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The Journal of the American Homebrewers Association®

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Spectacular Stouts

Stouts were top of mind at the Big Beers, Belgians and Barleywines Festival in Vail, Colo. in January. The Experimental Brewing Seminar featured "Stouts: Beyond Tradition," with four brewers sharing their tips and thoughts about the style. They also shared their beers: attendees sampled 11 different stouts at the early morning seminar. Breakfast of champions, indeed.

Bell's Brewery, Inc. has been playing around with stouts since Larry Bell started the brewery in 1985, said director of operations John Mallett.

"He was throwing all kinds of goofy stuff in beers, including cherries," Mallett said. Bell's hosts "All Stouts Day" in early November each year, offering about 16 different stouts on tap. For imperial stouts, such as Bell's Expedition Stout (10.5 percent ABV), Mallett said the idea is to "build a beer that is big and hearty, but doesn't have an overwhelming alcohol component. You need a really clean ferment—vital, healthy yeast is the key to making a beer like this."

Brian Dunn, founder of Great Divide Brewing Co. in Denver, got inspiration for one of his brewery's best-known beers from Bell's. "My first memory of imperial stout was [Bell's] Expedition," said Dunn. Great Divide launched Maverick Imperial Stout in 2003, but the brand name was short-lived. "I screwed up a trademark search," admitted Dunn. It was rebranded in 2004 as Yeti Imperial Stout. Many variations of Yeti have been brewed, with Chocolate Oak Aged Yeti, a summer seasonal, as the top-selling version. There is also Oak Aged Yeti, Espresso Oak Aged Yeti, Barrel Aged Yeti, and Oatmeal Yeti.

The oak versions are aged on a blend of French (lightly toasted) and American (untoasted) oak chips. "We decided to use chips [instead of barrels] because

we didn't necessarily want the whiskey character in these beers," explained Dunn. For the Espresso version, Great Divide adds a cold water "toddy" with espresso from local roaster Pablo's Coffee. "We think the cold toddy tastes better than the hot-made espresso," said Dunn.

Cory King of Perennial Artisan Ales in St. Louis also uses a cold toddy process for Sump Coffee Stout. Perennial also brews a Mexican chocolate stout, Abraxas, with cacao nibs, ancho chiles, cinnamon sticks, and vanilla beans. King said Perennial's stouts "don't make sense on paper for a production brewery, with 20 percent oats. But I love a rich, decadent stout."

Special ingredients are added post-fermentation in sanitized nylon bags in a brite tank, usually steeping for about a week. One caveat: watch for the possibility of microbial growth on vanilla beans, said King.

Like Mallett, King believes a clean fermentation is key for stouts. "We use the Chico strain and let the malt profile create the flavors," he said.

Copper Kettle Brewing Co. owner/brewer Jeremy Gobien got inspiration for the brewery's award-winning Mexican Chocolate Stout from a visit to the historical site of Tikal in Guatemala. The beer is based on a Mayan cacao beverage, brewed with cacao, cinnamon, and a blend of three peppers: ancho (plum, raisin, tobacco), guajillo (green tea, berry, smoke), and habanero (citrus, intense heat).

"We struggle to get a consistent flavor profile with the beer," said Gobien, due to the changing intensity of chile peppers. "Every time you get it, it might be a little bit different. That's the beauty of a handmade product."

Jill Redding is editor-in-chief of Zymurgy.

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The purpose of the Brewers Association is to promote and protect small and independent American brewers, their craft beers, and the community of brewing enthusiasts. The Brewers Association is a not-for-profit trade Association under Section 501(c)(6) of the Internal Revenue Code.

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



>> GET THERE!

GREAT VEGAS FESTIVAL OF BEER

After a record turnout in 2014, Motley Brews will host the fifth annual Great Vegas Festival of Beer (GVFB) on April 11 near Fremont East Entertainment District, returning with more beer and vastly expanded culinary options. In addition, the festival offers enhanced programming with revamped BrewLogic educational sessions and a full afternoon of live music. The 2015 festival's beer list will offer guests the choice of more than 300 brews from 100 different breweries. In addition, the culinary menus, located in the signature Gastropub, will draw from the talent of more than a dozen prominent Las Vegas chefs.

"We're doing more this year to evolve the festival experience beyond a traditional beer sampling," said Brian Chapin, founder of Motley Brews. "There

was a great response from guests during the debut of the Gastropub and BrewLogic at last year's festival. We want to continue to explore the diversity of craft beer through innovative ideas to keep the festival fresh and exciting for beer lovers and novices alike."

Motley Brews is once again proud to partner with the Nevada Craft Brewers Association (NCBA) to support local craft brewers and prominently feature great Nevada beers at the festival. A portion of ticket sales will be donated to the NCBA and participating brewers will introduce rare specialty beers brewed exclusively for the festival. More information can be found at greatvegasbeer.com.

March 7

Philly Craft Beer Festival

Philadelphia, PA

phillycraftbeefest.com

March 11-14

Kona Brewers Festival

Kailua-Kona, HI

konabrewersfestival.com

March 13-14

Beer, Bourbon & BBQ Festival

Timonium, MD

beerandbourbon.com

March 21

Spring Craft Beer Festival

Uniondale, NY

springcraftbeefestival.com

March 28

Northern Lights Rare Best Fest

St. Paul, MN

northernlightsrarebeerfest.com

April 3-4

Spring Beer & Wine Fest

Portland, OR

springbeerfest.com

April 12

Classic City Brewfest

Athens, GA

classiccitybrew.com/brewfest.html

April 17-19

SweetWater 420 Fest

Atlanta, GA

sweetwater420fest.com

April 18

Missouri Beer Fest

Columbia, MO

missouribeerfestival.com

For more craft brewing events, go to CraftBeer.com

>> YOU'VE GOTTA DRINK THIS TRÖEGS SPLINTER BROWN

I experienced Splinter Brown at the brewery in Hershey, Pa. The beer is so highly carbonated, you can only get it at the brewery and they won't sell you a bottle to take home due to safety concerns. It's a Belgian-style dubbel mixed with a sour in French and Hungarian oak barrels to form a sour brown ale. The resulting beer is epic and turned a traditional IPA drinker into a lover of sours and Belgians. Thank you Tröegs!

Reviewed by Kevin Kelly

Breinigsville, Pa.

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:

13th ANNUAL Best Beers in AMERICA

It's time once again for Zymurgy's Best Commercial Beers in America Survey!

As homebrewers and beer lovers, Zymurgy readers have the most educated and adventurous palates on the planet. So for the 13th year, we're asking you, "Who brews the best beers in the land?"

Just go to HomebrewersAssociation.org/zym-best-beers and type in your favorite beers. You will need to have your AHA membership number handy. You can vote for both domestic and imported beers, but they must be available for purchase in the United States. Voting ends March 13. We will tabulate the results and present them, along with clone recipes for some of the top beers, in the July/August issue of Zymurgy.

While you're voting, please take a minute to review one of your top beers, in 150 words or fewer, and include that in a "Comments" field (this is appreciated but not mandatory.) We'll include some of your comments in the July/August issue as well as in the "You've Gotta Drink This" in future installments of Beeroscope.

Thanks for voting!

>> GREAT PRODUCT

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Wall Menu Boards from Tap Boards™ come with chalkboard or dry erasable surfaces. Create your own custom beer tap menu with ordinary chalk or a dry erase pen. Erase the board surface with a damp towel to update your latest offering.

Wall Menu Boards are perfect for home brewery use and have routed keyholes on the back for easy wall mounting. A top groove holds chalk or a pen.

Chalkboard menus come in green or black, and dry erase menus are available in white or black. They can be purchased for \$19.99 (includes free shipping) at TapBoards.com.



Photos courtesy of Tap Boards™;
Oskar Blues, Breckenridge Brewery

>> THE LIST:

9 NEW BEERS TO TRY

Nine new and noteworthy releases from craft breweries across the country.



> 1. Oskar Blues is adding **PINNER Throwback IPA** to the brewery's year-round lineup of beers in 12-ounce cans and on draft. Coming in at 4.9 percent ABV and 35 IBU, this brew will be easy to throw back. Dry-hopping with several different heady hops, including a killer experimental variety, gives PINNER a tropical, stone fruit aroma with hints of pine and smooth malt in the flavor.

oskarblues.com



> 2. Breckenridge Brewery expanded its barrel-aged offerings with the nationwide release of **Barrel Aged 72 Imperial** in 22-ounce bottles. For the first time, the Colorado brewery will package one of its specialty barrel-aged beers in large format and ship it to all 37 states in which it distributes. This unique release is a whiskey barrel-aged take on the brewery's

Small Batch 72 Imperial, an imperial chocolate cream stout made with Rocky Mountain Chocolate Factory chocolate.

breckbrew.com

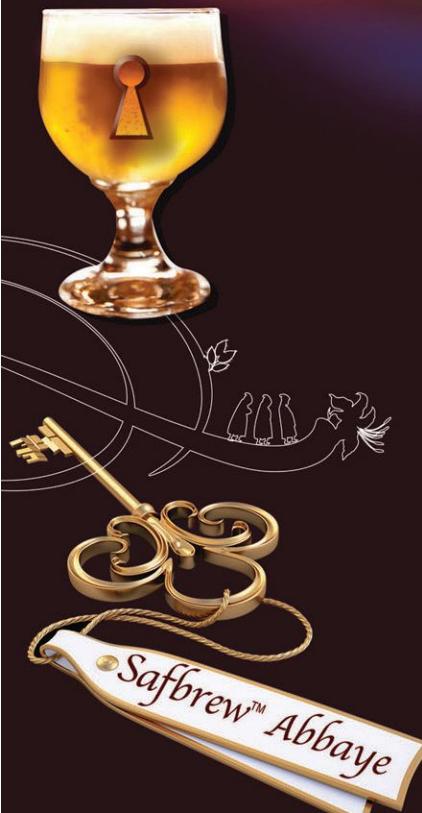
> 3.

Age an India pale ale? Really? Stone Brewing Co. released a beer that defies the notion of consuming hoppy beers at their freshest, particularly the West Coast-style IPAs for which Stone is famous. While nearly every IPA on the planet should be drunk as fresh as possible, that is *not* the case with **Stone Enjoy After 12.26.15 Brett IPA**. Intended

Continued on page 6 >

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for aging until at least December 26, 2015, this unique IPA is inoculated with Brett, which will transform the beer over time in fascinatingly and deliciously unpredictable ways when stored under proper cellar-ing conditions.

stonebrewing.com

> 4. & 5.

Green Flash Brewing Co. is showing off the breadth of its IPA prowess with the national, dual debut of **Soul Style IPA** and **Jibe Session IPA**. The “single” and “session” offerings will round out the craft brewery’s flavorful portfolio, offering an IPA to suit every palate and occasion. Green Flash is simultaneously introducing its first-ever variety pack featuring eight 12-ounce bottles of classic Green Flash favorites (four West Coast IPA, two Double Stout, and two Hop Head Red). greenflashbrew.com

> 6.

Sierra Nevada’s new **Hop Hunter IPA** features oil from wet hops (Cascade, Centennial, and CTZ) steam-distilled in the hop field, minutes after harvest. For the first time, drinkers can taste wet-hop character year-round. This pure, powerful hop essence is used alongside traditional hops to create the ultimate IPA experience. sierranevada.com

> 7.

Victory Brewing Company is sharing its best-kept secret with full distribution of **Victory Helles Lager** to 35 states. Long held as an extremely popular favorite in the

Philadelphia region because of the area’s longtime love affair with lagers, Victory Helles Lager is made in the traditional German style, creating a full-bodied golden brew with unsurpassed balanced flavors. victorybeer.com

> 8.

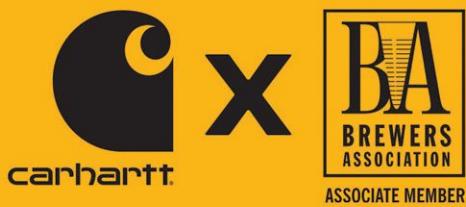
New Belgium’s new year-round release **Slow Ride Session IPA** is an easy-going 4.5 percent ABV and 40 IBU. A blend of eight hop varieties twists together fruity scents of lemon, peach, lime, and grapefruit. Target, Cascade, Nelson Sauvin, and Centennial hops are added to the boil and Mosaic, Simcoe, Amarillo, and Citra were used for dry hopping. newbelgium.com

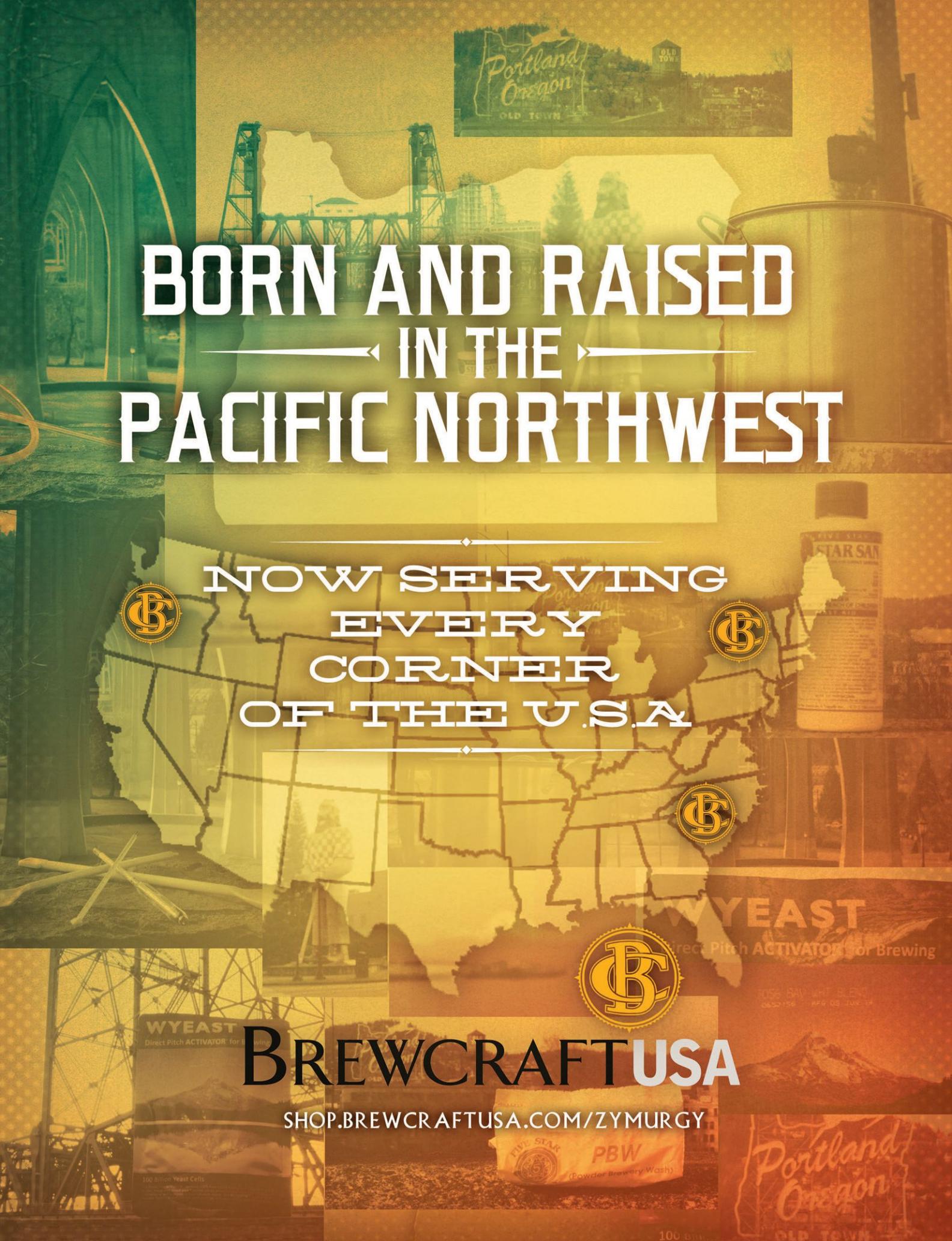
> 9.

On the HBO series *Game of Thrones*, things are often not what they seem. There may be no better example than the three-eyed raven, which in Bran Stark’s dreams and visions is a bird. But as Bran discovers in the season four finale, the raven is actually a mysterious old man whose body is fused with the roots of a weirwood tree beyond the wall. Just like the mythical creature, the next beer in the *Game of Thrones* series from Brewery Ommegang is not exactly what it appears to be. **Three-Eyed Raven Dark Saison Ale** is a saison, but it’s also a dark ale. It will be available in spring 2015 when the hit show returns for its fifth season. ommegang.com



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Portland
Oregon

By Gary Glass



AHA Governing Committee Election

Please vote! Three of the 15 Governing Committee seats are up for election this year, with 10 worthy candidates vying for those seats. Ballots for the 2015 AHA Governing Committee election must be submitted by March 31. I urge all AHA members to participate by casting their votes online at HomebrewersAssociation.org.

The Governing Committee and its various subcommittees make the decisions that determine the course for your association's future. Thus the members of the Governing Committee play a critical role for the AHA.

Candidate statements and ballots can be found on HomebrewersAssociation.org under the Membership section and linked from the Governing Committee pages. Thank you for voting!

Radegast Club of the Year Award

Don't miss out on your club's chance of bringing home the second annual Radegast Club of the Year Award. Entries must be submitted via the form on HomebrewersAssociation.org by March 31.

This award, named for the Slavic god of hospitality credited with inventing beer (another deity/saint-named award à la the Ninkasi Award and Gambrinus Club Award), was originally conceived as the "Awesome Club of Awesomeness" award. Basically, we are looking for what makes homebrew clubs awesome.

Tell us what your club does to promote the hobby, educate your members, support your community, and have fun. See the Clubs section under Community on HomebrewersAssociation.org to submit an entry on behalf of your club, as well



IX Encontro Nacional das Acervas, the Brazilian equivalent of the AHA's National Homebrewers Conference.

as for more details on this new award. The entry form allows for uploads of documents, PowerPoint presentations, videos, and other visuals to support your submission.

Entries will be judged by members of the AHA Governing Committee. The winner of the 2015 Radegast Club of the Year Award will be announced June 13 at the National Homebrewers Conference in San Diego.

Brazilian Homebrewers Conference

Last November, I had the privilege of joining Beer Judge Certification Program president Gordon Strong as an invited speaker for the IX Encontro Nacional das Acervas, the Brazilian equivalent of the AHA's National Homebrewers Conference. The conference organizers generously paid for my travel expenses in exchange for giving two presentations and judging in their national



An attendee pours a homebrew at IX Encontro Nacional das Acervas in Brazil.

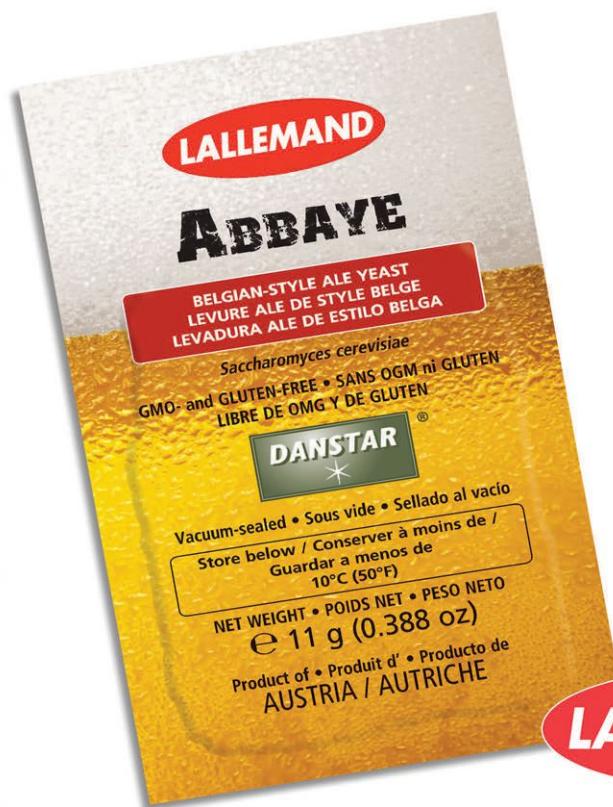
competition. My presentations focused on the history and evolution of homebrewing in the United States and on the structure and history of the AHA—topics specifically requested by the event organizers, as Brazilian homebrewers are working on developing their own national homebrewers organization.

The Brazilian homebrewing community is still in the early stages of development, but it is advancing at a pace far faster than what the U.S. homebrewing community experienced a couple of decades ago. One reason for their rapid development is that they can draw upon the vast resources available in print and online from the

United States. Brazilians are eager to learn from the experiences of U.S. homebrewers, while building their own uniquely Brazilian homebrewing community.

One of the challenges they face is the fact that most information on homebrewing available online or in print is in English (it probably wasn't a coincidence that most of the homebrewers at the conference spoke excellent English). Another is their limited access to ingredients, most of which must be imported from the U.S. or Europe, and which likely are not nearly as fresh as, but are substantially more expensive than, what we have here in the U.S. Access to malt extract is extremely limited, so almost all Brazilian homebrewers are all-grain brewers from the start.

Despite their challenges, I found that the quality of the homebrews entered in the Brazilian national competition was close to what's commonly judged at contemporary competitions in the U.S.—many entries rivalled some of the best homebrews I've ever judged. In addition, homebrewers in Brazil are just



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as friendly and eager to share and learn as homebrewers in North America—I suppose, in that regard, homebrewers are really the same everywhere.

Homebrew Supply Shop Surveys

The American Homebrewers Association conducts numerous surveys, particularly of members, to gain insight into homebrewing and to ensure we are doing our best to serve AHA members. We also survey the retailers that sell homebrew supplies to homebrewers. Through those surveys, we can gain valuable information on homebrewing trends and can provide retailers with data that can help their businesses better serve the homebrewing community.

One of the things we track is aggregate changes in revenue at the retail level. This information helps us determine the approximate size of the overall homebrew market, how many homebrewers there are in the U.S. (we estimate there are at least 1.2 million, making around 2 million barrels of beer per year), and the growth we are seeing from year to year. Our 2009 survey indicated that the average shop saw around 16 percent growth in gross revenue over 2008. In 2011, that number jumped to 24 percent, then to 29 percent in 2012. In 2013, average overall growth in gross revenue was 11 percent.

In 2014, we began tracking revenue change on a quarterly basis. In Q1 and Q2 of 2014, overall growth as compared to Q1 and Q2 in 2013 respectively was just four percent for both quarters. Drilling down further, we found that shops that do less than half of their sales online saw 0.3 percent average growth in Q1 and -2.0 percent in Q2. Looking further at “brick and mortar” stores that have been in business five years or more, we found -4.0 percent growth in Q1 and -7.0 percent in Q2 relative to 2013. We will be compiling the rest of the 2014 information early this year.

What does this mean for the homebrewing community? There is no clear answer. This data really only tells us what is going on at the retail level. One explanation for the decline in revenue is that there are now a lot

more retailers in the U.S. than there were just a few years ago, and thus more competition between shops. Our survey also tells us that there has been a dramatic shift toward all-grain brewing. As every all-grain brewer knows, it's cheaper to buy ingredients for an all-grain batch than for an extract batch of the same beer. Thus, the shift to all-grain brewing means the retailer is seeing on average less revenue per sale of ingredients for a batch of beer than in past years.

The slowdown in growth (or in many cases actual decline of revenue) could

also mean that homebrewers are brewing less frequently. That's not an unlikely scenario, given the rapid growth of craft brewing in this country. Increasing employment may also be influencing frequency of brewing. With homebrewers having so many options for a large and diverse selection of locally-made craft beer, the compulsion to brew at home may be declining. Or it could be that fewer homebrewers are getting into the hobby or more homebrewers are dropping out of the hobby than in years past. Another contributor to the

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Matt Weide Best In Show Winner NHC 2014



"I made a key lime mead that won Best in Show at NHC 2014. When making meads, I use dozens of carboys and 1 gallon jugs throughout the year. The only thing I use to clean and sanitize my gear is PBW and Star San." - Matt Weide

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slowdown in growth at retail could be from homebrewers bypassing homebrew supply shops by purchasing ingredients in bulk through group buys from wholesalers, or by purchasing ingredients from a local brewery.

Most likely, all of the above factors are playing a role to a certain extent.

The local homebrew supply shop plays a critical role in the health of our hobby. It is where most homebrewers got their first homebrew kit, where they get valuable advice on the hobby, the source of many homebrewing classes, and the host for many homebrew club meetings. Local shops serve as drop-off points and sometimes judging sites for homebrew competitions. They donate prizes for competitions and club raffles. In short, the local homebrew supply shop is in most cases the hub of the local homebrewing community.

Of course, not all homebrew supply shops are created equal and not every shop owner is equally dedicated to serving the homebrewing community. Not every homebrew shop has every grain, hop, or variety of yeast you might be looking for—managing a huge amount of perishable inventory is a serious challenge—yet, in my travels around the country I have found that the vast majority of shops do an admirable job serving the homebrewers in their area.

In 2015, the AHA is launching a major research project to learn how we can better promote the hobby; the goal is to bring more people into homebrewing, which will be good for local homebrew shops, homebrew clubs, and AHA membership. Regardless of what promotional campaign might emerge, ultimately the health of the hobby will depend on a strong local retail tier supporting local homebrewing communities. So now I ask you, for the good of our greater homebrewing community, please Support Your Local Homebrew Shop!

Until next time, happy homebrewing!

Gary Glass is director of the American Homebrewers Association.

by Our Readers

AHA Research and Education Fund

Dear *Zymurgy*,

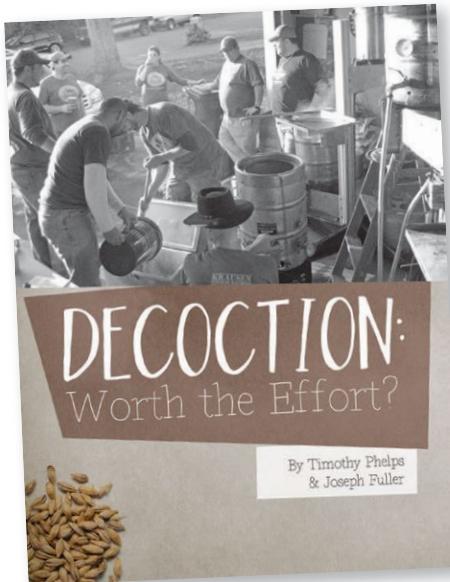
I think the AHA Research and Education Fund is a great program; however, I wish the AHA could more tightly regulate the individual experiments so that they would yield more useful and definitive results.

I appreciate the commitment and work that the Krausen Commandos put into their decoction experiment ("Decoction: Worth the Effort?" in November/December 2014 *Zymurgy*), and I apologize for the criticism I'm about to give, but it was rife with flaws and poor practices that rendered the results nearly meaningless. There are three grievous errors in particular that I take issue with.

The first is the inability to hit the target OG for all the batches. A diligent, experienced brewer should be taking a gravity reading at the beginning of the boil and be able to hit a target OG within 0.001 points. It's not a big deal when you're just brewing a random batch of homebrew, but eliminating variables is important in an experiment like this.

The second is the most severe problem: the batches were dramatically underpitched. A typical lager pitch rate is 1.5mm cells/ml/*P. That means to ferment 5.5 gallons of a 1.053 batch, you need about 400 billion cells. The authors said they pitched two smack packs per batch. Even at maximum freshness, the beers only got 200 billion cells.

The final is the pitch and fermentation temperature. Many homebrewers like to pitch at a higher temp and then lower to lager-fermentation temp. This is not what professional breweries do, and I feel we should seek to emulate commercial brewery practices whenever it is appropriate. I would go so far as to say



you are not making a lager if you pitch warm, regardless of fermentation temp.

I realize the AHA has a lot of important and time-consuming work to do, but these experiments need more regulation for consistency so the results are relevant to all homebrewers. The current experiments are about as trustworthy as some random post on a homebrew forum saying, "I did X and it worked great!"

Matt Monson
Charlottesville, Va.

Zymurgy associate editor Amahl Turczyn replies: No need to apologize for your criticism; we accept and appreciate all feedback, positive and negative. In response to yours, please remember that while the hobby continues to advance by leaps and bounds and the line between amateur and professional brewer continues to blur, it remains the duty of the AHA (and by extension the REEF) to serve all homebrewer skill levels. This particular experiment may have garnered less interest among more advanced brewers than other articles, but it was perfectly valid for beginning brewers

questioning the necessity for decoction mashing. Regarding pitching temperatures, here again, advanced homebrewers should indeed strive to emulate commercial brewery practice, and many do. But not all homebrewers have the setup or equipment to pitch at "proper" lager yeast cell counts, propagate their own starter cultures, or even chill fermenters to ideal lager temperatures. They can still make great beer, though. And in fact, pitching instructions from yeast labs that sell pure culture yeast to amateur brewers back that up: they explicitly state one vial or smack pack is sufficient for 5 gallons of beer, and that lagers may be pitched at room temperature until signs of activity are evident, then brought down to fermentation temps. We encourage you to apply for your own REEF experiment and apply the rigorous lab protocol and consistency standards you've suggested. Homebrewers of all levels would likely benefit.

