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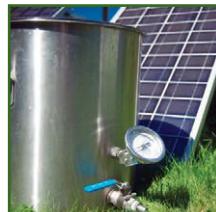
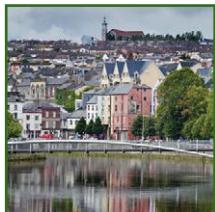


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## >> GET THERE!

### HOLIDAY ALE FESTIVAL

The winter season holds many gifts for beer lovers in the form of big, bold ales designed to fend off the cold chill of a long winter's night. Each year, the Holiday Ale Festival in Portland, Ore. gathers up dozens of these winter warmers for a joyous five-day celebration. As a result, this quintessential Portland event has earned a reputation as the premier winter beer tasting venue on the West Coast.

Held in the heart of downtown Portland, the Holiday Ale Festival, scheduled for December 4-8, keeps attendees warm and dry under a large clear-top tent that covers Pioneer Courthouse Square while allowing for views of the city lights. Gas heaters create a cozy ambience under the boughs of one of the region's largest decorated Christmas trees.



More than 50 winter ales are featured at the event, some created specifically for the festival to bring warmth and cheer to the holiday season. An initial tasting package costs \$30 at the door, and advance VIP and general admission ticket packages will go on sale in November. For more information, visit [holidayale.com](http://holidayale.com).

**November 1-10**  
**Mendocino County Mushroom, Wine & Beer Festival**  
 Mendocino County, CA  
[www.visitmendocino.com](http://www.visitmendocino.com)

**November 1-10**  
**San Diego Beer Week**  
 San Diego, CA  
[www.sdbw.org](http://www.sdbw.org)

**November 2**  
**Maine Brewers Festival**  
 Portland, ME  
[www.learnyourbeer.com](http://www.learnyourbeer.com)

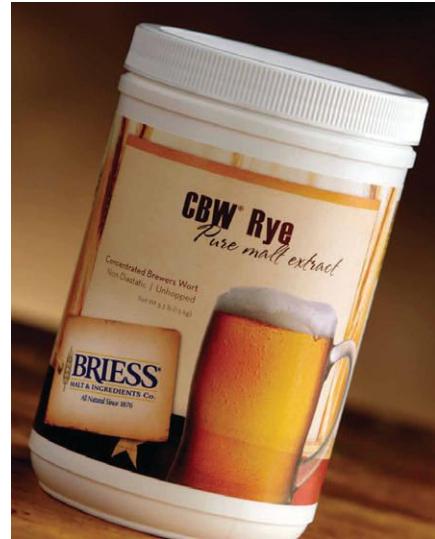
**November 2**  
**All Colorado Beer Festival**  
 Colorado Springs, CO  
[www.allcoloradobeerfestival.com](http://www.allcoloradobeerfestival.com)

**November 2**  
**Craft Beer Festival**  
 Pinellas Park, FL  
[www.cajuncafeonthebayou.com](http://www.cajuncafeonthebayou.com)

**November 9**  
**Brew Your Cask Off**  
 Atlanta, GA  
[www.brewyourcaskoff.com](http://www.brewyourcaskoff.com)

**November 16**  
**Treasure Coast Beer Fest**  
 Port St. Lucie, FL  
[www.treasurecoastbeerfest.com](http://www.treasurecoastbeerfest.com)

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## >> GREAT PRODUCT

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CBW® Rye can also be used with other malts and extracts to develop a unique rye beer, or to add interest and complexity to just about any extract or all-grain beer style. CBW® Rye delivers light golden color and is 9° Lovibond at 8° Plato. It is currently available as LME only.

Briess CBW® malt extracts are 100 percent pure, unhopped, nondiastatic brewer's grade malt extracts produced in a 500-barrel brewhouse in the U.S. They have a high degree of fermentability and FAN. In addition to being used to brew extract beer, they are effective in the all-grain brewhouse for yeast propagation or to adjust gravity, color, or flavor. For more information, visit [BrewingWithBriess.com](http://BrewingWithBriess.com).

## >> BREW NEWS:

### SIERRA NEVADA CROSS-COUNTRY COLLABORATION

Sierra Nevada Brewing Co. is celebrating the opening of its new Mills River, N.C. brewery by bringing revered craft brewers to North Carolina via a cross-country festival path in 2014. A dozen craft breweries across the U.S. will join Sierra Nevada in the creation of a variety 12-pack—one partner brewery per beer—to be released in summer 2014. A multi-weekend, west-to-east tour of regional festivals will culminate with the Mills River doors opening.

"We want to highlight the success of craft beer, not just our own next step," said Ken Grossman, Sierra Nevada's founder. "Craft brewers are a close bunch, and we've all helped each other get to this point. This is a fun way to showcase even just a fraction of the talent that's out there, and somehow 12 beers doesn't feel like enough. If this weren't already a logistical mammoth, we'd brew with even more of our great peers."

The specific travel path for festivals is a work in progress, but in spring 2014, these breweries will visit Chico to develop recipes and begin brewing:

- Allagash Brewing Company, Portland, ME
- Ballast Point Brewing Company, San Diego, CA
- Bell's Brewery, Inc., Kalamazoo, MI
- Cigar City Brewing, LLC, Tampa, FL
- Firestone Walker Brewing Co., Paso Robles, CA
- New Glarus Brewing Company, New Glarus, WI

- Ninkasi Brewing Company, Eugene, OR
- Oskar Blues Brewing Company, Longmont, CO
- Russian River Brewing Company, Santa Rosa, CA
- Three Floyds Brewing, LLC, Munster, IN
- Victory Brewing Company, Downingtown, PA
- Local brewing community in Asheville, NC

The collaboration will also champion advances in the industry and the greater craft beer communities surrounding the partner breweries.

"We've long supported ingredients research, and we hope these beers see success that allows us to further help malt and hops evolve," said Grossman. "We also aim to highlight the state brewers guilds our partners belong to. It's a small but important nudge to keep our industry's momentum strong."



## >> YOU'VE GOTTA DRINK THIS

### FUNKWERKS TROPIC KING



The incredible aroma of this imperial saison from a smaller Fort Collins, Colo. brewery gives hints of mango, peach, and passion fruit likely from the Rakau hops. A wonderful light spicy note is balanced by a luscious mouthfeel and a medium dry finish that makes this beer incredibly drinkable—I did a double take at the 8 percent ABV! Tropic King's delicious complexity married with refreshing drinkability have made this my new favorite summer/fall beer. Here's to the brewers at Funkwerks—well done!

Reviewed by Kevin Crumpton, Colorado Springs, Colo.



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](mailto:zymurgy@brewersassociation.org).

## >> BEER TIDBIT

### PLINY THE YOUNGER TOURISM IMPACT

A new study by the Sonoma County (Calif.) Economic Development Board (EDB) found that the county's craft beverage industry contributed an estimated \$123 million to the local economy in 2012. The EDB also performed a tourism economic analysis during the two-week release of Russian River's Pliny the Younger in February 2013. The total economic impact due to tourist spending during this two-week event was estimated to be \$2.35 million. The EDB found that about 65 percent of the estimated 12,500 attendees were tourists who came to Sonoma County specifically for the beer.



## >> CRAFT BREWER PROFILE WYNKOOP'S ANDY BROWN

BY JILL REDDING

"People definitely want to try new beers all the time and I appreciate that I have the freedom and support to try new things," said Brown.

Then, of course, there's the now-famous Rocky Mountain Oyster Stout, a project in which Brown was at first a reluctant participant. After reading a couple press releases about oyster stout offerings from other craft breweries, Brown and Wynkoop's Marty Jones put together an April Fool's video in 2012 on how the brewery was creating a new stout using Rocky Mountain oysters, otherwise known as bull testicles. Not everyone got the joke, and media members expressed interest in trying the exciting new beer.

"We had a lot of fun doing the spoof video, but then the phone calls and press inquiries started rolling in," explained Brown. "It quickly became apparent that it was going

to be very hard to say no to the goldmine of promotional opportunity we had on our hands. At first I was worried that I wouldn't be taken seriously as a quality brewer, or that it would be perceived as a gimmick to sell beer, but in the end I just decided to take my ego out of the equation. What can I say? We grabbed opportunity by the...uh...horns." The brewery recently released the beer in two-packs.

When I asked Brown, who started homebrewing in his early 20s, to provide a clone recipe for this issue, he went back and forth on which beer to include, finally deciding on the brewery's popular Colorojo, an imperial red ale. Brown said he gets a lot of questions from homebrewers about the hops, which impart notes of tangerine, blood orange, and tropical fruit.

"Personally, I get a lot of inspiration from trying new foods and culinary traditions, especially while traveling, and of course trying beer from other breweries," said Brown.

Jill Redding is editor-in-chief of *Zymurgy*. 

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## Wynkoop Colorojo

### INGREDIENTS

for 5.5 U.S. gallons (20.8 liters)

<b>12.0 lb</b>	(5.4 kg) U.S. pale two row malt
<b>1.5 lb</b>	(0.68 kg) Weyermann® Munich Type II (Dark)
<b>1.0 lb</b>	(0.45 kg) Weyermann® Caramunich® II
<b>8.0 oz</b>	(226 g) flaked oats
<b>3.0 oz</b>	(85 g) Simpson's Dark Chocolate Malt
<b>0.7 oz</b>	(20 g) El Dorado pellets, 15.3% a.a. (80 min)
<b>0.6 oz</b>	(17 g) El Dorado pellets, 15.3% a.a. (60 min)
<b>1.25 oz</b>	(35 g) El Dorado pellets, 15.3% a.a. (10 min)
<b>1.3 oz</b>	(37 g) Citra pellets, 14.5% a.a. (0 min)

**0.25 oz** (7 g) Amarillo pellets,  
10.7% a.a. (0 min)  
**2.25 oz** (65 g) Amarillo whole leaf,  
10.1% a.a. (hop back)  
**2.0 oz** (56 g) Amarillo whole leaf,  
10.1% a.a. (dry hop)  
Whirlfloc at 15 minutes before end of boil  
White Labs WLP051 Cali Ale V or similar  
yeast

**Original Gravity:** 1.076 or 19.0 Plato

**Final Gravity:** 1.014 or 3.5 Plato

**IBU:** 64

**ABV:** 8.2%

**Boil Time:** 90 minutes

#### DIRECTIONS

We boil our Denver city water before the brew day and acidulate it with gypsum or acidulated malt. The single infusion mash temperature for this beer is 154° F (67.5° C) for 50 minutes. We sparge with 170° F (77° C) water for mash out and get a pre-boil gravity of about 1.068 or 17 Plato. The first hop addition is 10 minutes after a good rolling boil is established. After the boil, we steep the zero minute hop addition for about 15 minutes and knock out the hot wort through the whole leaf hops in a pressurizable hop back that I made from an old filter housing. You could use your mash tun as a hop back if you don't have a hop back. We ferment at 69° F (21° C) and then after 10 days rack the beer to a conditioning tank, adding the whole leaf dry hops in weighted infusion bags. After eight days of dry hopping, we rack the beer to a serving vessel, add finings, carbonate, and serve after 72 hours.

**Tasting Notes:** I really like American imperial red ales that have the maltiness to back all the hops we add. Colorojo has a deep reddish brown color and some haze because it is unfiltered. The IBUs are not out of hand and I like being able to keep the three hop varieties distinct in the flavor and aroma of the beer. El Dorado is a new hop variety with interesting tropical fruit and juicy candy flavors, but Amarillo really steals the show as the signature hop for this beer with its tangerine flavor. Drinking this beer is like biting into a really bitter blood orange. I know some of these hop varieties are hard to come by, but if you stop by the Wynkoop I will be happy to get you some of ours for your clone homebrew. Just save me a bottle!

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By Gary Glass



# Learn to Homebrew Day



This issue is likely hitting your mailbox just days before the 14th Annual American Homebrewers Association Learn to Homebrew Day on November 2. If you have already registered your site, thank you! If not, get on it! See [HomebrewersAssociation.org](http://HomebrewersAssociation.org) for details on Learn to Homebrew Day, to register a site, or to find a registered site in your area.

## Radegast Club of the Year Award

Earlier this year, the AHA announced the creation of a new annual club award, the Radegast Club of the Year Award. This new award, named after a Slavic god credited with inventing beer (fits nicely with other awards such as the Ninkasi Award and Gambrinus Club Award), focuses on all the great things homebrew clubs do besides winning medals in competitions.

Does your club have a cool educational program for your members? Perhaps your club is involved with supporting a local charity? If so, we want to know about it! See the Clubs section under Community on [HomebrewersAssociation.org](http://HomebrewersAssociation.org) to submit an entry on behalf of your club, as well as for more details on this new award.

Submissions for the award must be received by March 31, 2014. The first Radegast Club of the Year Award will be announced at the 2014 National Homebrewers Conference in Grand Rapids, Mich.

## AHA Membership Dues

Starting January 1, 2014, membership dues for the American Homebrewers Association will be going up by \$5 for a single-year U.S. membership, an increase of 13 percent over the current

membership price of \$38. It's been 12 years since the last price increase, and a lot has changed since 2002. This \$5 increase in membership is less than half the 30-percent inflation seen since 2002, according to the U.S. Bureau of Labor Statistics, and much less than the 46-percent increase in our costs for printing and mailing each copy of *Zymurgy* magazine over that timeframe.

Here are just a few of the things the AHA has accomplished since 2002:

- Grew the AHA Member Deals program by 420 percent to more than 900 participating locations
- Launched [HomebrewersAssociation.org](http://HomebrewersAssociation.org) website. A complete redesign of [HomebrewersAssociation.org](http://HomebrewersAssociation.org) with even more great homebrew content will be hitting the interwebs later this year.
- Introduced eZymurgy, giving members

- instant access to volumes of *Zymurgy* magazine from 2000 to the present
- Introduced *Zymurgy* apps for Android and iPhone/iPad, with free access for AHA members
- Introduced the Research & Education Fund
- Introduced the Radegast Club of the Year Award
- Assisted with the legalization of homebrewing in Utah, Oklahoma, Mississippi, and Alabama
- Worked with homebrewers on homebrew-related legislative issues in nine

other states, including California, Georgia, Iowa, Illinois, Kansas, Louisiana, Michigan, Ohio, Oregon, Washington, and Wisconsin.

In addition, we will be adding another eight pages to your favorite homebrewing magazine, *Zymurgy*, to accommodate additional content including articles from the Research & Education Fund. Of course, the AHA will continue to support homebrewing rights legislation wherever necessary and will continue to build upon all of the great programs and events the AHA offers.

## Digital AHA Membership

With the onset of the new year, the AHA will be offering a new membership option that includes all of the great benefits of a regular membership, minus the mailed copy of the magazine. With the launch in 2012 of e*Zymurgy* and *Zymurgy* apps in 2013, many members have inquired about a digital-only option out of environmental concerns. The new digital AHA membership means fewer trees needed to print the magazine and less energy consumed and pollution produced in the delivery of the magazine.

Rest assured, all members, regardless of the membership option you choose, will continue to have access to all of the great digital content on e*Zymurgy* and the *Zymurgy* apps at no additional charge!

## AHA and BJCP

As a show of support for the Beer Judge Certification Program (BJCP), a volunteer-run, non-profit association that tests and certifies beer judges, the AHA will be assisting the BJCP to fulfill administrative tasks and provide financial resources for BJCP trainer staff travel. This offer of support for the BJCP is intended to allow the BJCP to offer more judge exams to more prospective judges and help us reach our mutual goal of adding to the pool of judges available to judge the more than 400 AHA-BJCP sanctioned homebrew competitions that are held every year, including the AHA National Homebrew Competition.

Competitions perform an important function within the homebrewing community. Not only do they offer recognition for outstanding brewers and their beers, they also provide entrants with valuable feedback on their creations by the judges. The process of preparing to take the BJCP exam and the act of judging also helps to hone brewing skills by providing insight on how to properly evaluate beer and identify and correct flaws.

The AHA is happy to offer this assistance to the BJCP, which remains an entirely independent association.

Until next time, happy homebrewing!

**Gary Glass is director of the American Homebrewers Association.**

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# Women and the NHC



Dear Zymurgy,

I recently attended the National Homebrewers Conference in Philadelphia with my husband, who has been homebrewing for over 10 years. I accompanied him and attended seminars as a way to learn more about this passion he has become so committed to. To my surprise, I enjoyed the conference more than I thought I would. Below is a list of 10 reasons other women may find these conferences appealing.

10. You can eat as many French fries as you like and nobody cares.

9. You can improve your culinary skills by attending seminars on pairing cheese with appropriate beers.

8. You get to hang out in dimly lit places like Monk's Cafe, which can be much appreciated if you've indulged in too many French fries and a lot of cheese.

7. You receive admiring glances and kind words from male attendees who wish their spouses/partners/persons of interest were accompanying them.

6. You receive loving, almost incredulous, looks from your husband when discussing the chemistry of beer tastes while sharing a pint over lunch.

5. You gain an appreciation of your own spouse who is not one of those guys wearing Viking horns or a giant hops hat during the evening tastings.

4. You refresh your appreciation of the classics, researching and acknowledging that Pliny the Elder is not only a fantastic beer (my new BBE: best brew ever), but was an historical figure.

3. You NEVER wait in line to use the restroom!

2. Your husband feels so indebted to you that he agrees to take you to a Nora Ephron play to hear five women discuss clothes, shoes, and relationships.

1. A female won the national Homebrewer of the Year Award!

Ruth W. Kauffman  
Lancaster, Pa.

## Real Ale

Dear Zymurgy,

Dave Carpenter's article on Real Ale (July/August 2013) was an excellent primer and gave some very good suggestions for building a cask system from equipment most brewers might easily obtain. However, for those who want to go the whole firkin way in serving cask conditioned ale, there are some options that will make it cost effective.

Search the used market for a beer engine. I bought one in the UK for a good price. I also sourced two new pins (4.5 gallons) from Hereford Casks in the UK for a reasonable price. They sit vertically and do not require a cradle. They also came embossed with my homebrewery name on them—one can never be too careful about getting casks back. Various sundries came from UK Brewing Supplies, which is actually located in Pennsylvania. The owner, Paul Pendyck, was a great help. In the end I spent around \$500, although I was fortunate in that the items I bought in the UK came back as luggage



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#### BANJO THE BREW DOG

Dear Zymurgy,

I've always enjoyed seeing and reading about other brew dogs. I wanted to share one of our brew pups, Banjo. She loves every part of the brewing process, from eating malted barley, lapping up sweet wort, and helping with the occasional spill. She's a true brew dog. I can't imagine brewing without her.

