share at home with friends—or not share, but relish over reminiscences of balmy spring evenings and bonfires after sundown... (8/10)

Total Score: (43/50)

Bouquet/Aroma: First impression includes spicy and woody notes with nutmeg and cinnamon, but they are in balance with the apple. I get moderate to low alcohol in the background. The fermentation character is clean and allows some honey and light caramel sweetness to come through. The balance is a little heavy on the spicy side. (8/10)

Appearance: Golden color with reddish-copper highlights; some bubbles emerge when poured and form wispy trails that stream from the bottom of the glass; pristine clarity. (6/6)

Flavor: Overall character is an interesting marriage between sweetness and sourness. When it first greets the palate, it seems like it wants to be sweet, but then the tartness begins to grow and pushes it towards a moderately sour finish that lingers. Alcohol notes are present, but quite subtle considering that this is 10 percent ABV. Dangerously drinkable! The carbonation is low but sufficient to elevate it from the palate and prevent it from being cloying. The body is medium, with residual sugars balanced by acidity and tannins. Bumping up the tannins a notch would add some complexity to the aftertaste. (21/24)

Overall Impression: This is a very nice example of an ice cider that pays homage to its Quebec roots. The sweet and sour impression is a nearly flawless representation of the guidelines for this style. Sulfites become a little too pronounced as it warms, and a slight increase in the tannic character would add complexity, but these are minor detractions from a delicious and well-crafted cider. (9/10)

Total Score: (44/50)

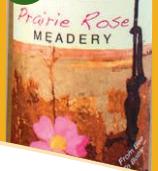
Bouquet/Aroma: Strong apple aroma with an interesting sweet-and-sour impression. Slight woody notes. Some yeast sulfur notes vent early on but don't persist. Fairly clean fermentation. Hint of caramel. Slight alcohol sharpness evident. Apple has a strong fruity component with light floral notes. (8/10)

Appearance: Tall, white, frothy head, settles like soda pop. Effervescent. Crystal clear. Deep, burnished gold color, almost amber. (6/6)

Flavor: Full body. Starts out sweet and apple-fuity but the acidity comes on quickly to balance and ultimately overtake the finish. Clean fermentation. Heavy palate, reminding me more of mead than cider. Light, woody tannins. The apple has a slight cooked or baked character, adding a light caramel backdrop. Fruity apple flavor and acidity carry the day, though. The high alcohol is hidden, just showing up as a slight warmth in the throat. (21/24)

Overall Impression: A strong, full-bodied cider that is complex, interesting, and a bit dangerous. The sweetness does make it fairly easy to drink, but the acidity and woody tannin do a great job balancing so that it is clearly a cider. Obviously different from the usually-much-drier and lighter-bodied Applewine style. The body and mouthfeel are quite big, which does encourage sipping. However, acidity in the finish also encourages another drink. Well done. I tried this at different temperatures and prefer it at cellar- to cool-room temperature. If it's too cold, the acidity really takes over and you miss out on some of the great apple flavor. (9/10)

Total Score: (44/50)



THE JUDGES' SCORES FOR ORANGE SPICE MEAD



Bouquet/Aroma: Complex aroma focused on the expression of honey with a hint of citrus acidity and very light spicing that's not individually distinguishable. A bit of alcohol nips the nose. Nice subtle blend of character to yield a pleasant bouquet. (8/10)

Appearance: Very pale yellow. No carbonation; a still mead. Brilliant clarity. Long-lasting legs. A very pretty mead. (6/6)

Flavor: Honey expression is dominant. Although this is a semi-sweet mead, it's a bit sweet both up front and in the finish. Orange citrus notes are quite evident but subtle. Spices, while also evident, blend very subtly; I only pick out cinnamon as an individual spice. There are some noticeable tannins that add to the medium body. No carbonation; additional carbonation would help to liven up the mead, and perhaps balance sweetness and emphasis on honey. Alcohol is there: not harsh or hot, but a pleasant warmth. I get some sherry notes in the aftertaste that are likely oxidation. (20/24)