More on Decoction

Dear *Zymurgy*,

It was with great interest that I read "Decoction: Worth the Effort?" You have to admire the work those guys put in. I was puzzled by the results, however. Call me old fashioned, but I have done hundreds of decoction mashes and I consistently get at least a 20-percent higher yield with a double decoction as opposed to a single infusion. I don't know how a triple decoction and a single infusion could end up with the same OG if they had the same grain bill. The article doesn't have the times and temperature charts of the decoction nor does it state the origin of the malt used, so it's not possible to figure out what went wrong—but something clearly did.

Thank you for the fine work that you all do. I'm looking forward to many more *Zymurgy* articles in the future.

Weston Sampson
San Marcos, Texas

Learn to Homebrew Day

Dear *Zymurgy*,

There is no shortage of craft breweries around Indianapolis; there are six breweries within a three-mile radius of my house. Most of them have specials on growler fills throughout the week so we haven't really felt the urgency to brew at home lately.

Alas, I know the real satisfaction of making homebrew is sharing the experience. Since I was unable to locate a registered Learn to Homebrew Day event in Indianapolis, I invited friends over for a celebration. During the demonstration, we discussed equipment, ingredients, and the process of making partial extract beer while cooking a batch of Irish Red Ale. (Our house brew cat, Stihl, is paws on when it comes to quality assurance.)



Thank you for providing great magazine content and for bringing brewing enthusiasts together!

Danna Korak
Indianapolis, Ind.

Canine Supporter

Dear *Zymurgy*,

Here's my homebrew supervisor, Teddy. He's 13 years old and still going strong. He has done a great job supervising all of my brews but has yet to lift a paw. His support is still greatly appreciated.



Tom Pellack
San Francisco, Calif.



Pumpkin Tap Kit

Dear *Zymurgy*,

I saw the pumpkin tap kit (November/December 2014 Beeroscope) in use at the Augusta Bottoms Beer Fest in October. Friendship Brewing did a great job with the pumpkin.

Jim Biehle
Ballwin, Mo.

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

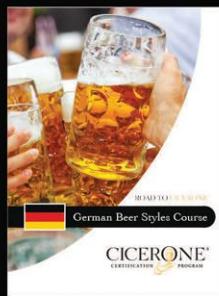
Hey homebrewers! If you have a homebrew label that you'd like to submit for the Dear Zymurgy section, send it to magazine art director Jason Smith at jason@brewersassociation.org.

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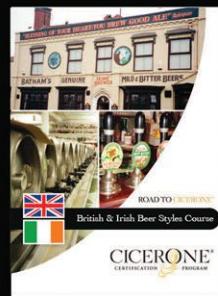
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by Professor Surfeit



The Clone Zone

Dear Professor,

I recently compared my clone brew of Harpoon's Winter Warmer to the commercial brew. I noticed that the CO₂ bubbles in the commercial brew were smaller in size and travelled to the surface of the brew more frequently than in my homebrew clone. I usually carbonate my beers at 20 psi for four days then serve at 8 psi. I also noticed that my unfiltered homebrew had less mouthfeel than the commercial brew.

My questions:

1. Why the difference in CO₂ appearance and frequency of bubbles rising between the two beers?
2. Does less mouthfeel in my brew affect the CO₂ bubble difference between the two brews?
3. What do you suggest I do to improve my clone to resemble the commercial version in both mouthfeel and CO₂ composition?

Much appreciated,
Chris Brown

Dear Chris,

Let's start with "clone" beers. Whether your clone beer came from a kit or from your own recipe formulation, it is difficult to make a homebrew clone turn out exactly like the beer you are trying to duplicate. The first few times of brewing a clone recipe, you usually get somewhat close to what you're aiming for. Tweaking the recipe to improve your results is part of the fun of homebrewing. And that is essentially what your inquiry is about—how to tweak your recipe.

From the information you've given me, it seems that your clone beer has less body than the actual Harpoon Winter Warmer. Next



time, mash at a higher temperature and add dextrin malts to increase the body. Use a yeast that doesn't attenuate as much. These suggestions might get you in the direction you want to head.

The frequency of bubbles could be more carbonation or could actually be a dirty glass that has nucleation points releasing carbon dioxide faster. Glass temperature and beer temperature also determine rates of carbon dioxide release. Also, different types and

shapes of glassware will affect the release of carbon dioxide. I'm assuming the glassware conditions were equal.

Finally, let me comment on the source of your carbon dioxide. You say you force carbonate. Sometimes carbon dioxide gas canisters can be contaminated and affect flavor and aroma and your perception of the beer.

Bring in the clones,
The Professor, Hb.D.

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Ammonia, Anyone?

Dear Professor,

I recently made an all-grain batch of Yorkshire ale with a recipe I have used many times before. The grain was new and the yeast starter normal. For the first two days of fermentation, all went normally, then the fermenter gave off a powerful ammonia/urea smell that did not clear in the next few days.

Before the smell kicked in, I took some yeast and cultured it for the next batch. The starter I made from the yeast I took behaved normally and had no unusual odor.

I have dumped the beer batch (which still smelled) and the yeast on the grounds that things that smell bad usually are bad.

In looking through my books, I found no mention of an ammonia/urea odor during fermentation. Have you heard of this and do you know where the problem might have come from?

Bill Miller

Dear Bill,

Ammonia in beer? I've smelled ammonia leaks in refrigeration systems in old breweries, but never experienced a hint of ammonia in homebrew fermentations. I asked a few of my colleagues and they scratched their heads, too. I can only assume that something got added to the beer that wasn't intended to be added.

With more than 40,000 American Homebrewers Association members reading Zymurgy, maybe someone can share a similar experience and the reason why this may have happened.

I would note one thing: some yeast nutrients, particularly for home wine makers, smell like urea, because these nutrients have urea as an ingredient. I trust you didn't add any of these nutrients to your brew. I would not recommend using this type of nutrient in beer—ever!

Yours in doubt,
The Professor, Hb.D.

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

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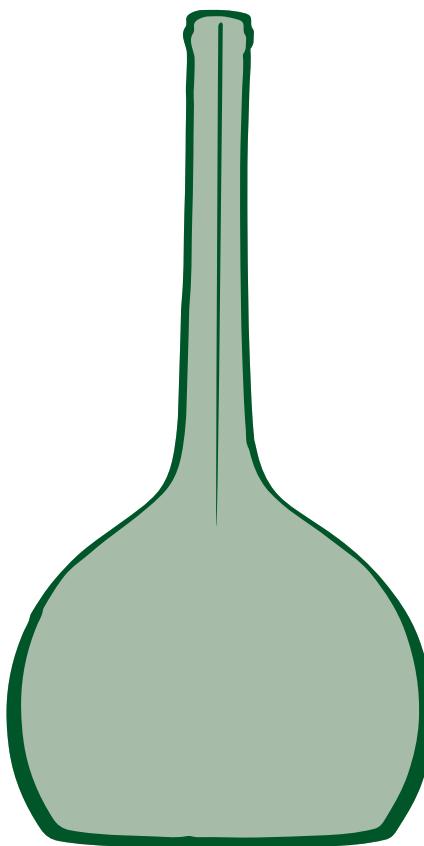
By Amahl Turczyn

Gose

Gose (pronounced goes-uh) is an obscure and some would say un-German beer style: it is brewed with wheat malt and fermented with ale yeast, much like a weisse beer, but it is flavored with coriander and salt. Like the similarly light, sour Berliner weisse, it got its tartness from lactic acid, and was almost certainly spontaneously fermented at one point in its 250-year history, so there's a nod to the Belgian lambic beers as well.

Originating in the German town of Goslar, it achieved a huge following in the 18th and 19th centuries, soon becoming a specialty of the town of Leipzig. Goslar brewer Johann Ledermann is credited with supplying Leipzig with most of its gose when he was hired at Rittergutsbrauerei Döllnitz in 1824. It was at that time a bottled beer, however, and much like some of the early cask-conditioned real ales of Britain, it was delivered to pubs still fermenting in barrels. It was then up to the publicans to determine when it was ready to bottle, and how long it should condition. This in turn affected degree of carbonation and clarity of the final product, which was packaged from the barrels (again by the publican, not the brewer) in unique, guitar-shaped bottles with unusually long necks. These necks were stoppered with plugs of yeast rather than corks or crowns, and this closure would move up the length of the bottle's neck as the beer's degree of conditioning increased.

Gose was a difficult beer to brew mainly because of the acidity balance, and its quality, once it finally reached the customer, was heavily dependent upon the skill of the pub's cellar men. It was yet another locally brewed, region-specific style that was not intended to sit around. Thus the pubs with



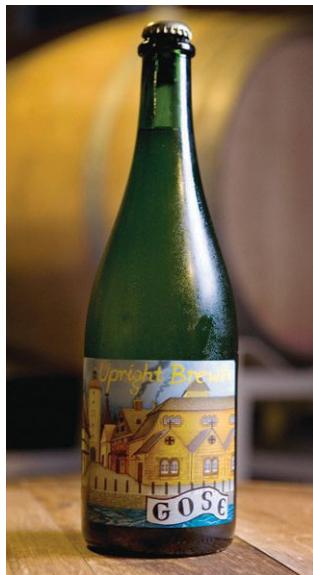
the highest demand tended to sell the best gose. And demand in that area of Germany in the 19th century was apparently so high that while it was well worthwhile for breweries to undertake it—at one time it was estimated that 80 gose breweries existed—most could not supply enough. So gose breweries like Rittergutsbrauerei Döllnitz used their product's rarity to their advantage, making it an exclusive product for select pub accounts. It was therefore unlike working-class beers like porter; rather, it was an expensive luxury reserved for only those who could afford it.

These days, Leipziger gose is still a relative rarity even in Germany, but that has more to do with the fact that few breweries have bothered to make it since World War II. After fits and starts in the area at reviving gose, only two Leipzig breweries currently produce it: the Bayerischer Bahnhof Gasthaus and Gosebrauerei (which makes a version that is actually exported to the

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U.S.) and the Ernst Bauer brewery, which contract brews a version of the original Rittergut Döllnitz gose. Interestingly, Ernst Bauer produces the beer for Adolf Goedecke, a descendant of the owners of Rittergutsbrauerei Döllnitz.

In the United States, there has been more interest in gose among craft brewers, but they also tend to be much freer with their interpretation of the style. Ron Gansberg of Cascade Brewing Barrel House in Portland, Ore. produces seasonal variations of gose, including a holiday-themed autumn version that adds orange peel, cinnamon, and nutmeg to the original salt and coriander flavors, and a dark red winter variety that takes the previous spice list and adds hibiscus flowers and cranberries. Another Portland brewery, Upright Brewing, produces a more traditional gose, but ferments it with French saison yeast—the dryness would certainly add an interesting dimension to the tart, savory finish.



Many U.S. craft brewers, including Cascade Brewing Barrel House, Upright Brewing, and Hollister Brewing, are experimenting with the gose style.

Perhaps the strictest adherence to Leipziger gose in the U.S. comes from Hollister Brewing in Goleta, Calif. Brewer Eric Rose's Tiny Bubbles is noticeably, even aggressively tart, but light on the coriander and only slightly saline, and he ferments it with hefewizen

yeast. Rather than spontaneous lactic fermentation tempered by blending later, Rose pitches an active dose of *Lactobacillus* grown up separately before the brew day, then allows the bacteria to build up an appropriate level of tartness in the gose wort. Three or four days

later, he pitches the weizen yeast to finish things off.

An homage to Rittergut Döllnitz gose with a result similar to Tiny Bubbles seems an appropriate target for our recipe. So how should we go about producing that intense

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Photo courtesy of Cascade Brewing Barrel House;
Upright Brewing/Ahmatou Vincent; Hollister Brewing Company

Dollars to Döllnitz Gose

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

4.0 lb	(1.81 kg) German Pilsner malt
4.0 lb	(1.81 kg) German wheat malt
1.0 lb	(0.45 kg) acid malt
0.5 lb	(227 g) rice hulls (in mash to aid sparge)
0.25 oz	(7 g) whole Saaz hops, 4% a.a. (60 min)
WhirlFloc	(10 min, optional)
0.25 oz	(7 g) whole, fresh-ground coriander seed (5 min)
Hefeweizen yeast	2 L starter or 145 mL slurry
10 g	salt (or to taste) at bottling
3.0 oz	(85 g) 88 percent lactic acid (or to taste) at bottling
reverse-osmosis filtered	(or activated charcoal filtered) water

Original Gravity: 1.045 (11.25° P)

Finishing Gravity: 1.009 (2.25° P)

IBUs: 3

SRM: 3.2

ABV: 4.7%

Boil Time: 60 minutes

Assumed Brewhouse Efficiency: 75%

DIRECTIONS

Reserve 14 of the 16 ounces of milled, acidulated malt. Mash the remaining

2 ounces acid malt with pilsner and wheat malts, along with rice hulls at 149° F (65° C) and hold for 45 minutes. Add remaining acid malt and continue to mash, stirring every 15 minutes, for another 45 minutes. Don't worry if mash temperature falls slightly during this secondary mash. Add heat to bring the mash temperature up to 168° F (76° C) and sparge at this temperature until runoff wort gravity reaches 1.008 (2° P) or pH 5.8 (whichever comes first). Collect enough wort in the kettle to allow for a final volume of 5.5 gallons after a 60-minute boil. Use fresh, whole coriander seed ground in a spice grinder or mortar and pestle, and add 5 minutes before the end of the boil. Chill to 70° F (21° C), aerate and pitch. Ferment at 68° F (20° C) until terminal gravity is reached. Crash to 40° F (4° C) and cold condition for one week, then rack. Add salt and lactic acid to taste, blending thoroughly. Two ounces of lactic acid at bottling (along with the acid malt contribution from the mash) will result in a mildly tart beer, whereas 3 ounces will be noticeably tart. Package and carbonate or bottle and prime. Note: If adding gyle, sugar, or malt extract to prime, be sure to taste for the correct acid and salinity balance before blending in priming.

EXTRACT VERSION

Substitute 6.9 lb (3.12 kg) wheat malt extract syrup for the pilsner and wheat malt. Omit rice hulls and acid malt. Dissolve extracts completely and proceed with boil. Note that color may be slightly darker (5.3 SRM) with the extract recipe, and more lactic acid will likely be needed at bottling to achieve the same level of tartness. Also due to the omission of acid malt in the mash, acidity might be somewhat one-dimensional compared with the all-grain version.

sourness—we're targeting a mash pH of 3.4, similar to that of a Berliner weisse or gueuze—in a homebrewed gose?

Since souring methodology is a big part of this beer, let's go down the list of the more conventional components, and leave the acid question for the end. The malt bill is a simple and traditional 50/50 blend of wheat and Pilsner malt. German malt

is called for, but domestic malts work equally well here. Use rice hulls as needed to speed lautering of the sticky, huskless wheat malt mash. A low, long mash temperature will provide a highly fermentable wort and a dry finish, although very little hop bitterness goes into this beer, and residual malt sweetness will be more than held in check by lactic acidity, salt, and carbonic acid from carbonation.

The advertisement features a circular logo at the top left with a castle illustration and the text "Castle Malting®". Below the logo, the word "Belgian" is written in large yellow letters, followed by "base" and "and" in smaller yellow letters, then "specialty" and "malts" in large yellow letters. The background has a warm orange gradient. Below the main title, the text "Tradition at its best since 1868" is written in a cursive font. At the bottom, there is a logo for BSG CraftBrewing with the website "www.brewerssupplygroup.com" and a QR code. To the right of the QR code is a green banner with the words "malt brew" and "The easiest way to order your favorite malt!" Below the banner are several bags of malt and a glass of beer.

Saaz adds a soft, grassy, noble aromatic note that goes well with the subtle sweetness of the modest coriander addition, though both aromatic components will be so subtle, you'll have to hunt for them below the yeast-derived esters. I prefer the leaf form of hops for this beer, but since hop character is so light, there's plenty of room for variation. Use a quarter ounce of your favorite noble aromatic variety at 60 minutes from the end of the boil. First wort hopping works well here too.

White Labs Hefeweizen IV (WLP380) is my perennial favorite for hefeweizen yeast, but any Bavarian wheat ale yeast will do. I've also had good luck with the Weihenstephan strain. Ferment cool, as low as 62° F (17° C) for clove phenol production if you have a strong starter, though the fruitier banana esters encouraged at 68° F (20° C) go well with the tart, savory flavor additions in gose.

Use reverse osmosis or carbon filtered water: the softer the better. One gram per

gallon of calcium chloride for 72 ppm calcium and 127 ppm chloride in RO or distilled water is recommended. This will provide enough calcium to help enzyme activity in the mash and enough chloride to soften and bring out malt sweetness, providing a pleasing contrast with the salinity and acidity of the beer. And with that, let's get back to how to approach that critical element of acidity.

While many homebrewers have launched themselves headfirst into sour brewing and lactic cultures, most are understandably hesitant to willingly introduce bacteria to their carefully sanitized brewing equipment. Several methods will get you there, some "riskier" than others, and a wealth of information is available from Michael Tonsmeire's *American Sour Beers*. For the purposes of this article, we're going to try to thread the needle between Safe, Easy, and Effective.

Sour Mashing

Traditional sour mashing is perhaps the most risky method, as it can produce some wildly funky off aromas and flavors. But many sour beer brewers much prefer the taste and complexity of acidity produced by a living bacterial culture as opposed to an acid or acid malt addition. Acid malt is soaked in or sprayed with naturally produced lactic acid, but the malt is then kilned, effectively killing the bacteria. Anecdotal evidence suggests that there may be sufficient living bacteria on acid malt to seed a lactic fermentation, perhaps even better than with regular pale malt. (Thomas Weyermann is rumored to have suggested adding a cup or so of finely crushed acid malt directly to the fermenter to encourage lactic fermentation for sour beers—if true, that may be something to consider.) This hybrid approach, coaxing a sour mash in the right direction using an initial dose of lactic acid from acid malt, is detailed in the Style Spotlight for Kentucky Common (July/August 2013 Zymurgy). As with that beer, the longer you keep the mash, the more tartness you can expect. The main advantage here is the quality and quantity of the bready, sourdough-flavored lactic acid, but it takes some planning ahead, can be tricky without specialized

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equipment, and risks contamination with other, funkier bacteria that may not fit well with gose.

Bacterial Cultures

Lactic cultures (or malo-lactic cultures, which go on to produce lactic acid during fermentation) can by contrast produce a super-clean sour character, but one drawback is that they may not produce enough acidity for some styles; they also require some specialized equipment (sous vide, anyone?) to keep them in the correct temperature range for optimum growth. So while a *Lactobacillus* culture like Wyeast 5335 or some of the malo-lactic pure culture strains may offer a complex, well-rounded tartness for this style, it might not be ideal for a home brewery setting unless it's a technique you are well versed in. And it is in fact riskier than the method German gose brewers of the late 19th century are believed to have used. They simply added a measured dose of lactic acid to the beer (probably to the boil, in the interests of sanitation and preventing cross-contamination) and were therefore able to precisely control the final amount of acidity.

Acid Malt

A third option is using acidulated malt, not as a starter for a separate sour mash, but as a direct addition to the main mash. Weyermann® Specialty Malts usually recommends no more than 10 percent of the total grain bill, and claims that anything under this amount will not add noticeable sourness. But if you want sourness, it unfortunately isn't as easy as just adding more. Due to pH buffering capacity of the mash and water, and the logarithmic nature of the pH scale itself, even doubling that amount won't get you the same tartness as will adding lactic acid. You'll get a crisp, perhaps even mildly tart result, somewhere in the low 4 pH range (think of the tartest Bavarian hefeweizen you've tried), but it won't be sour. If you're OK with that, by all means, increase the acid malt amount up to 20 percent. Weyermann claims this is naturally made, natural-tasting lactic acid, so it should at least in theory have the same bready, well-rounded quality of tartness we're looking for. Just heed a few cautionary bits of wisdom.

First, that much acid malt will bring your mash pH too low for optimum enzymatic conversion. You can get around this by adding only a few ounces at the onset of the mash, then adding the remainder halfway through. That way most of the starch conversion should be complete by the time you drop the pH, and you'll still get your full dose of acid, and some conversion of the acid malt's starches as well. Second, while it may be tempting to just add even 30 percent acid malt to go for that extra tartness, brewers who have tried this have reported mixed results. Most say that even that much will still only get the mash pH down to the low 4s, so there need to be other components in place to increase acidity further along in the process. Some have reported good results combining this with yeast and bacteria blends (Brett Lambicus, for example) known to provide tartness, but here again, this would be sacrificing Safe and Easy for Effective. So we too will take a hybrid approach, starting with acid malt, but ending with a lactic acid addition like the gose brewers of yore.

88 Percent Lactic Acid

Those gose brewers, as stated above, added acid to the boil to avoid complications with live bacteria in their fermenters. However, acidity can have a negative effect on fermentation, so I propose adding the acid, which is easily and inexpensively purchased at your local homebrew shop, at packaging. Since some will like the beer as-is, with the only tartness coming from the acid malt addition, this gives them the option of adding no acid at all. Others will want to throw caution to the wind and empty the whole 4-ounce bottle into the beer. You'll also be adding your salt at this point, so you can fine-tune to your individual taste. Just please remember that carbonation will accentuate the sensation of both dryness and acidity, so if the beer is really dry, too much acid can result in a gratingly sharp result. And also remember that old culinary adage about salt: you can add, but you can't subtract it, so the suggested amount is definitely on the cautious, conservative side.

Why add the salt at bottling? Because oddly enough, sodium chloride can also affect yeast health during fermentation: osmotic pressure on the cell wall becomes

a problem with too much salt pre-fermentation. As always, there are also downsides to adding acid and salt at the very end. Some have claimed the tartness from concentrated acid, as opposed to "naturally brewed," leaves the beer very one-dimensional. And originally, gose was salty because the brewing water used had an unusual amount of salinity in it, so perhaps adding it at the end doesn't give the same savory complexity that it might at the beginning. However, there are too many compelling reasons to not subject your enzymes and yeast to all these chemical extremes, and the use of acid malt-derived tartness and hefeweizen yeast will provide sufficient flavor and aromatic complexity to mitigate the one-dimensional complaint.

As with any of these recipes, feel free to tinker with it and make it your own; and if you feel you've hit upon a brilliant variation, please let us know.

Resources

1. Hieronymus, Stan. "First of all, it's pronounced gose-a," Beers of Conviction blog, appellationbeer.com, Sept 28, 2010.
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Amahl Turczyn is associate editor of Zymurgy.



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In the 12 months after he and John Hickenlooper started Wynkoop Brewing in 1988 in Denver, Russell Schehrer used only five hop varieties to brew his beers. Schehrer, the groundbreaking brewmaster after whom the Brewers Association named its annual award for innovation, wasn't going old school when he made his India pale ale with only three hop varieties—Bullion, Cascade, and Willamette. He simply didn't have many to choose from.

>>

Twenty-six years later at the 2014 Craft Brewers Conference (CBC), also in Denver, brewers had a chance to taste more than a half dozen beers made with the latest varieties of American hops—these are hops that didn't have names a year ago—and to rub and sniff even more identified only by numbers. More new varieties are on the way, and they include plenty from other hop growing countries and some from parts of the United States where farmers only recently began growing hops.

NEW PUBLIC VARIETIES AND NEW ACRES

The public breeding programs in Oregon (United States Department of Agriculture/Agricultural Research Service) and Washington (Washington State University) released four new varieties at the end of 2013 that are available for farmers anywhere in the country to plant. "I honestly don't know how many acres are out there," said Ann George, administrator for the Hop Growers of America, in early September. "We might be up to 20 harvestable acres."

That would provide enough hops for brewers to begin making pilot batches to assess their aroma and flavor in beer. In recent years, the most popular new varieties have all come out of private breeding programs and have not been available for all farmers to grow. "[The private programs] have a good mechanism for getting hops in the hands of brewers and getting feedback," George said. That allows them to develop interest in varieties before they are released, guaranteeing that demand will meet, or exceed, supply.

"The public program hasn't had that," George said. She spent time with private breeders last year, and they shared valuable advice. "We have to learn to take those (new releases) to the next level."

In the past, farmers relied on the biggest breweries committing to large amounts of a particular variety. Now they are left guessing how much in total hundreds, and even thousands, of pounds smaller breweries will buy. Cashmere, the hop that attracted the most attention from brewers at CBC, was the one in shortest supply last spring. "Just a 47-hill plot. We don't know yet

NEW PUBLIC HOP VARIETIES



CASHMERE

7.7 to 9.1 percent alpha acids
3.5 to 4.5 percent beta acids
22 to 24 percent cohumulone
Melon, tropical fruit



TAHOMA

7.2 to 8.2 percent alpha acids
1 to 2 percent oils
Citrus, cedar, pine



YAKIMA GOLD

8.8 to 10.5 percent alpha acids
1.9 to 2.3 percent oils
Lemon zest, spicy



TRIPLE PEARL

10.2 to 11.2 percent alpha acids
1.1-1.8 percent oils
Citrus, melon, pepper

how it will do in a 20-acre plot," George said. Cashmere is an offspring of Cascade, with 7.7 to 9.1 percent alpha acids, 3.5 to 4.5 percent beta acids, and 22 to 24 percent cohumulone. It has tropical and fruity flavors that set it aside from Cascade itself.

The other three public releases are Tahoma (7.2 to 8.2 percent alpha acids, 1 to 2 percent oils), Yakima Gold (8.8 to 10.5 percent, 1.9 to 2.3 percent), and Triple Pearl (10.2 to 11.2 percent, 1.1-1.8 percent). Availability of these new public varieties will likely be tight until at least after the 2015 harvest.

Most farmers interested in growing Cashmere started with a single plant from the National Clean Plant Network at Washington State. How fast they can propagate that into a field of hops varies. Nate Jackson at Jackson Hop Farm in southwest Idaho said he expects to harvest 10 acres in 2015. Like other farmers in Idaho, he's expanded acreage steadily. He started growing hops on 60 acres in 2008, had

340 in 2014, and expects to harvest 480 in 2015. Overall, Idaho farmers boosted acreage by 13 percent in 2014.

New acres are as important as new varieties. Craft breweries used more than half the hops grown domestically in 2014. That means if craft beer production continues at the predicted rate, farmers might need to expand acreage by as much as 50 percent within the next several years. Most of that must continue to happen in the established hop growing regions of Washington, Oregon, and Idaho, because new hop farms that have sprung up elsewhere will be able to provide only a fraction of the hops brewers want.

There is less agricultural competition for land in Idaho than the other two states, and snow runoff provides a reliable water source. Acreage in Idaho collapsed in 2009 after the hop glut that quickly followed shortages in 2007 and 2008, but in 2015 acreage will likely surpass 2009. The Idaho Hop Commission has acquired

equipment so its members can speed the process of evaluating how new varieties will grow in Idaho, compared to Oregon or Washington, where they are bred.

"I think Idaho has come a long way (since 2008)," Jackson said. Yield has increased significantly and farmers are now able to get almost a full crop from first-year hops, as they do in the Yakima Valley but seldom elsewhere. Jackson grew high alpha Super Galena hops at the outset, but now most of his yards are devoted to aroma varieties. He and other Idaho farmers are experimenting with doing their own breeding.

"It's in its infancy," he said. "We made several crosses that fit with what people are looking for." Local breweries have made test batches with three of these varieties, but Jackson hasn't given any of them names yet. Farmers he's consulted in Washington "told me it's not good to name them until you are ready to roll," he said.

NEW PROPRIETARY VARIETIES

When Jason Perrault, who both breeds (Select Botanicals Group and the Hop Breeding Company) and grows hops, talks to brewers, the first questions he gets are about the availability of recently-released varieties like Citra and Mosaic, or what new hops are on the horizon. They don't ask about breeding higher alpha hops, used primarily to add bitterness, but he makes it a point to explain just how important that is.

Hop growers were able to plant more Cascade and Centennial hops, as well as the popular new varieties, in recent years without building out infrastructure for two key reasons. First, Anheuser-Busch InBev cut back contracts while it reduced massive inventory buildups, particularly of Willamette. Second, there was more alpha acid available than brewers worldwide needed. Now AB InBev is buying more hops and alpha acid is closer to being in balance, creating more demand for hop acreage.

"That's an angle people don't think about," Perrault said, discussing the difficulty of estimating how many more acres farmers may need to plant in the next five to eight years. Fields that yield more alpha, from plants that either have higher levels



Harvest time in Washington's Yakima Valley.

of alpha acids or that are more productive (or both), may ease some pressure. "They could eliminate 30 percent of acreage needed for alpha," he said.

The Hop Breeding Company (HBC) is just as focused on aroma. Just before CBC, it gave the hop previously known as HBC 366 a name: Equinox. It contains 14 to 15 percent alpha acids, but its oil content (2.5 to 4.5 percent) and composition are what have brewers excited. HBC growers harvested more than 130 acres of Equinox, compared to 20 in 2013, although that won't begin to meet demand. (For the sake of comparison, as recently as 2007 farmers planted fewer than 250 acres of Centennial, compared to more than 2,800 in 2014.)