Here's a picture of her at the Middleton Brewing brewpub in Wimberley, Texas, taking a nap while we brew.

Happy brewing,  
Joseph Kouba  
San Marcos, Texas



#### FROM OUR READERS

A homebrew label from Zymurgy reader Chris Goodwin.



by Professor Surfeit



# Hop Addicted

Dear Professor,

I've only been brewing for a year or so, but I was crushed when I read your response to Mike Kilgore about his 100+ IBU question (Dear Professor, May/June 2012). I understand we can't taste past a certain IBU level, but are you confirming Mike's suspicion that you can't attain 100+ on home equipment, or even 80+?

I've been doing 6-gallon batches in a 15-gallon converted keg with 60-90 minute boils using popular homebrew software to calculate my IBU levels. Are these calculations not correct? If not, is it the small batch size or just equipment used? If this is the case, what is special about full-scale breweries that lets them hit these IBUs?

Thanks,  
Patrick Kafka

*Oh Dear Patrick,*  
*I hate to keep popping your bubbles, but even those claims of high IBUs on labeled commercial craft beer are only "calculated" values. When actually tested, the IBUs are much lower. So it is not just homebrewers who struggle to achieve the holy great ale. It takes a great effort for any brewer, whether homebrewer or professional, to achieve very extreme high levels of IBUs in their beer. It involves all components of the brewing process from malt, yeast, hops, temperature, water, and the process of brewing, fermenting, and conditioning. If it were straightforward and simple to achieve, we'd be reading about the more closely held processes that brewers use to get there.*

*One technique that I've previously mentioned is to add processed hop extract to achieve bitterness levels. Adding real hops at the finish will add flavor and aroma. Some of the most popular hoppy ales might just be dosed with*



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Hop to it,  
The Professor, Hb.D.

### When Beer is Not Beer

Dear Professor,

I'm a homebrewer and also a business consultant for several craft breweries. I am working on an interesting new project, trying to create a zero alcohol craft beer. In short, I think there is a market of people who want the experience and taste of a craft beer but who cannot have alcohol for a variety of reasons.

Instead of going the O'Doul's route and brewing a beer and distilling it down to under 0.5 percent ABV, I am trying to get the beer to be 0.0 percent ABV. My best guess is that this means no yeast, no fermentation, and thus not technically beer. Any insight you could provide in pointing us in the right direction would be a huge help.

Cheers,  
Matt G

Dear Matt,

You're pushing the envelope here. Do you want me to get exiled from Zymurgy, using space for a no-alcohol beer? At the risk of igniting a conflagration, I think you still could distill down to 0 percent but that would cost you a lot of whatever flavor is left. There are zero alcohol faux beers out there. They are simply a formulated beverage that tastes similar to beer.

But the bottom line is that alcohol contributes to the character that most people enjoy as beer. Finding those substitutes that mimic the warmth, mouthfeel, flavor, and aroma of alcohol is going to be your challenge. I suppose if you want to take it to the next step you might also find a psychoactive ingredient that mimics the buzz of alcohol, but they'd quickly outlaw it if you did.

Thankful I like real beer,  
The Professor, Hb.D.

**Hey homebrewers! If you have a brewing-related question for Professor Surfeit, e-mail professor@brewersassociation.org.**

By Amahl Turczyn Scheppach

# Dampfbier



**D**ampfbier, literally “steam beer,” is another ancient, working class brew born of necessity. It bears many similarities to Kentucky Common and California

Common, in that its origin was very region-specific, with a local population making the best use of what brewing ingredients were available and affordable. In the case of Dampfbier, that place of origin was the Bavarian Forest, near the Czech border with Germany, though later followings of the style cropped up in the Ruhr region of Westphalia, and more recently revived in 1989 by the Erste Dampfbierbrauerei (First Steam Beer Brewery) in the small Bavarian town of Zwiesel.

Though not imported to the United States, a few German interpretations are currently brewed. For example, the Maisel Brewery in the Bavarian town of Bayreuth

makes a smooth, reddish-copper version with fruity notes of peach, banana, and some caramel and nuts. Zwiesel's is darker, almost chestnut, with more plum than banana, bread, and bit of bubble-

gum. It also has a faint melon tartness, all of which will be familiar to brewers of Bavarian weisse beer—only without the grainy wheat notes. Our recipe's target will be closer to Zwiesel's version, on



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# Schwarzwälder Dampfbier

## INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

<b>5.25 lb</b>	(2.38 kg) German Vienna malt
<b>4.0 lb</b>	(1.81 kg) 6-8° L German Munich malt
<b>4.0 oz</b>	(113 g) 80° L Cara-Munich malt
<b>2.0 oz</b>	(57 g) 400° L Carafa malt (optional—adds about 4 SRM)
<b>1.0 oz</b>	(28 g) Hallertauer Mittelfruh pellets, 4% a.a (FWH)
<b>0.75 oz</b>	(21 g) Hallertauer Mittelfruh pellets, 4% a.a, (whirlpool 10 min)

Wyeast 3333 German wheat or White Labs WLP830 Hefeweizen IV ale yeast

**Original Gravity:** 1.048 (12° P)

**Finishing Gravity:** 1.009-1.010 (2.5 P)

**IBUs:** 16

**SRM:** 12 (with Carafa)

**ABV:** 4-5%

**Boil Time:** 60 minutes

## DIRECTIONS

Mash for one hour at 150° F (66° C). Sparge until wort gravity reaches 1.008 (2 P) or pH 5.8 (whichever comes first). If necessary, top off the boil volume with brewing liquor and discard anything else

from the lauter; tannins, silicates and other grain extractives will contribute a harshness that you definitely don't want in your Dampfbier. Add second hops at flameout and steep 10 minutes (or during whirlpool) before chilling. For a more traditional, ester-forward banana, bubblegum, and apple profile, chill to 68° F (20° C), aerate and pitch. Allow to rise naturally to 72° F (22° C). Ferment three to five days, or until terminal gravity is reached. For a more phenolic brew emphasizing clove and stone fruit esters, chill to 62° F (17° C) and ferment at that temperature for seven to 10 days or until terminal gravity is reached. Make sure you have a sufficient quantity of yeast (185 B cells, 2 packs/vials, or a 1.65 L starter) if you will be cold-pitching. Carbonate and condition 3-4 weeks at 40° F (4° C).

## EXTRACT VERSION

Substitute 3.5 lb (1.59 kg) pale malt extract syrup and 2.75 lb (1.25 kg) Munich malt extract syrup for the Vienna and Munich malts. Steep specialty grains in 160° F (71° C) water for 30 minutes; rinse grains, dissolve extracts completely, and proceed with boil. If Munich malt extract is unavailable, one can use amber malt extract instead, but due to the variations in amber extract composition from brand to brand, results may vary.

the darker side of the scale, but most modern versions range a bit lighter, from red-amber to copperish gold. A few craft brewers within the U.S. have also tried their hand at a revival of the style, among them Victory Brewing in Downingtown, Pa., The August Schell Brewing Company in New Ulm, Minn., and Colorado Springs' Phantom Canyon Brewing.

Like the Common beers of the United States, Dampfbier was made by locals for locals—it was not meant as a keeping beer, nor was it meant to be transported any great distance. At only about 12° P (1.048 SG) and at no more than 5 percent ABV, it was barely more than a session-strength ale. Its brewers did not have exacting control over fermentation temperatures, so in a time when lager beers were popular but relatively expensive to make, ales like Dampfbier were fermented fast and warm, usually in about three days, and consumed fresh.

Brewers could condition the beer at somewhat cooler temperatures, thanks to 30-foot-deep storage cellars they dug into the rocky hills of the region; casks were lowered into these caves, their contents krausened with a measured amount of boiled, unfermented wort, and left to carbonate and mature for three or four weeks. This practice resulted in a smooth, well-attenuated, fairly clear beer by ale standards, but while the "steam" from California Common is believed to refer to the formidable conditioning pressures built up before casks were tapped, sources suggest Dampfbier carried a much lighter volume of CO<sub>2</sub>. So the "steam" is thought to be a reference to the turbulent evolution of gas during the beer's warm (and originally open) fermentation. Considering the rocky, yeasty head of foam that forms on the top of the ferment with many of the Bavarian wheat yeast strains, it's plausible to suggest that that might also have been compared to "steam." There is actually a traditional German steamed dumpling called "dampfnudel" which, when rising, closely resembles the foamy, yeasty fermentation of its namesake beer.

During Germany's Industrial Revolution, when Dampfbier really came into its own as a style, wheat was a precious

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commodity, more likely to be used for bread than beer. So brewers in the Black Forest region had to make do with somewhat crudely malted barley, which probably was more like today's Munich malts than pale malt. Most grain bills call for a blend of one-third light Munich malt to two-thirds Pilsner malt for the base, with a few recipes adding a bit of darker malt for color. Vienna malt would also be an appropriate substitute for Pilsner in the base malt blend, though light Munich should also be included; Vienna alone would produce too pale a beer. Dark Munich malts are a bit too toasty, so use the lightest Munich malt you can find, preferably 6-8° L. And with such a low hopping rate, caramel malt should also be avoided, even though many modern examples exhibit a caramel-like sweetness. With such a light beer, it can easily get too sweet if full attenuation isn't reached. However, a modest addition of CaraMunich malt adds a pleasant fullness on the palate, and coupled with a tart weissbier yeast (see below), it tends to enhance the maltier, breadier character of the Munich malt. Mash for fermentability—a single infusion is fine.

Wealthier regions of Bavaria did of course brew weissbier, so their breweries became the best source for brewers yeast. Enough surplus wheat ale yeast was produced at these breweries that Dampfbier brewers could take what they needed; so essentially, Dampfbier is a Bavarian wheat ale made with an all-barley grist. Fermented above 70° F (21° C), the yeast will contribute fruity esters and spicy phenols to the beer, depending upon the strain you choose to use. Some strains will also give the beer a slightly tart tang, like the Zwiesel version mentioned previously, and this is an intriguing complexity; it also adds a bit of balance to the malty beer. So you have some choice here, depending upon which character you prefer. I personally like plum, apricot, and apple for esters; generally low phenols (though a bit of clove is nice); and a slight tartness. My favorite weisse beers are Unurlt, Plank, and Hopf, all of which include a nice dose of acidity at the finish. So Wyeast 3333 or White Labs WLP830 Hefeweizen IV are my preferred strains for Dampfbier; they are not the exact same strains used by

those breweries, as far as I know, but they will lend a similar tartness to the brew. They will also produce lots of clove at lower temperatures (around 62° F, or 17° C), so if you favor clove over banana and apple, and have a large enough quantity of yeast at pitching to fully attenuate your Dampfbier, by all means try the recipe with a cooler ferment!

If you do go for the more traditional warm fermentation, it's a good idea to use several drops of a silicon polymer antifoam like

Fermcap S—one mL per gallon is usually sufficient, and if you add it in the kettle, you get less foam there too, and enough antifoam carries over into the fermenter to prevent or reduce blowoff. Otherwise, despite not having the viscosity of a wheat malt wort, things can be fairly explosive at high krausen.

Hops, too, were readily available to the original Dampfbier brewers, but the best quality hops from the nearby Hallertau region were reserved for the breweries that

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could afford them. The Black Forest brewers had to settle for cruder local varieties, so they used as little as they could get away with. As a result, the style generally has very low bitterness, seldom exceeding 15 IBUs, and little hop aroma, at least traditionally. We of course have the luxury of using the very same high-quality hops they were denied; Hallertau Mittelfruh is excellent in Dampfbier, and its floral, soft spice aroma is surprisingly compatible with the fruity, yeast-derived esters from the wheat beer yeast. So, while it's not

strictly traditional, I like to add a modest aroma addition at flameout in addition to a first wort charge of Mittelfruh.

One ingredient the region had in abundance was water, but with its relatively high hardness and alkalinity, it didn't have an ideal profile for the brewing of light amber ales. But assuming brewers boiled the water prior to mashing in, allowing carbonates to precipitate and a reduction of residual alkalinity, the profile would look much better: about 20 ppm

**THE BLACK FOREST BREWERS HAD TO SETTLE FOR CRUDER LOCAL VARIETIES, SO THEY USED AS LITTLE AS THEY COULD GET AWAY WITH. AS A RESULT, THE STYLE GENERALLY HAS VERY LOW BITTERNESS, SELDOM EXCEEDING 15 IBUS, AND LITTLE HOP AROMA.**

calcium, 17 ppm magnesium, 120 ppm chalk, 4 ppm sodium, 8 ppm chloride, 18 ppm sulfate, and a residual alkalinity of 74. A water profile similar to that used for an Oktoberfest beer would be a good starting point if you are building your brewing water from scratch.

As for carbonation, krausening is traditional, and does a great job producing a tightly beaded foam. It also keeps you safely within the dubious confines of the Reinheitsgebot. But while I nearly always krausen and bottle my weissbiers, mainly to achieve the high levels of carbonation (and yeast) that fit so well with the style, I find there is less reason for the extra work when one only needs 2 to 2.5 volumes, as with Dampfbier. So force carbonating before the long cold-conditioning period of three to four weeks is fine; this is an all-malt beer, so foam retention and quality should not be an issue. Serve cold in your favorite German stein with a side of Dampfnudel or, if you are in a particularly black and foresty mood, a slice of Schwarzwälder Kirschtorte.

#### Resource

German Beer Institute,  
[www.germanbeerinstitute.com](http://www.germanbeerinstitute.com)

**Amahl Turczyn Scheppach** is the associate editor for *Zymurgy*. He is a former professional brewer who now brews at home in Lafayette, Colo.



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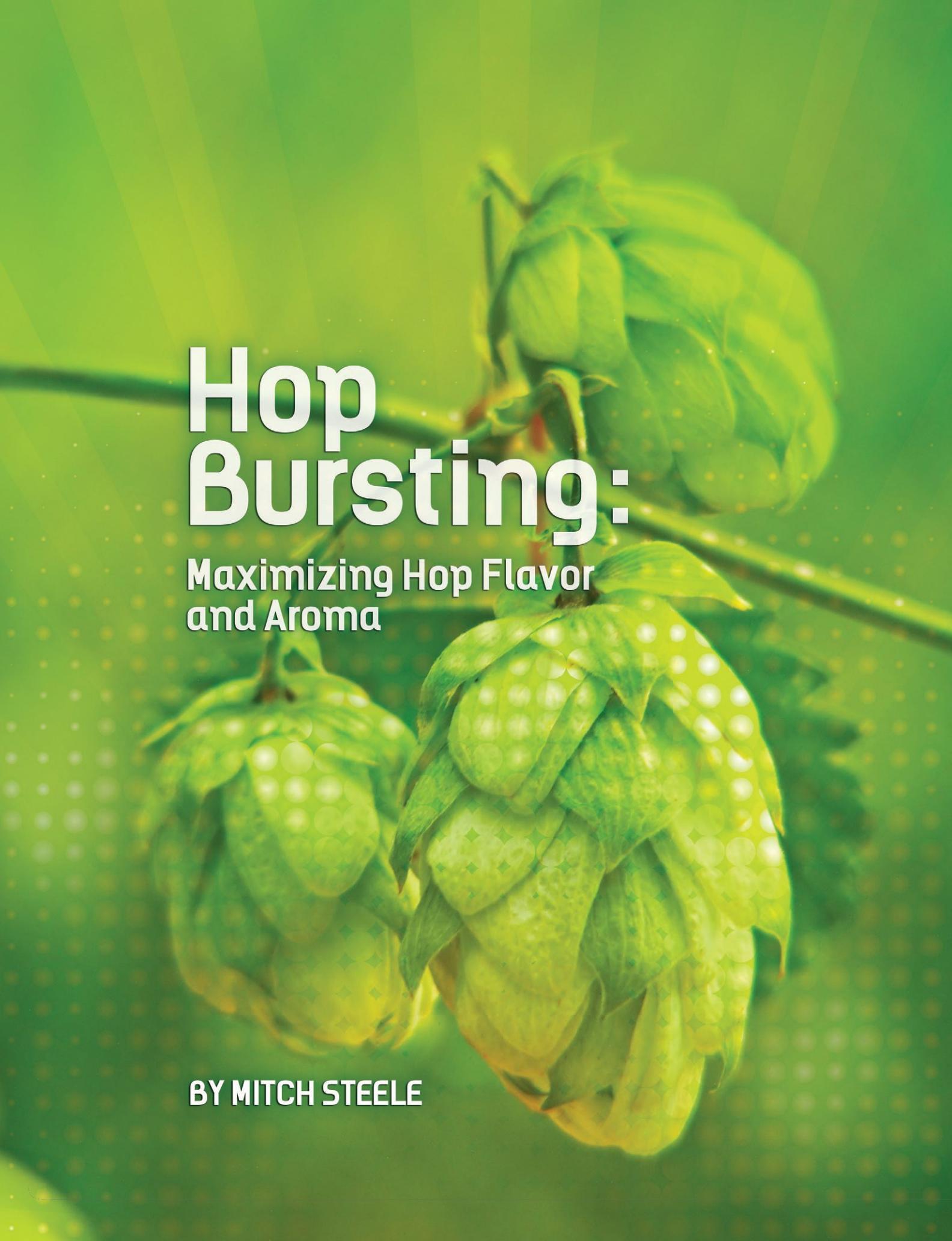
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# Hop Bursting:

## Maximizing Hop Flavor and Aroma

BY MITCH STEELE



In June, I gave a talk at the National Homebrewers Conference in Philadelphia on some interesting new techniques and ingredients that can be used for brewing IPAs. One of the topics I reviewed was the technique called “hop bursting.” Many brewers are using hop bursting to maximize hop flavor and aroma in their beers, and it is gaining in popularity.

In short, hop bursting refers to eliminating or minimizing the early kettle hop addition, frequently referred to as the “bittering addition,” and getting most or all of the hop alpha acid isomerization and bitterness from late kettle additions. The desired end result is a smoother bitterness and enhanced hop flavor and aromatics.

### Hop Utilization

Most brewers understand the dynamics between the timing of the hop addition and its impact on bitterness, flavor, and aroma retention in the resulting beer. The basic premise of this dynamic is that the longer the amount of time the hops are boiled, the more isomerization of hop alpha acids to iso-alpha acids is achieved. Iso-alpha acids are more soluble in wort and provide the bitterness that carries through to the resulting beer.