Overall Impression: This is a tasty, enjoyable mead with a nice combination of orange and spice; it would benefit from a bit more of both to showcase against the sweet honey expression. Carbonation, with its additional acidity, would also help to balance the sweetness. The alcohol is nicely subtle, yet warming. Oxidation needs to be managed, as the sherry notes are somewhat distracting. Still quite drinkable, especially for sipping on a cold night. (7/10)

Total Score: (41/50)



Bouquet/Aroma: Fruity, ripe orange with cinnamon and clove play behind low sweet floral honey expression. Clean, low alcohol notes accent the honey and floral presentation. Orange blossom accompanies honey and a hint of pie spice. (9/10)

Appearance: Pale straw with the barest blush of pink. Brilliant clarity. Pétillant carbonation elegantly laces the legs like stockings on sides of the glass. (6/6)

Flavor: Initial floral honey expression has a slight sherry and nutty note, like walnuts, that emerges momentarily on a second sip, then fades as a soft acidity. Elegant structure and creamy texture allow sweet honey, orange zest, and spices to dance on the tongue. Medium- to full-bodied; finishes with a clean, light acidity and low, lingering alcohol warmth. On further sips, the spices recede to showcase floral honey and orange zest. (21/24)

Overall Impression: Both the first and last sips remind me of orange spice cake with walnuts and candied citrus. Orange is in the background and doesn't overpower the honey. Likewise, the spices are delicately applied so as to provide an elegant balance among all components. Truly the Champagne of the prairie. (9/10)

Total Score: (45/50)



Bouquet/Aroma: The spices lead out as soon as the bottle is uncorked, with nutmeg at the forefront, followed by cinnamon and clove. As the mead sits and breathes, the spices settle and the orange essence starts to emerge. Honey lends some underlying sweetness, but is in more of a supporting role. A little more citrus character would be nice. (8/10)

Appearance: The color is very pale yellow with slight orange highlights. The bottle uncorked with a very slight hiss, but there is essentially no carbonation; excellent clarity. (6/6)

Flavor: It starts with sweet honey notes that are very smooth and support the other flavor elements nicely. The spice notes include the trinity of cinnamon, nutmeg, and cloves. Orange character is present, but subtle and delicate, adding a hint of acidity to the finish. Alcohol is noticeable, adding a pleasant warmth with just a little bite. The balance is in the range of semi-sweet to sweet, but not cloying. The spices add some tannins that help dry out and lengthen the finish. (22/24)

Overall Impression: This is a complex and easy-drinking example of a mead that nicely meshes spices, fruit, and honey. The spice components are in harmony, but the orange essence is perhaps a little too subtle. A little more citrus, particularly in the flavor, would tie everything together, and the acidity might add complexity to the finish. The technical execution is outstanding, and the layers of flavors make it very enjoyable. Thanks for sharing! (8/10)

Total Score: (44/50)



Bouquet/Aroma: Interesting complexity. Definitely has a spicy orange character with moderate sweetness, floral notes, and a light alcohol spice. I get clove and cinnamon, along with a rounded, almost vanilla-like impression. Clean fermentation character. The spiciness grows as it warms. (8/10)

Appearance: Crystal clear. Pale yellow color. A few tiny bubbles form a ring. (6/6)

Flavor: Medium-full body. Not totally still. Moderately sweet but with balanced acidity. The orange flavor is prominent but balanced with the floral notes. The spices add a little bite in the finish—they are warming and help balance the sweetness and honey flavor. Slight alcohol warming in the finish, accentuated by the spices. Clean fermentation profile and aftertaste. (20/24)

Overall Impression: Like a grown-up orange soda or Creamsicle. The spice is noticeable but not overwhelming and adds a complexity to the orange and floral honey that might otherwise seem too simple. Has a perfume-like character like some Middle Eastern dishes. Quite enjoyable with the acidity and slight sparkle cutting through the sweetness and lifting the flavors. I get the impression the carbonation might be accidental since it's at a very slight level. A touch more age would smooth the alcohol a bit and improve the presentation. Refreshing and interesting, building complexity as it warms. Clean flavors, expertly blended. (9/10)