The challenge with expanding new varieties is simply propagation. "Once you get enough mature acres it is much more sta-

ble," Perrault said, talking specifically about Citra, which was released in 2008. There's finally enough plant material to balance production and contracted demand (non-contracted demand is another discussion). HBC growers harvested almost 1,700 acres of Citra, compared to fewer than 700 of Mosaic, which was released only in 2012.

Perrault and Gene Probasco of John I. Haas, who share decisions at the Hop Breeding Company, did not know in the fall if they would release a new variety in 2015. "We've got several hops that brewers are very interested in and very excited about," Perrault said. "We've taken an approach that (a new variety) truly has to add value. We're not going to put one out there just to keep up with the Joneses."

Certainly there are plenty of choices, with more on the way:

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- Hopsteiner gave Hopsteiner 01210 a name before CBC: Lemondrop. It lives up to that name, with a distinct lemon-like aroma and flavor, as well as other citrus and fruity character. The alpha acids are 5.5 to 7 percent and the oil content 1.4 percent. "I get pictures every week and they are looking very good. We've got quite a waiting list," Bill Elkins of S.S. Steiner said shortly before harvest. He'll continue to gauge demand as Steiner has with another popular hop, Calypso. "Each year we've increased acreage, but that gets gobbled up under contract," he said. "Those who have used it increase requests." Craft brewers remain very interested in Hopsteiner 06300 (14 to 15 percent alpha acids) and its orange-chocolate character, as well as the pungent Hopsteiner 05256 (18 to 19 percent alpha acids). Another experimental hop, Hopsteiner 04190 (3 to 6.5 percent alpha acids and 5 to 6 percent beta acids), has done well in trials in Germany. "It's a niche hop," Elkins said, but well suited to hoppy pale lagers.
- Azacca (14 to 16 percent alpha acids, 1.8 to 2.2 percent oils) began attracting attention when Victory Brewing featured it in Hop Ranch Imperial IPA. Roy Farms harvested about 75 acres in 2014, and Wyckoff Farms is also growing the IPA-friendly variety. Roy Farms made oil-rich Jarrylo (14.75 to 17 percent alpha acids, 2.5 to 3.75 percent) available after the 2014 harvest. Its spicy, orchard fruit aroma and flavor are particularly well suited for saisons. Both of those were bred by the American Dwarf Hop Association, and the floral and citrusy ADHA 871 (13 percent alpha acids, 2 percent oils) is next in line, waiting for a name before it heads to the marketplace.
- Last year, Eric Desmarais at CLS Farms harvested 10 bales (2,000 pounds) of a hop he called Multi-Head. He since trademarked it as Medusa and in September expected to harvest 60 to 75 bales. They were all pretty much spoken for, with most going to Sierra Nevada Brewing for its Harvest Wild Hop IPA released in December. Interest in the

new hop soared in mid-summer due to an article in *Smithsonian* magazine about *neomexicanus* hops, the botanical variety of *Humulus lupulus* unique to the American West. Desmarais cultivated Medusa from a plant provided by Todd Bates in New Mexico. Bates bred Medusa and other varieties, currently unnamed, from plants he collected near Taos.

All other hops used in beer are either *Humulus lupulus lupulus* (landrace varieties like Saaz or Hallertau Mittelfrüh) unique to Europe, or a cross between *lupulus* and *neomexicanus*. The USDA-ARS National Clonal Germplasm Repository in Oregon contains scores of other examples of *neomexicanus*, and they can still be found growing wild in various parts of the country. Desmarais said he thinks it is worth considering that those hops, which migrated from Mongolia about 500,000 years ago and have adapted to the regions where they grow, might be better suited to cultivate in some areas of the country than those bred for the Northwest.

LOCAL HOPS FOR LOCAL BREWRIES

HGA's George estimates that farmers outside the Northwest planted hops (many of them first year "babies" that would not yield harvestable cones) on about 1,000 acres in 2014. For perspective, farmers in Spain, not exactly known for growing hops, planted more. Nonetheless, growers in several states—notably New York, Michigan, Wisconsin, California, and Colorado—have invested in the infrastructure to grow and process hops on a serious scale.

In the process, they've already found ways to distinguish their hops from those from traditional hop growing regions. A few examples:

- Hops-Meister in California has revived two different varieties of California Cluster—as recently as 1971 Cluster and its various sub-varieties accounted for more than 80 percent of the hops grown in America—called Ivanhoe® and Gargoyle®.
- Several New York farms are marketing some of their hops as heirloom. There

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were 9,765 farmers growing hops in New York in 1879. They planted 39,072 acres of hops and accounted for 80 percent of the production in the country. Production fell to 20 percent of that within 20 years and eventually died out. Most of the found plants are genuine heirlooms that have been growing in the wild for up to a century. "It's like finding wild apples," said Steve Miller of Cornell University, who has been at the center of the state's effort to support hop farming. "The majority are so-so." Going forward, farmers are more likely to distinguish themselves based on the quality of what they grow rather than variety. "I think five years from now we'll be in that position," he said. "(Brewers will say) this Fuggle or this Cascade is not just local—I actually like it better than I can get elsewhere."

- Michigan farmers are growing two varieties developed at Great Lakes Hops in Zeeland, which propagates hop plants and ships them to farmers across the country. Lynn Kemme, who did the breeding, calls one Mackinac ("A party in your mouth, like going to Mackinac") and the other Michigan Copper. He hadn't planned on releasing them to grow as quickly as he did. He offered 14 breweries the opportunity to evaluate 20 varieties. Those two were easily the top picks, and brewers insisted he make them available to growers.
- The monks at Monastery of Christ in the Desert in New Mexico are growing six varieties of *neomexicanus* hops cultivated by Bates. They use them in some of the Monks' Ale beers made at Sierra Blanca Brewing near Albuquerque, and sell them to commercial breweries and homebrewers.
- Gorst Valley Hops in Wisconsin is introducing a wild-type variety the company has been tracking for seven years. It's called Top Secret until they trademark a name. It is very downy mildew-resistant, with average yield and moderate alpha. The aroma is floral with spicy and earthy undertones. Director James Altwies said they hope to establish its genetic lineage in the coming months. It definitely is

Humulus lupulus lupulus and likely was open bred with *Humulus lupulus lupuloides* (a native hop found in eastern and north-central North America). It has some characteristics of Cluster grown in Wisconsin in the 1860s, a variety that may well have been brought in from the East Coast.

KEEPING UP WITH THE AMERICANS

Hop growers elsewhere have noticed American brewers' affection for aroma hops. They also are aware that in many cases artisanal brewers in other countries, including their own, have begun to demand hops with the New World character found in those from the American Northwest, New Zealand, and Australia. Farmers in many other countries have started to grow more Cascade hops, and breeders have used American hops, particularly Cascade, in developing new varieties.

The most notable new varieties are three from Germany with Cascade as a mother: Mandarina Bavaria, Hüll Melon, and Hallertau Blanc. The Germans call these, along with Cascade, "flavor hops." The German Hop Growers Association first served samples of beers made with those varieties at the 2012 Craft Brewers Conference. However, horrible growing conditions in 2013, the first year they expected to harvest a significant amount of those hops and the high alpha Polaris, basically set things back a year. Still, some found their way into a few notable beers: Mandarina Bavaria and Hüll Melon were used in Firestone Walker's Easy Jack and Hallertau Blanc was used in the brewery's dry-hopped saison, Opal.

In 2014, 150 of the 1,192 German hop growers cultivated at least one of the flavor hops. Another 50 likely will in 2015. They harvested 100 metric tons (one metric ton is about 2,200 pounds) of Mandarina Bavaria, compared to 19 in 2013; 50 tons of Hüll Melon (7 in 2013); 40 of Hallertau Blanc (5); and 100 of Polaris (29). They expect Mandarina acreage to double in 2015 and Hüll Melon and Hallertau Blanc to increase by about 60 percent.

In England, Endeavour—a cross between Cascade and English Wye Target—is most

often described as less-intense, English-grown Cascade although it contains more alpha acids. However, hops with more intense aromas have emerged from a breeding program established by Charles Faram & Co. These include Jester (8 percent alpha acid), which has "wild American fruity flavors," and several daughters of Jester.

French hop growers have approached "flavor hops" in an Old World manner. Three new hops all have the classic, but low alpha, Strisselspalt as a mother. Barbe Rouge (9 percent alpha acids in 2013, but higher in previous trial years) is the latest. It has been described as berry-like, floral, spicy, and citrusy. Acreage is very limited, with more planned in the spring.

Stan Hieronymus is the author of *For the Love of Hops: The Practical Guide to Aroma, Bitterness and the Culture of Hops* and a frequent contributor to Zymurgy. A version of this article appeared in the November/December 2014 issue of The New Brewer.

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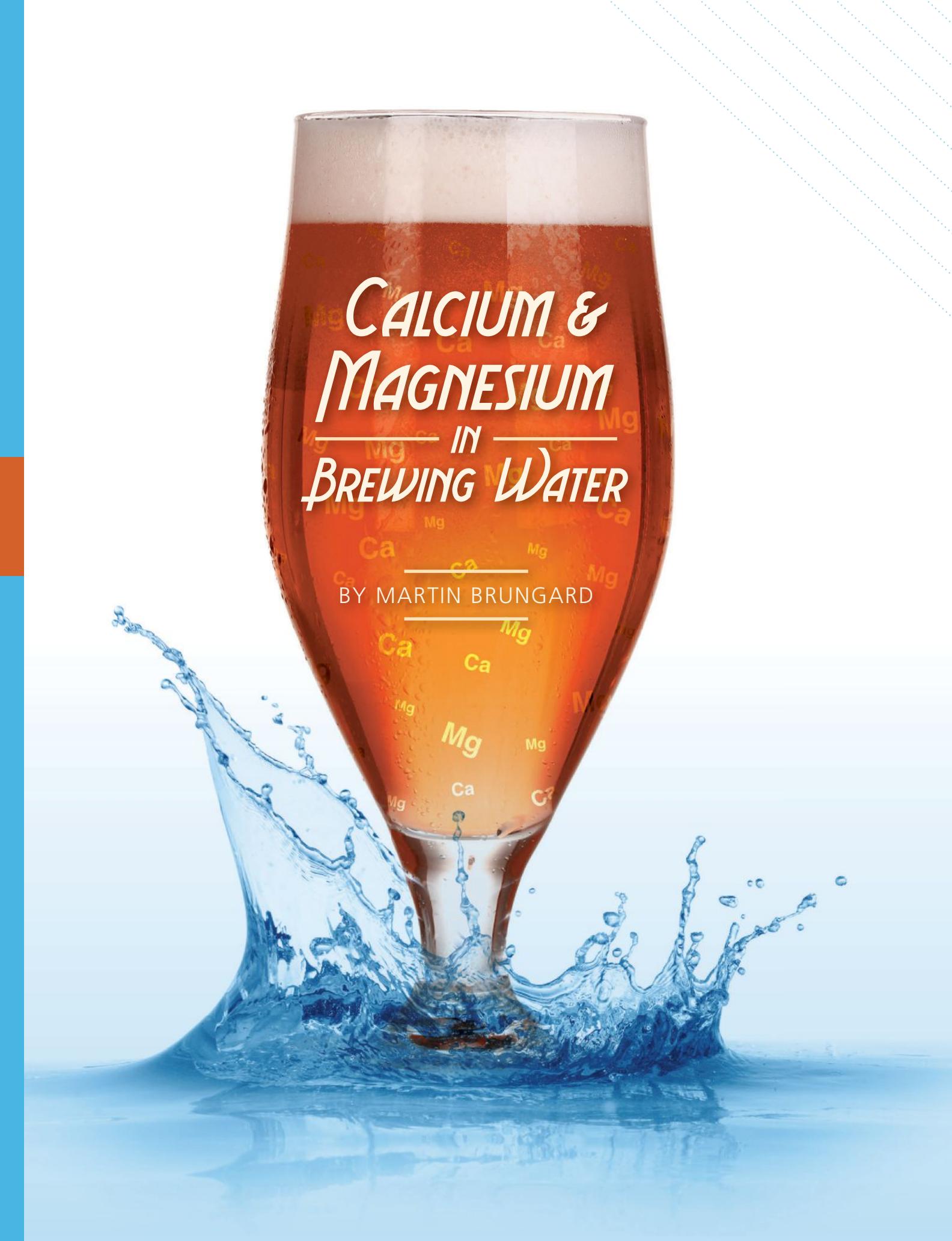
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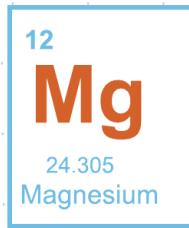
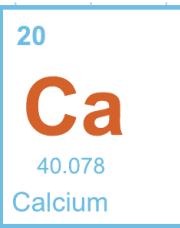
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A glass of dark beer is shown, partially submerged in a pool of blue water. The beer has a thick, white head. The glass is filled with the beer, which has a reddish-brown hue. The water surrounding the base of the glass is splashing upwards, creating a dynamic scene. The background is plain white.

CALCIUM & MAGNESIUM --- IN BREWING WATER

BY MARTIN BRUNGARD



Along with H₂O molecules, water typically contains a variety of ions that play important roles in the sugar production, fermentation, flocculation, and flavor of beer.

Calcium is an important ion in brewing water. A common suggestion has been for brewing water to contain a minimum calcium content of 50 mg/L (aka parts per million or ppm). Another typical recommendation is for brewing water to have little or no magnesium content. This article explores the appropriate levels of calcium and magnesium for brewing water.

Calcium and magnesium are the principal ions creating hardness in drinking water. They are important factors in reducing mash pH through their reaction with malt phytin. In addition, calcium and magnesium are important co-factors in yeast health and performance. Fortunately, wheat and barley malt have significant natural calcium and magnesium content. The typical ratio of magnesium to calcium in wheat and barley ranges between 2 and 6 parts magnesium to 1 part calcium.^{12,15} If all of that mineral content transfers from the malt into wort, a moderate gravity wort (1.045 OG) will have calcium and magnesium content of roughly 60 and 150 mg/L, respectively.^{4,13} Therefore, typical brewing wort already has significant calcium and magnesium content, regardless of how much the brewing water

started with. A summary of the benefits of calcium and magnesium in brewing is presented below.



Calcium

Calcium (Ca) can be beneficial in brewing water since it improves the flocculation of trub and yeast and reduces the extraction of astringency-causing tannins and silicates from grain husk. It improves wort runoff from the lauter tun, enhances hop flavor, and reduces haze and gushing potential in beer. Calcium is also a factor in the activity of the alpha-amylase enzyme that converts starches to sugars and dextrins. Calcium has a minor role in yeast health, but very little is needed for yeast growth.²² Of those benefits, the most important may be removing oxalate from wort, reducing mash pH, and improving yeast flocculation.



Magnesium

Magnesium (Mg) is a major yeast nutrient and a key component in yeast cell composition. Like calcium, magnesium reacts with malt phytins to lower the mash pH, but with reduced effect compared to that for calcium. Magnesium

accentuates flavor with a sour bitterness when present in brewing water at concentrations approaching 40 mg/L. When brewing water's magnesium content exceeds that level, astringent flavor perceptions may be produced in beer. Magnesium is an important factor for activating several glycolytic enzymes that convert sugars to alcohol.²² Studies have shown that a minimum of 5 mg/L magnesium improves yeast flocculation. As mentioned previously, typical wheat or barley wort contributes far more than 5 mg/L magnesium to the wort. So it is not necessary to add magnesium to brewing water unless it is desired for its flavor, enzymatic, or yeast health effects.

Oxalate Removal

Oxalates are natural organic acids present in wheat and barley. Oxalates precipitate out of the wort by combining with excess calcium in the mash. If there is insufficient calcium content in the brewing water, oxalate can remain in the wort and cause beerstone (calcium oxalate) formation in fermenters, bright tanks, and kegs. The author's review of breweries with and without beerstone issues suggests that a minimum calcium concentration of about 40 mg/L in brewing

water appears to reduce beerstone occurrence. But with that said, we know there are beers routinely brewed with low calcium content water. For example, Pilsner and other lager styles may taste better or cleaner with less than 40 mg/L calcium in brewing water and some brewers keep their brewing water relatively mineral-free. While there are reasons to use low calcium content water, brewers should understand that other measures may be needed to ensure adequate yeast performance, beer clarification, and beerstone removal.

Mash pH Reduction

Increasing calcium content in mashing water does help reduce mash pH through its chemical interaction with phytins from the malt to produce acids. However, this approach to mash acidification can indirectly affect beer flavor. While the calcium ion has little flavor itself, the sulfate or chloride that is paired with mineral additions such as calcium sulfate (gypsum) or calcium chloride can impart flavors to beer. High levels of sulfate or chloride ions may create mineral flavors in finished beer that may or may not be desirable. If a brewer needs to add excess calcium to the

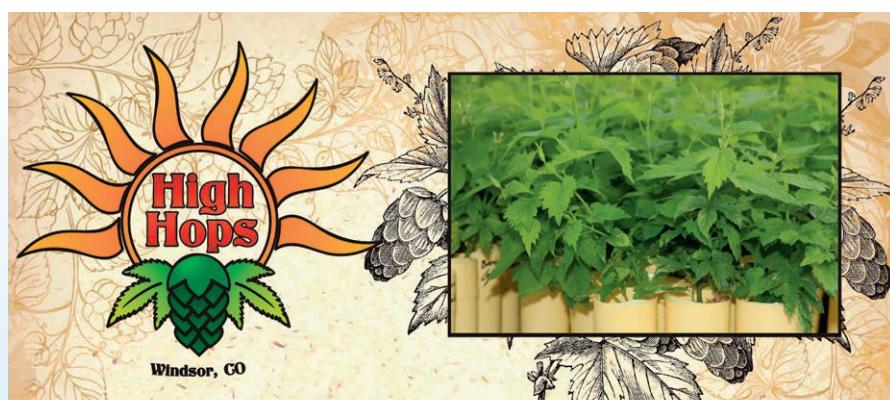


brewing water to achieve a desirable mash pH, a better alternative may be to employ an acid addition to the mash. However, a little flavor from the water is a good thing. Anecdotal evidence suggests that a minimum amount (say 20 mg/L) of calcium and its associated sulfate or chloride ions can enhance beer flavor.

Enzyme Activity

Enzymes convert starches into fermentable sugars during the mash. As mentioned previously, alpha-amylase is an important malt enzyme that actually requires a calcium ion in each enzyme molecule for that enzyme to perform well.⁶ Calcium is required for the enzyme's starch conversion capability and to protect against denaturing at mashing temperatures. Fortunately, the natural calcium content of wheat and barley generally fully supplies alpha-amylase with all the calcium needed for sugar conversion in a typical mash.

The lifespan of alpha-amylase in the mash is affected by temperature. Mash temperatures above 158° F (70° C) quickly denature alpha-amylase.¹ Even at lower mashing temperatures, the enzyme life span is limited. Research shows that adding extra calcium to alpha-amylase (above its single calcium ion requirement) improves the enzyme's resistance to high-temperature degradation and increases its activity.¹¹ Research with barley-derived alpha-amylase shows that its activity can be increased by 50 percent when the wort calcium content is about 400 mg/L.¹ Since typical wort contains less than half that calcium content, that result is not directly applicable to typical brewing. Fortunately, other studies indicate that the temperature stability and activity of alpha-amylase is proportional to calcium content. Therefore, we can extrapolate that brewing with high calcium



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Since yeast requires magnesium at higher concentrations than other metal ions, yeast growth can be decreased by magnesium displacement.

content brewing water (say 140 mg/L) might increase enzyme activity by about 15 percent compared to brewing water with no calcium content.¹⁴ But at a more typical 50 mg/L calcium in brewing water, activity improvement is negligible. Although enzyme activity is important, a better solution to promoting good enzyme activity may be to reduce the mashing temperature slightly instead of adding excess calcium to the water.

Yeast Growth

Yeast requires a variety of nutrients and ions to foster its growth. While calcium and magnesium are necessary constituents for yeast growth, the major ions utilized by yeast are potassium and magnesium. It turns out that calcium is just a trace ion for yeast growth, similar to zinc. To help illustrate this, yeast composition per kilogram (dry-basis) shows that yeast has about 22 grams of potassium, 2.7 grams of magnesium, 0.5 gram of calcium, and 0.12 gram of zinc.²³ The magnesium and calcium content of natural wheat and barley wort and this yeast composition indicate a greater need for magnesium in brewing compared to calcium. In a way, it makes sense that brewing yeast have evolved to thrive on the higher magnesium content in typical wort.

Research shows that for yeast growth, wort must contain a minimum content of 10 to 20 mg/L calcium and 42.5 mg/L magnesium.¹⁶ While those ion concentrations should not be assumed to be exact, it should be apparent that those minimum requirements are a fraction of the content provided in typical wort. From that comparison, it is also apparent that the calcium requirement for yeast growth is very low and there

is no need for additional calcium in the brewing water for yeast health, growth, or fermentation performance.

In fact, increasing the calcium content of wort can interfere with yeast's magnesium uptake. This is due to calcium and magnesium both being loosely bound to the cell walls of yeast. When other metal ions such as calcium, iron, manganese, and zinc are present in the wort, they preferentially displace magnesium from binding sites on the yeast cell.²³ Magnesium's ability to bind to yeast is more limited than those other ions due to its requirement for specific binding site conditions. Calcium is not that picky and can ultimately displace magnesium from the yeast and potentially limit yeast growth.^{8,21,23} Therefore, higher calcium content in brewing water increases the likelihood that magnesium will be displaced from yeast cells. Since yeast requires magnesium at higher concentrations than other metal ions, yeast growth can be reduced by magnesium displacement. More evidence of yeast's low calcium requirement is that yeast actively eject calcium from the yeast cell through its cell membrane to maintain a low interior cellular calcium concentration between 4 and 8 mg/L.^{15,16}

Yeast Fermentation

Research by Rees and Stewart¹⁵ shows that as yeast become magnesium deficient, their ability to uptake and convert maltose and maltotriose is reduced. As shown in Table 1, those two sugars comprise over half the fermentable content of typical wort. Therefore, failure to convert those sugars could have a significant effect on beer quality and attenuation. This reduced ability to convert those sugars is

Table 1 - Typical Wort Content

WORT COMPONENT	AVERAGE WORT CONTENT (%)
MALTOSE	41
DEXTRINS	22
MALTOTRIOSE	14
GLUCOSE/FRUCTOSE	9
MALTOTETRAOSE	6
SUCROSE	6

Source: Briggs, DE, et al³

more typical in magnesium-deficient lager yeasts and is rare in ale yeasts

Magnesium availability is vitally important in governing the breakdown of wort sugars and carbohydrates into components such as ethanol.²⁰ In experiments using a glucose-based growth medium (initially free of calcium or magnesium), it was shown that the ratio of magnesium to calcium added to the medium had an effect on yeast growth.¹⁷ At a Mg to Ca ratio of 0.1, yeast growth was impeded. At a Mg to Ca ratio between 0.35 to 0.5, lag time was extended. At a Mg to Ca ratio of greater than 1.8 (typical of malt wort), yeast growth was rapid. Maintaining the ratio of magnesium to calcium concentrations can improve the availability and conversion of those sugars into ethanol and other fermentation products.

Yeast Flocculation

Yeast flocculation performance is highly influenced by the calcium content of the wort. Stratford reports that yeast flocculation has a direct specific requirement for calcium.¹⁹ In some cases, the degree of flocculation can actually be detrimental. For

example, excessive or early flocculation can reduce the yeast population in the wort, which may slow or end the conversion of malt sugars into alcohol. There are plenty of cases where brewers have to work to “rouse” their yeast to complete a ferment.

Flocculation is generally inhibited during active fermentation by the presence of mannose, maltose, glucose, and sucrose in the wort²⁴ and is relatively unaffected by the wort or beer pH. However as yeast complete their growth and fermentation phases and those sugars are consumed, beer pH becomes highly influential in flocculation.⁷ Fortunately, typical ale and lager strains are flocculent in the usual beer pH range of 3.9 to 4.8.³ Therefore, ensuring that the finished beer pH falls within this range is important for improving beer clarification.

It also turns out that excessive flocculation is a problem for dry yeast producers. Excessive calcium content causes yeast to agglomerate into tightly-bound, dry cell masses that fail to separate properly into functioning yeast upon rehydration.² Researchers report that

elevated calcium content in brewing water may create excessive flocculation that may be detrimental to the potential reuse of the yeast. This phenomenon helps illustrate that calcium is an important control measure for flocculation performance. If the yeast drop out of wort prematurely, the culprit could be too much calcium in the brewing water.

The rate of yeast flocculation is less important in lager brewing since the lagering process provides the time and conditions necessary to precipitate yeast and clarify beer. However, flocculation rate is often important in ale brewing since those beers are typically served relatively young. Rapid clarification may be desirable for making the beer more presentable. A minimum of 50 mg/L calcium content in ale brewing water can be helpful in promoting flocculation and beer clearing and even higher calcium content can be employed to increase that clearing rate. Although time is money, clarification by flocculation and settling is not the only alternative for brewers. Some employ filtration

or centrifuging to clarify their beer, which reduces the importance of yeast flocculation performance. Low calcium content water may be more feasible for brewing if the brewer uses those yeast removal techniques.

Yeast Species Specialization and Adaptation

Like many organisms, adapting to the environment is an important factor for survival, but adaptation is not instantaneous. Significantly altering the ionic content of wort can alter the behavior and performance of yeast. Research indicates that gradual change in the wort environment over the course of about 12 days can acclimate yeast to a new wort condition.^{9,10}

Given the potential for calcium to displace magnesium in yeast, it is apparent that yeast that has not adapted to higher calcium concentrations could be adversely affected by an abrupt increase in wort calcium content.

Adaptation is an important factor in yeast selection. While English ale yeast may function well with wort created from high calcium content water, Bohemian lager yeast may be overwhelmed and suffer fermentation problems. Conversely, low calcium content water may be detrimental to yeast that is acclimated to high content. For example, English ale yeast may not adequately clear if the wort's calcium content is too low.

Guidance for Calcium and Magnesium Use

With the potentially adverse effects from excessive concentrations of calcium or magnesium, it is apparent that more attention should be directed to these important ions. For lager brewing, increasing the Mg to Ca ratio in brewing water could be helpful for improving yeast performance. For ale brewing, the water's calcium content can be used to alter the yeast flocculation rate to slow or enhance beer clarification or fermentation. If the ale doesn't clear fast enough, more calcium is possibly needed. If the yeast drops out prematurely leaving your wort under-attenuated, the water might have too much calcium.

Since malt produces wort with at least twice the magnesium content compared

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to its calcium content and since yeast benefit from the higher magnesium content, it appears that maintaining that ratio in the brewing water could be desirable. While there is little latitude to increase magnesium concentration in brewing water due to its resulting undesirable flavor in beer at concentrations above 40 mg/L, another way to maintain or improve that ratio is to limit the calcium content of brewing water.

Although some brewers advocate little or no magnesium content in brewing water, worldwide there are many water sources with moderate natural magnesium content that produce fine beers. An example is beer from Southern Bavaria where the typical water supplies contain 10 to 20 mg/L magnesium.⁵ Although some Bavarian breweries reduce their water's calcium and magnesium content with lime-softening, not all breweries employ that water treatment method. As evidenced by the taste of these typically malt-focused Bavarian beers, that modest level of magnesium does not appear to seriously affect their flavor. Therefore, minor additions of magnesium-containing minerals (Epsom salt, magnesium chloride) may be useful to help improve brewing water's Mg to Ca ratio. In hop-forward and bittered styles, beneficial beer flavor effects can be produced with a brewing water magnesium content of up to about 40 mg/L.

For lager brewing, a more feasible alternative for improving the Mg to Ca ratio may be to keep the calcium content of the brewing water low. In water with high calcium hardness and alkalinity (aka temporary hardness), pre-boiling the brewing water and decanting the clear water off the sediment is an effective way of reducing calcium content and alkalinity. Pre-boiling has been used in brewing to reduce high temporary hardness water for hundreds of years. Lime-softening can also be used to reduce calcium content and alkalinity in water with high temporary hardness. If the water source has significant permanent hardness, then the modern use of reverse osmosis or nano-filtration treatment may be better options for reducing the mineral content. If the water source has low calcium content, limiting the addition of

calcium-containing minerals (gypsum, calcium chloride, lime, chalk) may also be a useful technique for improving the Mg to Ca ratio. If you're brewing with very low calcium water and oxalate removal is desired, adding all the calcium minerals calculated for both the mashing and sparging water volumes to only the mashing water and not the sparging water helps increase the calcium content in the mash to help precipitate oxalate.

Another option to improve yeast performance is to pre-condition yeast with

elevated magnesium content during yeast starter propagation.¹⁸ This helps infuse yeast cells with magnesium ions to provide compensation for calcium displacement. Yeast producers often include magnesium in yeast supplements they employ for their yeast production operations. Avoid adding calcium to starter wort.