The consequence of adding hops early in the boil to maximize boiling time and bitterness is that much of the hop flavors and aromatics are volatilized and escape with the steam as the boil evaporates

and concentrates the wort. To counter this situation, brewers typically follow the bittering addition with later doses of more aromatic hops that are boiled for a shorter amount of time, and therefore

retain more hop flavor than the earlier additions.

Hop utilization is a common measurement used in calculating the amount of



iso-alpha acids obtained by kettle additions. The basic formula for hop utilization is:

Hop Alpha Acids added X 100  
Iso-alpha acids obtained

In general, when using hop pellets, utilization can be anywhere from 25 to 35 percent, depending on the amount of time the hops are boiled, the alpha acid content of the hops, the intensity of the boil, and the wort gravity. Complex formulas and spreadsheets are available online and in beer formulation programs that attempt to estimate utilization numbers, factoring in time of addition and other issues that impact utilization. From these calculations, brewers can determine a reasonable hopping schedule for their recipes, and get a reasonable prediction of IBU levels.

Example of hop calculations:

Grams hops =  
(wort volume (L)) (desired IBU)(0.001)  
(% utilization) (weight average alpha acids)

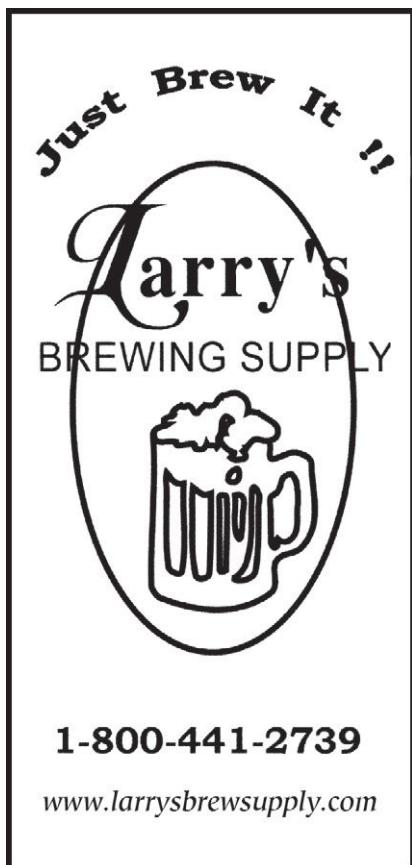


Table 1: Examples of hop utilization values under varying circumstances.

Hop Utilization Chart					
WORT DENSITY (BALLING)	8-12.5	12.5-16	16-18	18-20.5	20.5-23
BOIL TIME (MINUTES)	UTILIZATION %				
90	31%	28%	27%	26%	24%
60	28%	26%	24%	23%	21%
30	15%	14%	13%	13%	12%
15	8%	8%	7%	7%	7%
5	5%	5%	5%	4%	4%
0	5%	4%	4%	4%	3%

Table 2: Hopping Schedules in the Brewhouse

Hopping Schedules In The Brewhouse	
TRADITIONAL	HOP BURSTING/ MODIFIED HOP BURSTING
Bitter	Bitter
Largest addition (based on alpha acid contribution)	Very little or none. First wort hopping if used.
Usually only 1-2 varieties	
Often not highly aromatic	
Flavor	Flavor
Late boil addition	Very large addition
Typically 1-2 varieties	Many varieties
More aromatic varieties used	
Aroma	Aroma
Flameout and/or whirlpool addition	Very large addition
1-2 varieties	Many varieties
Highly aromatic varieties used	Highly aromatic varieties

Ounces hops =  
(gallons wort) (desired IBU)  
(% utilization) (weight average a.a.\* ) (7490)

\*a.a.=alpha acids

Using different hop products, such as whole hops or CO<sub>2</sub> extract, will change the utilization result. In general, whole hops provide the lowest utilization and extracts provide the most, sometimes up to 40 percent when added early in the boil.

## Hopping Methods

First, let's review traditional hopping methods. Since the homebrewing and craft brewing revolution that started in the 1970s, most brewers have approached kettle hopping by using three to four hop additions during a 60- to 90-minute boil. The first, or bittering, addition usually consists of what is commonly referred to as a bittering hop, usually with a high alpha acid content and little in the way of hop oils (or flavors). Varieties such as Magnum, Nugget, Galena, and Warrior are commonly referred to as bittering hops. The idea behind the bittering addition is to impart most of the wort bitterness—70 to 80 percent of the total.

Brewers then add flavor hops in one or more stages later in the boil. These hops are boiled anywhere from five to 30 minutes, providing varying amounts of bitterness depending on when they are added. It's important to note that typical utilization rates are 15 to 20 percent, and more flavor and aroma are retained. Hop varieties used include East Kent Golding, Hallertau, Cascade, and many others, depending on what style of beer is being brewed. Many brewers look for low cohumulone values, as research suggests that high levels of cohumulone increase bitterness harshness, although that supposition is falling out of favor among several brewers.

At the end of the boil, flameout, or whirlpool, more hops, referred to as "aroma" hops, are added, providing both flavor and aroma. Many brewers neglect to consider the bitterness obtained from this addition, but it can be substantial, depending on the volume of hops added. I've seen utilization numbers as high as 20 percent from the whirlpool additions at Stone Brewing Co.

One interesting thing I learned while writing *IPA: Brewing Techniques, Recipes and the Evolution of India Pale Ale* is that in the 1800s, English brewers felt that boiling their hops more than 30 minutes resulted in a coarser, harsher bitterness. For that reason, many brewers from this period pulled their hops out at 30 minutes and added a fresh dose (the hops were in bags). They repeated this process several times, and the result was reportedly a smoother, cleaner bitterness.

The thinking behind hop bursting is similar. Long boiling times are eliminated, and all the hops are added later in the boil. Often these amounts are at ridiculous quantities, but the result is an intense hop flavor. Many feel it is a cleaner, smoother bitterness, with more hop flavor retention.

Massive late-kettle hopping is nothing new, and many brewers over the years have added large amounts of hops at the end of the boil and/or in the whirlpool to brew

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## Hop Burst IPA

### Ingredients

for 5 U.S. gallons (19 liters)

10.0 lb	(4.54 kg) pale malt
1.0 lb	(0.45 kg) 20° L crystal malt
8.0 oz	(227 g) light Munich malt
0.2 oz	(5.6 g) Magnum pellets, 11% a.a. (FWH) – optional
1.5 oz	(42.5 g) Amarillo pellets (15 min)
1.5 oz	(42.5 g) Centennial pellets (15 min)
0.8 oz	(22.6 g) Amarillo pellets (whirlpool)
0.8 oz	(22.6 g) Simcoe pellets (whirlpool)
0.8 oz	(22.6 g) Centennial pellets (whirlpool)
0.8 oz	(22.6 g) Citra pellets (whirlpool)
0.8 oz	(22.6 g) Sterling pellets (whirlpool)
0.8 oz	(22.6 g) Amarillo pellets (dry hop)
0.8 oz	(22.6 g) Simcoe pellets (dry hop)
0.8 oz	(22.6 g) Centennial pellets (dry hop)
0.8 oz	(22.6 g) Citra pellets (dry hop)
0.8 oz	(22.6 g) Sterling pellets (dry hop)
1 teaspoon	gypsum
~10 gallons	water
	White Labs WLP001 California or Wyeast 1056 American ale yeast

Target Original Gravity: 1.064/16° P

Target Terminal Gravity: 1.011/2.8° P

Brewhouse Efficiency: 70%

Color: 8° L

IBU target: 70

ABV: 7%

### Mashing

Mix the gypsum with 4.25 gallons (16 L) water, heat to 185–190° F (85–88° C) and then let cool to about 170° F (77° C). Combine the milled malts with the water and stir thoroughly to wet all the malt. Hold at 152° F (67° C) for 60 minutes.

### Lautering and Sparging

Start drawing wort off and adding it back over the top of your mash until the wort is reasonably clear, then divert the wort flow to your kettle/pot. When the wort level is just above the grain, start sparging with 165–170° F (74–77° C) water.

Continue sparging and drawing wort off until you reach 7.5 gallons (28.4 L) in your kettle/pot, or until your wort is at 2.25° P/1.009 SG, whichever comes first. Top up pre-boil kettle volume to 7.5 gallons (28.4 L) with brewing liquor if necessary.

### Boiling

Start heating the wort when you are about half-way through the sparge. Add hops according to the schedule in the recipe, and boil for 60–90 minutes (until you hit your gravity target).

At the end of boil, turn the heat off and stir the wort to create a whirlpool. Add the whirlpool hops (some brewers like to add in stages here, for example, 50% of the whirlpool hops at flameout, and 50% of the whirlpool hops about halfway through the cooling cycle).

### Chilling/Aeration and Fermentation

Chill the wort to about 65° F (18° C), aerate, and add the yeast. Ferment at 68–70° F (20–21° C). When primary fermentation is almost complete, consider racking off into another vessel before dry hopping.

### Dry-Hopping

Add the hop pellets (again, some brewers may want to try adding 50% initially, then add the remaining 50% three to four days later). Shake your carboy, or agitate the beer somehow to get the hops thoroughly mixed and suspended in the beer. Repeat the agitation twice, at 24-hour intervals.

Chill the beer to 35° F (2° C) and age for at least seven days before racking off the hops and packaging.

### Mini-Mash Version

Substitute 7.3 lb (3.3 kg) pale malt extract syrup or 5.9 (2.67 kg) pale dry malt extract for pale malt. Conduct a mini-mash with the Munich and crystal malts at 155° F (68° C) for 45 minutes. Rinse grains, dissolve extract completely, and proceed with boil.

fantastically hoppy beers. Where hop bursting differs from this practice is the elimination or minimization of the bittering addition. Another key component of hop bursting is to use many varieties of hops in the later additions, as opposed to only one or two. The concept here is to also get massive hop flavor complexity.

Some cautions regarding hop bursting:

1. Skipping early hop additions can result in excessive foaming of the wort during most of the boil. Hops, once added and suspended in wort, act as a very effective foam inhibitor. One way to deal with this is to simply add a very small amount of hops at the beginning of the boil to control the foam.
2. Hop utilization will change drastically using hop bursting, and can be very difficult to predict with formulas. Utilization is substantially decreased when adding hops later, even in higher amounts.

### Modified Hop Bursting

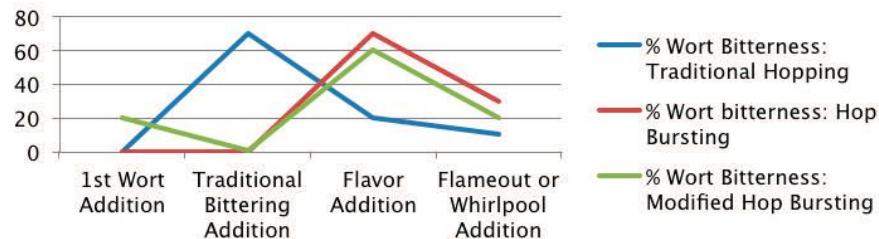
Many brewers try hop bursting and then go back to using a variation of the process that includes adding some bittering hops. One effective method that we've used at Stone includes a first wort hop addition (hops added to the first bit of wort recovered from the lauter). The hops steep in the wort as the lautering proceeds, and are then boiled. The traditional bittering hop addition is then skipped, and no more hops are added until the late flavor/aroma additions. Research, including our own in-house analysis, has proven up to a 10-percent increase in utilization by using first wort hopping vs. a traditional bittering hop addition at the beginning of the boil, and many brewers feel the result is a smoother bitterness as well. The thinking is that the extra residence time in the wort increases the extraction of the resins and makes them easier to isomerize when the wort comes to a boil.

At Stone Brewing Co., we have used hop bursting or a modified hop bursting process a few times. The first was when we brewed the collaboration Kelsey McNair/Ballast Point/Stone San Diego County Session Ale, a session IPA that was late-hopped with five different varieties. This beer had no bittering addition, but it did

have a mash hop and first wort addition. One added benefit we saw from this technique was that the beer retained its intense fresh hop character long past its designated 90-day shelf life.

Another example is our Stone Enjoy By IPA, in which the bittering hop accounts for only 40 percent of the bitterness; the rest is provided by massive late hop and whirlpool additions that also provide

Figure 1: Percentage of Bitterness Obtained by Varying Hopping Schedules





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**Ingredients Checklist:**

- ✓ Malt
- ✓ Hops
- ✓ Yeast
- ✓ Spices
- ✗ Chlorine?
- ✗ Sediment?
- ✓ Clear, Fresh Water

loads of flavor and aromatics. I remember the first time we brewed this beer. We taste/aroma check all our fermentations daily for quality reasons, and when this beer was nearing the end of fermentation, the hop character was so huge that we thought it had already been dry-hopped. Stone Enjoy By IPA comes in at about 85 IBUs, but the bitterness is smooth and the hop character is intense.

Other commercial beers that are known to use hop bursting or massive late-hopping

techniques include AleSmith Evil Dead Red, GoodLife Mountain Rescue Pale Ale, Heretic Evil Twin, and many beers from Altamont Beer Works. Many of Matt Brynildson's beers at Firestone Walker as well as Bell's Two Hearted Ale and Hop Slam are thought to use a modified hop bursting technique with large late-boil additions. Most of Drake's hoppy beers use modified hop bursting, and Alexandra Nowell took that technique with her to Kinetic Brewing when she left Drake's and joined them earlier this year.

## Hop Bursting Tips

1. If you remove the bittering hops, make sure you add more than that amount (based on alpha acid contribution) to the late additions because utilization most likely will be substantially lower.
2. Consider using several varieties in the late additions and flameout whirlpool additions. This provides increased complexity, and as an added benefit, helps you survive hop shortages if you can't get the hops you need to brew the same beer. It's much easier to approximate the hop aromatics of many different varieties than it is to replicate a single hop that you can no longer get.
3. If brewing an IPA, for the late additions consider using each of the 4 C's (Cascade, Columbus, Centennial, Chinook), as well as Citra, Simcoe, Amarillo, Mosaic, and/or Southern Hemisphere hops such as Nelson Sauvin or Motueka.
4. Realize you may have to add some bittering hops to minimize foaming. If you do, consider using first wort hopping, and keep the IBU contribution in single digits. Using a traditional low-alpha aroma hop, or a small amount of a traditional bittering hop, is an effective technique if you have to add hops early in the boil.
5. Use pellets for the late-hop additions. Adding massive amounts of whole hops presents challenges in getting enough utilization, and whole hops also tend to soak up lots of wort. Extracts, in my opinion, don't provide sufficient flavor contribution for hop bursting.
6. Hop bursting is an effective method to enhance the classic hop flavors in Pilsners (Hallertau or Saaz) or English pale ales (Golding or Fuggle).
7. The distinction between "bittering" hops and "aroma" hops is becoming quite blurred as new hop varieties and techniques are developed. Don't be afraid to go non-traditional with your hopping approach. You may or may not like the result, but you will likely learn something new every time.

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BREWING WATER SERIES:  
**Ireland**

Guinness Lake in Wicklow Mountains Ireland



*Editor's Note: This new series explores the water quality from famous brewing centers, its effects on beer styles, and the relevance to modern day homebrewing.*

Ireland has long been known for its stout and porter brewing expertise. For more than 250 years, Ireland has been home to an assortment of storied breweries. Notable breweries include Harp, Beamish, Murphy's, and Guinness. Their brewing success, history, and lore can often be tied to the water native to each brewery.

The popular perception of Irish water (mainly Dublin) is that it is hard and alkaline. This article will explore the condition of water in various cities across Ireland and how that affects brewing practices and beer styles in the country.

## GEOLOGY

Geology has a direct effect on water quality in a region. Ireland is an island with a total land area similar to that of Indiana. In Map 1, the major rock types found

across Ireland are presented in a highly generalized format. Several cities with prominent brewing history are denoted on the map.

Dundalk is the home of the Harp brewery, Dublin is home to Guinness, and Cork is home to the Beamish and Murphy's breweries. Although the map implies that the various areas are covered only with the stated rock types, there is some intermingling of rock types in many of the areas. The most important information that should be taken from the map is that much of central Ireland is covered with limestone, and other rock types exist around the periphery of the island.

Limestone is a soluble stone that contributes hardness and alkalinity to water that comes in contact with it. Therefore, it is reasonable to expect that groundwater and surface water in Central Ireland is hard and alkaline. The map shows that Dublin is located in a limestone area. Additionally, several rivers draining from Central Ireland flow through the city.

Hardness in drinking water is primarily due to the presence of calcium and magnesium dissolved from limestone or dolomite rock. Dolomite is a magnesium-rich form of limestone. Typical drinking water from regions with limestone has a pH between 7 and 9. Under that pH condition, alkalinity in drinking water is largely due to dissolved bicarbonate. Both limestone and dolomite contain carbonate that dissolves into water, mostly as bicarbonate. Hard and alkaline water can be expected in limestone regions and soft, low-alkalinity water can be expected in regions with little or no limestone.

While hard and alkaline waters are present in many areas of Ireland, the country's softer and less alkaline waters are the key to its successful brewing history. As noted on the map, Ireland has non-limestone areas. In Southern Ireland, a wide veneer of sandstone and slate sits over deep limestone beds. Sandstone and slate are both relatively inert geologic formations that do not contribute much mineralization to water flowing over it or through



BY MARTIN BRUNGARD

it. Igneous rock formations found in Northern Ireland and along the east and west coasts include granite, basalt, and gneiss. Igneous rock is also relatively inert and contributes little mineralization to water flowing over or through it.

Therefore, the geologic map can also be used to describe where softer, low alkalinity water supplies are likely to exist. For the major Irish brewery cities noted previously, the map shows that soft, low-alkalinity water is probably available. In the case of Dublin, that assumption is not as apparent and a closer review of its water supply is needed.