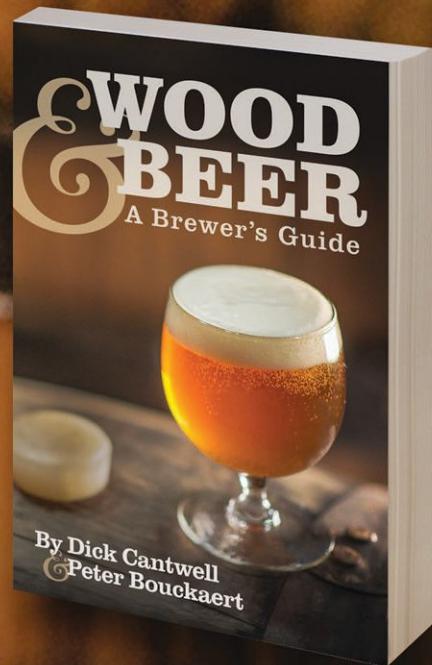
Total Score: (43/50)

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A Brewer's Guide

Coming Soon!

Peter Bouckaert and Dick Cantwell cover the history, physiology, microbiology and flavor contributions of wood, as well as the maintenance of wooden vessels.



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by Charlie Papazian



Paving the Way for Pioneers

I have recently been video interviewing America's craft brewing pioneers. Capturing the words, images, feelings, and history of American craft brewer pioneers is a challenge and a journey unto itself. Early on, I interviewed Fred Bowman, who co-founded and opened Portland Brewing Company in the early-to mid-1980s. Fred provided me with this bit of wisdom: "You know, Charlie, before the pioneers there were explorers." That perspective has stuck with me throughout my reflections on the craft brewing phenomenon.

The difference between pioneers and explorers became even more vivid after I had happenstance to read David Grann's *The Lost City of Z*, a nonfiction account of explorers who journeyed into the vast, unmapped, uncharted unknown of the Amazon in the early 1900s. Most of those explorers had passionate ambition, but they went into the jungle without any knowledge of what they would find. They had financial backing, will, resources, often good intentions, and intelligence. They were fit, healthy, and optimistic. Their mission was to chart the unknown, frequently with an interest in finding lost cities and civilizations.

Almost all of the early explorers were laid to waste. There were many expeditions, many endeavors. Thousands died, succumbing to parasites, insects, heat, hostile indigenous people (though not all were hostile), disease, mold, naturally occurring poisons, fungus, disorientation, and madness, to name but a few.

The stories of Amazon exploration are extreme examples of the journeys and unknown plights of explorers. But they serve as reminders that early craft brewers were not necessarily pioneers. One



Ed Falkenstein at Palmetto Brewing Company in Charleston, S.C.

definition from Webster states that a pioneer is a group or person who originates or helps open up a new line of thought; one who prepares for others to follow. Explorers can be defined as individuals or groups who become familiar with an unknown by testing and experimenting, or as those who travel for adventure or discovery.

While there is an element of pioneering with all of the original microbrewers, they certainly didn't have in mind that they were preparing for those who followed. Only now in retrospect do we add that nuanced reason. In reality, the original microbrewers were explorers. So were the original homebrewers. There was little that was charted.

The original homebrewers who emerged in the very early 1970s were explorers. Beer knowledge was largely cached and

secured in the vaults of private breweries. Information and knowledge about the art and science of brewing on a small and homebrewed scale was lost or inaccessible. And even if the knowledge existed, it was masqueraded in terms of large-scale production. The price of any sound knowledge that existed was so expensive that it was effectively inaccessible to the ordinary person.

As homebrewing explorers we (myself included) were journeying into the unknown. We pursued adventure and knowledge we weren't sure even existed. So we built upon our experiences and shared. We survived. We brewed our homebrew based on the simplest of ideas and whatever was available. We bought hop flavored malt from our local supermarket. Fresh ingredients were not available, and beer-making ingredients and equipment were hard to come by.