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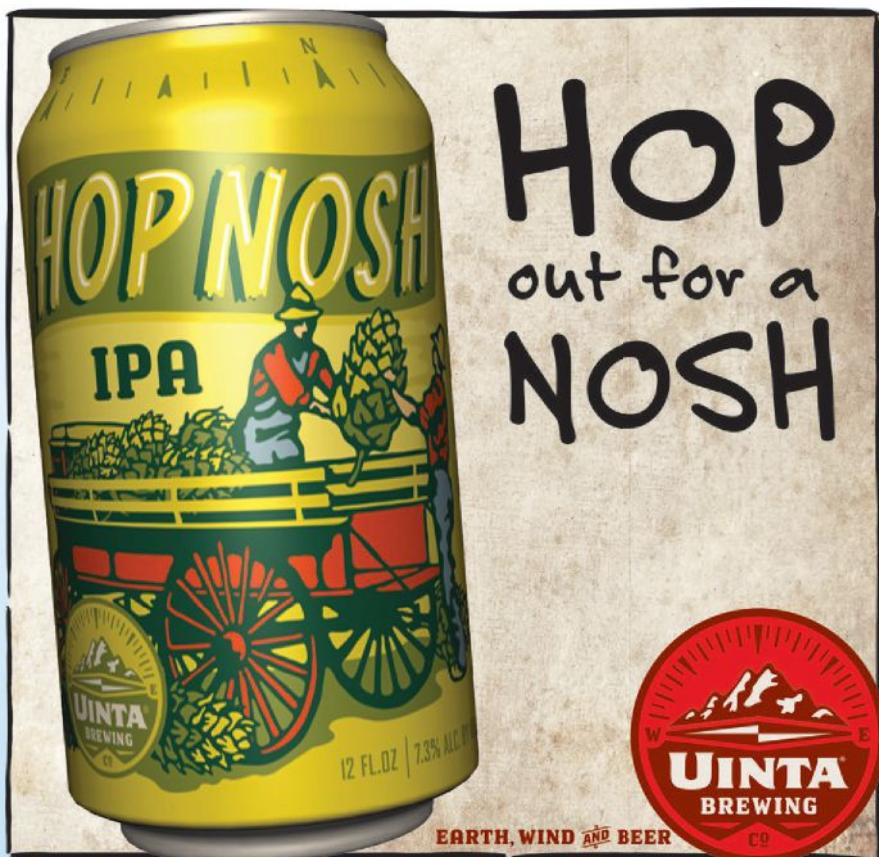
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CONCLUSIONS

- Calcium is required in brewing water only to the degree needed to enhance desirable beer flavor, produce adequate beer clarification, and limit beerstone production.
- A minimum of 50 mg/L calcium in brewing water does appear useful for improving clarification in ales. Higher calcium content may be useful for increased beer clarification. Less calcium is needed if beer is clarified by filtering or centrifuging.
- Brewing water with less than 50 mg/L calcium may be desirable for lager brewing. However, a minimum level of calcium of around 20 mg/L and its associated chloride or sulfate anions does seem to improve beer flavor. Brewing with no mineral content in the brewing water can create dull tasting beer.
- Magnesium is an important component for yeast health and performance. Low magnesium content of less than 10 mg/L in brewing water is not likely to affect finished beer flavor and modest content of less than 20 mg/L has limited taste impact. Avoid exceeding 40 mg/L due to potential taste issues.
- Lager yeast is more likely to be adversely affected by elevated calcium content in brewing water. If poor lager fermentation performance is noted, reduced brewing water calcium content may improve lager yeast performance.
- Improvement in the temperature stability and activity of alpha-amylase enzymes is minor at the modest calcium levels typically used in brewing water. Don't add excess calcium in pursuit of improved enzyme activity.
- Increase the calcium content of mashing water to at least 40 mg/L to precipitate calcium oxalate in the mash tun and help reduce beerstone formation further downstream in the brewery. Alternate beerstone control measures (more cleaning) may be required if very low calcium content brewing water is used.
- Yeast performance and flavor may differ over time as the yeast acclimate to the ionic content of the brewery's wort in comparison to the yeast producer's propagation condition.
- Adjust brewing water calcium content to produce adequate flocculation in ales. If yeast flocculation is excessive, reduce the calcium content of brewing water. Lagering, filtering, or centrifuging processes reduce the need for yeast flocculation and the need for high calcium content in brewing water.
- Calcium and magnesium content in brewing water does reduce mash pH. However, an external acid addition (liquid acid or acid malt) can be more effective for reducing mash pH than adding extra Ca or Mg.
- Adding magnesium salts (Epsom salt or magnesium chloride) to yeast starters to pre-condition yeast may improve fermentation performance.



Martin Brungard is an expert in brewing water chemistry and an engineer specializing in water treatment. He is the author of the Bru'n Water software for brewing water adjustment. He was a technical editor for Brewers Publications' *Water: A Comprehensive Guide for Brewers* by John Palmer and Colin Kaminski. The author extends his thanks to John Palmer, A.J. DeLange, and Chris White for their review of this article. A version of this article originally appeared in the July/August 2014 issue of *The New Brewer*.

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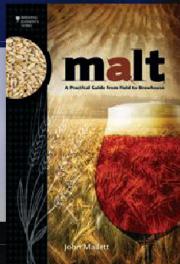
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Editor's Note:

The following is an excerpt from *Malt: A Practical Guide from Field to Brewhouse* by John Mallett, published by Brewers Publications in 2014.

malt

The Soul of Beer

By John Mallett



Like stock creates the base of every great soup, malt provides several key attributes that define beer as we know it, including color, flavor, body, and, eventually through fermentation, alcohol. When formulating the malt bill for a beer, a brewer should take each of these factors into consideration. Grain bills vary widely; some may utilize only one type of malt while others call for complex combinations.

Flavor

Throughout my years of brewing with Bell's, Old Dominion, and Commonwealth Brewing, I have had many discussions about malt and its contribution to beer flavor. Beer drinkers often have differing opinions as to what defines "malty" flavor. As brewers and maltsters, the techniques we use to capture and produce those flavors also vary. Our exposure to other flavors and our subjective perceptions impact the way malt manifests in the finished product.

If I were to stick a pin on a map to define what malty means to me, it would land close to Munich malt. Although malt also contains toasty, sweet, burnt, and husky flavors, the rich, aromatic flavor of Munich malt is what springs to mind when someone says the word "malt." Even small additions of Munich malt to a recipe seem to fill out the middle palate. If I am writing a recipe, chances are that there is some Munich malt included. Beyond that, I'm very open to malt styles; German, Belgian, English, and lots of American malts all get their turn on the mashing stage.

Chewing malt is a vital part of beer formulation; it is the best way to explore and analyze the combination of subtle differences between varieties. It's amazing how many people are disconnected from their senses of taste and aroma. Beer enthusiasts and brewery employees seem reluctant

to actually eat ingredients during tours and trainings, and it takes considerable prodding to get people to actually put raw materials in their mouths to truly experience a flavor. Munching on malt lets a person assess more than just flavor, giving a brewer a direct example of crucial quality metrics such as differences in friability¹ and moisture content. There are many practical and delicious reasons to put malt in your mouth, all of which help decide what grains will be best for your beer.

Brewing Perspectives

A wide variety of philosophies and techniques is used by brewers in grain bill formulation. Creating a complex yet well-balanced beer is equal parts art and science. It is difficult to quantify the multitude of individual flavor contributions from specific malts, so the brewer must move beyond the spreadsheet. It can be very enlightening to learn how different brewers approach this challenge.

Conceptualizing, brewing, assessing, and tinkering with a recipe is how most brewers approach developing exceptional beers. The process of dialing in a recipe can sometimes take years, but that path can be shortened with sufficient vision, experience, and careful calculations. Brewers approach beer formulation from many different angles: some are technical, thriving off spreadsheets and gross



percentages; others are research-based, scouring available resources to get a sense of the range for a given style. And then there are the extremely intuitive brewers who are able to bring a holistic sense of how the individual parts will add up and interact to form a beautiful and balanced beer. Talking to great brewers about how they envision a beer and then pull the malt bill together gives insight into all brewing processes. Thoughts from a few such brewers are shared in the following section.



Cigar City Brewing Co. (Tampa, Fla.)

Wayne Wambles is the main creative force behind the delightfully complex beers at Cigar City in Tampa, Fla. On the continuum of technical focus to artistic vision, Wambles embodies the artistic approach; his conceptualization takes many cues from painting. He described base malt as being the canvas that provides structure for beer. Mouthfeel is analogous to texture of the brush strokes. In his view, specialty grains provide color—toasted and caramel malts impart bright colors whereas dull colors come from darkly roasted malts. With this outlook it is not surprising to find that Wambles often builds resonating and powerful malt flavors in his beers through very complex grain bills. “With Big Sound, our Scottish beer, we use 11 different malts; mainly toasted and caramel malts.”

As he works toward the initial recipe, he may remove or add malt. He describes his approach to formulation in a simple way: “Generally I sit down and try to get an idea of what I want to make: I have a preconceived notion of color, gravity, and IBUs. Then I determine what type of malt flavors I want. After I write down the malts that I want to use, I then fill in the gaps with percentages and IBUs.” It is only after the percentages are determined that he plugs the recipe into an older version of Pro Mash brewing software that he has been using for years. This gives him a good estimate of what he should expect in the brewhouse.

Here's how Wambles might formulate a theoretical English barleywine. To build the desired underlying supporting complexity he would start with two different types of Maris Otter base malt. His approach is that “when building a wine, great vintners will oftentimes use grapes from different parts of the land.” Wambles would add some cara malts and a bit of Vienna or another toasted malt to the Maris Otter.

Wambles likes to use Maris Otter as a base malt in many different styles; for porters he feels that it builds a complex malt flavor characteristic of the style. He describes that flavor as malty-biscuity with a bit of earthiness. At 3° L it tends to add a lot of flavor without much color and is therefore a great foundation for malt-forward and low-alcohol beers. “It has built-in flavor that you just don't get with pale. If milled properly I think that it mashes better. If you just crack it, then it lauters very well.” Cigar City uses Simpsons as its main supplier for Maris Otter.

“I like English specialty malts a lot,” Wambles explains. “American malts are very clean but the English cara and crystal malts seem to have more depth. They carry fruit flavors that American malts do not.” For the bright, clean malt flavors needed to complement the flavorful hops in American IPAs, he prefers caramel malts from Briess or Great Western.

Wambles also eagerly shared his love for the fig- and prune-like flavors from English dark caramel malts such as Baird or Simpsons, noting his appreciation for their contributions to styles such as Belgian dubbel or Belgian dark strong. In the robust porter style he likes to use pale chocolate malts. “You can stack chocolate malts up and jack up the percentages, and get a more rounded beer without too much dry, burnt, char flavor.” He likes Cara-foam® malt to add body as well as chocolate rye malt because “you can use lower percentages to get great rye flavor without a difficult lauter.” Briess Special Roast™ is another go-to malt in his recipe development.

To elevate complexity Wambles recommends adding some Victory®, aromatic, or biscuit malt to the grist but warns, “if you overuse it, it turns into a mess.”



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Wambles believes formulating a complex beer requires a deft hand to prevent crossing the line from subtle to dominating. For example, in regards to double IPAs he feels that a touch too much caramel can transform the beer from delightful to “a big sweet mess” that often tastes under-attenuated. Similarly he noted that excessive black patent malt leaves a finish dominated by char and ash flavors. Too much toasted malt, like Victory®, imparts a flavor like unsweetened peanut butter that tastes awful to him.

Wambles is careful to not dilute the malt characteristics with unintended yeast flavors. He likens it to “covering a painting with wax paper” when beers are served with too much suspended yeast. With specialty malt additions that sometimes top 40 percent, it is clear that Cigar City’s commitment to substantial malt flavor is a key part of its brewing program.



Jen Talley (Auburn, Calif.)

Jennifer Talley's ebullient personality is a window into her passion for brewing. She has been brewing professionally for more than 20 years; first at Squatters Brewery in Salt Lake City, next at Craft Brew Alliance (Red Hook) in Seattle, then Russian River Brewing Co., and finally at Auburn Alehouse. Her many years of pub brewing allowed her the opportunity to trial and refine recipes and the processes for developing them. The desire to make flavorful beers within the lower alcohol constraints required by the state of Utah inspired her to brew creatively.

For Talley, recipe development begins with substantial research. “Before I sit down, I want to learn about the style; read, taste, talk to other brewers. Know the history; learn from it, not to copy but to find what I like about it. Only then do I put pen to paper.”

After determining her target parameters including wort starting gravity, alcohol percentage for finished beer, color, and most importantly malt flavor notes, she

begins her calculations. The underlying foundation of the beer is the base malt. She feels it's important to actively taste the malt as the beer takes shape in her mind. Of particular importance are the specialty malts needed to get to her final objective. She is also keenly aware of the synergy with other ingredients in the beer. “You can destroy everything you are trying to bring out from the malt by over- or under-hopping the beer. The malt does not exist in a vacuum. You need to think about how they all interact.”

When formulating a beer described as “mid-color, malt-forward with middle range hops to provide counterpoint,” Talley would start with about 40 percent Maris Otter pale malt or Gambrinus ESB malt and back that up with the house base malt, likely a standard American two row pale malt. To build a layer of malty character she would add roughly 15 percent of 10° L Munich malt. Adding 5 percent of a midrange 40–60° L caramel malt would complete the initial recipe. Small corrections would likely be made after transferring these quantities into her formulation spreadsheet. The tweaks to the final recipe might include an addition of Carafa® III of less than 1 percent to fine-tune the color. When the first batch of the beer was in her glass she would eagerly seek opinions to determine what additional modifications would be beneficial. For her, the benefit to brewing at a pub was that ready access to different points of view: “I always have open ears to my customers.” She considers the recipe a living document and that subtle changes are not just acceptable, but desired.

When asked what malts stand out to her after years of brewing, she was quick to respond. “Weyermann® Pilsner malt. You just cannot substitute; you need to spend the money on the great malt for the Pilsner style. That flavor is hard to describe; there is a slightly bready but bright maltiness to it.”

She likes Cara-Aroma® from Weyermann® and feels that it brings a depth of caramel maltiness with an added complexity. “It is gentle and bold at the same time with a great color range.” Brewing in Utah taught her how to maximize flavors within the

constraints she faced. "If you want a beer that has a malt background you only have so much room. You have a limited amount of malt that you can actually add, because you need fermentable sugars too."

Another favorite is Hugh Baird roasted barley; she feels it should be the star in a dry Irish stout. To increase color without much flavor she likes Carafa® III, the dehusked black. "No one will ever know it is in your beer. At 1 to 3 percent it can give you the black or the red you want to match the style." She feels that it is hard to get true red hues, as opposed to copper or amber, and visually there is a large and important difference.

For Talley, the largest problem she encounters as she tries new beers is an excessively heavy hand with specialty malts. "Someone has mistaken punching you in the face for flavor. Overuse is inarticulate in formulation. When I just can't finish my pint, typically they have overused specialty malt." In her experience, key culprits include Victory®, chocolate, black malt, and even roasted barley.

"I have a hard time with biscuit. It is easy to overdo it."

When asked about her least favorite malts, she replied, "Peat malt; it's too phenolic. If you want smoke flavor, use real smoked malt."

Wambles holds the same opinion: "Anything peated," Wambles says. "I have trouble with it in any beer; it is my number one hated malt."



Jon Cutler

Piece Brewery and Pizzeria (Chicago, Ill.)

Chicago's busy and cool Wicker Park neighborhood is the home of Piece Brewery & Pizzeria. Jonathan Cutler has headed up brewing operations since they first opened in 2001. In the time since, the beer produced in the tight brewhouse has garnered plenty of acclaim, including medals at the World Beer Cup® and Great American Beer Festival®.

When Cutler formulates the malt bill for a beer, he thinks about it in three parts. "Base malt is the foundation you build on; with it you're probably already 90 percent of the way there. I'm always thinking of base malt first." German Pils malt is his first choice if he is working on a German style. If the beer is American, he will use two-row pale malt. He uses the second portion of malt to "turn the dial and point to the style." The addition of malts like Munich or crystal to the base malt adds a desired complexity to

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match the style. He uses the third part, finishing malts, to tweak the beer's functionality. "It serves a purpose; enhancing head or bringing up the color. I'll use oats, wheat, or maybe a bit of Carafa® to bring it all together."

For Cutler, the composition of a beer is like a piece of music. "It's lyrical, like a song. Your base malt is kind of your bass track; it's your rhythm, the structure the whole beer is built on. Then you bring in some guitar or keyboard, something interesting. Then you come in on top with your vocals and tie it all together, put a bow on it; some little thing that makes it. It turns a boring song into something that you say, 'that's kind of different. I haven't heard that before.' The song needs to have a hook." He adds that, "your first batch is like a demo tape. You may add some backing vocals if need be. It might need a little more cowbell. The malts must work together mellifluously before you know that the cut is ready to press."

Cutler's favorite base malts are pale and two row malts from Rahr, Weyermann® Pilsner, and wheat. Common instruments for the middle section? "I am a fan of Munich, English pale, melanoidin, and light caramel like C-15 and C-60." He uses a wide variety of finishing malts, but Carapils® or dextrin are essential to his beers. "There is nothing else like them." He is a fan of the whole Weyermann® catalogue and loves the unique flavors of Cara-Foam®, Cara-Hell® and Cara-Wheat®.

"The variety of roast malts is incredible. What kind of roast malt for your stout? Different malts give very different results." He loves the counterpoint that Munich or chocolate malt brings to a stout. By sitting in the middle, "They tie it all together; it doesn't just go from base to char."

Cutler's least favorite malt is C-60, but he also recognizes that it is essential to craft brewing. "It has great character and is the quintessential malt for American pale ale, but is prone to oxidation within a very short period of time. There is nothing worse than the

Base malt is the canvas that provides structure for beer. Mouthfeel is analogous to texture of the brush strokes—specialty grains provide color.

—Wayne Wambles, Cigar City Brewing Co.

ribey², oxidized C-60 flavor. It's the perfect middle ground malt but it is a catch-22. It can make a perfect beer but it can also break it."

His parting advice? "Learn by doing. Sometimes when you taste a malt, it doesn't necessarily translate to the beer. You need to taste it in the finished beer and learn from that."

Footnotes

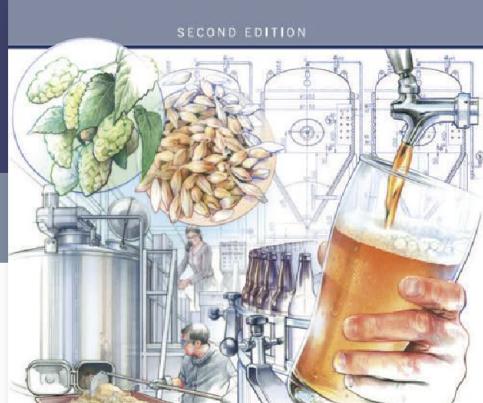
1. Friability is the property of being easily crumbled or pulverized. Fully

modified malt should be friable, unmalted barley is not.

2. Ribes is a British flavor descriptor for bruised tomato or blackcurrant leaves. It is associated with catty flavor.



For a malty recipe sneak peek, head on over to
[HomebrewersAssociation.org/
maltreipe](http://HomebrewersAssociation.org/maltreipe)



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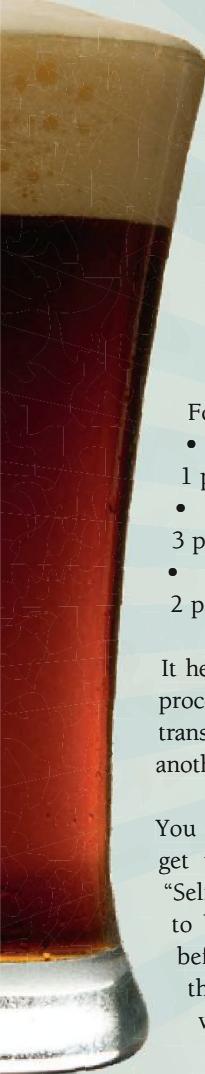
TRANSFORMERS

TURNING ONE RECIPE INTO ANOTHER

BY DREW BEECHUM

**IN 2009,
AUTHOR MICHAEL RUHLMAN
BLEW MY MIND WITH HIS
“COOKBOOK,” *RATIO*.**

The book is about as different from a standard cookbook as you've ever seen. Instead of trotting out another set of recipes for biscuits, bread, and pasta, he shows you what professional chefs know—the slight variations needed to make radically different products.



GUIDING PRINCIPLES

I tend to look at different recipe styles as an exercise in holistic adaptation. What changes had to happen between two environments to make a beer become something else? What other styles emerged because of Pilsner? Where did all of the old brown ales go?

I think beer styles came about when brewers figured out what worked in their area and brewed happily until people began talking about the next big thing (see IPA).

Sometimes this is a good thing. “Hey Johann, did you hear about that pale, sparkly beer that Josef is brewing over in Pilsen? Wonder if we could make something like that?”

“I heard about this guy Vinnie making a stronger, more bitter IPA by ‘doubling’ the ingredients. Let’s look at our IPA recipe.”

Sometimes it’s terrible. “Bob and Doug from Molson just released an Ice beer! We need to copy them now!”

RULE 1:

Pay Attention to Location—

Ingredients

The chief real estate maxim is “location, location, location,” and it’s no different with beer. Read about the history of various classic styles and a common theme emerges: the influence of location. What’s your water source? What grows in your area? What does the local royalty allow you to do?

We can pay attention to location chiefly via our ingredients. Want to change your brown ale recipe to the basis of a Munich dunkel? Start by changing all your ingredients to German. Switch your hops from the distinctive, earthy English varieties to the spicy German noble varieties—so long Fuggles, hello Hallertauer! Use a German lager strain. Now you’re cooking with gas!

It’s truly amazing how many recipes you can “fake” just by using the local ingredients.

For example:

- **Biscuits:** 3 parts flour, 1 part fat, 2 parts liquid
- **Bread Dough:** 5 parts flour, 3 parts water (plus yeast and salt)
- **Pasta Dough:** 3 parts flour, 2 parts egg

It helped crystalize a way to explain a process I’ve done naturally for years—transforming one homebrew recipe into another using slight variations.

You know that panicked feeling you get when you first say to yourself, “Self, today’s the day we’re going to brew a beer we’ve never brewed before”? (If you don’t talk to yourself that way, you should try. It does wonders for your reputation.)

There are a few ways that I usually approach this endeavor:

1. Grab a recipe book and start scouring for one that fits my needs. (See every online forum out there for the ubiquitous suggestion: “Start with *Brewing Classic Styles* or *CloneBrews*.“)
2. Ask my trusty friends what recipe they prefer. (Huge problem here—to me, asking for help with a homebrew recipe is like asking for directions.)
3. Take a look at my ever-growing collection of recipes and attempts at beers and see what fits, what I liked, and what needs changing.

While I gather information all three ways, I admit that I tend to put a lot of stock in approach number three. I can look at 1,001 other recipes and never be quite certain how they’ll translate on my system, to my methods, and to my tastes, so this is where my own experience comes into play.

BASIC BROWN

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

9.0 lb	(4.08 kg) Maris Otter pale malt
1.0 lb	(0.45 kg) Simpsons 55° L crystal malt
0.25 lb	(113 g) Simpsons pale chocolate malt
0.4 oz	(11 g) Admiral, 14.75% a.a. (60 min)
0.5 oz	(14 g) Progress, 6.25% a.a. (10 min)
Wyeast	1275 Thames Valley ale yeast

Original Gravity: 1.050

IBU: 26 **SRM:** 16 **ABV:** 5.1%

DIRECTIONS

Mash in at 154° F (67° C) for 60 minutes.

EXTRACT VERSION

Substitute 7 lb (3.18 kg) Maris Otter malt extract syrup for Maris Otter pale malt. Reduce crystal malt to 0.75 lb (340 g). Steep crystal and chocolate malts in 155° F (68° C) water for 30 minutes. Drain, rinse grains, dissolve extract completely and proceed with boil.

TRANSFORMER VARIANT BASIC DUNKEL

Substitute Weyermann® Munich malt for Maris Otter

Substitute Caramunich for 55° L crystal malt

Substitute Carafa II Special for chocolate malt

Substitute Magnum (14% a.a.) for Admiral

Substitute Hallertau (4% a.a.) for Progress

Substitute Wyeast 2308 Munich Lager for Thames Valley ale yeast

Original Gravity: 1.050

IBU: 24 **SRM:** 18.6 **ABV:** 5.1%

EXTRACT VERSION

Substitute 7 lb (3.18 kg) Munich malt extract syrup for Munich malt. Reduce Caramunich malt to 0.75 lb (340 g). Steep specialty malts in 155° F (68° C) water for 30 minutes. Drain, rinse grains, dissolve extract completely and proceed with boil.

HOBO BOHO PILSNER

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

11.0 lb	(4.99 kg) Bohemian Pilsner malt
2.25 oz	(63 g) Saaz, 4.5% a.a. (60 min)
1.0 oz	(28 g) Saaz, 4.5% a.a. (0 min)
Wyeast	2124 Bohemian Lager yeast

Original Gravity: 1.051

IBU: 40

SRM: 3.2

ABV: 5.2%

DIRECTIONS

Adjust water with calcium chloride (~1 tsp for a neutral water source) and minimal

other minerals. Strike with 16 quarts (15.14 L) of 134° F (57° C) water to rest at 122° F (50° C) for 20 minutes. Decoction #1: pull 1/3 of the mash with minimal liquid. Raise to 152° F (67° C) for 20 minutes in a separate vessel and then bring to a boil while stirring. Add back to the main pot to raise the mash to ~150° F (~66° C). Decoction #2: pull 1/3 of the mash volume with minimal liquid. Bring to a boil. Add back to the main pot to raise to a 10-minute, 168° F (76° C) mash out. Ferment for two weeks at 48-50° F (9-10° C). Raise to 64° F (18° C) for 24 hours and then crash to 35° F (2° C) for two more weeks.

EXTRACT VERSION

Substitute 8 lb (3.63 kg) pilsner malt extract syrup for pilsner malt. Proceed with boil. Note that extract recipe will be slightly darker in color (~4 SRM) than all-grain version.

TRANSFORMER VARIANT JOHANN'S PILS

Substitute	Weyermann® Pilsner malt for Bohemian
	An infusion mash schedule with a protein rest is sufficient for the highly modified base malt: 30 minute rests at 122° F (50° C) and 148° F (64° C), followed by a mash out at 168° F (76° C)
Substitute	Hallertauer or Tettnang hops for Saaz
Adjust	water with gypsum (~1 tsp for a neutral water source)
Substitute	Wyeast 2206 Bavarian Lager yeast for Bohemian Lager yeast

Original Gravity: 1.052

IBU: 40

SRM: 3.2

ABV: 5.3%

EXTRACT VERSION

Substitute 8 lb (3.63 kg) pilsner malt extract syrup for pilsner malt. Proceed with boil. Note that extract recipe will be slightly darker in color (~4 SRM) than all-grain version.

TRANSFORMER VARIANT HOBO DEVIL

Substitute	a Belgian pils malt like Castle for Bohemian and increase to 12 lb (5.44 kg)
	An infusion mash schedule with a protein rest is sufficient for the highly modified base malt: 30 minute rests at 122° F (50° C) and 148° F (64° C), followed by a mash out at 168° F (76° C)
Add	0.5 lb (227 g) aromatic malt
Add	2 lb (0.9 kg) table sugar to the boil
Decrease	bittering addition of Saaz to 2.0 oz (57 g)
Substitute	Wyeast 1388 Belgian Strong Ale yeast for Bohemian Lager yeast

Original Gravity: 1.076

IBU: 35

SRM: 4.7

ABV: 8.9%

EXTRACT VERSION

Substitute 8.75 lb pilsner malt extract syrup for the base malt; steep aromatic malt in 155° F (68° C) water for 30 minutes. Drain, rinse grains, dissolve extract and sugar completely and proceed with boil.

RULE 2:

Pay Attention to Location—Water

What about water? It's important, right? Well, yes. After all, the primary difference between a classic Bohemian Pilsner and a Northern German Pils is all about that more mineral-laden German water that accentuates the hop bite. Would an IPA be nearly as assertive without the sulfate?

Here's my advice: stop trying to replicate various brewing city waters to the tiniest ppm of a mineral. Those tables you see are typical average values and are also the raw water before brewery treatment. Don't think for a second that brewers with high carbonate water weren't figuring out how to remove at least part of the carbonate to protect their brewery plumbing, if nothing else!

Instead, pay attention to the overall quality of the water. Is it mineral laden? Is it higher in sulfate than chloride? Aim for a water profile that mimics the overall ratio of the water, not the exact numbers found in a moldering table somewhere.

Here's another reason to gently adjust your water: it changes. Right now with California's drought, for instance, I can't trust that my handy Ward Labs report is even remotely accurate, since our water sources are changing so drastically. By nudging my water in a preferred direction, instead of trying in Procrustean fashion to fit it to a table, I have more leeway in case it has gone completely off the rails.

For hoppy beers, I adjust with one to two teaspoons of gypsum. For malty beers, I use one to two teaspoons of calcium chloride instead. That's about it.

RULE 3:

Practicality

The brewers who "created" the style weren't going to go out of their way to do something impractical unless they had a dire reason to do so. Porter brewers back in the day aged their beer in massive vats because they needed time for it to develop the expected funky sour notes, and needed volume in order to make a profit.