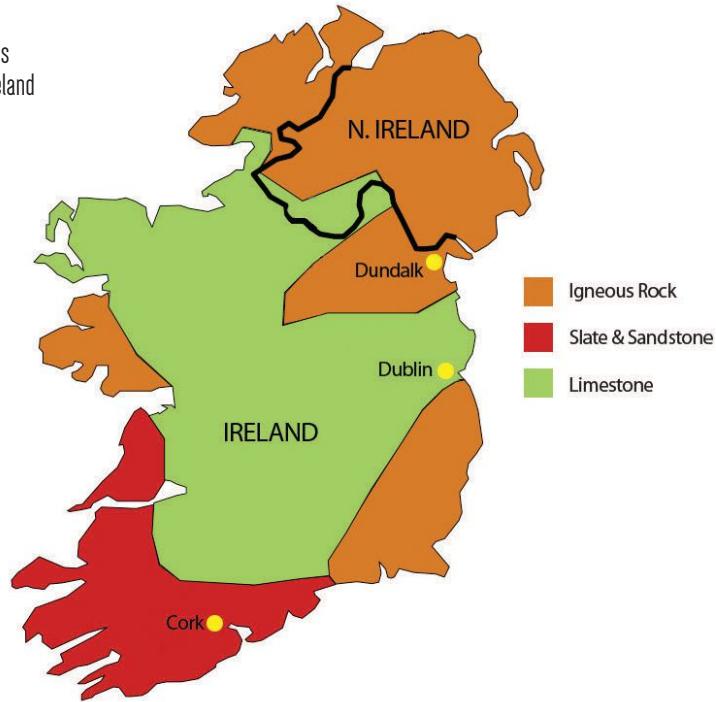
## WATER SUPPLIES

Where a brewery's water comes from has direct impact on water quality. The water supplies vary for these Irish brewing cities. Since the 1760s in Cork, a reservoir on the River Lee has collected river water that flows through mostly sandstone and shale lands in the region, resulting in fairly soft and low-alkalinity water. While the reservoir is the preferred supply, groundwater wells are utilized in dry periods. Groundwater is typically drawn from the limestone below the sandstone and shale and is hard and alkaline. Under normal conditions, Cork water is typically fairly soft and has low alkalinity.

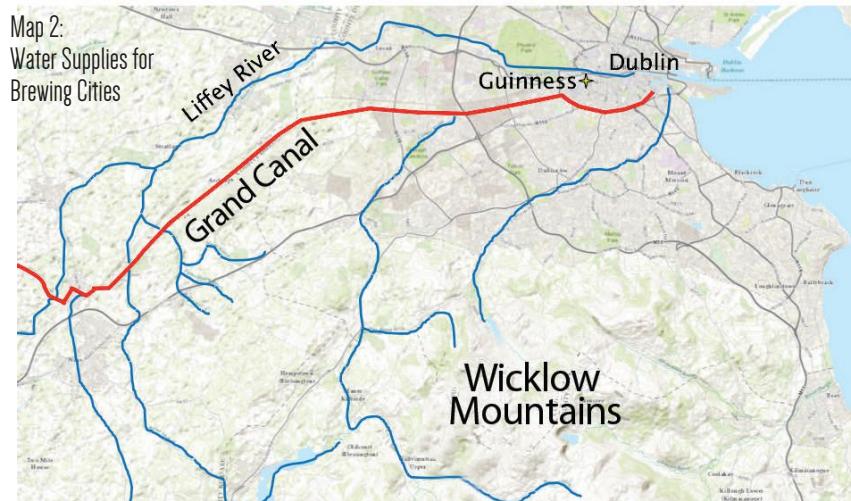
In Dundalk, a combination of river water and groundwater is used. Since the region is dominated by granite, sandstone, and shale, both the river water and groundwater are fairly soft and have low alkalinity. The Harp brewery has only been brewing its lager in this location since 1960.

Dublin presents the most complex water supply conditions and history. The water supply originally relied on the local rivers and wells, but they were insufficient to supply the growing city. By 1780, the Grand Canal was in operation as a barge canal. When the canal was built, the Dublin city fathers stipulated that the canal also supply the city with water. As noted in Map 2, water from the Wicklow Mountains south of Dublin was used to maintain the canal and deliver water to Dublin. Rivers and streams are highlighted in blue and the canal in red. Interestingly, the Grand Canal passes

Map I:  
Major Rock Types  
Found Across Ireland



Map 2:  
Water Supplies for  
Brewing Cities



within three-fourths of a mile of Guinness' St. James Gate brewery. The brewery location is shown on the map. Canal water leaking into groundwater probably helped recharge the original water supply wells at the Guinness brewery.

In the 1860s, Dublin began construction of a series of reservoirs and aqueducts to convey water directly from the Wicklow Mountains into the city. That reservoir and aqueduct system now supplies much of the southern half of Dublin, along with the Guinness brewery. The remainder of the city is supplied by the Leixlip water-

works, which draws water from the Liffey River. The Liffey receives some of its water from the Wicklow Mountains; however a portion of the flow is from limestone-dominated central Ireland. Depending on the rainfall conditions, the water quality in the Liffey River (and the water supply to the northern half of Dublin) can vary between hard/alkaline water and soft/low-alkalinity water.

## WATER QUALITY

Given the source water for these cities, some variation in water quality can be expected. However, the geology in the



## Bru'n Dry Stout

Brewing dry stout is easy when you have the right water. Low-alkalinity water, such as distilled or reverse osmosis water, is well suited for brewing a dry stout. The low alkalinity allows the wort pH to fall into a desirable low range and create a tart, acidic flavor that is a signature of the style. If the brewing water has high alkalinity, then acidification is probably needed for the mashing and sparging water to neutralize the excess alkalinity.

### INGREDIENTS

for 5.5 U.S. gallons (20.8 L)

6.5 lb (2.95 kg) two row pale malt  
1.3 lb (590 g) flaked barley  
14.0 oz (397 g) roast barley  
1.5 oz (42 g) East Kent Golding hops,  
5% a.a. (60 min)  
0.5 oz (14 g) East Kent Golding hops,  
5% a.a. (15 min)  
Irish Ale yeast

Original Gravity: 1.042

Final Gravity: 1.012

SRM: 31

IBU: 36

Assumed Efficiency: 76%

### DIRECTIONS

Mash pale malt and flaked barley in low-alkalinity water (acidify as necessary to produce a mash pH of 5.3 to 5.5) at a temperature of 146-150° F (63-65° C) for 60 minutes. Add roast barley to mash at end of mashing period. A mash out step to 168° F (76° C) is helpful, but optional. Sparge the mash with low-alkalinity water that is acidified to a pH between 5.2 and 5.7. Boil the wort for 60 minutes. Minimal brewing salts are desirable in the water. As a starting point, when using RO or distilled water, add a half-teaspoon

of both gypsum and calcium chloride per 8 gallons (30 L) of water, or use a program such as Bru'n Water to guide the mineral and acid additions.

### EXTRACT VERSION

A partial mash is recommended to help break down the flaked barley. Mash 2 lb (0.9 kg) of pale malt with flaked barley in low-alkalinity water at 120-150° F (49-65° C) (lower temperature is better) for 60 minutes. Add roast barley at end of mashing period. Sparge mash with low-alkalinity water (acidified as above). Substitute 3.5 lb (1.59 kg) of liquid pale malt extract for the remainder of the pale malt in the recipe. Use low-alkalinity water to dilute extract. Boil as indicated above.

### VARIATIONS

Many English hop varieties can be substituted in this beer. Irish Ale yeast is preferred for its ester profile; however a clean U.S. ale yeast may be substituted. For broadened flavor, an ounce or so of the roast barley may be substituted with black, coffee, or chocolate malt. If preferred, a separate liquor made from steeping the roast malt in low-alkalinity water can be created and added to the finished wort.

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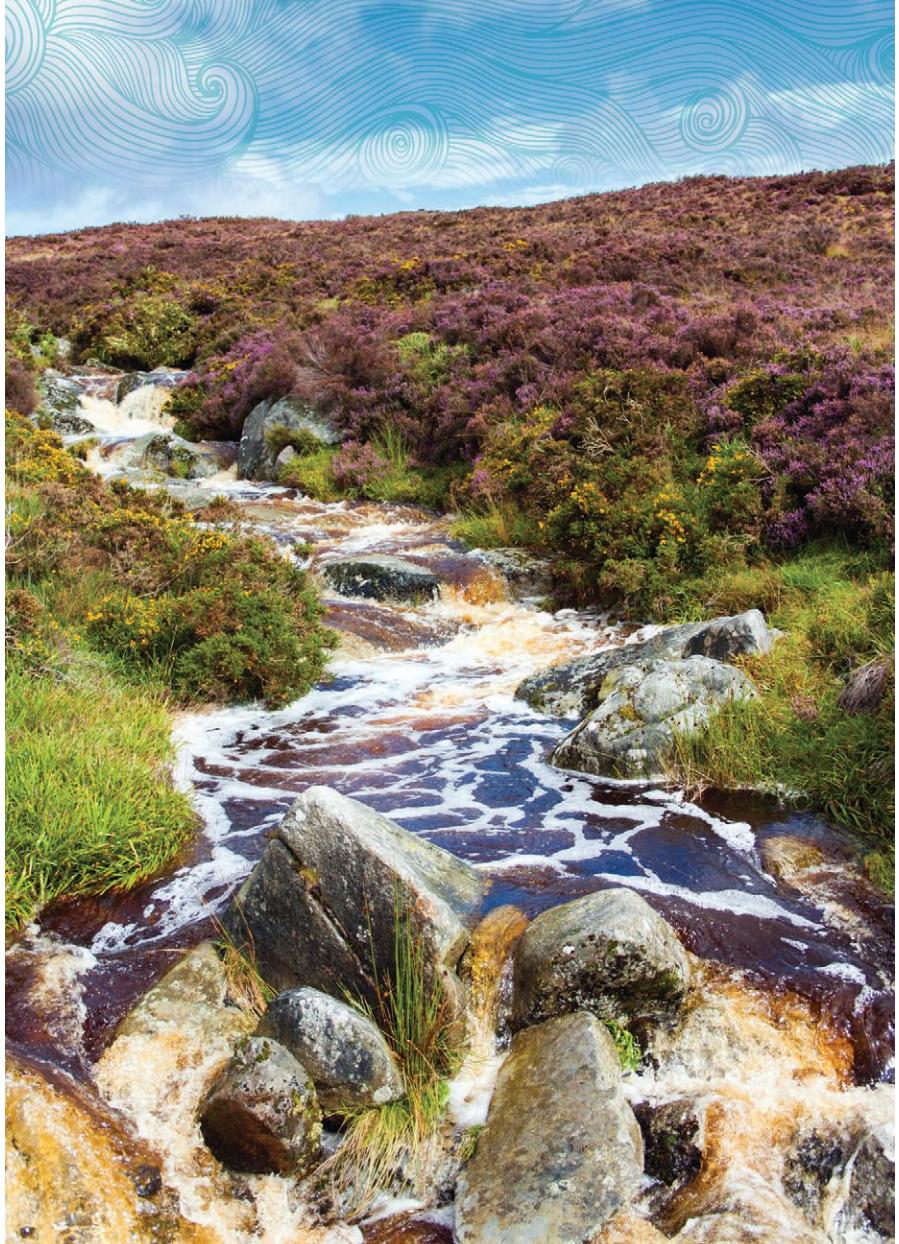
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watersheds feeding the water supplies does provide a basic indication of water conditions for those regions. Areas with igneous rock, sandstone, or shale will not produce much hardness or alkalinity in the water, while limestone areas will. In the case of the Wicklow Mountain watershed, the water quality may be typical of the profile in Table 1.

Table I:  
Estimated Wicklow Water Profile

Ion	Concentration (mg/L)
Calcium	18
Magnesium	2
Sodium	13
Chloride	20
Sulfate	22
Bicarbonate	35
Residual Alkalinity (as $\text{CaCO}_3$ )	14

Source: Ballymore Eustace 2012 Water report

The Wicklow water profile was taken from one of the water treatment plants supplying Dublin. Although the ion concentrations are expected to vary with the water source and rainfall, all concentrations are relatively low. For comparison, distilled water has concentrations of zero for all ions. Please note that mg/L is also referred to as "parts per million" or ppm.

Along with the ionic concentrations, the Residual Alkalinity (RA) of the water is presented. RA relates how the water's hardness and alkalinity react in the mash. In general, very low or negative RA values are needed to brew pale beers while dark or acidic mash grists may need RA of up to 100.

Given the isolation of the Cork and Dundalk watersheds from limestone, it is reasonable that their water quality should be similar to that shown for Wicklow.

As noted previously, Dublin does obtain a portion of its water supply from the Liffey River that flows from the highlands of central Ireland and the Wicklow Mountains. The Leixlip water treatment plant supplying that water reports the concentration ranges in their water in Table 2. The variation is largely due to varying rainfall.

**They all laughed  
when I told them  
I make my own beer...**

**until I poured  
them a pint.**

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Table 2: Liffey River Water Profile

Ion	Concentration (mg/L)
Calcium	50 to 120
Magnesium	5 to 10
Sodium	10 to 15
Chloride	15 to 25
Sulfate	35 to 55
Bicarbonate	85 to 250

Source: Leixlip 2009 Water report

From the Liffey River report, we can see parallels to the Dublin water profile. A purported Dublin water profile is presented in Table 3. Many of the concentrations are similar. This purported Dublin water profile was compiled from a variety of references. In this profile, RA is extremely high and beyond what is needed for even the darkest or most acidic mash grists.

Table 3: Purported Dublin Water Profile

Ion	Concentration (mg/L)
Calcium	120
Magnesium	4
Sodium	12
Chloride	19
Sulfate	55
Bicarbonate	315
Residual Alkalinity (as CaCO <sub>3</sub> )	173

Source: Various

The Dublin profile is not well suited for brewing. It is unlikely that great beer could be made with this profile without water treatment. So how did Irish brewers in areas with similar water brew? The answer is in a simple technique: pre-boiling the water.

Pre-boiling water that has high concentrations of calcium and bicarbonate drives off carbon dioxide (CO<sub>2</sub>) from the water and causes calcium carbonate (chalk) to precipitate from solution and deposit at the bottom of the kettle. When the chalk has settled and the water is clear, the water is decanted off the sediment. This treatment provides reduced hardness and alkalinity. When the water chemistry is ideal and the process is performed properly, pre-boiling can reduce calcium to as low as 12 mg/L and bicarbonate to as low as 40 mg/L. Unfortunately, these condi-

tions are difficult to achieve. More reasonable endpoints of 20 mg/L calcium and 60 mg/L bicarbonate are more common.

With the suggested endpoints above, it is possible to calculate the effect of boiling on calcium and bicarbonate (HCO<sub>3</sub>) concentrations in the water. The ending calcium content of the boiled water can be estimated using the simple formula below with the water's existing calcium and bicarbonate content and an assumption for the ending bicarbonate content.

$$Calcium_{end} \text{ (mg/L)} =$$

$$Calcium_{start} \text{ (mg/L)} -$$

$$\left[ \frac{(HCO_3 \text{ start (mg/L)} - HCO_3 \text{ end (mg/L)})}{3.05} \right]$$

Assuming an ending bicarbonate concentration of 60 mg/L, the "boiled" Dublin water profile can be estimated as shown in Table 4. The Wicklow water profile is included in the table for comparison.

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Note that the boiling process only reduces the calcium, sulfate, and bicarbonate content and does not alter the other ion concentrations.

Table 4: Comparison of Boiled Dublin and Wicklow Water Profiles

Ion	'Boiled' Dublin profile	Wicklow profile
Calcium	37	18
Magnesium	4	2
Sodium	12	13
Chloride	19	20
Sulfate	55	22
Bicarbonate	60	35
Residual Alkalinity (as CaCO <sub>3</sub> )	21	14

All concentrations in mg/L

As Table 4 shows, the boiled water quality is brought much closer to the soft and low-alkalinity water present in the major Irish brewing cities. In addition, the "flavor ions" (magnesium, sodium, chloride, and sulfate) are all at moderate to low levels.

## HOW THEY BREW

The soft and low alkalinity water in these Irish brewing cities presents a sharp contrast to the purported Dublin water profile. However, those waters help illustrate the development of the light and crisp sourness in the Irish dry stout style. As mentioned previously, RA has a direct influence on the pH of the mash and resulting wort. When low RA water is used in brewing beers with relatively acidic grains (roasted barley in this case), the overall pH of the wort and resulting beer is decreased in comparison to typical beers. That is the source of the crisp sourness in the style.

While producing wort and beer with low pH can produce a good dry stout, performing a mash at low pH can degrade the resulting beer by creating excessive attenuation and reducing body. If the mashing water has low alkalinity, performing the main mash without the acidic roast barley may avoid creating a lower than desirable mash pH. The roasted grain or its steeped liquor can be added to the main wort following the mash. Guinness apparently uses

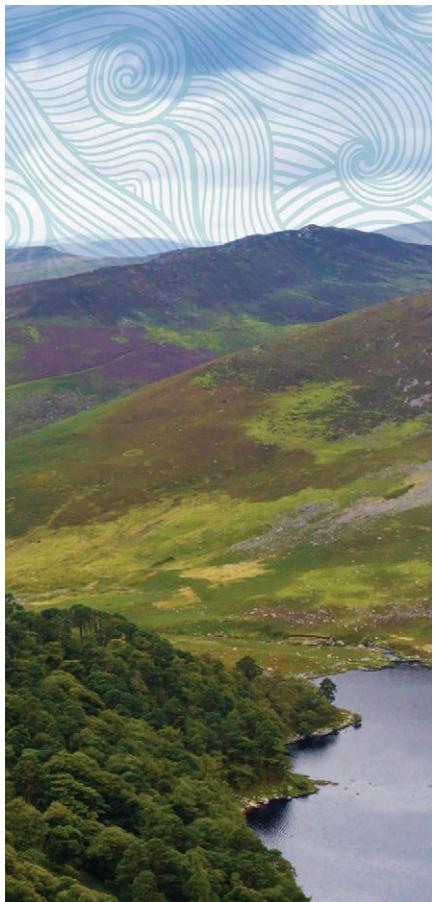
this two-part wort production method. Roast barley is steeped separately to create their Guinness Flavor Essence (GFE) that is added to the base malt wort after mashing. Although the lore is that Guinness "sours" the GFE prior to adding it to the base wort, low-alkalinity steeping water and roast barley will naturally create a pH between 4.3 and 4.6 without a souring step. That may be sufficient to create the tart flavor perception the beer is known for.

While soft and low-alkalinity water is well suited to dry stout brewing, more alkaline water is desirable for brewing other stouts and porters. For those beers, a higher RA helps neutralize acidic grains such as crystal and roast malts and may produce a more typical wort and beer pH. When brewing with higher alkalinity water, mashing all the base malt and acidic grain together will reduce the mash pH. That may help achieve a desirable mash pH. If the water alkalinity is too high, additional acid may be needed to help reduce the mash pH to a desirable level.

## WHAT IS AUTHENTIC?

The long-cited hard and alkaline Dublin water profile is not representative of the water sought for most brewing in Ireland. It is apparent that soft, low-alkalinity water was used in several cities to create the signature beers of the country. This is especially true for brewing dry stouts and Irish lagers. A number of points to consider in the quest for authentic Irish beers are presented below.