SoCarolina Otter Pils

EXTRACT RECIPE

INGREDIENTS

for 5.5 U.S. gallons (21 L)

8 lb	(3.6 kg) very light English malt extract syrup or 6.5 lb (3 kg) very light dry English malt extract
1.75 oz	(49 g) Mt. Hood or Liberty, 5% a.a. (7–8 HBU/210 MBU) 60 min
1.5 oz	(42 g) German Hersbrucker Hallertau, 4% a.a. (6 HBU/168 MBU) 20 min
0.75 oz	(21 g) American Crystal or Czech Saaz pellets, dry hop
0.25 tsp	(1 g) Irish moss powder, 10 min
German Pilsner lager-type yeast or White Labs Cry Havoc yeast	
0.75 cup	(175 ml) corn sugar (priming bottles) or 0.33 cups (80 ml) corn sugar for kegging

Target Original Gravity: 1.052 (13° B)

Approximate Final Gravity: 1.013 (3° B)

IBUs: about 33

Approximate Color: 7 SRM (14 EBC)

Alcohol: 5% by volume

DIRECTIONS

Add malt extract to about 2.5 gallons (9.5 L) of water. Add 60 minute hops and bring to a boil. The total boil time will be 60 minutes. When 20 minutes remain add the 20-minute hops. When 10 minutes remain add Irish moss. After a total wort boil of 60 minutes turn off the heat.

Immerse the covered pot of wort in a cold water bath and let sit for 15–30 minutes or the time it takes to have a couple of homebrews.

Then strain out and sparge hops and direct the hot wort into a sanitized fermenter to which 2.5 gallons (9.5 L) of cold water has been added. If necessary add additional cold water to achieve a 5 gallon (19 L) batch size. Aerate the wort very well.

Pitch the yeast when temperature of wort is about 70° F (21° C). Once visible signs of fermentation are evident ferment at temperatures of about 55° F (12.5° C) for about one week or when fermentation shows signs of calm and stopping. Rack from your primary to a secondary and add the hop pellets for dry hopping. If you have the capability, “lager” the beer at temperatures between 35 and 45° F (1.5–7° C) for 3 to 6 weeks.

Prime with sugar and bottle or keg when complete.

We crushed our grain with rolling pins and marveled at the brown color, cheesy aroma, and crispiness of the hops we were sold. Dried yeast was mostly crappy, though we didn't know any better. We survived by succeeding just enough to make drinkable homebrew.

The alternative to our exploratory endeavors was failure and an ocean of light, American-style lager, both domestically brewed and imported. Failure wasn't acceptable. We kept going back into the jungle, living off the land, so to speak. We braved the unknown, searching for a lost city of richness, diversity, and flavor.

I recall one time I had a keg of pale ale that turned lactic. As I was running out of beer at one of my parties, I served the sour beer at the end of evening to the smokers who were all outside in a detached garage. So desperate were the times that the keg was finished in continued celebration.

In retrospect, early homebrewers paved the way for today's homebrewers and we call them pioneers. But in those days we didn't consider ourselves pioneers. We were all in the jungle together, wondering WTF? How are we going to survive our need and desire for better beer? Who is out here with me?

Together with thousands of likeminded explorers, we coalesced and succeeded in charting the unknown, cobbling together thousands of pieces of sequestered knowledge. Perhaps one might nobly say we were hoping to pave the way for the pioneers who would follow us, but really, we were simply desperate for better beer.

We seemed to have succeeded in paving the way.

So let's cut the shuck and jive and get on with the recipe. Three years ago I toured

through Virginia, North Carolina, and South Carolina, visiting craft breweries along the way. In South Carolina, I visited Palmetto Brewing Company in Charleston, where I acquainted myself with founder and brewer Ed Falkenstein's accomplishments. His is the oldest craft brewery in South Carolina, founded 23 years ago in 1993. I enjoyed all his beers, but the one I marveled at was an exceptionally delicious “Pilsner” that blew me away. It was made with English Maris Otter malt rather than traditional Pilsner malt. I loved it and intend to brew it. Its rich complex maltiness and sunrise color complemented everything else that would ordinarily define a Pilsner-style beer. Here's the recipe that reflects my memorable taste experience.

Charlie Papazian is founder of the American Homebrewers Association and the author of *The Complete Joy of Homebrewing*.