And just like I talk about in "Brewing on the Ones" (November/December 2012

Zymurgy), keep everything in round amounts. No brewer is going to lug a sack of malt to the mill for a few pounds in a multi-barrel batch unless it's a potent addition.

RULE 4: **Embrace and Extend (or Contract)**

Now we come to my favorite: my “rocket fuel” rule. This is the rule for all those who’ve watched *Spinal Tap* and thought, “It really should have gone to 12.” Sometimes a style is really just something bigger. It’s a natural progression, at least here.

Look at stout styles: Irish dry stout, foreign stout, and Russian imperial stout. There’s a nice progression from the very sessionable to the very sippable. When I developed my stout recipes, I started from dry and gradually progressed. One thing you’ll notice, though, is that the specialty malts don’t jump appreciably. Almost all of the growth is in the base malts.

Why not change the specialty malts? The character gained from specialty malts is invariably volume dependent, not gravity dependent. Your imperial stout doesn’t really need more roasted grains to gain the color you want. You’ll want a little increase to deal with malt absorption, but that’s it.

A corollary rule: keep it to a pound or less of crystal malt per 5 gallons. What we’re extracting from the crystal malt is a certain amount of sweet “oomph.” As with roasted specialty grains, just because you’re going bigger doesn’t mean you need to scale the crystals in line as well. Think of it this way: crystal and caramel malts are your seasonings. Keeping your crystals in line with the rule above will allow you to grow the beer without it becoming overwhelmingly sticky and cloying.

In another extension of a previous rule, a brewer is going to use what they have on hand to increase their beers. If it’s in the brewery already, it’ll probably go into the beer. As a perfect example, take everyone’s cheap, go-to college beverage—malt liquor. All that’s required is a perfectly

KYLE'S DRY STOUT

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

6.5 lb	(2.95 kg) Maris Otter pale malt
1.0 lb	(0.45 kg) 120° L crystal malt
0.75 lb	(340 g) roasted barley
0.25 lb	(113 g) chocolate malt
0.25 lb	(113 g) black malt
0.5 oz	(14 g) Target, 11% a.a. (60 min)
1.0 oz	(28 g) Fuggle, 4.5% a.a. (15 min)
Wyeast	1084 Irish Ale or White Labs WLP004 Irish Ale yeast

Original Gravity: 1.042

IBU: 26

SRM: 45.5

ABV: 4.3%

DIRECTIONS

Single infusion mash for 60 minutes at 154° F (68° C).

EXTRACT VERSION

Substitute 5 lb (2.27 kg) Maris Otter malt extract syrup for Maris Otter malt. Steep specialty grains in 155° F (68° C) water for 30 minutes. Drain, rinse grains, dissolve extract completely, and proceed with boil.

TRANSFORMER VARIANT KYLE'S BOAT STOUT

Increase Maris Otter to 10 lb

(4.54 kg)

Add 1 lb (0.45 kg) flaked oats

Increase Target to 0.75 oz (340 g)

Original Gravity: 1.064

IBU: 37

ABV: 6.6%

EXTRACT VERSION

Substitute 7.75 lb Maris Otter malt extract syrup for the base malt; steep oats with specialty grains in 155° F (68° C) water for 30 minutes. Drain, rinse grains, dissolve extract completely and proceed with boil.

TRANSFORMER VARIANT KYLE'S GREAT STOUT

Increase Maris Otter to 16 lb
(7.26 kg)

Add 1 lb (0.45 kg) flaked oats

Add 1 lb (0.45 kg) molasses

Increase Target to 1.5 oz (42 g)

Increase Fuggle to 1.5 oz (42 g)

Original Gravity: 1.101

IBU: 66

ABV: 10.8%

EXTRACT VERSION

Substitute 12.3 lb Maris Otter malt extract syrup for the base malt; steep oats with specialty grains in 155° F (68° C) water for 30 minutes. Drain, rinse grains, dissolve extract and molasses completely, and proceed with boil.

CORNUCOPIA AMERICAN LAGER

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

8.0 lb	(3.63 kg) Cargill IdaPils malt
3.0 lb	(1.36 kg) flaked maize
0.25 oz	(7 g) Magnum, 14% a.a., 60 min
0.5 oz	(14 g) Mt. Hood, 6% a.a., 10 min
Wyeast	2035 American Lager or WLP840 American Lager yeast

Original Gravity: 1.051

IBU: 16

SRM: 2.9

ABV: 5.2%

DIRECTIONS

Single infusion mash at 150° F (66° C) at 1.5 quarts/lb. Ferment at 50° F (10° C) for two weeks. Lager at 32° F (0° C) for two weeks.

EXTRACT VERSION

Substitute 5.5 lb (2.49 kg) pilsner malt extract syrup for IdaPils malt and 2 lb (0.9 kg) corn sugar (dextrose) for flaked maize. Note extract version may not have the same sweet corn aromatics and flavor that a cereal mash can provide.

as important to consider how to shrink your beers and turn them down from 12 to 4, which is not as easy. And as with the aforementioned advice, you'll want to reduce your malt bill by removing the base grain over the specialties.

RULE 5:

Pay Attention to History

And finally, the rule I've been trying to avoid because it's the most studious. Almost everything I've mentioned here so far depends on knowing styles and style history.

There's a caveat—the history that we know and love and have read over and over again is most likely romantic folde-rol. They're really just drinking stories told by brewers to beer drinkers and possibly contain as many plausible facts as the urban legends about albino alligators in New York City's sewer system. But even given their dubious nature, the stories can still offer you guidance and/or inspiration.

Take, for example, IPA. "Brewed stronger and hoppier to survive the journey to India and never sold in England," blah, blah, blah... As folks doing actual research have shown, it's a rubbish story. But it still gives you a baseline understanding that IPA is stronger and hoppier than the now-standard pale ale. The idea of wooden casks rocking back and forth in the hold can also trigger a great idea: an oaked IPA. It's 100 percent ahistorical because actual oak beer casks were lined to keep the beer and wood apart, and therefore did not impart oak flavors, but that doesn't stop it from being a wonderful beer.

Belgian golden strong, on the other hand, seems to be derived from two colliding pieces of history. The first is worldwide prohibition movements. Just like the U.S., much of the world at the dawn of the 1900s was caught in alcohol prohibition fever. Belgium, reeling from the devastating onslaught of World War I, banned the sale of spirits at bars and introduced minimum sale quantities at stores. This prohibition lasted from 1919 all the way until 1983! The second factor was the rise of Pilsner (also see the introduction of Westmalle's Tripel to the world).

TRANSFORMER VARIANT CORN-FED ROCKET FUEL

Increase IdaPils malt to 10 lb (4.54 kg) total

Add 2 lb (0.9 kg) corn sugar

Original Gravity: 1.077

IBU: 16

ABV: 9.0%

EXTRACT VERSION

Substitute 8 lb (3.63 kg) pilsner malt extract syrup for IdaPils malt, omit flaked maize and increase corn sugar (dextrose) to 3.25 lb (1.47 kg).

good American lager recipe and a lot of sugar, corn, or corn syrup.

I'm jumping the gun a little on the next rule, but it is important to note that, his-

torically speaking, this approach of turning it to 12 is backwards. Over the years, the starting gravities of beers and beer styles have fallen in response to the pressures of modern work and life. It's just

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With spirits banned, Belgian brewers pounced and began reversing the trend of lighter and lighter alcohol levels. They intended to replace strong booze with strong beer. Brouwerij Moortgat jumped into the fray with its Victory Ale, brewed to celebrate the end of World War I. Later the beer earned the nickname "Devil" (or "Duvel" if you're Flemish) because of its strength. But until 1970, it was a strong, Scottish-inspired beer—big, dark, and brown. With Pilsner pointing everyone's eye toward golden colored beers, Duvel transformed into the stylish devil we know today. Is it a true story? It seems to check out, but then again, brewers and beer drinkers tell stories.

Here's where knowing history helps. If you combine what you know about one style and what the history was at the time of other styles, you can quickly surmise that Duvel, a strong beer created in response to Pilsners, would be Pilsner-like, only bigger. Take a Pilsner recipe (100 percent Pils malt, noble hops), add some sugar (20 percent) to boost the gravity, and then swap in appropriate yeast.

That reminds me. I really need to make a Belgian Scottish ale again soon.

SOME ASSEMBLY REQUIRED

Of course, there's no guarantee that you'll hit your mark perfectly the first time out of the gate. That's where your well-practiced art of brewing comes into play. But hopefully these suggestions will get you nearer to your target with some logical rules.

Another way to use this technique is to combine it with my article on batch splitting, ("More Beer from Your Brew Day," September/October 2010 Zymurgy). By thinking about how related everything is, you can more easily plan delicious splits to garner more beer from your precious brew days.

Drew Beechum is a member of the AHA governing committee and the Maltose Falcons homebrew club. He lives in Pasadena, Calif.

BOURBON OAKED IPA

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

6.0 lb	(2.72 kg) domestic two-row malt
6.0 lb	(2.72 kg) Maris Otter pale malt
1.0 lb	(0.45 kg) Simpsons 55° L crystal malt
0.5 lb	(227 g) biscuit malt
0.5 lb	(227 g) honey malt
0.5 oz	(14 g) Cascade, 8.3% a.a., first wort hop
0.25 oz	(7 g) Chinook, 10.4% a.a., 45 min
1.0 oz	(28 g) Amarillo, 8.9% a.a., 30 min
1.0 oz	(28 g) Warrior, 15.6% a.a., 15 min
0.5 oz	(14 g) Cascade, 8.3% a.a., 0 min
1.0 oz	(28 g) Cascade, 8.3% a.a., dry hop for 1 week

2.0 oz	(56 g) American oak cubes soaked in bourbon, secondary
Wyeast	1056 Chico Ale, WLP001 California Ale, or Safale US-05 yeast

Original Gravity: 1.070

SRM: 11

IBU: 79

ABV: 7.2%

DIRECTIONS

Mash at 153° F (76° C) for 60 minutes.

EXTRACT VERSION

Substitute 4.75 lb (2.15 kg) pale malt extract syrup for domestic two-row and 4.75 lb (2.15 kg) Maris Otter malt extract for Maris Otter pale malt. Steep remaining grains in 155° F (68° C) water for 45 minutes. Drain, rinse grains, dissolve extracts completely, and proceed with boil.

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JESTEM PIOWAREM DOMOWYM
I AM A HOMEBREWER



HOMEBREWING IN POLAND

BY STAN HIERONYMUS

In June 2013, a five-judge panel from Austria, Belgium, England, Germany, and the United States chose an imperial IPA as grand champion of Poland's largest homebrew contest, Konkurs Piw Domowych Birofilia. On December 6, the Zywiec Brewery released Brackie Grand Champion Birofilia 2013 Imperial IPA, made using homebrew competition winner Czeslaw Dzielak's recipe and distributed throughout Poland. The style originated in America.

In July 2013, judges who gathered in Boston chose two winners in the Samuel Adams LongShot Homebrew Contest. Boston Beer Company brewed those two beers, along with one using a recipe from an in-house competition, and distributed them nationwide in 2014. One of those beers was based on a recipe by Chicagoan Cesar Marron for a style known as Grätzer or Grodziskie. It originated in the Polish town of Grodzisk.

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As in much of the rest of the world, homebrewing is booming in Poland. The 2014 contest run by the Polish Home Brewers Association (Polskie Stowarzyszenie Piwowarów Domowych, or PSPD) attracted 782 entries, an increase of more than 75 percent from the year before. The PSPD, started by 24 homebrewers in 2010, now has more than 500 members in eight local branches.

That's considerably different than 1998. Volker Quante, now a colonel in the German army responsible for the military's satellite communications systems, was a soldier about to begin a three-year assignment in Warsaw. A newcomer to making beer at home, he asked on Homebrew Digest if there were any homebrewers in Poland or Warsaw. He received one answer. Andrzej Sadownik wrote back, "If you arrive here, we'll already be a party of two!"

Quante and Sadownik brewed beer together, and occasionally visited breweries, Quante said, basically begging for ingredients because there was no place for homebrewers to acquire them.

Sadownik had been introduced to homebrewing in 1994 when he spent a year as a research assistant in the chemistry department at Lehigh University in Bethlehem, Pa. Czeslaw Perun, a member of the local Polish community, demonstrated the finer points of the hobby. Sadownik admitted, "[Perun] seduced me with the quality and beauty of his homebrew" and then insisted Sadownik learn himself, lending him the necessary equipment. "The first brew was an instant success as well as the following six others," Sadownik said.

When he returned to Poland he was determined to "propagate in my country the hobby which gives so much joy and



Homerewer Jacek Kocurek in his Master Brewer apron, awarded to champion brewers in the Birofilia Festival by Zywiec.

Photos courtesy of Stan Hieronymus



Czeslaw Dzielak draws a pint of his grand champion Imperial IPA at the rollout party in December 2013.

pride and which simultaneously seems to be a powerful educational tool.” Others refer to him as the “father of homebrewing in Poland” but he defers. “My role here has just been a transmitter between the USA and Poland,” he said, crediting Perun and Charlie Papazian’s *The New Complete Joy of Homebrewing*.

An American influence is evident. For instance, the most entered category in the 2014 Konkurs Piw Domowych (Homemade Beer Contest) was Cascadian Dark Ale. A few months after an American “I am a Home Brewer” video was posted on You Tube in 2009, Polish homebrewers collaborated to make their own, “Jestem Piwowarem Domowym” (with English subtitles). However, it would be most accurate to conclude they are joining Americans—as well as Czechs, Scandinavians, Brazilians, and others—rather than following them.

JUDGING BEER

The PSPD has established its own beer judging program, similar to the Beer Judge Certification Program (BJCP) but with interesting differences. (Three Poles are members of the BJCP, including

Tomasz Rogaczewski, who sought out an English tutor when he prepared for the exam. Rogaczewski is also co-founder of Pracownia Piwa, the second craft brewery opened in Poland by homebrewers.) They’ve written their own style guidelines, created their own process for certifying judges, and fashioned their own scoring system.

Judges must first take part in two days of theoretical and sensory training and then pass an exam (and they must renew their certification regularly, taking the sensory test again). Judges advance from C, the beginning level, to B, and theoretically (because no one has done it yet) to A based on judging experience, accruing points as in the BJCP, and by taking additional theoretical and sensory exams. Sensory training is a cornerstone of the program.

Almost everybody who has entered a beer into competition is familiar with the BJCP scoresheet that allots 12 points for aroma, 3 for appearance, 20 for flavor, 5 for mouthfeel, and 10 for overall impression. The Polish criteria put more emphasis on appearance and bitterness. Aroma is

worth 12 points, color 3, foam (including the structure and quality) 6, flavor 17, bitterness (intensity and quality) 6, and mouthfeel 6. Although judges are expected to comment on overall impression, there is no point value.

“Bitterness is the element that makes beer special,” said Krzysztof Lechowski, who served on the committee to write the guidelines and succeeded Sadownik as PSPD president. He calculates that taste accounts for 58 percent of the score in the Polish system, aroma 24 percent, and appearance 18 percent. On the BJCP scoresheet, taste is 63 percent (of the 40 points not assigned to overall impression), aroma 30 percent, and appearance 8 percent (these total 101 because of rounding). How the 10 “overall impression” points (20 percent of the total score) are allocated depends on each judge.

BEYOND THE TIPPING POINT

Sadownik and Quante met Ziemowit Falat not long after they began brewing together. Falat and some friends had started a magazine for beer enthusiasts in 1997, *Piwosz Ilustrowany* (beer-lover

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James' *Billy Cart*

In our neverending quest to discover how Ss Brewtech's gear is helping you brew better beer, we stumbled upon James' Instagram account . When we saw his 7 gal Chronical and a mobile brewing sculpture he dubbed "The Billy Cart", we knew we had to meet this brewer from Australia! James' intro into home brewing began like many home brewers. James' co-worker, Swanny, was brewing his own beer and James was more than willing to help consume his friend's delicious brews. While he was enjoying the free beer, he also became interested in the science behind brewing. Starting first with various 'brew in a bag' kits, he has now moved on to brewing farmhouse ales, sours, and is even now experimenting with some barrel aged beers!

Check out more of how they brew Down Under and find out why in the world James rides his brewery at
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illustrated). The scope of the magazine expanded in 1998 after Sadownik wrote, "Juz pora zaczynac warzenie domowe." ("It's time to start homebrewing.") Quante also provided fodder, writing about the brewing process and providing pictures of his rather simple equipment. "This started a movement which none of us had expected," Quante said.

Falat and his partners first used their magazine to sell brewing supplies to homebrewers in 2000, then opened Browamator in 2002, initially as a shop for homebrewers. Browamator began selling ingredients to commercial breweries in 2004 and now those sales account for about 70 percent of business. Falat wrote and published the first guide for Polish homebrewers in 2004 and sold 4,000 copies during the next four years.

Browamator organized the first Konkurs Piw Domowych at Zywiec in 2003, and Sadownik established the rules, running the contest with the help of his wife, Anna. Unlike most competitions in the United States, this one does not include all styles. The homebrewers announce which styles—in 2014 there were 10—will be featured about six months in advance.

The Zywiec Brewery in the town of the same name in southwestern Poland began brewing and distributing the grand champion beer in 2009, and in 2010 established the Birofilia Festival with homebrewing as a major component. It is held on the grounds of the expansive brewery, and includes one of the largest gatherings of breweriana collectors in Europe, booths with regional food, and more than 600 beers along the "World Beer Avenue." Select homebrewers

pour their beer in a tent where there are demonstrations throughout the day and live music later on.

Brewers earn the right to pour beer by winning in previous competitions at Zywiec. They also receive aprons from Zywiec with the name of their home brewery, their own name, and a tagline that reads "Mistrz Piwowar" (Master Brewer).

"I'd like to emphasize the role of Grupa Zywiec (a subsidiary of Heineken) in establishing the association," Sadownik said. "I believe it was the first time ever that a big brewing company gave substantial help to homebrewers. I don't think the association could have been established in 2010 without the helping hand of Heineken's Chris Barrow (the president of Grupa Zywiec at that time)."

IMPERIAL IPA

When Czeslaw Dzielak's Imperial IPA won best of show at Birofilia 2013, none of the other homebrewers appeared surprised. Tomasz Rogaczewski, co-founder of Pracownia Piwa, explained that was because everybody expected Dzielak would have won years before. He began brewing in 2008 and his champion Imperial IPA was the 288th batch he brewed. His 338th batch, a dubbel,

earned him a second straight grand champion award at Birofilia 2014.

The 32-year-old Dzielak teaches history and physical education at a secondary technical school. He's written a business plan and acquired some of the necessary licensing, but still needs investor financing if he is to open his own brewery. Should he succeed, the

other competitors in Polish homebrew contests may well be as happy about it as he is.

Dzielak's original Imperial IPA recipe was for 51 liters, which he split in half for fermentation and dry hopping. The percentage of each of the fermentables is slightly different in this 5.5 gallon recipe, which assumes 75 percent efficiency.

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

10.0 lb	(4.5 kg) Pilsner malt
1.5 lb	(0.68 kg) wheat malt
1.5 lb	(0.68 kg) 10° L Munich malt
0.4 lb	(181 g) 60° L Cara-Gold malt
1.0 lb	(0.45 kg) sugar
1.125 oz	(32 g) Magnum, 14.5% a.a. (60 min)
0.7 oz	(20 g) Zeus/Columbus, 14.2% a.a. (30 min)
0.7 oz	(20 g) Simcoe, 11.9% a.a. (20 min)
0.7 oz	(20 g) Citra, 12.7% a.a. (15 min)
0.7 oz	(20 g) Centennial, 10.0% a.a. (10 min)
0.7 oz	(20 g) Ahtanum, 5% a.a. (5 min)
0.7 oz	(20 g) Amarillo, 10.1% a.a. (2 min)
0.7 oz	(20 g) Simcoe, 11.9% a.a. (1 min)
1.4 oz	(40 g) Zeus/Columbus, 14.2% a.a. (dry)
1.4 oz	(40 g) Citra, 11.9% a.a. (dry)
1.4 oz	(40 g) Amarillo, 10.1% a.a. (dry)
1.4 oz	(40 g) Simcoe, 11.9% a.a. (dry)
Wyeast	1056 American Ale yeast

Original Specific Gravity: 1.076

Final Specific Gravity: 1.014

Boiling Time: 80 minutes

Primary Fermentation: 8 days at 66-70° F (19-21° C)

Secondary Fermentation: 6 days at 54° F (12° C)

DIRECTIONS

Dough in with 18 quarts of water at 131° F (55° C). Heat 17 minutes to 150.6-151.7° F (65.9-66.5° C), rest for 45 minutes. Heat 7 minutes to 159.8-161.6° F (71-72° C), rest for 15 minutes. Heat 6 minutes to 169-170° F (76-77° C). Lauter. After boiling, chill to 70° F (21° C) and pitch. After primary fermentation, dry hop for six days at 54° F (12° C). Carbonate to 2 volumes CO₂.

EXTRACT VERSION

Substitute 8 lb (3.63 kg) pilsner malt extract syrup for pilsner malt, 1 lb 3 oz (540 g) Munich malt extract syrup for Munich malt and 1 lb 3 oz (540 g) wheat malt extract syrup for wheat malt. Omit Cara-Gold malt. Dissolve extracts and sugar completely and proceed with boil.

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— Piotr Wypych, Browar Artezan

THE REVIVAL OF GRODZISKIE (GRÄTZER)

Both Sadownik and Quante are members of the commission founded in 2011 by PSPD to revive Piwo Grodziskie (also known at Grätzer). Brewing originated in the town of Grodzisk in the 16th century, and the unique beer made entirely with oak-smoked wheat malt was sold around the world as recently as 80 years ago. The last brewery in Grodzisk closed in 1993. Even before the commission was formed, some of its members met in Germany with American Shawn Scott, an avid homebrewer who works on special projects with Choc Beer Company in Krebs, Okla.

As a result, Choc brewed a beer called Signature Grätzer with one of the original yeast strains used to ferment Grodziskie and oak smoked malt from Weyermann® in Germany. Scott wrote about that beer, and included a recipe, in articles that appeared in *The New Brewer* and *Zymurgy*. The one in *Zymurgy* (November/December 2012) inspired Marron to brew his LongShot competition winner. The Choc beer won a silver medal at the 2012 Great American Beer Festival.

In Poland, several recently opened small breweries have made their own versions of Grodziskie. In addition, the principals who revived Browar Fortuna, a regional brewery on the verge of closing, are renovating one of the shuttered breweries in Grodzisk and plan to be brewing there by summer.

GAINING MOMENTUM

When Darek Doroszkiewicz, Jacek Materski, and Piotr Wypych began selling Browar Artezan beer in the summer of 2012, they discovered the Polish market was not ready for what they were making. They were the first homebrewers in Poland to open their own small brewery, and they struggled to sell 20 hectoliters (about 17 U.S. barrels) a month.

“The market today is completely different than two years ago,” Wypych wrote via email. “There are many more ‘craft’ pubs, and they are crowded every week. They are sucking up every barrel of beer that [the brewers] can produce.”

The trio began with a five-hectoliter brewhouse, soon expanding it to 10. In September, they took delivery of a new 30-hectoliter brewhouse with fermentation tanks that would boost capacity to 5,000 hectoliters a years. Not surprisingly, several other homebrewers have followed their lead, and still more have indicated they will, too.

“It’s hard to say what the market will look like in three months,” Doroszkiewicz said last June. But he already knew one thing—Artezan was going to need to make a lot more beer.

Stan Hieronymus is the author of *Brew Like a Monk, For the Love of Hops*, and *Brewing with Wheat*. He is a frequent contributor to *Zymurgy*.

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MEAD EXPERIMENT:

Same Must, 12 Different Yeasts



By Chris P. Frey

Editor's Note: This is the fifth published experiment from the AHA's Research & Education Fund. For more on the REF and to see other completed projects, go to HomebrewersAssociation.org/community/research-and-education-fund.

Mead is an increasingly popular home and craft brewed beverage, but the current level of available information is considerably less than that for making beer. One challenge for mead makers is to really understand the contribution of flavors and aromas that various yeast strains provide.

While mead yeasts have information available from their producers, virtually all of it relates to their use in wine. Grapes have different nutrients, sugars, and flavor compounds than honey. By using a dozen of the most popular strains under identical conditions, this project provides another set of data points for mead makers to reference.

BACKGROUND

At two previous National Homebrewers Conferences (Chicago 2003 and Baltimore 2005), members of the Ann Arbor Brewers Guild (AABG) and the Fermental Order of Renaissance Draughtsmen (FORD) homebrewing clubs put together presentations on "Same Wort, Different Yeast." In Chicago we served 16 kegs of a Belgian dubbel fermented with 16 unique Belgian strains, and in 2005 it was 18 tripels, each fermented with a unique strain. Experiments such as these allow us to better understand the nuances and differences that these microscopic but

critical creatures create in the finished beer. When everything else is held constant (grain bill, hops, boil and chilling, temperatures, days of fermentation, sanitation regimen, etc.) and only the yeast is changed, its contribution to flavor, attenuation, and aroma becomes apparent.

During the 2014 National Homebrewers Conference in Grand Rapids, Mich., we gathered a panel of judges to evaluate our mead experiment samples to see what influence the yeast had on our must. Our plan was to create a poster presentation to support the mead track of the conference seminars and to serve the mead at the conference.

THE PROJECT

The AABG has the good fortune of having professional mead maker and *The Compleat Meadmaker* author Ken Schramm as a longtime member. Additionally, we have an impressive array of talented mead makers within our club of more than 170 members. Our collective knowledge and experience base was deep and allowed for critical thinking and discussions as we prepared to take on this project.

Schramm facilitated the purchase of a 55-gallon drum (660 pounds) of cold



pressed Michigan wildflower honey for the AABG. The experiment required only 20 gallons, so members of the club eagerly purchased the surplus. The honey was obtained locally from "the troll under the bridge," Tom Reed, a beekeeper in Aloha, Mich. whose hives are located under the Mackinac Bridge. The honey was sourced primarily from Trefoil, Star Thistle, and Northern Michigan Basswood.

Wisps of cotton candy and other delicate aromas wafted from the drum of honey upon opening. The process of cold pressing preserves more of the volatile floral aromatics.

To get the honey pumped from the 55-gallon drum, Schramm wrapped a heat band around it, heating the honey to about 95° F (35° C), below the threshold to cause any deleterious effects on delicate aromas. The process de-crystallized the honey as well as made it fluid enough to pump from the drum to the awaiting buckets. The honey has a ratio of 1.7:1 fructose to dextrose, so it tends to crystallize quickly.

THE PROCESS

We agreed to use the no-heat method to maximize the honey's aromas. Additionally, no sulfates or other wild yeast inhibitors were used. All equipment was carefully sanitized prior to coming into contact with the must.

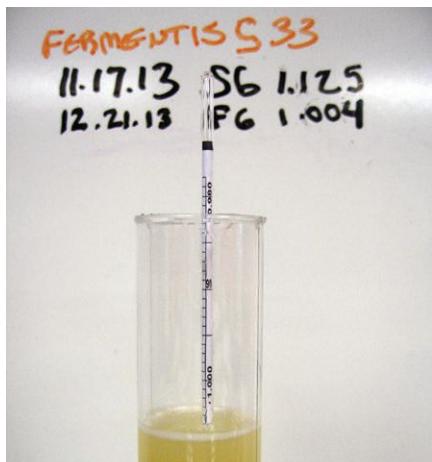


We used a digital scale to ensure each new 7.9-gallon plastic bucket fermenter received exactly 20 pounds of honey. Each bucket was topped off with water to exactly the 6-gallon mark. The first gallon was warm to help dissolve the honey.

Each fermenter was provided a double dose of yeast—two smack packs of Wyeast, two vials of White Labs, or two packs of dry yeast. For the dry yeasts, two packs were fed three grams of Go Ferm in 106–110° F (41–43° C) water and sat for 10 minutes prior to pitching.

Each bucket received about one minute of stirring, utilizing a drill with a paint stirrer tool to blend the honey, nutrients, and water, as well as to oxygenate each fermenter.

The temperature of all the buckets was 68° F (20° C) after the yeasts were pitched and initially fed. It would have been preferable to start at a slightly lower temperature, but storing a dozen 7+ gallon fermenters under temperature-controlled circumstances was beyond the team's capabilities. However, by



fermenting the meads side by side, we ensured that temperature was not a factor. The experiment started in the fall, and the primary fermenters were stored on the basement floor, keeping the ambient temperatures between 63 and 65° F (17–18° C) throughout the primary fermentation process.

A starting gravity of 1.125 was uniform across the fermenters. These were going to be big or "sack" meads.

Each fermenter was labeled and the lids were put on. When dealing with 12 different strains and identical fermenters, positive identification was a priority. Additionally, tape was put on each fermenter so that daily feeds and CO₂ releases could be recorded.