- Flavor ion concentrations (magnesium, sodium, sulfate, and chloride) are low and should not be notable in the beers. The concentrations in the Dublin and Wicklow profiles provide guidance.
- Dry stout brewing should use low-alkalinity water and use separate base malt and roast malt mashing/steeping. Combine the worts after mashing/steeping.
- A kettle wort pH of 5.0 to 5.2 is recommended for dry stout brewing to provide tart and crisp flavor. Kettle wort pH for other beer styles is typically 5.3 to 5.5.
- Higher alkalinity water is suitable for brewing other stout and porter styles, not dry stout. The excessive alkalinity



of typical Dublin profiles may not be suited for any brewing.

- Mashing all grains together is suitable when brewing other stout and porter styles using higher alkalinity water.
- A kettle wort pH of 5.5 to 5.6 can help extract more flavor and color from roast malts and smooth their flavors. This higher pH may be preferred in these other stout and porter styles.
- The pre-boiling calculation can be used to estimate what the ending calcium and bicarbonate concentrations might be when starting with high-alkalinity water. Use the calculated values to amend the high-alkalinity water to reflect that treatment.

**Martin Brungard is a recognized expert in brewing water chemistry and a professional engineer specializing in water treatment. He is the author of the Bru'n Water software for brewing water adjustment. He was also a technical editor for Brewers Publications' new book *Water: A Comprehensive Guide for Brewers* by John Palmer and Colin Kaminski.**



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PRACTICAL TIPS FOR  
*Sustainable  
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By Dan Schreffler

*"Waste not, want not."* I heard my grandfather say that phrase so many times growing up. I heard it when I'd use hot water when cold would do; I heard it when I'd leave the refrigerator door open too long; and I'd really hear it when I left food on my plate.

My grandfather shared with me the experience of growing up in the Great Depression, not having much of what we take for granted. "Waste not, want not" was a way of life—making do with what little you had, and making full use of all you had.

Besides family, environment played an important factor in my interest in sustainability. I grew up in West Hazleton, a small borough located in the anthracite coal region of Northeastern Pennsylvania. I saw the contrast between the state's natural beauty and the impact of mining and industry. The beauty of the Delaware Water Gap National Park and the Appalachian Trail contrasted with stripped land, culm banks, and polluted streams.

Family and environment taught me to think about the impact of the daily choices I make. Are they wasteful? Will they threaten what I hold most important? I want to be sure my new favorite obsession, beer and mead making, reflects those values, too.

## BREW UNTO OTHERS

Sustainable brewing is producing the best possible beer in a socially, environmentally, and ethically responsible manner, while being economically viable. It's a broad and long-term view of processes and impact. It's what I would call "brew unto others"—considering who bears the costs and who benefits from our choices and actions.

This concept has a successful track record with commercial breweries. An online search of "sustainable brewing" reveals the admirable sustainable practices of many well-known and established breweries: New Belgium, Sierra Nevada, and Alaskan Brewing, to name just a few. In Pennsylvania, we have our own solid examples of sustainable breweries: Fegley's Brew Works, Yards, Victory, and, closer to my home, newcomers like Susquehanna Brewing Company and ShawneeCraft. Read their sustainability statements and you'll see an alignment of their values to their everyday business.

Like the commercial guys, homebrewers can align their own brewing processes to reflect those values. As with most things in life, there are always tradeoffs; nothing is black and white.

## APPLICATIONS TO HOMEBREWING

Brewing is a set of definable processes to which we can apply sustainable practices. Select a part of your brewing process, try



Instead of a specialized burner, a camp stove is used to boil wort—and cook lunch!

out one or two concepts, and see how it works for you.

### Budget

Before you even start, consider how much time and money you spend annually on equipment, ingredients, and utilities. There is a difference between "want to spend" and "can spend." What does your household budget and free time enable? It is better to consider family money and time obligations up front. Set up a budget

and track your spending on brewing. This is a good lesson for those thinking of going pro.

### Equipment

Once your financial and time constraints have been mapped out, you can select the right equipment that fits within your budget. But don't go on that buying spree yet!

**Try, share, and reuse.** You can't realize savings in dollars and energy by buying something you will not use! Avoid having equipment collecting dust by taking advantage of your local clubs and homebrew shops. Attend their brewing demonstrations to see equipment in action. Our area is lucky to have two supportive homebrew clubs, Wyoming Valley Homebrewers and Scranton Brewer's Guild, that host events like "Learn to Homebrew Day" and share equipment with members old and new. Borrow that bottle filler before you buy to be sure it will really meet your needs. Coordinate with your brewing friends. Do you each need your own grain mill, bottle filler, burner, keg/carboy washer, or even brew kettle? These can easily be shared, with the costs split among you.

Chuck Yarmey, our club's founder, has used the same basic setup for decades, spending just over \$200 for equipment. It

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# 6'Schrefferelli Organic Stout

## EXTRACT RECIPE

This brew has a number of sustainable components: 100 percent organic ingredients; 30 minute boil/reduced fuel use; partial boil/reduced chilling water needs; and proven benefit of locking in cleaning, sanitation, yeast, and fermentation processes. It only took me 19 batches to figure it out! This was the 2009 National Organic Brewing Challenge Best of Show winner. Bonus sustainability tip on equipment: enter contests that have brew pots as prizes!

## INGREDIENTS

for 5 U.S. gallons (18.93 L)

<b>5.0 lb</b>	(2.27 kg) organic dark dry malt extract
<b>1.0 lb</b>	(0.45 kg) organic roasted barley
<b>4.0 oz</b>	(113 g) organic chocolate malt
<b>2.0 oz</b>	(57 g) organic 20° L crystal malt
<b>2.0 oz</b>	(57 g) organic UK First Gold hops, 7.5% a.a. (30 min)
<b>5.0 oz</b>	(142 g) organic dry malt extract to prime
	Wyeast 1084 Irish ale yeast

**Water/treatment:** Dunmore tap water.  $\frac{1}{4}$  Campden tablet used to remove chlorine.

**Boil time:** 30 minutes

**Original Gravity:** 1.045

**Final Gravity:** 1.013

**IBUs:** 27

**SRM:** 34

## DIRECTIONS

Steep grains in 2 gallons (7.6 L) of 150° F (66° C) water for 20 minutes, remove grains and add water, bringing to 3 gallons (11.4 L). Bring to a boil, turn off heat, add extract; return to slow boil; add hops and continue slow boil for 30 minutes. Chill to 62° F (17° C). Transfer to bucket. Add remaining water to bring to 5 gallons (18.93 L). Pitch at 62° F (17° C). Find a cool spot in the house not warmer than 68° F (20° C), and allow to ferment for 14 days. Bottle condition using DME and then wait three months. Patience is rewarded. This one also works well with organic blueberry extract added to taste at bottling.

Spent grain can be used as mulch, with the added benefit of providing food for wildlife.



also helps to have good friends who have handed down equipment along the way.

**Think multitask vs. unitask.** I'm a fan of Alton Brown on the Food Network. His rule is that the only uni-tasker in the kitchen should be the fire extinguisher. Everything else should have many uses. I prefer using buckets instead of carboys because I can use the bucket to clean and sanitize other equipment, and I have yet to figure out how to soak beer bottles to remove labels in a glass carboy. Overly customize a cooler into a mash tun and it will only be useful as a mash tun. By limiting the modifications, you can use it as a mash tun, fermentation temp controller, and, oh my, a cooler!

Scaling down recipes to smaller 3-gallon (11.3 L) batches and/or brew-in-a-bag is another excellent way to utilize existing kitchen pots or at least less equipment for mashing and boiling. Scaling is especially beneficial when trying a new recipe. That garlic cucumber ale may be better tried in 1- to 2-gallon (3.78-7.5 L) test batches.

Whatever you do need to buy, research the total cost of ownership over time. Are initial savings offset by frequent replacement, fuel, or electricity costs? The AHA Forum is a good place to explore real world experience with equipment.

## When and Where to Brew

Deciding when and where to brew will help with energy avoidance and recapture on brew day and during fermentation. In Pennsylvania, we have all seasons—cold winters; hot, humid summers; temperate but short springs and falls. I brew between September and June, lagering only in winter, and rarely brew in July and August as my house cellar temperatures are in the mid to upper 70s by then. Of course, your brewing season and options will depend on your local climate.

Winter, or "heating season," presents an opportunity to lessen mash tun and boil kettle heat loss and to capture water vapor and heat simply by brewing inside. No special equipment is needed other than a ceiling fan to disperse the heat and vapor into the house, lessening energy use by the humidifiers and furnace—much the

same way you can hang laundry inside to dry, adding moisture to that dry winter air instead of running the clothes dryer.

Cool weather also offers low-tech options for chilling and fermentation temperature control. This can be as simple as placing the covered brew kettle outside to chill to a few degrees cooler than your target, and then using the cool spot of your house to keep fermentation temps in range. Pitching a few degrees cooler than target fermentation temperature enables the majority of the fermentation activity to take place within a few degrees of target temperature. I've found the majority of the fermentation is over before the temperatures get out of range. If not using ambient temperatures to chill, cooler ground water in winter will reduce water and time to chill.

When heating season is over, brew outside, especially if you utilize air conditioning or dehumidifiers. The bonus is getting outside and enjoying the backyard.

As mentioned previously, sustainability



## Corvus Corax Organic Baltic Porter

### ALL GRAIN RECIPE

This is an organic all-grain variant of Zek's Porter from *Brewing Classic Styles*. All styles can be brewed sustainably, even using lager yeasts—just don't make them in the summer! This is for cold weather brewing, inside to capture mash and boil heat and moisture, when ground water temps enable you to chill quickly to those lager pitch temps. Plus with 100 percent organic ingredients, you have a beer that's good for body and soul. This took first place in the Porter category in the 2013 National Homebrew Competition first round in Atlanta.

### INGREDIENTS

for 5 U.S. gallons (18.93 liters)

<b>12.0 lb</b>	(5.44 kg) organic Munich malt
<b>7.0 lb</b>	(3.18 kg) organic Pilsner malt
<b>13.0 oz</b>	(369 g) organic 60° L crystal malt
<b>10.0 oz</b>	(283 g) organic Carafa II malt
<b>4.0 oz</b>	(113 g) organic chocolate malt
<b>2.0 oz</b>	(56 g) organic German Spalt Select, 5.5% a.a. (60 min)
<b>1.0 oz</b>	(28 g) organic German Spalt Select, 5.5% a.a. (15 min)
	Wyeast 2206 Bavarian Lager yeast

**Water/treatment:** Dunmore filtered tap water.  $\frac{1}{4}$  Campden tablet used to remove chlorine.

**Boil time:** 90 minutes

**Original Gravity:** 1.098

**Final Gravity:** 1.025

**Mash Efficiency:** 65% (opportunity to improve upon this!)

**IBUs:** 32.5

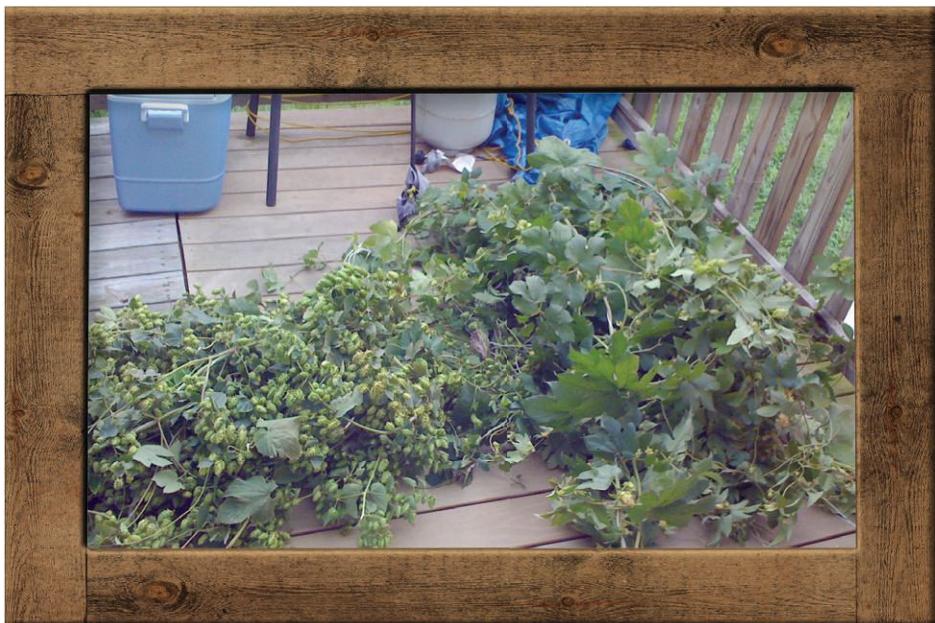
**SRM:** 32.6

### DIRECTIONS

Note substitutions and recipe tweaks of *Brewing Classic Styles* recipe as unable to obtain organic Lublin hops or Special B malt. Mash at 151° F (66° C). Pitch enough healthy yeast at 50° F (10° C). Ferment for 30 days at 50–53° F (10–12° C).

### EXTRACT VERSION

Substitute 4 lb (1.81 kg) organic pilsner malt extract syrup and 8.5 lb (3.86 kg) organic amber malt extract syrup for Pilsner and Munich malts. Steep specialty grains in 160° F (71° C) water for 20 minutes. Rinse grains, dissolve extracts completely and proceed with boil.



The ultimate control over what is in your ingredients and how they are produced is to grow your own hops, herbs, and fruit.

choices are not black and white. I have brewed in hot weather and utilized a wine chiller to ensure proper fermentation temperatures. It was the right tradeoff to ensure the mead or beer came out with the characteristics I wanted. The point is, you have a lot of options if you plan out your brewing.

### Ingredients

First, do not buy what you do not plan to use immediately. This is especially true of hops, yeast, pre-crushed grains, and certain adjuncts that are best used fresh. Impulse buys lead to no room for food in the refrigerator, degraded quality of your beer by using up stale stock, or worse, wasted ingredients because they went bad.

Once I decide what's needed, I personally want to know what is in the ingredients I use, where they came from, and how they were produced, including how the workers were treated and the impacts on the air, water, and wildlife.

By choosing organics, I get an understanding of some of those factors. Organic farming is designed to encourage soil and water conservation and reduce pollution<sup>1</sup>. No synthetic chemical weed killers or pesticides are used. This means fewer chemicals in the environment and in us; and usually better habitat for wildlife and beneficial insects. (For more insight on organic and non-organic farming, see the Dear Zymurgy in the July/August 2009 Zymurgy.)

Organics have a few downsides: cost, availability, and selection. Grains are about 40 percent more expensive, and hops about 20 percent more depending upon variety. Availability and selection have improved over the past five years, but places to buy organics remain limited. My local homebrew shop, Simply Homebrew, will special order for me and there are online sources such as Seven Bridges and Northern Brewer. Not all varieties of hops and grains are available organically, but I have been able to find good substitutes, or tweak the recipes.

Read the labels on all your ingredients. Getting organic ingredients from across the globe negates some of the environmental

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# Organic Cream Ale

## ALL GRAIN RECIPE

100 percent organic ale inspired by *Brewing Classic Styles*' Weed, Feed, and Mow. I substituted grains and hops that I had available. This is a good candidate for brew-in-a-bag. It took second place in Light Hybrids at the 2013 War of the Worts.

### INGREDIENTS

for 5 U.S. gallons (18.93 liters)

<b>4.75 lb</b>	(2.15 kg) organic two row malt
<b>4.75 lb</b>	(2.15 kg) organic Munich malt
<b>1.7 lb</b>	(0.77 kg) organic rice syrup (in boil)
<b>0.4 oz</b>	(11 g) organic Hallertauer, 6.9% a.a. (60 min)
<b>0.4 oz</b>	(11 g) organic Hallertauer, 6.9% a.a. (30 min)

White Labs WLP001 California ale yeast

**Water/treatment:** Dunmore filtered tap water. ¼ Campden tablet used to remove chlorine.

**Boil time:** 60 minutes

**Original Gravity:** 1.056

**Final Gravity:** 1.011

**Mash Efficiency:** 65% (opportunity to improve upon this!)

**IBUs:** 16

**SRM:** 7.8

### DIRECTIONS

Mash at 149° F (65° C). Add rice syrup at beginning of boil. Chill to 62° F (17° C) (capture that chill water and reuse it!). Ferment at 62–65° F (17–18° C) in a cool place in your house.

### EXTRACT VERSION

Substitute 3.125 lb (1.42 kg) organic pale malt extract syrup and 3.125 lb (1.42 kg) organic amber malt extract syrup for pale and Munich malts.

benefits. If you can, get to know the farmers and see how they produce their products. When you can't get to the farm, look for the organic label.

**Grow your own.** The ultimate control over what is in your ingredients and how they are produced is to grow your own hops, herbs, and fruit. In my urban area with a small 40' x 60' backyard, I am able to organically grow blueberries, blackberries, raspberries, strawberries, a few varieties of hops, and many different herbs for much of my beer and mead making needs. Not only does it ensure I get fresh ingredients, it also provides food sources for my pollinating insect friends. By growing organically and not applying chemical pesticides and herbicides, I have been able to establish a healthy yard for beneficial insects and birds that take care of most of my insect pest problems. Growing your own also provides use for spent grains by mulching and composting them.

Malt and hops are wind-pollinated and do not need insect pollinators, but fruit beer, mead, and cider makers need bees. Over the past six years, on average, 30 percent of all the honeybee colonies in the U.S. have died off over the winter. Researchers and keepers are looking for a root cause, and it appears to be a number of natural and manmade contributors: early springs, cold snaps, pesticide use (especially neonicotinoids), and lack of food due to drought and monoculture cornfields and lawns<sup>2</sup>.

What you can do:

- Buy organic foods to reduce chemicals/pesticides that can impact the bees.
- Limit weed killers and pesticide use at home, and look for organic alternatives.
- Make a bee habitat in your own yard—grow your own herbs, fruit, or simply add flowers and water sources.
- Let the dandelion and clover grow in your lawn—these are bee food, not weeds!

**Water as an ingredient.** Beer of course is about 90 percent water. Select water based on tests, taste, and cost. You may have very good tap water like I do, at a



Make sure your yard does not harm your ingredient makers, the bees. A bee-friendly yard ensures that ingredients needed to make beer, cider, and mead are available.