SoCarolina Otter Pils

ALL GRAIN RECIPE

INGREDIENTS

for 5.5 U.S. gallons (21 L)

10.0 lb	(4.54 kg) English Maris Otter pale malt
1.5 oz	(42 g) Mt. Hood or Liberty, 5% a.a. (7–8 HBU/210 MBU) 60 min
1.5 oz	(42 g) German Hersbrucker Hallertau, 4% a.a. (6 HBU/168 MBU) 20 min
0.75 oz	(21 g) American Crystal or Czech Saaz pellets, dry hop
0.25 tsp	(1 g) Irish moss powder, 10 min
German Pilsner lager-type yeast or White Labs Cry Havoc yeast	
0.75 cup	(175 ml) corn sugar (priming bottles) or 0.33 cups (80 ml) corn sugar for kegging

Target Original Gravity: 1.052 (13° B)

Target Extraction Efficiency: 75%

Approximate Final Gravity: 1.013 (3° B)

IBUs: about 33

Approximate Color: 7 SRM (14 EBC)

Alcohol: 5% by volume

DIRECTIONS

A step infusion mash is employed to mash the grains. Add 10 quarts (9.5 L) of 140° F (60° C) water to the crushed grain, stir, stabilize and hold the temperature at 132° F (56° C) for 30 minutes. Add 5 quarts (4.7 L) of boiling water and add heat to bring temperature up to 155° F (68° C) and hold for about 30 minutes. Then raise temperature to 167° F (75° C), lauter and sparge with 3.5 gallons (13.3 L) of 170° F (77° C) water. Collect about 5.5 gallons (21 L) of runoff. Add 60-minute hops and bring to a full and vigorous boil.

The total boil time will be 60 minutes. When 20 minutes remain add the 20-minute hops. When 10 minutes remain add the Irish moss. After a total wort boil of 60 minutes turn off the heat and place the pot (with cover on) in a running cold-water bath for 30 minutes. Continue to chill in the immersion or use other methods to chill your wort to about 70° F (21° C). Then strain and sparge the wort into a sanitized fermenter. Bring the total volume to 5.5 gallons (21 L) with additional cold water if necessary. Aerate the wort very well.

Pitch the yeast when temperature of wort is about 70° F (21° C). Once visible signs of fermentation are evident ferment at temperatures of about 55° F (12.5° C) for about one week or when fermentation shows signs of calm and stopping. Rack from your primary to a secondary and add the hop pellets for dry hopping. If you have the capability, "lager" the beer at temperatures between 35 and 45° F (1.5–7° C) for 3 to 6 weeks.

Prime with sugar and bottle or keg when complete.

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Of Beer and Forests

Quick, name the ingredients necessary for beer: Water. Barley. Hops. Yeast.

Those are the easy ones. But there's another you might not have considered.

Forests.

I'm not referring to evergreen-inspired brews like Deschutes Pinedrops IPA or Rogue's Juniper Ale. No, it's much more universal than that. Beer relies on healthy, functioning forests. Without forests, it's difficult to find clean water. And without clean water, no beer.

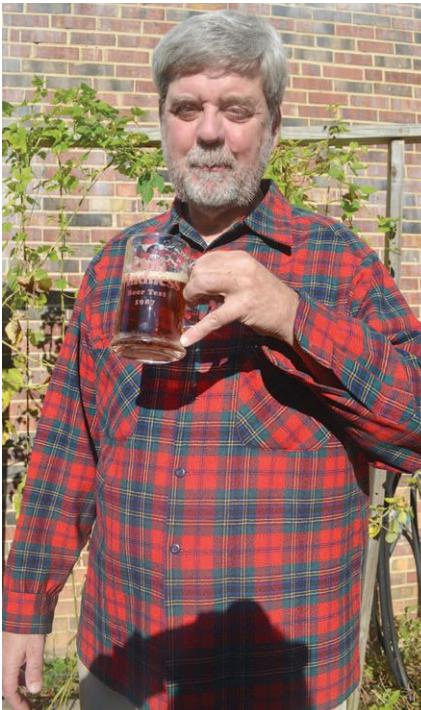
The Nature Conservancy's Chris Topik, director of the Restoring America's Forests initiative, knows this connection well. He's spent much of his career working to ensure forests are resilient and healthy.