Feeds of 2.8 grams of DAP and 4 grams of Fermaid K were provided on days 1, 2, 3, and 4. Care was taken during each feed, since, as expected, large releases of

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TABLE 1:
TASTING NOTES



YEAST STRAIN	KEN SCHRAMM	PAUL ZIMMERMAN	GAIL MILBURN
LALVIN 71B - 1122	Soft, not tremendously honeyed in expression, stem, winelike mid palate.	Mild aroma. Not a lot of honey character. Spice, herbal, a touch hot.	Woody, spicy, somewhat muted by alcohol heat. Cinnamon! Nutty, low honey (mead) expression. Needs fruit!
LALVIN D 254	Delicious - much higher perceived sweetness than numbers indicate. Nutty, peppery, bready, delicious. Loved it.	Pepper, citrus, big aroma and flavor. Nutty, fruity, good mouthfeel. Herbal, woody and acidic.	Orange, grapefruit, spicy phenols. Rubbery, meaty, soy sauce yeastiness. Urea late in the aroma. Lingering acid/tannins.
LALVIN D 47	Liked this better than others. Extremely yeasty nose, some nuttiness. Structurally sound, clean on palate, stayed nutty over time.	Very hard to find aroma. Spicy, nutty, herbal, fruit. Hot.	Very bready, yeasty. Herbal (rosemary). Some sulfur in taste (corn, asparagus). Berries, woody. Harsh acidic, lack of complexity.
LALVIN EC 1118	Nose and palate didn't work together. Aroma was better than the taste, powerful alcohol up front. Med-full on mouthfeel. Lots of citrusy notes.	High alcohol, spicy, star anise. Hazy, dry, med-finish, waxy flavors. Sharp, wood.	Dry, hot alcohol, acidic. Some sulfur, clay/earthy. Some kerosene, esp. in flavor. White, legs. Harsh. Perfume, vinous.
FERMENTIS S33	Didn't much like the nose, and the palate didn't up the game at all. Herbal, pepper, ethanol out of balance. Wonk.	Herbal, cinnamon, alcohol and acidic, phenol, hot.	Banana/clove. Dry, acidic. Unbalanced. Belgian like. Some tropical fruit late. Green leaves.
LALVIN KIV 1116	Ethanol nose. I got lots of fermentation notes, but others did not. Citrus, pear, spice. Cocoa, tropical fruit, surly.	Hot. Spice, wood, fruit, citrus and herbal.	Under the alcohol heat, a nice expression of spicy, orange blossom-like honey. Needs age, and back sweetening would really showcase this honey.
PREMIER CUVEE	Herbal, cinnamon, peppery estery, more linear (nose matches the palate).	High alcohol, spicy, citrus, wax, anise, dry, sharp wood, late cinnamon.	Hot alcohols, a bit solvent. Waxy. Some spicy cinnamon. Medium body, waxy mouthfeel. Lingering papaya, spice, acid.
WHITE LABS 715 CHAMPAGNE YEAST	Grassy/herbal, summer field. Very stark on the palate. Has the markings of a mead that needs age.	Woody, herbal, hot, spicy, anise, citrus, dry. Melon on the nose with grass.	Hot alcohol but spicy. Grassy aromas, orange. Bready, waxy. Basil and oregano late.
WHITE LABS 720 SWEET MEAD	Rubbery/phenolic nose. Hazelnut, rounded soft honey character. Tough to get past nose.	Nutty, sweet, balanced, phenols, spicy, fruity. Creamy, not bright.	Spicy, smoky phenols. Orange blossom-like. Acid doesn't quite balance sweetness.
WYEAST 1056 AMERICAN ALE	Peppery, some funk on the nose. Better palate than nose.	Nutty aroma, almost yeasty, herbal with citrus and anise.	Nutty, dank, mushroom like. Some sulfur. Woody, Chardonnay. Orange. Some Fruit Loops linger.
WYEAST 4184 SWEET MEAD	Notes of cotton candy, bubblegum, white wine grape. Low to no phenolics. Fullness (Muscadine, Riesling), some disagreement over acidity. True to the honey.	Good honey, citrus, mild/pleasant, white grape, bubblegum. Nice finish.	Cotton candy sweetness. Very vinous and grape-like, a sweet white wine. Woody. Balanced. Residual honey sweetness.
WYEAST 4632 DRY MEAD	Low character in both nose and palate. Cleanly alcoholic.	Pretty smooth, decent nose. Honey is there but not big. Spice, nutty, fruity, anise.	Dry. Woody, vanilla, spicy cinnamon. Alcohol heat apparent. Acid lingers mostly because it is so dry.

**DAN FICK****MATT GOEBEL****PHIL WILCOX**

No unexpected aroma or flavor. Hot alcohol present. Flavors and aromas were very muted.	Muted, alcohol, light flavored, some nutty/toasty.	Nice, very plain. Med/low expression, Aromatics OK - neutral.
Light aroma. Multiple aromas. Nutty and medium body for how dry it is. Flavors are also fairly intense.	Lightish alcohol, good mouthfeel, white grapes, musty, nutty, woody. Hints of musk melon in the nose. Alcohol evident, not hot.	Good aromatics, spicy, peppery, dryness apparent. Very middle of the road.
Strange aromas of soap and buttery and cedar aromas and flavors. Very dry and high acidity.	Toasty/nutty/wood/cinnamon nose. Spicy notes, cinnamon, alcohol, musty/nutty flavors. Acid balanced.	Mild aromatics, mild everything. Clean, a bit hot in flavor and finish. No legs.
Aroma much better than flavor. Flavor very acidic and hot alcohol. Harsh. High level of star anise and orange. Quite woody.	Nose better than taste, alcohol in the nose and taste. Not balanced, acidic and alcohol on the end. Thinnish body, nose woody, slightly floral.	N/A
Aroma very low and muted. Alcohol and acidity are very intense. Spicy, almost Belgian beer-like. Waxy.	Cinnamon nose and flavor. Higher alcohol acid and tannins on the end.	Muted aromatics, yeasty, fermented honey. Hot alcohol, slight burn to finish.
No real perceived yeast characteristics. Fairly clean but very hot and harsh.	Citrus, wood, cinnamon, wood alcohol evident, taste similar to smell. Decent honey expression.	Not a huge character builder. Alcohols apparent, some tannins, very mild in general. Need to ferment at lower temps.
Aroma and flavor match up well. High acidity. Hot alcohol. Moderate star anise and orange esters. Moderate woody. High perfume. High level of waxiness.	Highish alcohol, waxy notes, slight paper note in flavor and nose. Light woody, oaky, spicy also in nose.	N/A
Aroma matches flavor pretty well. The honey comes through in both. Honey gives moderate floral, spicy, woody, citrus aromas and flavors.	Light wood/citrus nose, frames alcohol. Thinnish body, some oak/citrus/ephemeral acid on the back end, alcohol.	N/A
Sweetness seems lower than FG would indicate. Likely due to high acidity. Balance seems good. Perhaps could use a touch more acidity.	Light orange, sharp, some alcohol. Nutty/yeasty, sweetness acid balanced. Nice body, aged/oxidized note.	Sweetness apparent, mild additions of yeast character almost negligible, really lets the honey shine through.
Moderate honey flavors and aromas. Some strange kind of rubbery aroma. Lots of anise. Alcohol is harsh.	Light citrus up front, cinnamon/wood follows in flavor. Alcohol evident, white grape/musty.	N/A
Aroma and flavor match up. Most flavors are pretty low in intensity. High sweetness and alcohol remain. Hot alcohol but not as harsh as some of the others. Fairly complex but low intensity.	Muscatine grape/musk melon nose, some sweetness. Nose carries into flavor, nicely balanced.	High white grape notes, very winey. Plenty of residual sweetness left, sweet finish. Acidity medium to high. Tannins noticeable in the finish.
No perceived yeast off flavors evident apart from a rubbery note. Alcohol is pretty intense.	Nose great, floral, hot alcohol, decent body, light acidity.	OK aromatics, very neutral, alcoholic heat apparent.

CONTINUED >

TABLE 2: MEAD GRAVITY READINGS

YEAST STRAIN	Day 1	Day 14	Day 21	Day 28	Day 40	Day 200
LALVIN 71B-1122	SG: 1.125	1.022	1.008	1.006	1.005	1.003
LALVIN D 254	SG: 1.125	1.022	1.010	1.007	1.004	1.004
LALVIN D 47	SG: 1.125	1.021	1.006	1.005	1.004	1.002
LALVIN EC 1118	SG: 1.125	1.012	1.004	1.003	1.002	1.002
FERMENTIS S33	SG: 1.125	1.024	1.011	1.006	1.004	1.004
LALVIN KIV 1116	SG: 1.125	1.021	1.007	1.005	1.004	1.004
PREMIER CUVEE	SG: 1.125	1.014	1.002	1.002	1.002	1.002
WHITE LABS 715	SG: 1.125	1.012	1.004	1.003	1.002	1.002
WHITE LABS 720	SG: 1.125	1.041	1.040	1.040	1.040	1.034
WYEAST 1056	SG: 1.125	1.072	1.068	1.054	1.048	1.004
WYEAST 4184	SG: 1.125	1.051	1.038	1.028	1.024	1.020
WYEAST 4632	SG: 1.125	1.021	1.006	1.004	1.002	1.001
TEMP	68° F	64° F	64° F	63° F	63° F	66° F

CO₂ were experienced with these additions and consequent stirs. Rocky heads of up to four inches over the bucket lip occurred in some fermenters with as little as two to three stirs. After about three to four days, the CO₂ releases were significantly reduced. During the first three days, meads were stirred to release CO₂ at least twice daily.

THE YEASTS

The yeasts were chosen via an online dialogue with club members identifying their go-to yeasts, while others suggested lesser-known strains. The cutoff at a dozen strains was somewhat arbitrary, but it provided plenty of samples to test.

Wyeast 1056 was chosen as a “calibrator” yeast strain. It probably isn’t anyone’s go-to yeast for mead, but it was chosen because even the most novice brewer likely is familiar with it.



FERMENTATION

Gravity readings were taken a half dozen times during the 200-day fermentation period, and the meads were racked on days 28 and 40. On day 28 they were moved from plastic primary fermenters to glass carboys to reduce the potential oxygen uptake through the plastic walls.

On day 40, the meads were moved off the floor and onto a lab bench and then racked over to fresh carboys. This was to obtain gravity readings, provide

clarification, and to keep the temp in the low 60s, as winter was bringing the basement floor temperatures down to the upper 50s.

While it is common practice to cover beer fermenters to keep light off of the brew, the group wasn’t sure this was necessary for meads. We decided to err on the safe side though, and covered them.

We used a hydrometer (purchased through Beer, Beer & More Beer) to take accurate finishing gravities.



Photos © Peter Smith Photography

KEGGING

After 200 days of fermentation, it was time to keg the meads in preparation for delivering them to Grand Rapids. The meads likely finished weeks or even months prior, but the carboys were clear and we needed to make arrangements to borrow a dozen kegs (a tip of the hat to Jason Henning!). Meads were carefully transferred and pressurized under 12 pounds of nitrogen, on the club's recommendation that nitrogen would have less of an effect on aroma and flavor than CO₂.

A call went out to some of the best local mead minds to help sample the resultant meads and provide their senses of taste and aroma. Two meadery owners, two certified mead judges, and two prolific mead makers from the club responded and spent an afternoon evaluating the results.

THE RESULTS

Wyeast 1056 has a stated alcohol tolerance of 11 percent and it appeared that it wasn't going to budge much beyond 1.048 after two months. However, the finishing gravity was right in the range of the other non-sweet blends. But the various descriptors for this neutral ale yeast were staggering (see Table 1 on page 64). They included peppery, anise, nutty, dank mushroom, herbal, citrus, woody, sulfur, Chardonnay, orange, cinnamon, white grape, and even Fruit Loops!

Several of the more familiar yeasts common to homemade mead makers fall into the Champagne varietals, such as the Premier Cuvee, Lalvin 1116, and Lalvin 1118. These also tended to showcase higher levels of alcohol and heat and lower perceived body, according to the panel.

A few of the readings stood out (see Table 2). As expected, the two Sweet Mead yeast strains from White Labs and Wyeast finished significantly higher than the others. The other 10 strains all finished very dry. No attempts were made to stop fermentation. These 10 finished around 16 percent ABV (sack), and as noted by the judging panel, many were perceived as having higher perceived body than others.

Interestingly enough, while most shared similar alcohol levels, some were clearly "hotter" than others. Schramm wondered if certain yeast strains generate more fusel alcohols, leading to an increased perception of heat.

Judging and describing these meads led to a divergent set of feedback from the panel, but many common threads can also be seen in the comments. What was clear was that each yeast strain contributed its own unique characteristics. The meads were not judged in the classic "competition" sense. The goal was to obtain perceptions and descriptors of the flavors, aromas, and mouthfeel. Three stewards poured the meads from the kegs in an adjoining room, so no one knew which strain of yeast they were receiving.

Each would quietly take their samples and write down their thoughts, and then a group discussion followed. The judges included:

- Ken Schramm, Ann Arbor Brewers Guild member and founder of Schramm's Meadery
- Paul Zimmerman, co-founder of B. Nektar Meadery
- Gail Milburn, Motor City Mashers member and certified Mead BJCP judge
- Dan Fick, CRAFT homebrew club

member and certified Mead BJCP judge

- Matt "In the Hat" Goebel, Ann Arbor Brewers Guild member and prolific mead maker
- Phil Wilcox, Ann Arbor Brewers Guild and Prison City Brewers member, as well as a prolific mead maker. (Note: Wilcox arrived late, so he was not able to sample all of the meads.)

Thanks to this experiment and the generous donation of time from our judges, mead makers now have some additional data points as they relate to these specific strains and can take their understanding of their properties to new levels as they produce and consume meads with friends and family.

Chris P. "Crispy" Frey is a member of the Ann Arbor Brewers Guild. He is also a member of the AHA Governing Committee and is a designate of that committee for the Brewers Association board of directors. He lives in Saline, Mich.



LEARN THE BASICS OF MAKING MEAD

HomebrewersAssociation.org/how-to-brew/mead/making-mead/

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by Amahl Turczyn

Fall Classic Homebrew Competition

The Oregon Brew Crew's 13th Annual Fall Classic Homebrew Competition, held each year after the hop harvest, was judged at 13 Virtues Brewing Company on October 25. Organizer Ted Assur provided some history of the venerable Portland-based club.

"The Oregon Brew Crew is the second oldest homebrew club in the nation (to the best of our knowledge), and the largest in the state of Oregon, with a membership of more than 300," said Assur. "It has been an incubator for many of the local breweries, and we are honored to have active membership of nationally-recognized professional brewers."

Similarly, the club's annual competition has had a strong following in the area for quite some time. "The Fall Classic was created by the OBC over 13 years ago to be one of the latest (in the year) regional, annual open-category competitions," Assur continued. The competition has a Fresh Hop category celebrating the local availability of hop cones utilized immediately from the harvest.

"Many of our members grow hops, or have immediate access to neighbors or farms that offer them in September," said Assur.

The larger of two BJCP-sanctioned competitions hosted by the OBC, the Fall Classic often attracts more than 400 entries from across the nation, with regular entrants from Massachusetts, Texas, and Florida. (OBC's other BJCP competition is its spring Heart of Cascadia competition, which exclusively features Pacific Northwest regional styles including Cascadian Dark Ales and Northwest Reds.)

This was Assur's third year helping run the competition. First timer Joel Sherman



RhuTarted, a Berliner weisse-style beer with rhubarb brewed by Jenn McPoland and Jeremie Landers, won Best of Show.

RhuTarted

RECIPE BY JENN MCPOLAND AND JEREMIE LANDERS
2014 OBC FALL CLASSIC
BEST OF SHOW

INGREDIENTS

for 5 U.S. gallons (19 L)

5.0 lb	(2.27 kg) Belgian pilsner malt
3.0 lb	(1.36 kg) German wheat malt
13.0 lb	(5.9 kg) rhubarb
1.0 oz	(28 g) Saaz hops, 4.0% a.a. (30 min)
Wyeast	2565 Kölsch yeast

Original Gravity: 1.040

Final Gravity: 1.010

ABV: 3.94%

SRM: 3.9

IBU: 11

DIRECTIONS

Mash at 149° F (65° C) for one hour. Boil 60 minutes, adding Saaz hops at 30 minutes. Keep rhubarb frozen, then add at the end of the boil. Ferment at 68° F (20° C) for 6 days. Rack into keg and keg condition.

EXTRACT VERSION

Substitute 4 lb (1.81 kg) pilsner malt extract syrup for Belgian pilsner malt and 2 lb (0.9 kg) wheat malt extract syrup for German wheat malt. Dissolve extract completely and proceed with recipe. Note that extract version will be slightly darker than all-grain version.

assumed command as competition coordinator, Assur was judge director, and Will Minderhout and Dan May reprised their roles as cellarmaster and lead steward, respectively.

Best of Show winners Jenn McPoland and Jeremie Landers met at the Oregon Brew Crew's annual meeting at Widmer Brothers Brewery. Landers had just joined as a new member back in July 2006. Rob Widmer was nice enough to let them get married there four years later, with the wedding officiated by Beer O'Clock radio show host Lisa Morrison.

McPoland has been brewing since about 2004, Landers since 2006; and they have been brewing together pretty much since they met. The couple loves to brew traditional styles like stouts and IPAs, but they also enjoy experimenting with spices and fruits.

Their hobby has grown bigger over the years and they have now turned their garage into an 11-tap "McPolanders Taproom" where they share their homebrew as well as their favorite commercial brews with friends and neighbors.

They have supported homebrewing for many years by serving on the board of the OBC, as well as through continued participation in club events, helping new homebrewers and those looking to learn how to brew. They support craft beer in general by volunteering at as many beer festivals as they can, and by working directly for the Oregon Brewers Guild at festivals. McPoland is also the volunteer coordinator for Portland's annual Spring Beer & Wine Fest, now in its 21st year.

Recently, McPoland and Landers had the pleasure of brewing an India session ale for the Willamette Week's Beer Pro/Am festival with John Harris from Ecliptic; a Cascadian dark ale, which won at the Timber Army Homebrew Competition at Lompoc; and most recently, a Widmer Collaborator-winning IPA.

For the Fall Classic, the best of show RhuTarted, a Berliner weisse-style beer fermented with Kolsch yeast and "tarted" with rhubarb that the couple brews annu-



Dave Heineck and Jaro Strba won the Best New Homebrewer category with their IPA.

Jaro and Dave's 4C's IPA

RECIPE BY JAROSLAV STRBA
AND DAVID HEINECK

2014 OBC FALL CLASSIC BEST NEW
HOMEBREWER BEST OF SHOW

INGREDIENTS

for 11.5 U.S. gallons (43.5 L)

25.0 lb	(11.3 kg) Northwest pale two-row malt
1.0 lb	(450 g) dextrin malt
0.75 lb	(340 g) 40° L caramel malt
0.75 lb	(340 g) 20° L Munich malt
2.0 oz	(56 g) Chinook pellets, 11.6% a.a. (60 min)
2.0 oz	(56 g) Columbus pellets, 13.9% a.a. (60 min)
1.0 oz	(28 g) Chinook pellets, 11.6% a.a. (15 min)
1.0 oz	(28 g) Centennial pellets, 7.4% a.a. (15 min)
2 tablets	Whirlfloc (15 min)
1.0 oz	(28 g) Cascade pellets, 7.1% a.a. (1 min)
1.0 oz	(28 g) Centennial pellets, 7.4% a.a. (1 min)
1.0 oz	(28 g) Cascade pellets (dry hop 2 weeks)
2.0 oz	(56 g) Centennial pellets (dry hop 2 weeks)
1.0 oz	(28 g) Columbus pellets (dry hop 2 weeks)
Wyeast	1275 Thames Valley™ in a 4 liter (4.25 qt) starter

Original Gravity: 1.065

Final Gravity: 1.015

Assumed Efficiency: 75%

IBU: 85

SRM: 6

ABV: 6.8%

DIRECTIONS

Use a single infusion mash at 1.5 qt H₂O/lb (3.1 L/kg) grain for 60 minutes at 152° F (67° C). Sparge with 170° F (77° C) water to obtain 13.5 to 14 gallons (51-53 L) of wort. Portland Bull Run water was used; if using a similarly soft water, add salts as appropriate for an IPA. Boil, chill to 70° F (21° C), pitch and oxygenate. Ferment at 65° F (18° C) for one week or until finished. Racked onto dry hops and condition at 65° F (18° C) for two weeks. Target 2.5 volumes of CO₂.

PARTIAL EXTRACT VERSION

Substitute 20 lb (9.07 kg) pale malt extract syrup for pale malt. Omit dextrin and crystal malts. Mash 1 lb (450 g) 20° L Munich malt at 155° F (68° C) for 45 minutes. Check for complete conversion. Drain, rinse grains, dissolve extract completely, and proceed with boil. Partial extract recipe color will be slightly darker than all-grain version (9 SRM).

ally, wasn't their only victory. Three more of their beers won medals at the event, including a Southern English brown, a specialty beer (Vanilla Bourbon Russian Imperial Stout), and a Pilsner.

McPoland summed it up succinctly: "You might say we love beer."

This year, OBC's Fall Classic also included a Best New Homebrewer category, sponsored by Brew Brothers, with its own Best of Show award for the highest scoring entry out of all entrants who have never entered a competition before. That honor went to Jaroslav Strba, along with co-brewer David Heineck, for their 4 C's IPA.

Strba is an inveterate hobbyist and started his foray into fermented beverages by attempting Oregon Pinot Noir. Unfortunately, his better half didn't really enjoy the wine, but since he had already invested in all the equipment, he decided to try to make the beer of his native Slovakia. He'd long enjoyed the wonderful, crisp, hoppy Plzenské (Pilsners), so beginning in 2011, he made Pilsner brewing the focus of his passion.

He and Heineck have been neighbors and friends for about 13 years, logging many miles together as cycling partners. After one long ride, Strba invited Heineck for a beer; about a year later, with that fond memory in mind, they started brewing together. The duo pooled their equipment and added some more to allow them to make 10-gallon batches to split between them. They have been brewing ever since, starting simply and learning and improving techniques and recipes.

Heineck's wife refers to them as, "Two boys out in the garage playing with their chemistry set." That's about right, as Strba is a doctor and Heineck is a chemical engineer. They both enjoy the process and science as well as the diversity and flavors of the beers they create. The two had enjoyed sharing their creations with friends and received many favorable comments from them, so entering a competition seemed like the next logical step.

Amahl Turczyn is associate editor of *Zymurgy*.

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KUDOS—BEST OF SHOW

AHA/BJCP Sanctioned Competition Program

October 2014

Oaktoberfest 2014, 125 entries—*Daniel Owens, Alameda, CA.*
Celebretion 2014, 109 entries—*John Orcutt, Sacramento, CA.*
Delaware Home Brew Championship, 44 entries—*Candice Krauthauer/Dave Valle, Wilmington, DE.*
Made on American Street - American Beer Competition, 52 entries—*Thomas Hourican, Philadelphia, PA.*
Montana Mashup, 127 entries—*Alan McCormick, Missoula, MT.*
Portland to Seattle Beerfest 2014, 21 entries—*Daniel Janiga, Portland, OR.*
OktoberBest ZinZinnati, 274 entries—*Chris Siegman, Cincinnati, OH.*
2nd Annual Battle of the Brews, 18 entries—*Doug Jordan, Bend, OR.*
III Concurso Paranaense de Cerveja Feita em Casa, 90 entries—*Andrea Hiura, Curitiba, Puerto Rico.*
McKenzie Cider & Craft Beer Festival Homebrew Competition, 23 entries—*John Hedding, Albany, OR.*
Hoppy Halloween 17 - Toxic Doom, 533 entries—*Delano Stein, Lakeville, MN.*

November 2014

7th Annual Monster Homebrew Competition, 42 entries—*Jeff Hilland, Lago Vista, TX.*
California State Homebrew Competition, 434 entries—*Mike Riddle, Napa, CA.*
Southern Season Annual Homebrew Competition, 103 entries—*Kris Bengtson, Clayton, NC.*
Santa Fe Open Brewing Competition, 326 entries—*John Rowley, Santa Fe, NM.*
Rocky Mountain Homebrew Challenge, 318 entries—*Jeff Reid, Denver, CO.*

Salmonid HBC Grim Reaper IPA Challenge, 15 entries—*Jesse Neff, Idaho Falls, ID.*

Beer for Boobs IV, 290 entries—*Nathan Levengood, Dover, OH.*

Music City Brew Off, 317 entries—*Mark Quering, Chattanooga, TN.*

Skirmish in the Triad, 306 entries—*Russell Burnitt, Mooresville, NC.*

FOAM Cup, 547 entries—*Andrew Laidlaw, Golden Eagle, IL.*

Fall Throwdown 2014, 100 entries—*Jared Hatch, Daegu, South Korea.*

Hall of Foamers Home Brew Competition, 102 entries—*Chuck Ferguson, Lawrence, KS.*

SCH*ABC 7, 362 entries—*Matthew Kennedy & Joe Moran.*

Sioux Falls Craft Beer Expo Homebrew Competition, 67 entries—*Derek Wolf, Harrisburg, PA.*

2014 CRAFT Invitational - Strong Ale, 11 entries—*Pat Hyde, Port Huron, MI.*

Motown Mash, 260 entries—*Lester Foldi, Nutley, NJ.*

4th Annual Props and Hops Homebrew Competition, 76 entries—*Chris Anderson, Yucca Valley, CA.*

BrewDat, 24 entries—*Bill Mungai, Lake Charles, LA.*

MALT Turkey Shoot - 10th Annual, 215 entries—*Mel Thompson, Gaithersburg, MD.*

Battle of the Belgians, 17 entries—*Chris Becker, Springfield, MO.*

All About Ales, 128 entries—*Chris Bourdages, Bowmanville, Ontario, Canada.*

2nd Annual LIBME Homebrew, Mead & Cider Competition, 150 entries—*John Mulligan.*

Autumn Pour Homebrew Competition, 49 entries—*Rodney Kibzey, Portland, OR.*

IX Concurso Nacional Das Acervas, 126 entries—*Ricardo Zambelli, Sao Paulo, Brazil.*

FBI Club Competition, 55 entries—*Clay Blakenship, Fredericksburg, VA.*

2014 Butler Homebrew BASH, 150 entries—*Andy Weigele, Pittsburgh, PA.*

National Homebrew Championship - Final, 40 entries—*Lee Carpenter, Johannesburg, South Africa.*

Backroom Brewery Home Brewer Competition, 45 entries—*Tim Mannion, Chicago, IL.*

Cape Town Festival of Beer, 68 entries—*JC Steyn, Woodstock.*

Righteous Brewers of Townsville Porters and Stouts Competition, 35 entries—*Russell Carpenter, Hyde Park, Queensland, Australia.*

Big Spruce Home Brew Challenge, 12 entries—*Eric Gautier, Hubley, Nova Scotia.*

December 2014

2014 Nielsen Massey Homebrew Competition, 38 entries—*Patrick Elder, Chicago, IL.*

Los Angeles IPA Festival, 60 entries—*Evan Price, Anaheim, CA.*

Annual Brewsters Cup Mead Competition, 8 entries—*Ashley Whitney-Rawls, Beavercreek, OH.*

Fugetaboutit, 259 entries—*Patrick Gingadet, Chattanooga, TN.*

Happy Holidays Homebrew Competition (HHHC), 541 entries—*Tim Thomssen, Lincoln, NE.*

CiderDays Amateur Cider Competition, 56 entries—*Stephen Gale, Landing, NJ.*

2014 THIRSTY Classic, 162 entries—*Justen Parris, Davenport, IA.*

Palmetto State Brewers Open 16, 394 entries—*Shawn McBride, Charlotte, NC.*

ASH HBOY Holiday Ales, 15 entries—*Sam Paterson.*

Monk Melee IV, 76 entries—*John Yeomans, Langhorne, PA.*

Wort in Show, 82 entries—*Rodney Kibzey, Portland, OR.*

2do Concurso Cerveceros Santafesinos Leandro Lafferriere, 16 entries—*Fabio Brollo, Santa Fe.*

KLOB Kup, 35 entries—*Richard Dueweke, Kalamazoo, MI.*

Alzheimer's Holiday Brew Off, 55 entries—*Jim Thompson, Portland, OR.*

Pints and Knights Homebrew Competition, 104 entries—*Keith Eckert, Bellflower, CA.*

Primer Concurso Somos Cerveceros 2014-2015, 72 entries—*Hernán Castellani, Capital Federal.*

Beer and Beards, 42 entries—*Dave O'Connor, Kenmore, NY.*

ABQ Beer Holiday Fiesta, 189 entries—*Brian Ausderau, Albuquerque, NM.*

8th Annual Virginia Beer Blitz, 417 entries—*John Smith, Newport News, VA.*

American Homebrewers Association® Rally!

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March 14 | Sudwerk Brewery & UC Davis | Davis, CA

March 22 | The Fort Collins Brewery | Fort Collins, CO

March 28 | Swamp Head Brewery | Gainesville, FL

May 30 | Noda Brewing Co. | Charlotte, NC

See the [Events](#) section of HomebrewersAssociation.org for an up-to-date calendar

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HomebrewersAssociation.org

Entrance to an AHA Rally is always free for AHA members; non-members may attend by joining the AHA on-site at a discounted rate.