Select water based on tests, taste, and cost. Tap and filtered water may be a better alternative than bottled.

cost of less than a penny a gallon. You can get it tested either locally or through a third-party company. My test results showed that my local tap water is a good foundation for any style; there was no need for me to spend \$1 per gallon on bottled water, with its associated packaging/shipping material and energy use. If you use bottled water, check the manufacturer's site to see what is in it, or get it tested yourself.

Because my local water is so good, and because clean source water requires less work and cost to prepare for brewing, I work with local groups to ensure the quality is maintained for the long term. If you have good local water, watch out for threats to it.

#### BREW DAY

Now you've considered your equipment, ingredients, and time and place to brew. Of course, you've also previously learned proper yeast handling, cleaning, and sanitation practices so that this article isn't about how to make sustainable *mediocre* beer. It's time to move on to the brew day

#### Water Heating

I love the quote on Blichmann Engineering's website: "Isn't the whole

point to heat wort, not the atmosphere?" Homebrew gas burners are only 20-50 percent efficient,<sup>3</sup> so be sure you are doing all you can to save fuel and money. Adjust gas flow and air mix to get a nice blue flame that is still touching the burner nozzles, and protect it from wind. Tune this further by controlling your boil-off rate to about 8 percent.

Electric brewing offers the benefits of

being more efficient<sup>4</sup> if you are able to utilize renewable energy, either from your own residential system or by purchasing it from your utility company. My in-house brewing is done on my electric stove, utilizing 100 percent renewable energy—70 percent from my own backyard array and the rest from the utility.

#### *Chilling*

If you won't be using ambient air to chill your wort, you'll likely be using water via an immersion or counterflow chiller. Your initial chill water can be drawn from a pool or rain barrels using gravity or a pond pump. Once wort temperature reaches the intake water temperature, you can switch to tap water or an ice bath to get to pitch temperature.

No matter what the water source, capture and reuse it. It should not go directly down the drain or into the yard without serving another purpose.

- Return it to your pool or rain barrels.
- Capture the initial hot water for cleaning (another advantage of having buckets); and once down to about 120° F (49° C), capture for rinse or other reuse.
- In winter, use to fill the washing machine and for toilet flushing.

*Warning: chiller outflow is initially very hot and is an effective grass killer as well as a burn hazard!*

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Electric brewing offers the benefits of being more efficient if you are able to utilize renewable energy, either from your own residential system or by purchasing from your utility company.



No matter what the water source, capture and reuse it. My chilling water is used to water the garden and lawn.

### Packaging, Storage, Serving

Patience! Never serve a beer before its time. If the taste is not what you expect, let it age out a bit before tossing or drinking it to “use it up” quickly before the next batch. Not all off flavors will age out, but some will.

Think before buying that old refrigerator on Craigslist. It may be cheap up front, but savings diminish quickly over time depending upon the year manufactured. An '80s-era refrigerator will cost \$140 more a year to operate than a new one, wasting more energy in the process.<sup>5</sup> If you really need another refrigerator, consider replacing your primary refrigerator with a more efficient one and use your old one for homebrew needs.

And finally, the old standard—reuse bottles. Pick up a case of local craft beer, enjoy with friends while discussing homebrew sustainability, and then refill those bottles with your own fine sustainable homebrew—perhaps made from some of the award-winning recipes included here.

### REFERENCES

1. [www.mayoclinic.com/health/organic-food/NU00255](http://www.mayoclinic.com/health/organic-food/NU00255)
2. [http://gallery.mailchimp.com/5fd2b1aa990e63193af2a573d/files/What\\_Happened\\_to\\_the\\_Bees\\_This\\_Spring2013\\_opt.pdf](http://gallery.mailchimp.com/5fd2b1aa990e63193af2a573d/files/What_Happened_to_the_Bees_This_Spring2013_opt.pdf)
3. [www.theelectricbrewery.com/FAQ#How\\_long\\_does\\_it\\_take\\_to\\_heat\\_with\\_electricity](http://www.theelectricbrewery.com/FAQ#How_long_does_it_take_to_heat_with_electricity)
4. [www.theelectricbrewery.com/FAQ#What\\_are\\_the\\_benefits\\_of\\_brewing\\_with\\_electricity\\_vs.\\_gas](http://www.theelectricbrewery.com/FAQ#What_are_the_benefits_of_brewing_with_electricity_vs._gas)
5. [www.energystar.gov/index.cfm?fuseaction=refrigcalculator&screen=1](http://www.energystar.gov/index.cfm?fuseaction=refrigcalculator&screen=1) (upright 19-21 cu")

**Dan Schreffler has been homebrewing and making meads and ciders for five years, with more than 100 batches to his credit. He is a member of the Wyoming Valley Homebrewers in Pennsylvania and the prior chair of the Northeastern Pennsylvania Sierra Club.**

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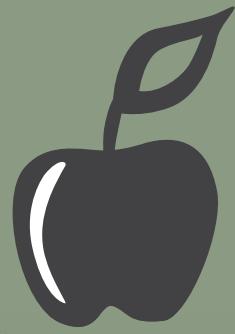
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# APPLES TO APPLES



# CIDER YEAST COMPARISON

BY STAN SISSON

**Editor's Note:** This is the first published experiment from the AHA's newly created Research & Education Fund (REF). For more on the REF, please see the sidebar on page 51.

**MY CIDER JOURNEY BEGAN MORE THAN A DECADE AGO.** I had tried making cider using a dried champagne yeast recommended by the owner of a local homebrew shop. This attempt produced a bone-dry, thin tasting cider that I found nearly undrinkable. I asked the shop owner about sweetening the cider, but he said I would have to use an artificial sweetener to keep the cider from re-fermenting.

After joining the Quality Ale and Fermentation Fraternity (QUAFF) homebrew club in August 2001, I attended my first QUAFF Oktoberfest picnic. I mentioned my cider disappointment to one of the members. He pointed out someone and said "Go talk to him about cider." I wish I could remember who that person was, as I owe him a debt of gratitude. He recommended that I use a beer yeast for a sweeter cider. He suggested White Labs WLP002 English Ale for its low attenuation.

Armed with this new idea, I went to Costco for some Tree Top apple juice to begin my first cider fermentation using a fresh vial

of WLP002. The resulting cider finished extremely clear and surprisingly sweet. Actually, the cider was a little too sweet for my taste, but I knew I was on the right track. I studied the White Labs yeast chart for a strain a little more attenuative than WLP002.

WLP004 Irish Ale looked about right, so I gave that a try on my next batch. Bingo: just the right level of residual sweetness for my taste, and the esters it produced were a great fit with the apple juice. Apparently it struck a chord with my friends too, as they raved about my latest cider. I felt a little guilty making these new ciders from such a simple method, but everyone liked them so much I couldn't stop.

Encouraged by my cider making successes, I decided to experiment with additional yeast strains. WLP550 Belgian Ale also produced a great cider, though with less "Belgian character" than I expected. Somewhere along the way I also got the crazy idea to ferment apple juice with the dregs of commercial bottle-conditioned beers.





LARRY STEIN, STAN SISSON, ED LITTLE, DWAYNE KUNIMOTO, CHRIS BANKER, CHUCK WEST, AND JOHN DEGRAZIA PARTICIPATED IN THE EXPERIMENT.

At a QUAFF holiday party, I put a gallon jug of Tree Top on the bar with a sign that said "Dump Dregs Here" on it, and passed the word around that I wanted the dregs from bottle-conditioned beers for a little experiment. People obliged, and by the next morning, that jug o' juice had become a very active starter. The resulting cider took first place at that year's San Diego County Fair Homebrew Competition.

By this time, another QUAFF member, Chris Banker, had also begun making some interesting ciders. Between the two of us,

we were beginning to increase the cider interest within QUAFF, and began encouraging others to give cider making a try.

Apple juice can be fermented with many different yeast strains, even mixed strains. Again, this was quite a revelation to me, since it seemed that most cider makers use the WLP775 English Cider strain. I began wondering which yeast strains the majority of cider drinkers actually prefer. A blind tasting of the same apple juice fermented with different yeast strains was the only way to answer this question.

## THE EXPERIMENT

After learning about the REF earlier this year, I formulated a plan to have seven cider makers ferment the same apple juice with seven different White Labs yeast strains. Why seven strains? Because I wanted to have the general public taste the different ciders under a somewhat controlled environment, and the jockey box I was planning to serve from has seven handles. Plus, some people consider the number seven to be lucky, and I knew I would need a little luck to pull this off.

I recruited six additional cider makers from four different San Diego homebrew clubs to help me with this experiment. I contacted White Labs, who agreed to provide the needed yeast strains. Furthermore, they welcomed the idea of hosting a blind tasting that was open to the public at their facility.

After some discussion within the group of cider makers, it was decided that we would use Kirkland Apple Juice from Costco. We elected not to use Tree Top because it is made from a concentrate. Based on Banker's experience, we agreed to use nutrients consisting of a half-teaspoon of Fermaid-K and a fourth-teaspoon of DAP for each 5-gallon batch. Since we did not all have oxygenation systems, aeration would consist of shaking the carboy for a minute. We agreed to ferment our ciders in the recommended temperature range for the strains chosen, hoping this would give a true representation of the characteristics of each strain.

The yeast strains were chosen to provide a relatively wide range of fermentation-related characteristics. WLP775 English Cider was included as a control, because it is the usual go-to strain for cider makers. The other yeast strains selected were WLP002 English Ale; WLP028 Edinburgh Ale; WLP500 Trappist Ale; WLP575 Belgian Ale Blend; WLP810 San Francisco Lager; and WLP862 Cry Havoc.

The cider maker using the lager yeast strain started two weeks before the rest of us, because his cider would be the slowest to ferment. We collected the fermentation-related data shown in Table 1.

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**TABLE 1: CIDER FERMENTATION DATA**

YEAST STRAIN	LAG TIME	FERM TEMP (° F)	FERM LENGTH	KRAUSEN	SULFUR	FLOCCULATION
WPL775 ENGLISH CIDER	10 HRS	65-67	14 DAYS	HIGH	LOW	HIGH
WLPO02 ENGLISH ALE	6 HRS	74-76	7 DAYS	MED-HIGH	NO	HIGH
WLPO28 EDINBURGH ALE	12 HRS	68-70	21 DAYS	VERY HIGH	NO	MED-HIGH
WLP810 SAN FRAN LAGER	8 HRS	59-61	28 DAYS	MED-HIGH	YES	FAIR
WLP500 TRAPPIST ALE	8 HRS	68-70	12 DAYS	MED-HIGH	NO	MED-HIGH
WLP575 BELGIAN ALE BLEND	12 HRS	68-74	10 DAYS	HIGH	SOME	HIGH
WLP862 CRY HAVOC	12 HRS	68-70	7 DAYS	HIGH	NO	FAIR

Once the ciders were done fermenting, they were kegged and carbonated to the same level. It should be pointed out that trying to get seven different individuals to cooperate at the level of detail we were trying to accomplish is a bit like herding cats, but fortunately it all worked out in the end.

Now that the ciders were ready for the blind tasting, a date was selected and a panel of experienced judges was assembled with the assistance of Harold Gulbransen, the AHA Governing Committee member who mentored this REF project.

#### THE JUDGING

The 10 judges were seated in a different area than the seven cider makers, and the ciders were poured into numbered cups where no one but the steward could see which was which. The judges filled out BJCP score sheets for each cider, as well as ranking them from most-favored to least-favored. The cider makers ranked the ciders, but did not fill out score sheets. After the judging was complete, the different strains were revealed, and considerable discussion took place.

On June 15, the seven ciders were presented to the general public in the White Labs tasting room, served on draft from the aforementioned jockey box. Those tasting the ciders were given a ballot and asked to rank the ciders in order of preference. Forty-five ballots were collected, and the results were compiled along with the results from the judges and cider makers (see Table 2).

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**TABLE 2: CIDER OVERALL RANKINGS**

YEAST STRAIN	JUDGES RANK	CIDER MAKERS RANK	PUBLIC RANK	OVERALL RANK
WPL775 ENGLISH CIDER	3 TIE	4	4	4
WLP002 ENGLISH ALE	2	1	1	1
WLP028 EDINBURGH ALE	1	2	3	2
WLP810 SAN FRANCISCO LAGER	7	7	7	7
WLP500 TRAPPIST ALE	5	6	5	5
WLP575 BELGIAN ALE BLEND	6	5	6	6
WLP862 CRY HAVOC	3 TIE	3	2	3



## Kettles | Brew Pots Wort Chillers | Lauter Tuns | Accessories



The characteristic that made WLP810 least favorite among all three groups was an excessive sulfur aroma. Sulfur production is common with some lager yeast strains. It is possible that additional lagering time might reduce or eliminate the sulfur character.

The characteristic that made WLP002 the top pick seemed to be a relatively high residual sweetness and a pleasant aroma. Apparently, many cider drinkers prefer a fair amount of sweetness in their ciders, which probably explains why many commercial ciders are back-sweetened. None of the ciders in this comparison were altered; whatever character differences were noted resulted from the different yeast strains.

### THE DETAILS

Of interest is that with 10 experienced judges all tasting the same ciders at the same time, the comments for Bouquet/Aroma and Flavor were vastly different from judge to judge. I suspect that those who have entered homebrew competitions and read their score sheets can relate to this. Here are a few comments for each strain.

**WLP002 English Ale:** "Crisp apple aroma. Clean fermentation character. Low esters, low phenols. Showcases apple aroma." "Very light straw color, slight haze." "Sweet apple, finishes a bit sweet. Balance toward sweetness over acid. Medium body, petillant carb, medium alcohol, very crisp finish."

**WLP028 Edinburgh Ale:** "Crisp apple aroma with a light fruity ester—flowery

## AHA'S RESEARCH & EDUCATION FUND

Each year at the National Homebrew Conference, the AHA's Governing Committee meets the day before the conference starts. We review the year's events and the AHA's financial statements, envision where the AHA is headed over the next several years, and brainstorm solutions to problems the membership has encountered over the previous year. During the 2012 meeting, GC member Chris Frey suggested we develop a new program for the AHA membership. The idea was to provide a new member benefit by creating an area on the website where members could go to access information that would allow them to "make better beer, mead, or cider."

The GC hypothesized that there are many members of the AHA who have original ideas for research projects and the results of these research projects could form an excellent resource for all members, allowing the entire community to improve their brewing endeavors. As such, the GC, AHA, and the Brewers Association approved the formation of the Research & Education Fund (REF). The REF was designed to provide reimbursements and guidance to AHA members who submit and receive approval for homebrewing research projects.

Any AHA member with an interesting idea for a research project can go to the AHA website and fill out an online form describing the project's goals, methods, materials, and costs. The proposal is then assigned a REF sub-committee member who acts as a mentor and liaison. Once the project is vetted by the entire sub-committee



and approved, the project can begin. A description of the project including its results must be submitted in a clear and concise form so it can be posted to the website. Once completed, the project coordinator will be reimbursed to defray the costs of supplies used in the research.

This cider yeast research project is the first in a series the Governing Committee has been monitoring. If you have an original idea for a project, let's hear about it. Go to the website and apply to the Research & Education Fund. If it's of interest to you, it's likely to be of interest to other AHA members.

—Harold Gulbransen



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like aromas. Very pleasant." "Very clear, very pale gold." "Very low sweetness, tart apple, moderate complexity, medium acid."

**WLP862 Cry Havoc:** "Medium apple aroma with a light flowery character. Light citrusy character. No phenols, no off aromas." "Very clear, pinkish tinge." "Extremely dry, some apple character, wine-like (Sauvignon Blanc)."

**WPL775 English Cider:** "Very subdued sweetness and apple." "Pale gold, slightly cloudy." "Tangy, but lacks some apple notes. Med-high acidity, tannic."

**WLP500 Trappist Ale:** "Very low apple aroma notes with a distinct spicy (almost Belgian) note." "Very pale straw, good clarity." "Quite tart, quite dry, distinct apple flavor notes."

**WLP575 Belgian Ale Blend:** "Little spice, esters, very fruity. Almost smells solventy." "Very clear, very pale gold." "Very dry, low to moderate sweetness, tastes bigger in the alcohol, moderate carbonation, sweetness and bitterness linger into aftertaste."

**WLP810 San Francisco Lager:** "Medium sulfur notes. Light 'yeasty' champagne aroma. As it warms, sulfur becomes unpleasant." "Clear, pale gold, good carbonation. Darker than other versions." "Quite dry and fairly tart. Low indistinct fruitiness. Sulfur is off-putting."

Many thanks to everyone who pulled together to make this experiment a success and a fun project. Many other strains deserve investigation as potentially great cider yeasts. Why not give them a try?