And he knows beer. The son of German and Austrian immigrants, he started homebrewing in the 80s as an inexpensive hobby he could do while his kids were young. He and a friend began brewing in their kitchens in Portland, Ore.—just as that city was transforming itself into the place craft beer lovers would come to call Beervana.

"We caught the wave of Portland brew mania," said Topik. "For us, it was a way to get together socially while brewing good, cheap beer."

Career, family demands, and relocation meant time off from brewing, but in recent years he's returned to the hobby. Now he grows hops at his Northern Virginia home. Not only do these go into the beer, the hop bines provide shade in the summer.

In many ways, beer is more than a hobby. Topik recognizes it as a part of human his-



The Nature Conservancy's Chris Topik, director of the Restoring America's Forests initiative.

tory, a tradition that has brought people together for millennia, which is why ensuring clean water and healthy forests is important to keeping that tradition alive.

"Healthy, resilient forests are vital in ensuring good, clean water," he asserted. "Areas that can support a forest can support a stream."

Forests prevent erosion and serve as filters for the water supply. They are where headwater streams originate. Little streams feed into bigger streams as they flow down a mountain, eventually leading to the basins that supply water for a variety of uses. Whether you're drinking a mass-produced light lager or a farmhouse sour, chances are its water originated in a small mountain stream.

"HEALTHY, RESILIENT FORESTS ARE VITAL IN ENSURING GOOD, CLEAN WATER."

Topik is working at the national policy level to ensure adequate funding and legislation to protect America's forests. Brewers large and small, along with other industries, are joining the effort. In Colorado, MillerCoors is partnering with The Nature Conservancy to fund large-scale forest restoration along the Upper South Platte River for Denver drinking water, and Anheuser-Busch is supporting a Poudre River forest restoration project near its Fort Collins brewery.

More than 15 craft breweries have banded together for the Oregon Brewshed® Alliance to protect and restore Oregon's forests and rivers.

"Beer is a water-intensive industry, but it's not the only one," says Topik. "The tech industry would have difficulty functioning without water. You need pure water to manufacture silicon microchips."

Across the country, brewers are stepping up to help the cause. Topik raises a glass of homebrew to the mountains and encourages others to do the same.

Matt Miller is director of science communications for The Nature Conservancy and editor of the Cool Green Science blog. Versions of this article originally appeared on treehugger.com and on Cool Green Science.

LISTENING TO AN INTERVIEW WITH CHARLIE PAPAZIAN IGNITED MY PASSION FOR CRAFT BEER.

I was 17 years old and Charlie was promoting *The Complete Joy of Homebrewing* on my local NPR affiliate. I was captivated by his description of the art of the craft, so I ran out to buy the book. Since then, I never looked back.

2016 marks Flying Dog's 25th anniversary, and innovation through homebrewing continues to be one of the backbones of craft beer's success. And **Homebrew Con 2016** brings my story full circle. I'm collaborating with Charlie on this year's commemorative beer.

I can't wait for you all to try it!



Matt Brophy
Flying Dog Brewmaster



BALLAST POINT

ORIGINAL

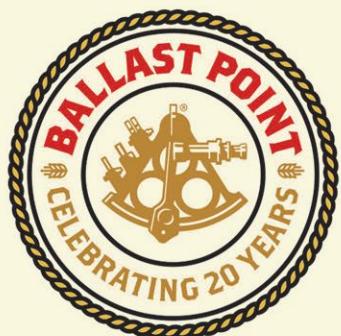
GRAVITY

20TH ANNIVERSARY
HOMEBREW COMPETITION

1996-2016

Back to our Roots.

This adventure has been two decades in the making, started humbly by a couple of home brewers in a small shop in San Diego. To celebrate our 20th Anniversary, we are introducing the Original Gravity Home Brew Competition to honor how it all began. For contest rules and deadlines, visit ballastpoint.com/OG20.



Open to US residents only. Must be 21 or older to enter.
Visit ballastpoint.com/OG20 for contest entry fee and complete rules. Brew responsibly.

#ballastpointOG20