**AHA/BJCP SANCTIONED
COMPETITION PROGRAM CALENDAR**

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



March 1
The Battle of Fredericksburg Homebrew Competition
Fredericksburg, VA.
Entry Deadline: 2/13/2015.
battleoffredericksburg.com/BOF2015

March 5
Garrison Brewing Home Brew Off
Halifax, Nova Scotia.
Entry Deadline: 2/12/2015.

March 7
19th Annual Cascade Brewers Cup
Redmond, WA.
Entry Deadline: 3/1/2015.
cascadebrewersguild.com

March 7
2015 Beans and Brews
Elizabethtown, PA.
Entry Deadline: 3/6/2015.
facebook.com/events/305200789672148

March 7
Bataille des Bières
Lafayette, LA.
Entry Deadline: 2/28/2015.
batailledesbieres.com/2015/

March 7
National Brewing Championships
Dublin & Galway, Ireland.
Entry Deadline: 2/8/2015.
nationalhomebrewclub.ie/competition

March 7
Shamrock Open XX
Raleigh, NC.
Entry Deadline: 2/21/2015.
carboyclub.com/shamrock-competition

March 7
The Coconut Cup
Miami, FL.
Entry Deadline: 2/13/2015.
miami-homebrew.org/competitions/coconut-cup

March 11
Rocket Rod Homebrew Competition
Kailua-Kona, HI.
Entry Deadline: 2/27/2015.
<https://sites.google.com/site/konabrewcontest/>

March 13
AHA National Homebrew Competition
1st Round - Austin
Austin, TX.
Entry Deadline: 3/11/2015.
HomebrewersAssociation.org

March 14
Hudson Valley Homebrewers 25th Annual
Poughkeepsie, NY.
Entry Deadline: 3/6/2015.
hvhb.brewcomp.com

March 14
Los Angeles Belgian Brew Challenge
Los Angeles, CA.
Entry Deadline: 2/27/2015.
labbc.pacificgravity.com

March 14
March Mashness
St. Cloud, MN.
cloudytownbrewers.org/competition/

March 14
Drunk Monk Challenge
Aurora, IL.
Entry Deadline: 2/27/2015.
knaves.org/DMC/index.html

March 14
2015 Peak-to-Peak ProAm
Longmont, CO.
Entry Deadline: 2/27/2015.
indianpeaksalers.org/index.php/mpeak-to-peak-proam

March 14
2014 CRAFT Invitational - Traditional Mead
Macomb, MI.
Entry Deadline: 3/11/2015.
crafthomebrewclub.org/gpEasy/index.php/Rules

March 20
AHA National Homebrew Competition
1st Round - Nashville
Nashville, TN.
Entry Deadline: 3/11/2015.
HomebrewersAssociation.org

March 20
Slurp & Burp Open
Portland, OR.

Entry Deadline: 3/13/2015.
strangebrew.org/slurp/

March 21
Mazer Cup International Home Competition
Boulder, CO.
Entry Deadline: 3/6/2015.
mazercup.com

March 21
Hop Courage
Great American Homebrew Contest
Los Angeles, CA.
Entry Deadline: 3/6/2015.
hopcourage.com

March 21
XXIX Bluebonnet Brew-Off - World's #1 HB Competition
Dallas/Fort Worth, TX.
Entry Deadline: 2/19/2015.
bluebonnetbrewoff.org

March 21
DC Homebrewers Club Cherry Blossom Competition
Washington, DC.
Entry Deadline: 3/7/2015.
dchbcompetition.com

March 21
Wizard of Saaz 8
Akron, OH.
Entry Deadline: 2/21/2015.
saazakron.com

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AHA/BJCP SANCTIONED
COMPETITION PROGRAM CALENDAR



March 21

SNAFU Winterfest

Las Vegas, NV. Entry

Deadline: 3/13/2015.

snafbrew.com

March 22

**BTR Pro-Am Homebrew Competition -
Light Stouts (13A-C + 23)**

Saint Petersburg, FL.

Entry Deadline: 3/15/2015.

March 22

Brewin' in the Isles

Brunswick, GA.

Entry Deadline: 3/17/2015.

brewscene.com/competition/?competition_id=128

March 27

**AHA National Homebrew Competition
1st Round - Seattle**

Bellevue, WA.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

March 27

**AHA National Homebrew Competition
1st Round - Sacramento**

Sacramento, CA.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

March 27

**AHA National Homebrew Competition
1st Round - Saint Louis**

Saint Louis, MO.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

March 28

**The Western NY Homebrew Competition -
"Amber Waves of Grain"**

Buffalo/Niagara Falls, NY.

Entry Deadline: 3/14/2015.

niagarabrewers.org/registration/

March 28

Great Arizona Homebrew Competition

Phoenix, AZ.

Entry Deadline: 3/20/2015.

brewarizona.org

March 28

**24th Annual Charlie Orr Memorial
Chicago Cup Challenge**

Crest Hill, IL.

Entry Deadline: 3/14/2015.

bosbeer.org/ChicagoCup/

March 28

The IBU Open

Des Moines, IA.

Entry Deadline: 3/20/2015.

ibuopen.com

March 28

**AHA National Homebrew Competition
1st Round - New York**

Astoria, NY.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

March 29

**The Brew Hut
2015 Annual Homebrew Competition**

Aurora, CO.

Entry Deadline: 3/15/2015.

thebrewhut.brewcomp.com

April 4

World Cup of Beer

Alameda, CA.

Entry Deadline: 3/4/2015.

worldcupofbeer.com/

April 10

**AHA National Homebrew Competition
1st Round - San Diego**

San Diego, CA.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

April 10

**AHA National Homebrew Competition
1st Round - Denver**

Denver, CO.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

April 10

**AHA National Homebrew Competition
1st Round - Chicago**

Aurora, IL.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

April 10

**AHA National Homebrew Competition
1st Round - Zanesville**

Zanesville, OH.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org



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**AHA/BJCP SANCTIONED
COMPETITION PROGRAM CALENDAR**



April 10

AHA National Homebrew Competition

Ist Round - Philadelphia

Montgomeryville, PA.

Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

April 10

AHA National Homebrew Competition

Ist Round - Saint Paul

Saint Paul, MN. Entry Deadline: 3/11/2015.

HomebrewersAssociation.org

April 10

Arizona Society of Homebrewers

Springfest

Scottsdale, AZ.

Entry Deadline: 4/3/2015.

azhomebrewers.org

April 11

South Shore Brewoff

Mansfield, MA.

Entry Deadline: 3/28/2015.

southshorebrewclub.org

April 11

The ALES Open

Regina, SK, Canada.

Entry Deadline: 3/25/2015.

alesclub.com

April 11

IV Concurso Estadual de Cervejas Caseiras da ACervA Catarinense

Blumenau, Santa Catarina, Brazil.

Entry Deadline: 4/2/2015.

acervacatarinense.com.br/concurso-estadual/iv-concurso-estadual

April 11

Colonial Cup

Charleston, SC.

Entry Deadline: 3/28/2015.

low-countrylibations.com

April 11

Hurricane Blowoff

West Palm Beach, FL.

Entry Deadline: 3/20/2015.

palmbeachdraughtsmen.com

April 12

Great Basin Brew-Off

Reno, NV.

Entry Deadline: 4/1/2015.

washoezz.net

April 18

Lucid BFD

Minnetonka, MN.

Entry Deadline: 4/5/2015.

lucidbfd.com

April 18

Between the Bluffs

Homebrew Competition

La Crosse, WI.

Entry Deadline: 4/11/2015.

explorelacrosse.com/bluffs-beer-wine-cheese-festival/

April 18

23rd Spirit of Free Beer

Homebrew Competition

Bethesda, MD.

Entry Deadline: 4/9/2015.

sofb.brewcomp.com

April 18

Bridging the Gap

Davis, CA.

Entry Deadline: 4/4/2015.

greenbeltbrewers.org/competition/

April 25

London and South East Craft Brewing Competition 2015

London, United Kingdom.

Entry Deadline: 4/19/2015.

londonandsoutheast.brewcompetition.com/

April 25

Poetry Slam & Muse Cup

Fort Collins, CO.

Entry Deadline: 4/16/2015.

slam.liquidpoets.com

April 30

Katy Wild West Brew Fest

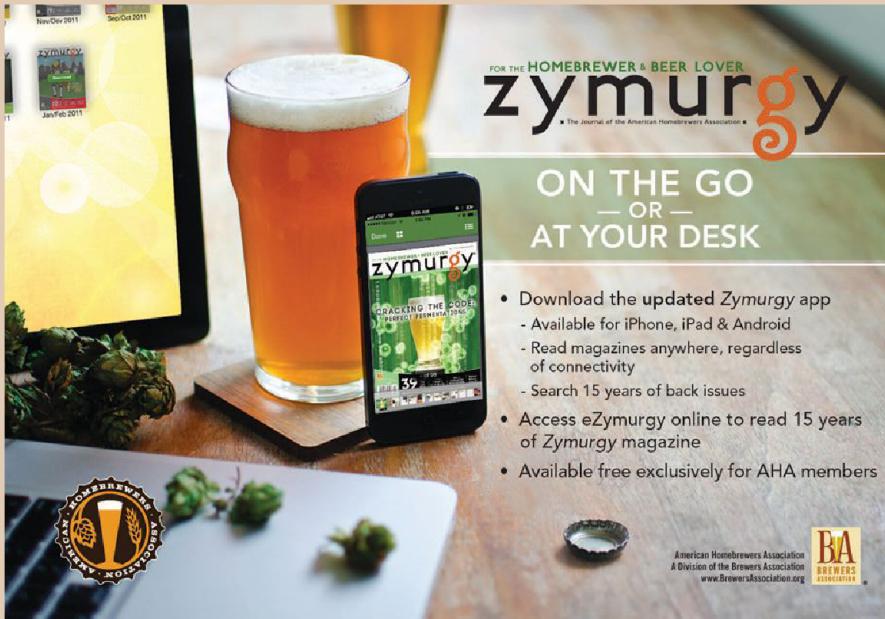
Katy, TX.

Entry Deadline: 3/30/2015.

katybrewfest.com



For an up-to-date calendar
of AHA and BJCP events
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HomebrewersAssociation.org



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Protein:
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Extract (dry):
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by Chris Bible

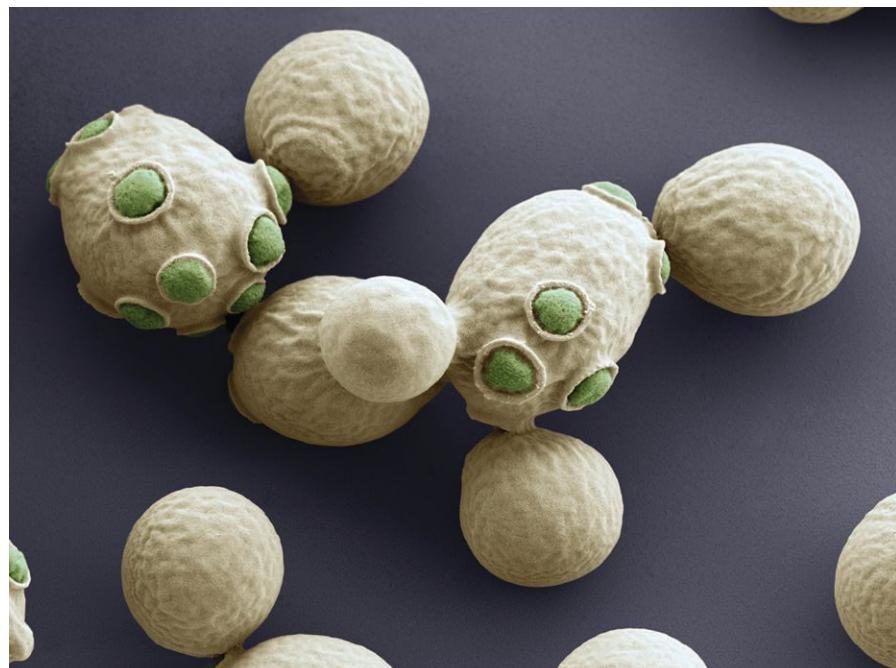
Impact of Yeast Pitching Rate on Beer Flavor and Aroma

You've probably heard the adage "Brewers make wort, but yeast make beer." Without yeast, there would be no beer. Brewer's yeast consumes dissolved carbohydrates in wort and converts the carbohydrates into alcohol, carbon dioxide, and other by-products through the action of anaerobic fermentation.

Brewer's yeast is classified as a unicellular fungi, and *Saccharomyces cerevisiae* and *Saccharomyces pastorianus* are the yeast species primarily used by brewers to produce ales and lagers respectively. Within these two broad categories are myriad strains of brewer's yeast that have been developed and cultivated over time for the purpose of producing specific flavor and aroma characteristics within specific types of beer.

Many variables affect yeast performance and flavor development during the fermentation process, including yeast species and strain, fermentation temperature, fermenter geometry, initial dissolved oxygen content in the wort, yeast nutrient content in the wort, overall health and viability of the pitched yeast, and yeast pitching rate. Brewers can manipulate these variables in order to develop desired flavors and aromas in beer.

Yeast pitching rate is a key variable managed by brewers when making beer. It is important to pitch a proper amount of yeast in order to have the yeast perform fermentation in a way that delivers the desired result. An often-quoted "rule of thumb" for the proper pitching rate is 1 million cells per milliliter of wort per degree Plato. Ales generally can do well with a slightly lower pitching rate, while lagers can generally benefit from a slightly higher pitching rate. Many yeast pitching rate calculators are available online (e.g.



mrmalty.com/calc/calc.html) to calculate the specific amount of yeast needed. But what happens to the beer if you pitch too much or too little yeast?

Impact of Yeast Pitching Rate

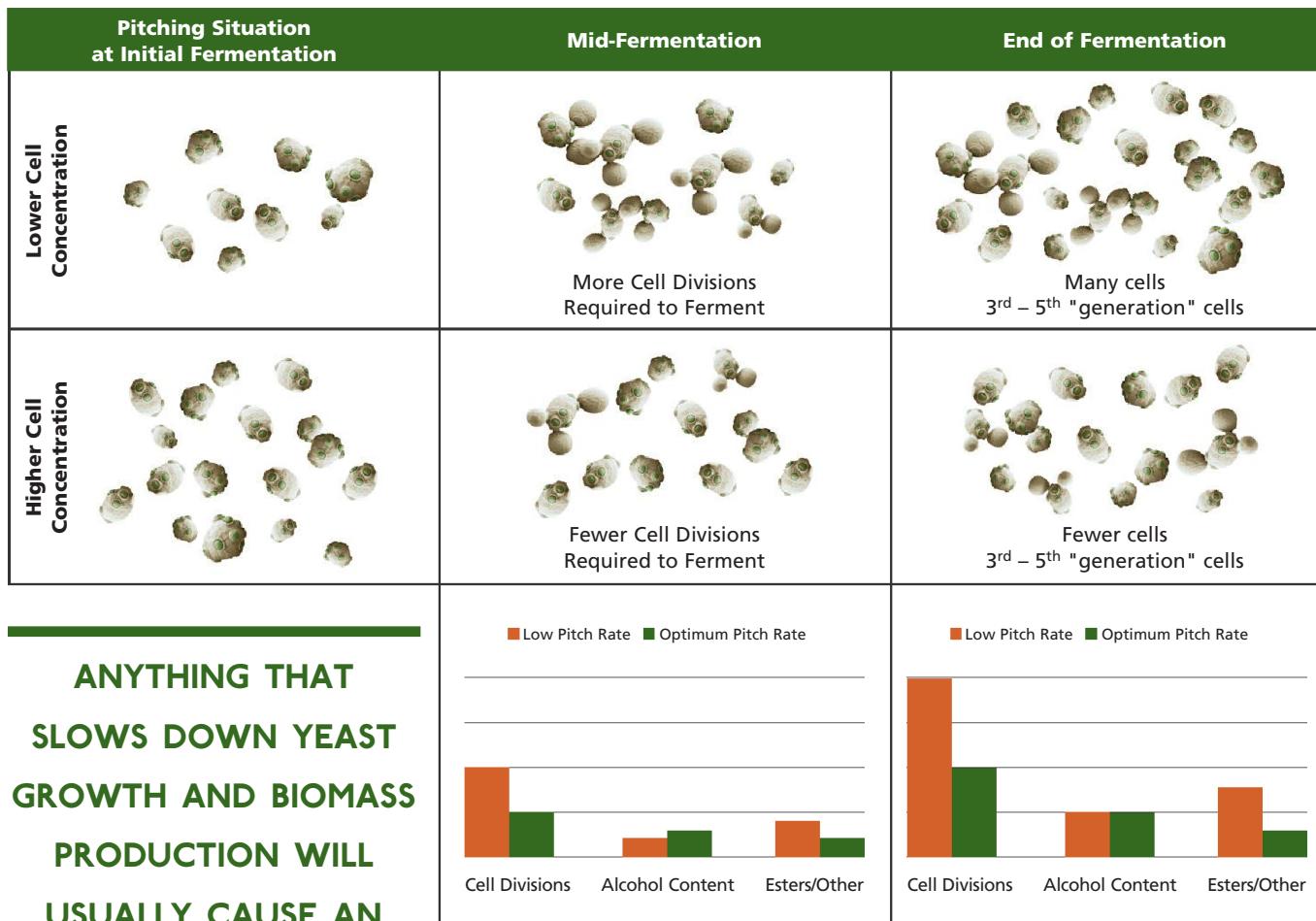
Yeast are living organisms affected by their environment. As yeast metabolize dissolved carbohydrates in wort, each cell is competing with other yeast cells for nutritional resources. The number of yeast cells competing for these resources will have an impact on how the biochemical metabolism of the dissolved carbohydrates occurs. Both overpitching and underpitching can cause changes to how fermentation happens, sometimes with unexpected results.¹

According to Dr. Chris White and Jamil Zainasheff in their book *Yeast: The Practical Guide to Fermentation*, underpitching gen-

erally affects flavor more, and overpitching generally has more long-term impact on yeast health over several generations.² Both overpitching and underpitching can cause the fermentation to be less than ideal and lead to production of higher levels of diacetyl and acetaldehyde, and can also cause low attenuation. A pitching rate that is too high can also cause ester production to be lower than desired, or cause the production of undesirable esters. It can also contribute to yeast autolysis flavors and reduce head retention. A pitching rate that is too low can cause slower fermentation with longer lag times that can allow wild yeast and bacteria to get the upper hand in the wort.

According to Wyeast, the pitching rate will have a direct effect on the amount of cell growth and biomass production during fermentation.³ Total cell growth

Figure 1: Illustration of Yeast Underpitching and Increased Ester and Flavor Compound Production



and number of cell divisions decrease as pitch rates increase. To understand this, consider that if you start the fermentation with fewer yeast cells, the cells that begin the fermentation will generally grow more and divide more frequently than if you started with a higher number of cells at the beginning of the fermentation. Ester production is directly related to yeast growth, as are most other flavor and aroma compounds. More total cell growth and cell divisions usually leads to more flavor compounds. Figure 1 illustrates this concept.

Cell growth is critical to yeast flavor production, specifically ester flavors, in beer.⁴ Yeast growth and ester production is controlled by acetyl-CoA (co-enzyme A), necessary for both yeast

growth and ester production. When CoA is being used by the yeast cells for growth, for example during the early stages of fermentation, it is not available for ester production. Producing more biomass requires that more CoA be used for growth, and therefore it is not available to produce esters. Anything that increases biomass production will

generally decrease ester production. Anything that slows down yeast growth and biomass production will usually cause an increase in ester production. Of course, increasing the rate of yeast growth to an amount higher than optimal can increase the production of fusel alcohols, which are ester precursors.⁵ Underpitching can do this, as can high

Table 1: Potential Effects of Under or Over Pitching Yeast

Potential Effects of Low Pitch Rate	Potential Effects of High Pitch Rate
Excess levels of diacetyl	Very low ester production
Increase in higher/fusel alcohol formation	Production of undesirable esters
Increase in ester formation	Very fast fermentations
Increase in volatile sulfur compound formation	Thin or lacking body/mouthfeel
High terminal gravities	Autolysis (Yeasty flavors due to lysing of cells)
Stuck fermentations	
Increased risk of infection	

YEAST PITCHING RATE DIRECTLY IMPACTS THE FLAVOR AND AROMA CHARACTERISTICS OF THE FINISHED BEER.

temperatures early in the fermentation. Table 1 summarizes the potential effects of under or overpitching yeast.

Conclusions

Yeast biochemistry is complex, and how yeast ferment wort to produce beer is affected by many different variables.

Yeast pitching rate directly impacts the flavor and aroma characteristics of the finished beer. It is always desirable to pitch an optimal amount of yeast and not over or underpitch. Although an optimal pitch rate is best, it is generally better to overpitch rather than underpitch, as underpitching is more likely to have a negative effect on the finished beer.

In some beer styles, a complex ester profile is desirable (e.g. German wheat). While underpitching may lead to a more intense and complex ester profile, this is probably not the best way to achieve a complex ester profile—under pitching can potentially cause many other problems (see Table 1). It will also be very difficult to reproduce a good result from underpitching due to the influence and interaction of other variables during fermentation.

In order to make the best beer possible, a brewer should use healthy, viable yeast pitched at an optimum cell count rate. It's also important to manage and control brewing process variables that affect yeast, such as initial wort oxygen content, yeast nutrient availability, and fermentation temperature. By properly managing important brewing variables that impact yeast, the yeast will be happy. And, of course, happy yeast make the best beer!

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3. wyeastlab.com/com-pitch-rates.cfm
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Chris Bible is a chemical engineer whose love of beer and science intersected when he became a homebrewer more than 13 years ago. He resides in Knoxville, Tenn. with his wife and son and especially enjoys brewing porters and stouts.



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One way beer judges check their palates is by using commercial "calibration beers"—classic versions of the style they represent. Zymurgy has assembled a panel of four judges who have attained the rank of Grand Master in the Beer Judge Certification Program. Each issue, they score two widely available commercial beers (or meads or ciders) using the BJCP scoresheet. We invite you to download your own scoresheets at www.bjcp.org, pick up a bottle of each of the beverages and judge along with them in our Commercial Calibration.



Our judges put the soon-to-be released 2015 BJCP Style Guidelines to use with this issue, evaluating two canned gose offerings from opposite sides of the country. (For more on this historical German style brewed with coriander and salt, see the Style Spotlight on page 19.)

First up was The Kimmie, The Yink and The Holy Gose from Anderson Valley Brewing Co. in Boonton, Calif. The name of the beer is a play on Boontling words: "A kimmie is an adult man (or a father), a yink is a younger man (or a son) and the Holy Gose...well, you get the idea," explained Anderson Valley brewmaster Fal Allen. (To learn more about the language of Boontling, go to andersonvalley-museum.org/boont.html.)

Before boiling, the wort is soured with Lactobacillus, imparting an initial refreshing tartness to the beer.

"We develop the acidity through a natural bacterial fermentation that also

brings a bit of funkiness to the beer and dries it out," said Allen. The wort is sterilized through boiling and then the batch proceeds through the rest of the process as per usual. "We use our house yeast to do the rest of the fermentation and we end up with a refreshing, tart beer that is unusual but still very quaffable and accessible."

The Kimmie, The Yink and the Holy Gose checks in at 4.5 percent ABV and is part of the brewery's Highway 128 Session Series.

Next up was Westbrook Gose from Westbrook Brewing Co. in Mount Pleasant, S.C.

"We had tried the Leipziger gose but found it pretty boring, and after reading more about the style in *Brewing with Wheat*, we decided to make our own version in 2012," said brewery founder Edward Westbrook, who said the brewery also uses a sour wort method to make the beer. "We did two batches that year

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.



Anderson Valley Brewing Co.
avbc.com

Westbrook Brewing Co.
westbrookbrewing.com

BJCP Style Guidelines
www.bjcp.org

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

that were packaged in 22-ounce bottles and it was pretty well received, so we decided to put it into six-pack cans, which were first released in July 2013. To the best of my knowledge it was the first canned sour beer from a U.S. brewery. Our distributors were skeptical at first, but they ended up selling out their first shipments almost immediately."

Westbrook Gose checks in at 4 percent ABV.

THE SCORES

The Kimmie, The Yink and the Holy Gose—Anderson Valley Brewing Co., Boonville, Calif.
BJCP Category: 27, Historical Beer: Gose



THE JUDGES' SCORES FOR THE KIMMIE, THE YINK AND THE HOLY GOSE



DAVE HOUSEMAN



BETH ZANGARI



SCOTT BICKHAM



GORDON STRONG

Aroma: Bready, yeasty wheat malt character. A light toasted malt note emerges along with a sea breeze aroma. Fruity fermentation esters; however, I don't perceive the characteristic coriander citrus notes or an acidic aroma. Slight sulfur note. No hop aroma, DMS, or diacetyl; good. No alcohol aroma. (9/12)

Appearance: Clear, pale yellow color with only a light haze that may be chill haze. Dense, thick, white head dissipated fairly quickly and couldn't be resurrected. Poor head retention after initial pour. Additional cloudiness expected from this wheat beer style. (2/3)

Flavor: Initial tangy, lemony, lactic acidity supported by a yeasty malt profile with a note of toasted malt, like bread crust. No hop flavor; very low hop bitterness. The acidity has citrus notes but not the characteristic coriander flavor. A bit of initial saltiness fades quickly and is barely perceptible. Lingering acidity in aftertaste along with acidic bitterness that balances the malt presence. (14/20)

Mouthfeel: Initial high carbonation, spritz on the tongue, dissipates rapidly after initial pour. Medium body with lighter mouthfeel due to initial carbonation and acidity. Bit of saltiness lingers on the tongue. (4/5)

Overall Impression: A refreshing interpretation of the gose style. The wheat malt character is welcome. Additional coriander and a bit more salt would add more authenticity and complexity to this beer. Nice acidity, however, for a salad or crudité courses. (7/10)

Total Score: (36/50)

Aroma: Meyer lemon aroma is at first pronounced, but dissipates as the sample sits. Earthy herbal spice and low graham wheat characters emerge, with a hint of DMS floating through. Citrus character suggests hop aromas, rather than fruit. (9/12)

Appearance: Pale straw with brilliant clarity. Fluffy white foam stands for a moment suspended, then falls to nothing. (3/3)

Flavor: A full, bready, wheaty, unmalted wheat berry grist character dominates the first sip, then gives way to a clean, soft lactic tartness, which combined with a moderate saltiness provides balance where hop bitterness seems absent. A light saltiness lingers and plays with the tartness in the finish. Low, lemon citrus whispers at the end. (16/20)

Mouthfeel: Very light bodied with softly sparkling carbonation. Tingling citrus zest combines with a soft saltiness that lingers on the tongue. (5/5)

Overall Impression: The soft, clean tartness and moderate saltiness cleanse the palate. It is simultaneously quenching and stimulating, without being an outright lawnmower beer. This would be the perfect first beer after a long day working or playing in the summer heat, served with freshly caught fish cooked over an open fire. (7/10)

Total Score: (40/50)

Aroma: Moderately salty, sulfury aroma with lemony character underneath. Carbonic acid adds an edge. Coriander may be present at a low level, but is not discernible underneath the strong mineral character. Apple cider notes add complexity. (9/12)

Appearance: Very light straw with excellent clarity. A little haze would be typical of this style. High carbonation formed a foamy white head when first poured, but dropped rather quickly. (2/3)

Flavor: Light bready malt character up front is similar to some lighter German weissbier examples. The malt yields rather quickly to a moderately strong salty/mineral character. Sourness is present at a low to moderate level, appropriate for this style. Not a lot of citrus character, and coriander is low or not present. Soft finish with low hop bitterness but still dry due to the high attenuation. A pleasant underlying earthiness permeates the flavor. (15/20)

Mouthfeel: Carbonation is moderately high, but drops quickly after it is poured from the can. The body is light but sufficient to support the salty, acidic, and earthy flavors. Very low alcohol, with no astringency or soapiness. (4/5)

Overall Impression: A solid interpretation of the gose style. The lactic sourness is at an appropriately restrained level, but does not have much complexity in terms of providing lemony notes. This could be due to the strong salty character and would be better balanced with a higher level of citrus notes of coriander. (7/10)

Total Score: (37/50)

Aroma: Fresh, clean aroma with a grainy, slightly lemony quality and a salty impression. Has a slight nutty quality, as if from yeast. The grainy notes certainly suggest wheat. Generally clean and inviting. (9/12)

Appearance: Very highly carbonated. A tall white frothy head with fine bubbles tops the glass. The head persisted fairly well, and crackled in the glass. Crystal clear. Pale yellow color. A very nice-looking beer. (3/3)

Flavor: Soft grainy wheat flavor with low bitterness and moderate acidity. The salt character is slight but noticeable; it certainly doesn't taste salty. Dry finish. Tart, apple-like flavor lasts into aftertaste. Coriander is elusive, except perhaps as a slightly earthy flavor. Seems very fresh and clean-tasting. The salt in the finish gives it a "juicy" quality and encourages another drink. (16/20)

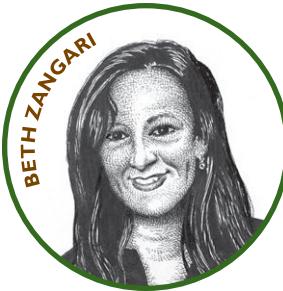
Mouthfeel: Medium body. Very high carbonation. Slightly creamy impression. Moderate sourness provides some pucker, but not astringent. No alcohol warmth. (4/5)

Overall Impression: Fresh, clean beer; very refreshing. The bright, juicy acidity and light touch of salt are well balanced. The coriander seems a bit hidden, except maybe as a light lemony aroma and some earthy flavor; certainly not as apparent as in many witbiers. The wheat is grainy in flavor but soft on the palate and adds to the body. A very drinkable beer that would be great in warm weather. (8/10)

Total Score: (40/50)



THE JUDGES' SCORES FOR WESTBROOK GOSE



Aroma: Light lemon, lactic acidic aroma initially. Mild, bready wheat malt backbone. Fruity fermentation esters with a hint of apple emerge along with the citrus notes, but not the aroma classically associated with coriander. No aromas associated with saltiness. No DMS, diacetyl, hop, or alcohol aromas. Overall, a pleasant, balanced aroma. (10/12)

Appearance: Cloudy as appropriate. Pale yellow. Rocky, white head initially, but the head fell fairly quickly and could not be easily roused. Initial carbonation rapidly dissipated. (2/3)

Flavor: Very sour and puckering with apple and citrus lactic character like a Sour Heads candy. Sourness more assertive than guidelines and best examples of the style. No hop flavor (good) and very low bitterness. Salt presence is under my threshold and not contributing to flavor. Dry finish. No DMS, diacetyl, or alcohol flavors. Some bready malt underpinnings. Some of the citrus notes may be from the coriander, but there isn't the classic coriander flavor. (14/20)

Mouthfeel: Medium to medium-thin body. Dry with a lighter mouthfeel due to acidity. Carbonation was moderate but fleeting, not effervescent, and not supporting head retention. (4/5)

Overall Impression: The lactic sourness is dominant, overwhelming other characteristics. The citrus notes, perhaps from coriander, were pleasant but some saltiness would have helped balance. This is a refreshing beer for a hot day, like a British shandy or German radler. Cans may not be an ideal package for a highly effervescent beer and the lactic character may have become stronger. (7/10)

Total Score: (37/50)

Aroma: Strong fruity apple aromas dominate, with distinct acetic acid sourness and hint of yeast. A faint spicy note reminds me of an apple-flavored breakfast cereal. Hop aromas are not distinct. Spice and sour dominate. (9/12)

Appearance: Straw color, and hazy. Rough white foam forms, but dissipated quickly. (3/3)

Flavor: Firm acetic sourness dominates the first sip and follows throughout with a moderately pronounced saltiness, supported with a bready, lightly spicy wheat character in the background. The salt/sour mix fills the role where bitterness normally provides balance. Coriander is subdued. (14/20)

Mouthfeel: Light bodied with spritzy carbonation. No alcohol warmth, no astringency. Puckering tartness combines with an almost gritty salt sensation, but gives way to an almost champagne-like lightness and dry, crisp finish (4/5)

Overall Impression: The description of the beer given by the brewer indicates it was spiced with coriander, which may account for the very fruity aroma, similar to what I have experienced in my homebrew with dry-spiced wit bier. The sour and salt combination reminded me of salt and vinegar potato chips.