**Stan Sisson is a longtime member of four different homebrew clubs in San Diego County: Quality Ale and Fermentation Fraternity (QUAFF), Foam on the Brain, Barley Literates, and Society of Barley Engineers. He lives in Santee, Calif.**



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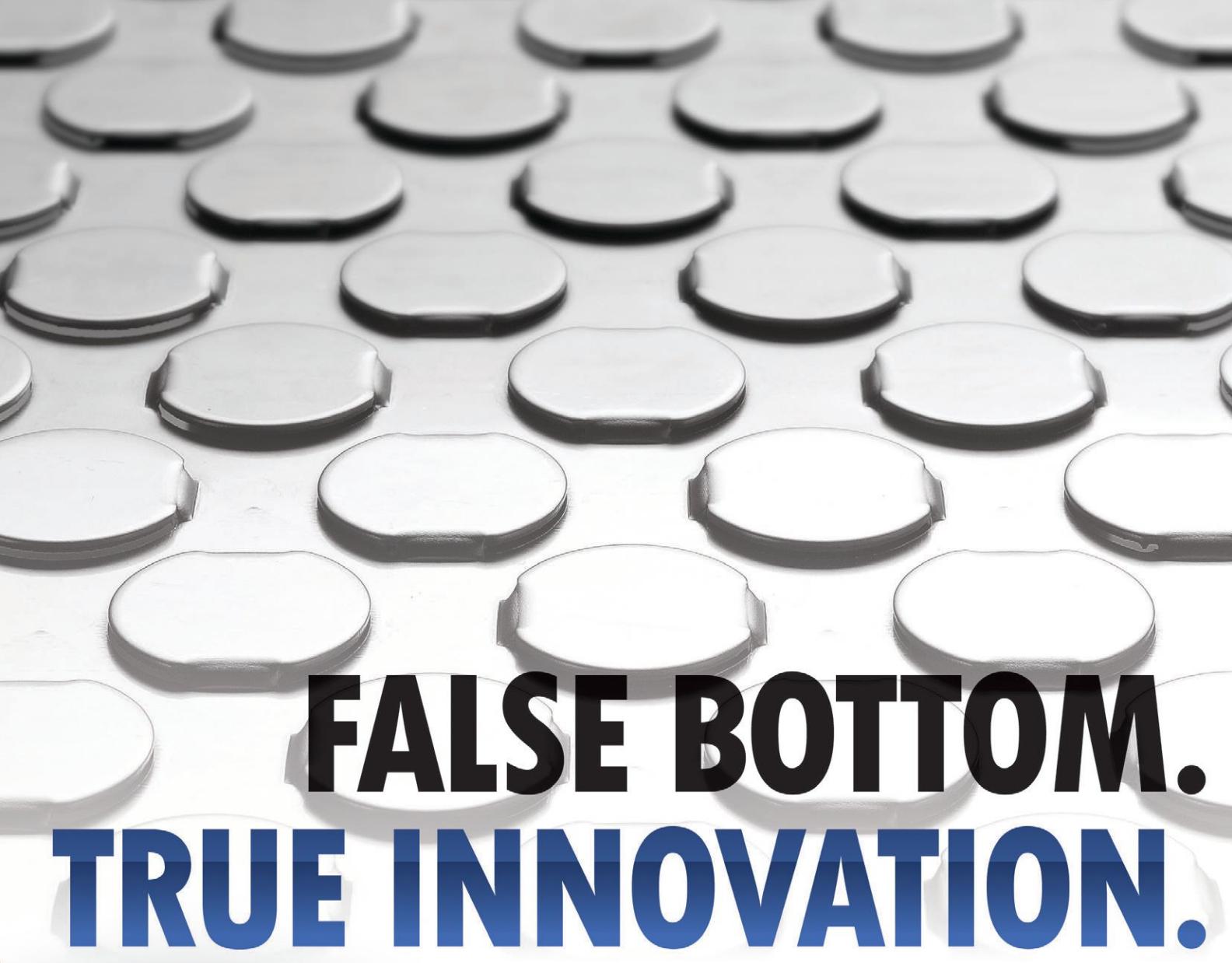


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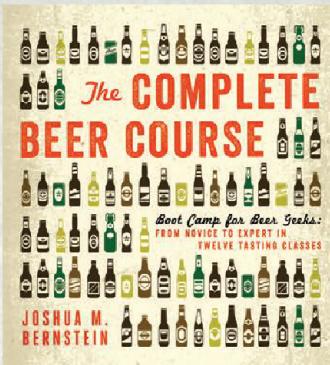
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## READING AND VIEWING

*The Complete Beer Course*  
by Joshua M. Bernstein

Billed as "Boot Camp for Beer Geeks," this newly released book offers 12 "tasting classes" covering the gamut of basic beer styles, with beers to try for each one. The beautifully designed and well-researched 320-page tome is a treasure trove of information on the brewing process, ingredients, beer styles, commercial breweries, and many other fun beery subjects and sidebars.

\$24.95, Sterling Epicure

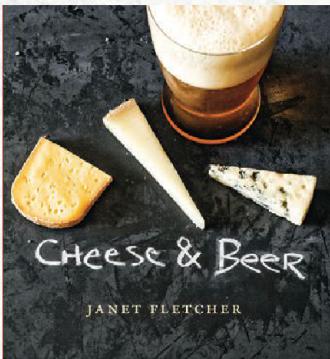


*Cheese & Beer*  
by Janet Fletcher

The worlds of artisan cheese and craft beer meet in this first-ever guide, an introduction to two dozen popular craft beer styles and the cheeses that pair best with them.

Fletcher is also the author of *Cheese & Wine*, but it wasn't until she paired cheese with craft beer that she said "the clouds parted."

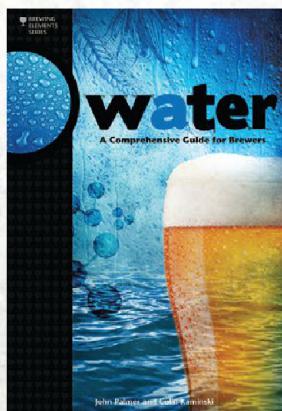
\$24.99, Andrews McMeel Publishing



*Water: A Comprehensive Guide for Brewers*  
by John Palmer and Colin Kaminski

The latest in the Brewing Elements series from Brewers Publications, this long-awaited title sheds light on arguably the most critical and perhaps the least understood of the fundamental elements in brewing beer, from the author of *How to Brew* (Palmer) and professional brewer Kaminski. Topics include an overview of sources, quality, and geography; how to read water reports; understanding flavor contributions; and the treatment and chemistry of brewing water.

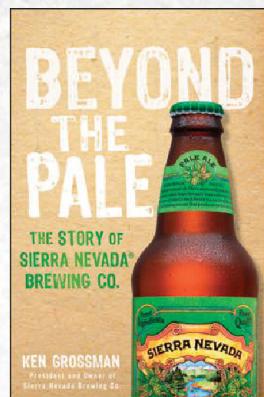
\$19.99, Brewers Publications



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A PEEK AT 20 NEW AND/ OR  
NOTEWORTHY ITEMS FOR THE HOMEBREWERS  
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*Beyond the Pale: The Story of Sierra Nevada Brewing Co.*  
by Ken Grossman



Those who attended the National Homebrewers Conference in Oakland, Calif. in 2009 were treated to a riveting keynote address from Sierra Nevada founder Ken Grossman about the fascinating early days of the brewery. *Beyond the Pale* further chronicles Grossman's journey from homebrewer and homebrew supply store owner to founder of one of the nation's largest and most innovative craft breweries. Make sure you have a Sierra Nevada Pale Ale in hand while you read this.

\$24.95, Wiley

### Crafting a Nation



This video documentary portrays the blood, sweat, and tears behind the craft beer movement. Highlighting several breweries across the country, it takes a look at the struggles and sometimes unexpected obstacles that stand in the way of the people who are passionate about craft beer and are determined to realize their dreams despite the personal and financial risks involved. This one is best viewed with a locally produced beer in hand.

\$14.99, Janson Media.

Available for digital download at [www.craftinganation.com](http://www.craftinganation.com) and on iTunes

## BEER IS FOOD



### Rogue Creamery Hopyard Cheddar

Hopyard Cheddar from Rogue Creamery is akin to an "IPA malted milkshake" with a savory texture and buttery finish. The hops evoke the aroma of a freshly poured IPA, followed by layers of sweet brown butter, hazelnuts, and buttermilk. The cheese is a collaboration with Rogue Ales & Spirits, which grows the Freedom hops on its Chatoe Rogue Hop Farm. Also available are Chocolate Stout Cheddar and Morimoto Soba Ale Cheddar.

\$11, [www.roguecreamery.com](http://www.roguecreamery.com)



### Hop-Pickles

In 2013, Dogfish Head Craft Brewery unveiled a line of "beer-centric foods to pair with food-centric beers," including four different kinds of brats and hardtack chowder. The all-natural, medium-spicy Hop-Pickle is made with 60 Minute IPA, caramelized onions, and Cascade hops, and is packaged by hand in Brooklyn Brine's artisanal kitchen. Dogfish describes the Hop-Pickle as "a culinary leap of taste combining the hoppiness of an IPA, the tang of a pickle, and just a hint of habañero heat."

\$8, [www.dogfish.com](http://www.dogfish.com)



## HOMEBREW TOOLS

### Dogfish Head Randall Jr.

Dogfish Head's new Mini Enamel Animal gives you the power for off-centered infusions. Just twist off the top, add hops, spices, fruit, or other off-centered ingredients, fill with off-centered ale, and savor the fruits of your creativity. The new Randall Jr. holds 16 ounces and is made of double-walled, BPA-free plastic. It is not dishwasher or microwave safe.

\$19.99, [www.dogfish.com](http://www.dogfish.com)



### Cool-Brewing Fermentation Cooler

The Cool-Brewing Fermentation Cooler is a cooler bag that can accommodate most 5-gallon and 6.5-gallon carboys and fermenting buckets. Simply add ice or ice packs to reach and keep the desired temperature. Perfect for hot weather and for use when a cool basement is not an option.

\$56, [www.cool-brewing.com](http://www.cool-brewing.com)



### Cool Zone

Cool Zone is a patent-pending fermentation temperature control solution that enables homebrewers to heat and cool their fermenters to maintain accurate temperatures without the hassles and guess-work associated with ice baths and swamp coolers. The digital controller (sold separately or with a package) allows for single- or multi-step fermentation temperature profiles. The setup can be customized based on batch sizes. Several package options are available.

\$139.95 and up,  
[www.inspiredbrewing.com](http://www.inspiredbrewing.com).

## Brew Bucket

Meant to provide a happy medium between a plastic food-grade bucket and an upscale conical fermenter, the patent-pending Brew Bucket is made of brewers grade 304 stainless steel. It features a rotatable racking cane, a conical bottom, and a 3/8" mini ball valve. Capacity is just under 7 gallons.

\$165, [www.ssbrewtech.com](http://www.ssbrewtech.com)



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### Dual Sided Chalkboard Tap Handles

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\$2.99, [www.wynkoop.com](http://www.wynkoop.com)



### Hopworks Bike Jersey

Many breweries offer bike jerseys, but Hopworks Urban Brewery and Hopworks Bike Bar in Portland, Ore. may be one of the most bike-friendly breweries out there, sponsoring the Hopworks Biketoberfest each September. The Portland-made jerseys feature a full-zip design with the HUB logo.

\$69, [www.hopworks.com](http://www.hopworks.com)



### Craft Beer Poster

The brand new Deconstructing Craft Beer poster, created by the folks at CraftBeer.com, is a great addition to home bars and breweries. The 24x36 poster is chock full of information about ingredients, flavors, tasting techniques, serving recommendations, pairing basics, and more. It's eye-catching as well as educational.

\$19.95,  
[www.BrewersAssociation.org](http://www.BrewersAssociation.org)

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### Breckenridge Brewery Snowboard

Two Colorado-based companies, Breckenridge Brewery and Never Summer Industries, teamed up to craft a collaborative artist series SL All-Mountain snowboard to kick off the 2013/14 winter season. Designed by Denver artist John Vogl, the snowboards will be given away in bars and liquor stores to launch the Colorado ski and snowboard season, and a limited number will be available to purchase on the brewery's website in November.

\$500, [www.breckbrew.com](http://www.breckbrew.com)



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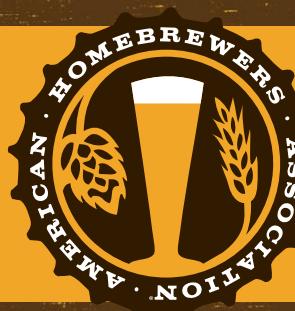
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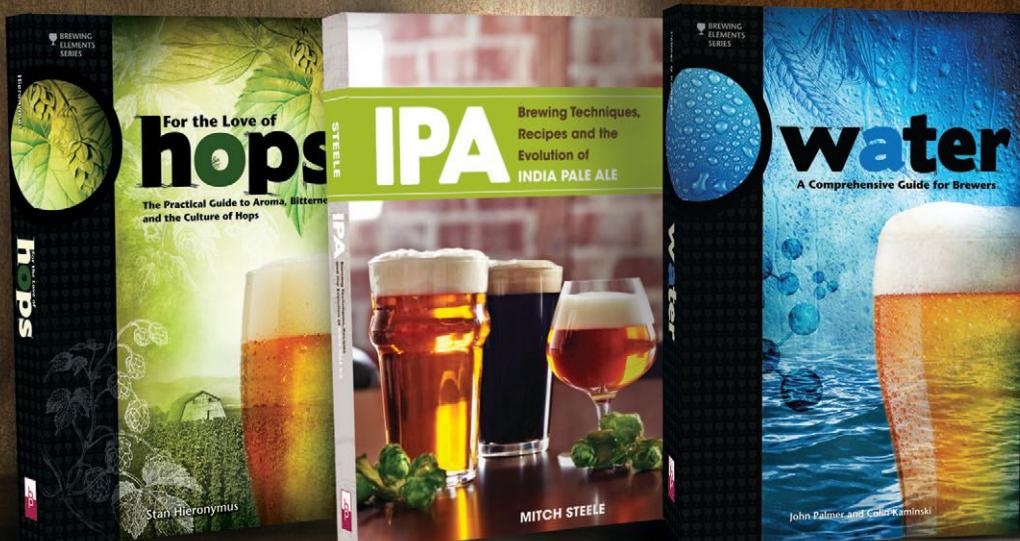
[AHAMemberDeals.org](http://AHAMemberDeals.org)

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by Amahl Turczyn Scheppach

# German Fest Stein Challenge



The 2013 German Fest Stein Challenge celebrated its third annual running July 25 through 28 in Milwaukee, Wis. Judging took place at Kegel's Inn, a historic German beer hall in West Allis, Wis., and the awards ceremony was held during Milwaukee's German Fest on the Leinenkugel's Heritage Stage.

According to organizers Patrick McHugh and Bruce Buerger, the Stein Challenge is limited to German-oriented styles of beer. It is believed to be the largest German-oriented homebrew competition in the U.S., with 250 entries in 2013. Beyond the more commonly recognized German styles such as schwarzbiere, doppelbock, and Munich helles, accepted styles also included Baltic porter, Bohemian Pils, Vienna lager, and the historic German style gose. Winners receive an authentic German stein.

Obviously, it takes a big club to put on a competition like this, but the host club Beer Barons of Milwaukee were up to the task. "We have over 200 active members and many BJCP ranked judges," said McHugh. "Milwaukee is especially rich in its diverse heritage, and we celebrate that diversity with several weekend ethnic festivals throughout the summer. Of course, German Fest is one of those, and the Beer Barons of Milwaukee

are very proud to be associated with the festival and homebrew competition."

Every effort was made to obtain top-quality judges for the competition. "Our Best of Show judging included a Grandmaster, Master, and National BJCP judge, as well as the head brewer for the Milwaukee Brewing Company," McHugh said. And as an added incentive, MBC chose one entry

## Subtle Difference Berliner Weisse

### 2013 GERMAN FEST STEIN CHALLENGE BEST OF SHOW

RECIPE BY MICHAEL DALLAS

#### INGREDIENTS

for 12 U.S. gallons (45.42 L)

**7.0 lb** (3.18 kg) German Pilsner malt  
**7.0 lb** (3.18 kg) white wheat malt  
**0.75 lb** (340 g) rice hulls (in mash)  
**1.25 oz** (42 g) Hallertauer pellet hops, 4.5% a.a. (15 min)  
 Wyeast 3191-PC Berliner Weisse Blend  
 Wyeast 5335 Lactobacillus Delbrueckii  
 Wyeast 1007 German Ale Yeast  
**7.0 oz** (198 g) per 5 gallons sugar to prime

**Target Original Gravity:** 1.034

**Approximate Final Gravity:** 1.005

**Approximate color:** 3 SRM

**IBUs:** 5

**Boil:** 15 minutes

#### DIRECTIONS

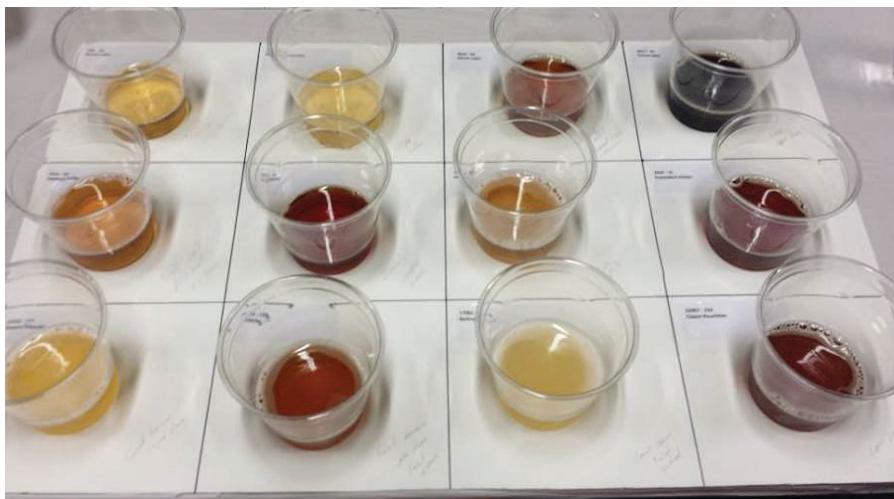
Mash grains at 149° F (65°C) for 90 minutes. Use rice hulls in mash to help lautering flow. Boil, chill, and divide into two batches for fermentation. Pitch Berliner Weisse blend (no starter) into one fermenter and Lactobacillus Delbrueckii (no starter) into the other. Add the pack of German ale yeast to the Lactobacillus Delbrueckii fermenter after

24-48 hours. Ferment both batches at 70° F (21° C) until terminal gravity is reached. Transfer to secondary and condition at the same temperature for four weeks before blending to taste, priming, and packaging.

**Extract Version:** Substitute 5.5 lb (2.49 kg) Pilsner malt extract syrup and 5.5 lb (2.49 kg) wheat malt extract syrup for the Pilsner and wheat malts. Proceed as above.

#### BREWER'S NOTES

I found a 2012 National Homebrewers Conference presentation online at [http://www.youtube.com/watch?v=\\_hClp9huB1M](http://www.youtube.com/watch?v=_hClp9huB1M) that was extremely helpful in learning how to brew a good Berliner. The presentation is from Wyeast Laboratories' Jess Caudill—it's a good watch. My next batch of Berliner has lacto starting at much higher temps, approximately 90-100° F (32-38° C) and letting the wort cool down on its own before adding the German Ale strain at normal ale fermentation temps. Hoping to increase the sour character a little more. Also, I hope to try to sour mash next time—so many ways to skin a cat! Never stop learning and experimenting!



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from the 12 Best of Show round finalists to ramp up to 15 barrels and put on tap at the Milwaukee Ale House. "That selection was our third place winner—Tom Gilbert's Av8r Doppelbock."

Dan Romanowich took second place overall with his Helles Hath No Fury, and Mike Dallas took Best of Show top honors with a Berliner weisse named Subtle Difference.

Dallas, a resident of the northwest Chicago suburbs, has been brewing for over seven years; like many AHA members, he began with a homebrew kit, and quickly found his new hobby turning into an obsession. Gratifying his thirst for information on home and craft brewing alike was the next challenge.

"I have a ton of books I use as references to help me design all my recipes," Dallas said. "My favorites include Jamil Zainasheff's *Brewing Classic Styles*, John Palmer's *How to Brew*, and Gordon Strong's *Brewing Better Beer*. I also listen to the Brewing Network for great info from homebrewers and professional brewers alike."