The presentation is more what I expect in a Berliner weisse, with its firm tartness. This interpretation will certainly appeal to fans of sour beers. (7/10)

Total Score: (37/50)

Aroma: Pronounced citrusy, lime-like aroma with a modest saltiness reminiscent of a margarita. Coriander adds an earthy character along with a light grassiness. Light malt character, with pleasant biscuit and wheat malt notes. Moderately high esters, with pear and dessert apple notes. (10/12)

Appearance: Highly carbonated. Forms a white, frothy head when poured. It drops fairly quickly, which seems to be a hallmark of the style perhaps due to the salt ions. Clarity is moderately hazy, with a cloudiness that adds a sheen to the light straw tapestry. (3/3)

Flavor: A long, flavorful beer with a lot of depth for such a low gravity. It starts smoothly, with light toasted notes and a wheat malt smoothness. The sourness grows and crescendos to a moderately intense level—a bit more than stated in the style guidelines, but pleasant. The saltiness is more subtle, just high enough to add a mineral edge to the finish. Flavor is not as fruity as the aroma, but has low levels of apple; and floral notes recall pears. Low to moderate hop bitterness is in balance. (17/20)

Mouthfeel: While carbonation level fell rather quickly, it still had a pleasant spritziness. The low alcohol and body make this a nice summer thirst quencher. Some light metallic notes from the lactic acid. (5/5)

Overall Impression: An interesting beer, with fruity and floral notes enhanced by the slight saltiness and sourness when the beer hits the palate. The citrus and spicy notes from the coriander add complexity. The balance is very good—perhaps a little on the sour side, but still a world-class example of the style. (9/10)

Total Score: (44/50)

Aroma: Strong lemony nose with sharp grain underneath. Herbal, floral note. Quite aromatic. The impression of sourness is low but it seems quite fruity and citrusy. The sourness doesn't seem totally clean. (8/12)

Appearance: Full haze and pale yellow color reminiscent of a hefeweizen. The moderate-sized wheat head settled fairly quickly, though. (2/3)

Flavor: High sourness hits you quickly. The salt jumps out in the finish and adds to the dryness; it isn't overdone, but it is fairly high. Sourness has a slight funk. Low bitterness. Light grain but not really tasting like doughy wheat. The coriander isn't distinctive to me, except as a lemony note; maybe that's just how it is perceived in combination with sourness. (15/20)

Mouthfeel: Puckering sourness. Medium body. High carbonation. Kind of creamy mouthfeel. Sharp from sourness. No alcohol or astringency. (4/5)

Overall Impression: Quite sharp and sour, with the sourness dominating the other flavors. The salt level is high but balances well with the aggressive sourness; the intensity of both is on the high side for my taste, but they are at least in a good proportion to each other. The coriander comes across as a lemony note. Since the sourness is so prominent, I think it should be cleaner. (7/10)

Total Score: (36/50)

malt

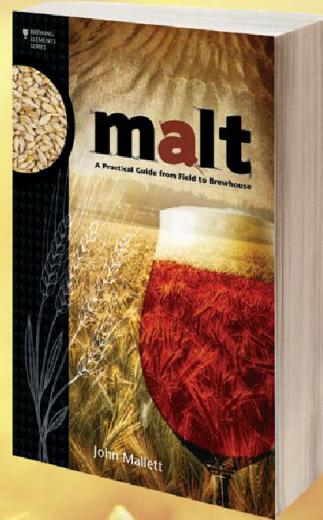
A Practical Guide from Field to Brewhouse

By John Mallett of Bell's Brewery, Inc.

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Candidates

Please read candidate statements at HomebrewersAssociation.org and cast your ballot online. For the 2015 election, there are 10 candidates running for three open seats on the Governing Committee.

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Ryan Chaytor

Sandy Cockerham

Lorena Evans

Michael Fry

Jonathan Fuller

Craig Hendry

Aaron Hyde

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Election Guidelines

Balloting is done online.

Go to HomebrewersAssociation.org, read the candidate statements, and cast your vote. Vote for up to three (3) candidates. You will need to include your name, member number and contact information. If you do not know your member number, would like to become a member or cannot vote online, call us toll free at 888-822-6273 or email info@brewersassociation.org.

All ballots must be submitted before midnight Pacific time, March 31, 2015.

All AHA members voting in the election are eligible for an additional entry in the Lallemand Scholarship drawing for Siebel Institute's two-week Concise Course. Check the appropriate box on the ballot to submit your entry into the drawing. The drawing will take place June 13, 2015 at the AHA National Homebrewers Conference in San Diego, California.

by Charlie Papazian



Going Wild with Wild Hops

This particular adventure in brewing began three years ago on my Boulder County homestead, about a quarter mile from the foothills of the Rocky Mountains. Left Hand Creek runs right through the middle of my property (yes, it was one of the creeks that massively flooded in 2013). The “wild” south side is a sanctuary for wildlife and some interesting plant life.

Every year I'd observe the wild hops on the south side struggle with competing trees, grasses, bushes, and plants. The harvest was always meager and virtually inaccessible. Hops grow among a thick bed of poison ivy, which isn't worth challenging. The hops may have originally washed down during centuries of flooding from the mountain mining towns, several of which had breweries. They also could have been indigenous to the area.

In the spring of 2012, I dug up several spindly hop roots and transplanted them along a deer fence surrounding a north-side garden. They grew about two feet high the first year. The second year they grew well along the fence line, offering a handful of small-sized hops (about the size of a peach pit) that I couldn't harvest because of the impact of the flood. Finally in 2014, in late August through mid-September, a bountiful harvest of hand-picked hops was air dried over three days under cover. They were vacuum packed, sealed, and frozen.

Wild hops grow in several areas along the Colorado foothills where water is nearby. Most of these wild hops seem to have an onion-like aroma when rubbed. Their alpha acid content is not high, but the yellow lupulin glands are evident and



sticky. The hops under my care grew very large—they were larger than my 35-year-old Cascade hops that grow nearby, though not as compact and dense. The shape of my wild hops appears almost square when looking down the “barrel.” My Cascade hops struggled with insects eating the leaves (but the harvest was

still great). My brown-stemmed wild hop vines suffered neither disease nor insect stress, appearing to be pest resistant.

Onion-like hop aroma usually puts me off, but I was intrigued and forced myself to keep an open mind. What other aroma character was I getting? They were some-

Gunnawanna 'Toberfest

MALT EXTRACT RECIPE

INGREDIENTS

for 5.5 U.S. gallons (21 L)

5.0 lb	(2.3 kg) amber malt extract syrup (or 4.3 lb [1.9 kg] dried amber malt extract)
8.0 oz	(225 g) German Caramunich malt
7.0 oz	(196 g) Belgian aromatic malt
3.0 oz	(84 g) Belgian Special-B malt
3.0 oz	(84 g) honey malt
8.0 oz	(225 g) light field honey
0.75 oz	(21 g) Mt. Hood hop pellets, 5.2% a.a. (3.9 HBU/109 MBU) 60 min
2.5 oz	(70 g) wild hops, 2% a.a. (5 HBU/140 MBU) 60 min
0.75 oz	(21 g) wild hops, 5 min
0.75 oz	(21 g) wild hops, end of boil
0.5 oz	(14 g) powdered (whole hops in blender) wild hops, dry hop
0.25 tsp	(1 g) powdered Irish moss
German, Bavarian, or White Labs Cry Havoc	lager yeast
0.75 cup	(175 ml) corn sugar (priming bottles) or 0.33 cup (80 ml) corn sugar for kegging

Target Original Gravity: 1.042 (10.5 B)

Target Extraction Efficiency: 75%

Approximate Final Gravity: 1.011 (2.8 B)

IBU: about 34

Approximate Color: 7 SRM (14 EBC)

Alcohol: 4.2% by volume

what earthy and herbal, reminiscent of some of the German grown noble hops I like to brew and dry hop with. I wanted to explore what these hops had to offer as far as bitterness character, but also aroma and flavor. I asked myself what style might best complement what I was experiencing with my hand-rubbed assessment. I also wondered about alpha acid content.

The hops had been dried to one-eighth of their fresh wet weight, to the point of dryness that let the cones spring back but not so dry that they would shatter. I assumed about a 2 percent alpha acid content based on my past observance of 2 to 3 percent Czech Saaz and other low alpha acid varieties.

I decided to brew a low alcohol Oktoberfest lager, light and sessionable so I could experience and observe the nuances of hop character. Corn (honey in accompanying

malt extract recipe) lightens the body while toasted malts impart a dominant malty accent to create synergy with the potential of oniony hop character. I was reasonably confident with my alpha acid guesswork, but to ensure that there would be a trusted level of bitterness, I dosed the kettle boil with a foundation of Mt. Hood hops. In my experience, Mt. Hood has a relatively mild and smooth hop bitterness that wouldn't mask the character of wild hops.

Doses of wild hops were made for the full boil, with abundant doses at five minutes before the end of boiling and at the end of boiling. My last challenge was figuring out how to dry hop with my whole wild hops. My brewing techniques are simple. I dry hop exclusively with hop pellets for ease of use and the dependable mixing and eventual settling (as sediment) of all the hop pellets. Clogged hoses and messy removal of whole dry hops is an exercise I avoid.

DIRECTIONS

Heat 1.5 quarts (1.5 L) water to 172° F (77.5° C) and add crushed grains. Stir well to distribute heat. Temperature should stabilize at about 155° F (68° C). Wrap a towel around the pot and set aside for about 45 minutes. Have a homebrew.

After 45 minutes, add heat to the mini-mash and raise the temperature to 167° F (75° C). Pass the liquid and grains into a strainer and rinse with 170° F (77° C) water. Discard the grains.

Add more water to the sweet extract you have just produced, bringing the volume up to about 2.5 gallons (9.5 L). Add malt extract, honey, and 60 minute hops and bring to a boil.

When 10 minutes remain, add the Irish moss. When five minutes remain, add the five-minute hops. After a total wort boil of 60 minutes, turn off the heat and add the end of boil hops. 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. 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 cold water to achieve a 5.5 gallon (21 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 about 55° F (12.5° C) for one week or when fermentation shows signs of calm and stopping. Rack from your primary to a secondary and add the wild hop powder for dry hopping. If you have the capability, "lager" the beer at temperatures between 35 and 45° F (1.5 to 7° C) for 3 to 6 weeks. Prime with sugar and bottle or keg when complete.

While watching my wife make a morning fruit smoothie for my daughter, I got a great idea. Why not put dried whole hops in a blender and powderize them? (Of course not with the smoothie, but the thought did cross my mind.) With the Vitamix® brand blender, there is enough designed power to create strong air currents to suck the hops down and through the blades. In a few seconds, my dried hops became hop powder. The aroma emanating from them was immense and fresh. What I quickly realized was that this was way better than hop pellets. When hops are processed into pellets, the pulverization and compression generates a great amount of heat, certainly changing and compromising some of the flavor and aroma character. I processed pulverized hops with no heat. The process is not only in reach of any homebrewer, but any craft brewer who wants to maximize fresh whole hop character with late and dry hopping techniques.

Gunnawanna 'Toberfest

ALL GRAIN RECIPE

INGREDIENTS

for 5.5 U.S. gallons (21 L)

6.5 lb	(3 kg) Munich malt (10-15° L)
12.0 oz	(340 g) flaked corn
8.0 oz	(225 g) German Caramunich malt
7.0 oz	(196 g) Belgian aromatic malt
3.0 oz	(84 g) German sauer malt
3.0 oz	(84 g) Belgian Special-B malt
3.0 oz	(84 g) honey malt
0.66 oz	(18 g) Mt. Hood hop pellets 5.2% a.a. (3.4 HBU/96 MBU) 60 min
2.5 oz	(70 g) wild hops, 2% a.a. (5 HBU/140 MBU) 60 min
0.75 oz	(21 g) wild hops, 5 min
0.75 oz	(21 g) wild hops, end of boil
0.5 oz	(14 g) powdered (whole hops in blender) wild hops, dry hop
0.25 tsp	(1 g) powdered Irish moss, 10 min
German, Bavarian, or White Labs Cry Havoc lager yeast	
0.75 cup	(175 ml) corn sugar (priming bottles) or 0.33 cup (80 ml) corn sugar for kegging

Target Original Gravity: 1.042 (10.5 B)

Target Extraction Efficiency: 75%

Approximate Final Gravity: 1.011 (2.8 B)

IBU: about 34

Approximate Color: 7 SRM (14 EBC)

Alcohol: 4.2% by volume

The addition of the powdered hops to the secondary fermenter as dry hopping presents one small challenge. Unlike hop pellets that initially float to the surface, disperse, then settle slowly saturated, the homemade dry hop powder does not mix easily nor quickly with the finished beer. A mass of slightly moist hop powder floats like a billowy cloud on the surface. Agitation is necessary initially, but as the hops become saturated with beer they migrate to the bottom of the fermenter, behaving like hop pellets. To compensate, a bit more head space is needed in the secondary fermenter for the floating powdered hops.

My Gunnawanna 'Toberfest (you're gunnawanna try brewing your own) is a medium-light bodied amber lager with a classic malt background. The wild hops come through, gently contributing to a mouthfeel, flavor, and aroma akin to noble hops. The onion-like character is

DIRECTIONS

A step infusion mash is employed to mash the grains. Add 9 quarts (8.6 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 4.25 quarts (4 L) of boiling water and add heat to bring temperature up to 155° F (68° C) and hold for about 30 minutes. Raise temperature to 167° F (75° C), lauter and sparge with 3.5 gallons (13.25 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 10 minutes remain add the Irish moss. When five minutes remain add the five-minute hops. After a total wort boil of 60 minutes turn off the heat and add the end of boil hops. 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. 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 about 55° F (12.5° C) for one week or when fermentation shows signs of calm and stopping. Rack from your primary to a secondary and add the wild hop powder for dry hopping. If you have the capability, "lager" the beer at temperatures between 35 and 45° F (1.5 to 7° C) for 3 to 6 weeks. Prime with sugar and bottle or keg when complete.



not evident, and there is absolutely no perception of American citrus hop character. I found the combination of malt and hop characters to be perfectly balanced in this low alcohol beer. Next time I will increase the dry hopping rate of wild hops to keep pushing the boundary.

Let's cut the shuck and jive and get on with the recipe.

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

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Preparing for the Hopocalypse

Everyone knows someone who constantly worries (occasionally justifiably) about stuff—except me. I don't need to know someone like that: I am that someone. While looking over my upcoming brewing schedule, I saw three IPAs on the list. Then it hit me: *what if there's another hop shortage?*

Once my blood pressure came back down from the stratosphere I thought of the perfect solution: hopless IPA.

At the 2014 North American Organic Brewers Festival, I tasted gruit from Widmer with yarrow, rosemary, and lavender. I tried one from Upright Brewing with wild lettuce, galangal, calendula, and white willow bark. Both were tasty.

Research revealed that the flavors of herbs and spices are actually defensive chemical weapons meant to keep bugs and other critters a safe distance away. What makes them edible is dilution. Bite into a whole leaf of oregano and the concentrated dose irritates the senses, but by adding a small amount to food, the senses are stimulated without being overwhelmed.

On Food and Cooking by Harold McGee has a section on herbs and spices that's very informative. Another good resource is gruitale.com.

The ascension of hops partially started with German princes asserting their independence from the Catholic Church, which held a monopoly on gruit. It took until the 16th century for England, the last holdout, to switch to hops.

I saw no reason to restrict myself to the herbs and spices that were in use long ago; so many more are available today. I studied the herb and spice section of



McGee's book and put together a list that had the qualities I was looking for: piney, citrusy, pungent, and woody.

Being frugal (some say cheap), I raided my wife's spice cabinet to see which ones on my list were already there. I chose nine: clove, caraway, thyme, mace, cumin, dill, rosemary, black pepper, and bay leaves. I brewed a two-gallon extract batch with an OG of 1.040, added S-05 yeast, and waited. After three weeks the FG was 1.008.

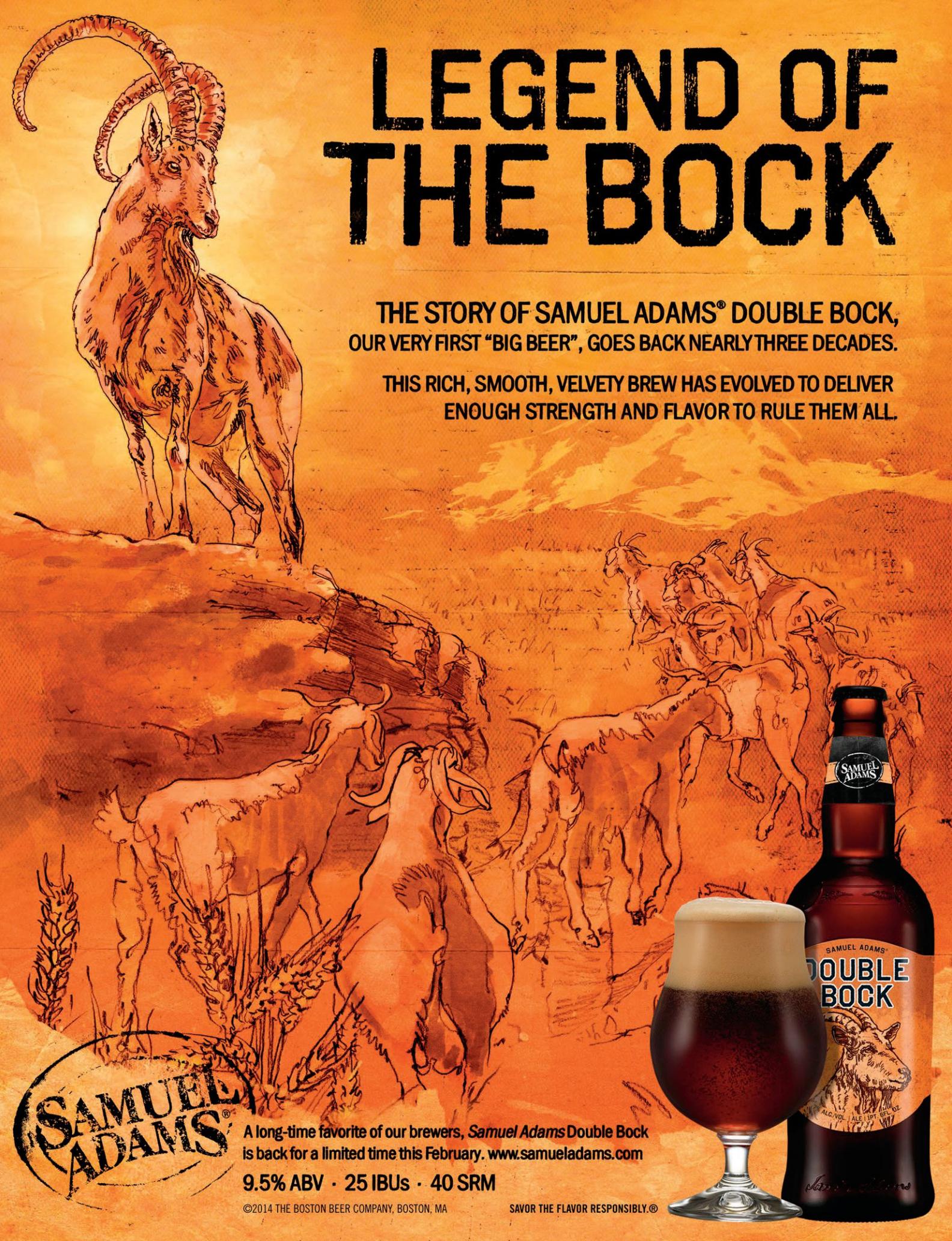
Next I divided the batch into nine Mason jars and added one herb or spice to each one. After a week I did a smell test. The next day I did a taste test. I then put together a list of combos that I thought would work well together, tasted a bunch of combinations, and came to some conclusions.

My choices for IPA would be thyme, cumin, dill, mace, and rosemary; or thyme, cumin, and dill. A bit of added grapefruit or lemon zest would really hit the mark.

For brown ale: clove, caraway, and bay leaves. For amber: thyme, mace, and cumin. For blonde ale/lager: thyme, mace, and cumin; or dill and rosemary; or any combo. Black pepper and caraway, with maybe a bit of coriander, along with Chico yeast could make a pseudo saison. The obvious choice for Scottish ale would be heather. Fennel or anise would fit right into English old ale. I'd use lemongrass or lemon verbena in a wheat beer, maybe with a bit of clove. And of course for pumpkin beer: cinnamon, ginger, nutmeg, allspice, and cloves.

Your taste buds may say "yuck" to the ones I chose, so do your own taste test. Start with the ones you like in food, and put together your own backup plan for the next hop shortage.

Steve Ruch is retired and lives in Vancouver, Wash. He has been homebrewing for 16 years.



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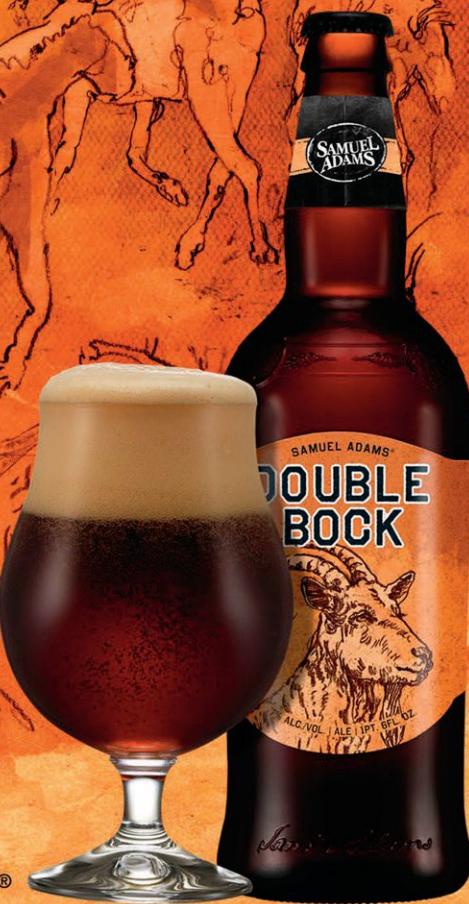
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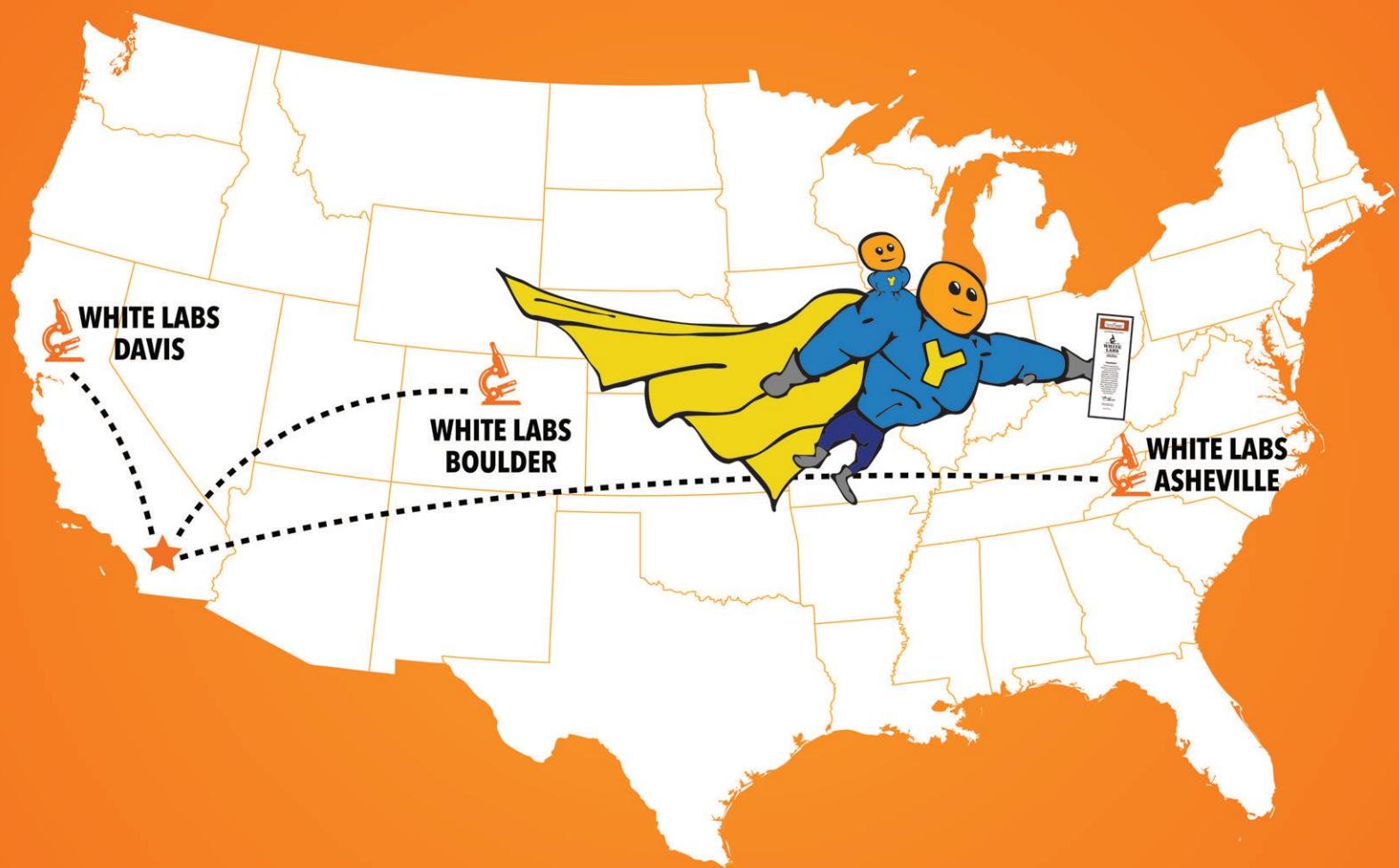
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