Dallas got into sour beers just a few years ago when he sampled New Belgium La Folie and "fell in love—[New Belgium brewmaster] Peter Bouckaert can rock a sour!" Since that time, he's been working to perfect his sour brewing technique. "I love the challenge of making German beers and sours," he related. "They are so refreshing on a hot summer day. Dan and Deb Carey at New Glarus also make an outstanding Berliner!"

So inspired is Dallas that he decided to take the leap so many homebrewers are taking. "My wife Jen and I are so excited about craft beer, I recently quit my job in local government so that we can focus on opening a new brewery in the local area," said Dallas. "Cross our fingers—we'll be serving our Berliner next summer!"

**Amahl Turczyn** is associate editor for *Zymurgy*. He is a former professional brewer who now brews at home in Lafayette, Colo.



## AHA/BJCP SANCTIONED COMPETITION PROGRAM CALENDAR

For complete calendar, competition and judging information go to  
[www.HomebrewersAssociation.org/pages/competitions](http://www.HomebrewersAssociation.org/pages/competitions)



- October 19**  
**Macon Oktoberfest Home Brew Contest**  
Macon, GA. Entry Deadline: 10/12/2013.
- October 19**  
**Beer Barons to Homebrewers**  
Bala Cynwyd, PA. Entry Deadline: 10/11/2013.  
[www.forever-care.com/events.php](http://www.forever-care.com/events.php)
- October 19**  
**OktobersBest**  
Covington, KY. Entry Deadline: 10/9/2013.  
[maltinusers.brewcompetition.com](http://maltinusers.brewcompetition.com)
- October 19**  
**Fredericksburg Brew Fest**  
Fredericksburg, VA. Entry Deadline: 10/14/2013.  
[www.fredbrewfest.com](http://www.fredbrewfest.com)
- October 19**  
**8th Annual New England Regional Homebrew Competition**  
Nashua, NH. Entry Deadline: 10/4/2013.  
[bfd.org/nerhbc/](http://bfd.org/nerhbc/)
- October 19**  
**Northeast Big River Homebrew Competition**  
Minneapolis, MN. Entry Deadline: 9/28/2013.  
[northeastbc.brewcompetition.com/](http://northeastbc.brewcompetition.com/)
- October 19**  
**Montana Mashup Competition MMXIII**  
Bozeman, MT. Entry Deadline: 10/10/2013.  
[brewmontana.com](http://brewmontana.com)
- October 19**  
**National Organic Homebrew Challenge**  
Santa Cruz, CA. Entry Deadline: 10/15/2013.  
[www.breworganic.com](http://www.breworganic.com)
- October 19**  
**Mountain Park Beer Festival**  
Mountain Park, GA. Entry Deadline: 10/4/2013.  
[www.mountainparkbeerfestival.com](http://www.mountainparkbeerfestival.com)
- October 19**  
**Philly Homebrew Club Fall Ales Competition**  
Philadelphia, PA. Entry Deadline: 10/5/2013.
- October 19**  
**Bayside Brewers Oktoberfest**  
Melbourne, Australia. Entry Deadline: 10/12/2013.  
[aysidebrewers.blogspot.com.au](http://aysidebrewers.blogspot.com.au)
- October 20**  
**Delaware Wine and Beer Festival Homebrew Championship**  
Dover, DE. Entry Deadline: 10/20/2013.  
[www.delawarewineandbeerfestival.com](http://www.delawarewineandbeerfestival.com)
- October 20**  
**Schleswig Wine & Bier Contest**  
Ida Grove, IA. Entry Deadline: 10/20/2013.
- October 25**  
**2013 SNAFU Sheldon Jackson/Marvin Edgeworth Memorial Homebrew Competition**  
Henderson, NV. Entry Deadline: 10/11/2013.  
[snafubrew.com](http://snafubrew.com)
- October 25**  
**Inaugural South African National Craft Beer Championship**  
Johannesburg, Gauteng, South Africa.  
Entry Deadline: 10/1/2013.
- October 26**  
**HOPS BOPS XXIX**  
Philadelphia, PA. Entry Deadline: 10/22/2013.  
[www.hopsclub.org](http://www.hopsclub.org)
- October 26**  
**Fall Classic**  
Portland, OR. Entry Deadline: 10/17/2013.  
[www.oregonbrewcrew.org/fallclassic](http://www.oregonbrewcrew.org/fallclassic)
- October 26**  
**Southeast Alaska Autumn Pour**  
Juneau, AK. Entry Deadline: 10/23/2013.
- October 26**  
**Hoppy Halloween 16 - They're Coming!**  
Fargo, ND. Entry Deadline: 10/19/2013.  
[hoppyhalloween.com](http://hoppyhalloween.com)
- November 2**  
**Sunshine Challenge #23**  
Orlando, FL. [www.cfhb.org/sunshine-challenge/](http://www.cfhb.org/sunshine-challenge/)
- November 2**  
**California State Homebrew Competition**  
San Francisco, CA. Entry Deadline: 10/12/2013.  
[www.nchfinfo.org/state-comp.html](http://www.nchfinfo.org/state-comp.html)
- November 2**  
**Nevada State Homebrew Championship**  
Reno, NV. Entry Deadline: 10/19/2013.  
[www.wzzcomps.net](http://www.wzzcomps.net)
- November 2**  
**Skirmish in the Triad**  
Greensboro, NC. [www.battlegroundbrewers.com](http://www.battlegroundbrewers.com)
- November 2**  
**2013 Music City Brew Off**  
Goodlettsville, TN. Entry Deadline: 10/5/2013.  
[www.musiccitybrewers.com](http://www.musiccitybrewers.com)
- November 2**  
**Novembeerfest 2013**  
Kent, WA. Entry Deadline: 10/29/2013.  
[www.wahomebrewers.org/novembeerfest/](http://www.wahomebrewers.org/novembeerfest/)
- November 2**  
**6th Annual Monster Homebrew Competition**  
Cedar Park, TX. Entry Deadline: 10/25/2013.  
[www.thedigpub.com](http://www.thedigpub.com)
- November 9**  
**Land of the Muddy Waters**  
Rock Island, IL. Entry Deadline: 10/31/2013.  
[www.mughomebrew.org/HOME/tabid/36/Default.aspx](http://www.mughomebrew.org/HOME/tabid/36/Default.aspx)
- November 9**  
**SCH\*ABC 6**  
Collegeville, PA. Entry Deadline: 10/30/2013.  
[www.SCHomebrewers.com](http://www.SCHomebrewers.com)
- November 9**  
**Knickerbocker Battle of the Brews**  
Albany, NY. Entry Deadline: 10/27/2013.  
[www.thoroughbrews.com](http://www.thoroughbrews.com)
- November 9**  
**Beer for Boobs**  
Zanesville, OH. Entry Deadline: 10/31/2013.  
[www.sodz.org/beer-for-boobs-competition/](http://www.sodz.org/beer-for-boobs-competition/)
- November 9**  
**Monster Mash**  
Jackson, MS. Entry Deadline: 10/18/2013.  
[hbamm.org/brewcomp/index.php](http://hbamm.org/brewcomp/index.php)
- November 9**  
**HopHead Fall Spiced Competition**  
Fort Collins, CO. Entry Deadline: 11/2/2013.  
[groupsites.com/Fort](http://groupsites.com/Fort)
- November 15**  
**I Concurso Norte Nordeste E Centro Oeste De Cerveja Artesanal**  
Salvador, Bahia, Brazil. Entry Deadline: 11/10/2013.  
[www.acervabaiana.com.br](http://www.acervabaiana.com.br)
- November 16**  
**FOAM Cup**  
Tulsa, OK. Entry Deadline: 11/2/2013.  
[foamcup.us](http://foamcup.us)
- November 16**  
**Rocky Mountain Homebrew Challenge**  
Denver, CO. Entry Deadline: 11/1/2013.
- November 16**  
**Los Angeles IPA Festival**  
Los Angeles, CA.
- November 23**  
**Son of Brewzilla Homebrew Competition**  
Middleburg Heights, OH. Entry Deadline: 11/15/2013.  
[beersnobs.org/cbwcomp/index.php](http://beersnobs.org/cbwcomp/index.php)
- November 28**  
**The Winnipeg Brew Bombers Present: The Half Pints ProAm Brew Challenge**  
Winnipeg, MB, Canada. Entry Deadline: 11/14/2013.  
[winnipegbrewbombers.ca/competition/](http://winnipegbrewbombers.ca/competition/)
- December 7**  
**Biere de Rock**  
Lone Tree, CO. Entry Deadline: 11/23/2013.  
[www.bierederock.com](http://www.bierederock.com)
- December 7**  
**Monk Melee III**  
Hulmeville, PA. Entry Deadline: 12/4/2013.  
[www.aleiens.com/page/monk-melee-iii-2013](http://www.aleiens.com/page/monk-melee-iii-2013)
- December 7**  
**Fugetaboutit 2013**  
Chattanooga, TN. Entry Deadline: 11/15/2013.  
[www.fugetaboutit.org](http://www.fugetaboutit.org)
- December 7**  
**Walk the Line on Barleywine**  
Dunedin, FL. Entry Deadline: 11/28/2013.  
[www.dunedinbrewersguild.com](http://www.dunedinbrewersguild.com)
- December 7**  
**7th Annual Virginia Beer Blitz**  
Hampton, VA. Entry Deadline: 11/23/2013.  
[www.colonialalesmiths.org/BeerBlitz/](http://www.colonialalesmiths.org/BeerBlitz/)
- December 7**  
**Nielsen-Massey Homebrew Challenge**  
Chicago, IL. Entry Deadline: 11/17/2013.  
[nielsenmasseychallenge.com/](http://nielsenmasseychallenge.com/)
- December 7**  
**North Sound Winter Homebrew Competition**  
Mount Vernon, WA. Entry Deadline: 11/30/2013.  
[www.mywiza.org/nswhc](http://www.mywiza.org/nswhc)
- December 14**  
**Happy Holidays Homebrew Competition (HHHC)**  
St. Louis, MO. Entry Deadline: 12/6/2013.  
[www.stlbrews.org/competition/hhhc/index.asp](http://www.stlbrews.org/competition/hhhc/index.asp)

## KUDOS—BEST OF SHOW

### AHA/BJCP Sanctioned Competition Program

#### June 2013

- 7th annual ABC Brews Crews Homebrew Competition, 363 entries—*Phil Sullivan, Royal Oak, MI.*  
Southern California Regional Homebrew Championship, 301 entries—*Brad Nixon, Corona, CA.*  
III Concurso Interno Acerva Paulista, 60 entries—*Paulo Mattos, São Paulo, Brazil.*  
California Mid State Fair Homebrew Competition, 96 entries—*Jeff Lampman, San Luis Obispo, CA.*  
San Diego County Fair Homebrew Competition, 825 entries—*James Jones, Santee, CA.*

#### July 2013

- Bona Fide Mississippi, 13 entries—*J.P. Myrick, Jackson, MS.*  
2013 WanCup2, 148 entries—*Ryoichi Takabayashi, Kanagawa, Japan.*  
Indiana State Fair Brewers' Cup, 1,224 entries—*HB/Tim Palmer, Fishers, IN.*  
2013 Buffalo County Fair Beer/Wine/Mead Competition, 45 entries—*Tom Malowski, Omaha, NE.*  
Critical Mash Homebrew Competition, 115 entries—*David Johnson, Edmond, OK.*  
Amador County Fair Homebrew Competition, 118 entries—*Mathew Kennedy, Sonoma, CA.*  
2013 Cowlitz Fair Competition, 33 entries—*Mike Schult, Carralls, WA.*  
El Paso County Fair Homebrew Competition, 52 entries—*Josh Bye, Colorado Springs, CO.*  
Battle of the Home Brews, 73 entries—*Adam Schwintz, Denver, CO.*  
KC Nanobrew Festival Judging, 45 entries—*Chris Roberts, Olathe, KS.*  
Battle of the Brews, 87 entries—*Clint Lang, Easton, MD.*  
E.T. Barnette Homebrew Competition, 74 entries—*Aaron Christ, Anchorage, AK.*  
Hopsanity in the Hill City, 68 entries—*Kevin Campbell, Roanoke, VA.*  
Summer Beer Dabbler Homebrew Contest, 50 entries—*Adam Meyers, Rochester, MN.*  
Alabama Brew Off, 225 entries—*Stott Noble, Birmingham, AL.*  
Michigan Mead Cup, 84 entries—*Paul Zimmerman, Ferndale, MI.*  
2013 SABC Amateur Brewing Challenge, 11 entries—*Clinton Fisher, Magill, Australia.*  
Lucid BFD, 151 entries—*John Clausing, Big Lake, MN.*  
Brew Haven, 89 entries—*Daniel Csoke, Oak Lawn, IL.*  
Spirits of Baker County, 70 entries—*Ryan Edwards, Vancouver, WA.*  
Crystal Coast Brew Off, 104 entries—*Sam Hood, Acworth, GA.*  
4th annual All American Brewoff, 100 entries—*Robert Bacon, Fayetteville, AR.*  
Highland Games Celtic Ale and Mead Competition, 21 entries—*Matt Miller, Billings, MT.*  
17th annual New Jersey State Fair Homebrew Competition, 229 entries—*Blake Crawford, Bergenfield, NJ.*

2013 Humpback Homebrew Competition, 55 entries—*Donny Richards, Ocean Springs, MS.*

2013 German Fest Stein Challenge, 241 entries—*Mike Dallas, Crystal Lake, IL.*

Antelope Valley Fair Homebrew Competition, 84 entries—*Sarah & Matthew Luker, Sylmar, CA.*

Napa Town and Country Fair, 42 entries—*Mike Riddle, Napa, CA.*

Iowa State Fair Homebrew Competition, 220 entries—*Paul Kay, Burlington, IA.*

Ventura County Fair Amateur Beer Contest, 73 entries—*Eric Drew, Ventura, CA.*

#### August 2013

Josephine County Fair, 32 entries—*Wayne Deruyte, Wimer, OR.*

St. Mary of the Rockies Harvest Fest, 35 entries—*Joe Homlar, Bailey, CO.*

BrewFest Encinitas Home Brew Competition, 97 entries—*Chris Everett, San Diego, CA.*

Lunar Rendezbrew XX, 522 entries—*Mark Peterson, Austin, TX.*

5th Annual Beehive Brew-Off, 599 entries—*Chris Detrick, Salt Lake City, UT.*

LA County Fair Homebrew Comp, 299 entries—*James Hilbing, Redondo Beach, CA.*

Best of the Bay, 232 entries—*Todd Quessenberry, Bellingham, WA.*

1st Annual Denver Beer Co. Homebrew Competition, 73 entries—*Tim Thomssen, Lincoln, NE.*

Dakota County Fair Homebrew Competition, 56 entries—*John Swanson, St. Paul, MN.*

Kentucky State Fair Homebrew Competition, 529 entries—*Ian Huber, Louisville, KY.*

National Capital Homebrewing Competition, 99 entries—*Jeff Manol, Toronto, ON.*

Beer Quest Flower Power, 21 entries—*Jason Davis, Lincoln, NE.*

Summer Smash Homebrew Contest, 41 entries—*Craig Schubert, Benson, AZ.*

Brew Jersey Homebrew Comp One, 125 entries—*Jesse Latriano, Monroe Township, NJ.*

The Homebrew Inquisition, 228 entries—*Mark Schoppe, Austin, TX.*

Denver County Fair Homebrew Competition, 113 entries—*Robert Bell, Colorado Springs, CO.*

Deer River Bar-B-Que and Brew Fest, 40 entries—*Mike Groom, Grand Rapids, MN.*

IAMNSOB Homebrew Competition, 28 entries—*Casey Mussman, Mason City, IA.*

Evergreen State Fair 2013, 251 entries—*Jeremy Allison, Oak Harbor, WA.*

Arkansas Beer Challenge, 17 entries—*Robert Bacon, Fayetteville, AR.*

9th Annual Western Idaho Fair Beer Competition, 147 entries—*Ryan Collings, Boise, ID.*

Benton Franklin Fair Homebrew Competition, 32 entries—*James Golovich, West, WA.*

Malt Madness VII, 498 entries—*Jason Wasnick, Pottstown, PA.*

Beer & Sweat, 330 entries—*Chris Meta, Pittsburgh, PA.*

Colorado State Fair Homebrew Competition, 829 entries—*Bill Dickey, CO.*

For What It's Worth, 196 entries—*Brian Moulton, Chicago, IL.*

Philly Homebrew Club Summer Sizzle, 24 entries—*Stephen LaMonica, Philadelphia, PA.*

East Idaho State Fair Homebrew Competition, 133 entries—*Jesse Neff, Idaho Falls, ID.*

2013 RBT British Ales Brewing Competition, 61 entries—*David Jones, Townsville, Queensland, Australia.*

Grain to Glass Picnique Belge, 48 entries—*David Schumacher, Kansas City, MO.*

## AHA SPECIAL EVENTS

Visit the Events section of [HomebrewersAssociation.org](http://HomebrewersAssociation.org) for more information.

#### October 19

**AHA Rally- RAM Restaurant & Brewery**  
Wheeling, IL

#### November 2

**AHA Learn To Homebrew Day**

#### November 9

**AHA Rally- Jester King Brewery**  
Austin, TX

#### November 14

**Great Lakes Brewing Company**  
Cleveland, OH

by Roger Barth, Ph.D.

# The Science of Carbonation

**C**arbon dioxide is essential to the flavor and foamy appearance of beer. In addition to providing much of the characteristic mouthfeel, a small fraction of the dissolved carbon dioxide (less than 1 percent) can react with water to produce carbonic acid,  $H_2CO_3$ , providing a tart flavor. Beer with insufficient carbonation is flat and lifeless, while beer with excessive carbonation is difficult to serve. The drinker wants a glass of beer with some foam on top, not a glass of foam with some beer on the bottom. Over-carbonated beer may gush, and in extreme cases it can rupture its container.

## Pressure

The amount of carbon dioxide that can dissolve in beer depends on the pressure and the temperature. Pressure is the force per unit of surface area that molecules exert by striking any surface. Pressure is given in a confusing variety of units. For beer-related work, the bar seems most suitable.

## TABLE I. PRESSURE UNITS.

To convert from the pressure unit to bar, multiply by the entry under "unit per bar." To convert bar to the unit, multiply by the entry under "bar per unit." For example, to convert 24.70 psi to bar, multiply by 0.06895 bar per psi to get 1.703 bar.

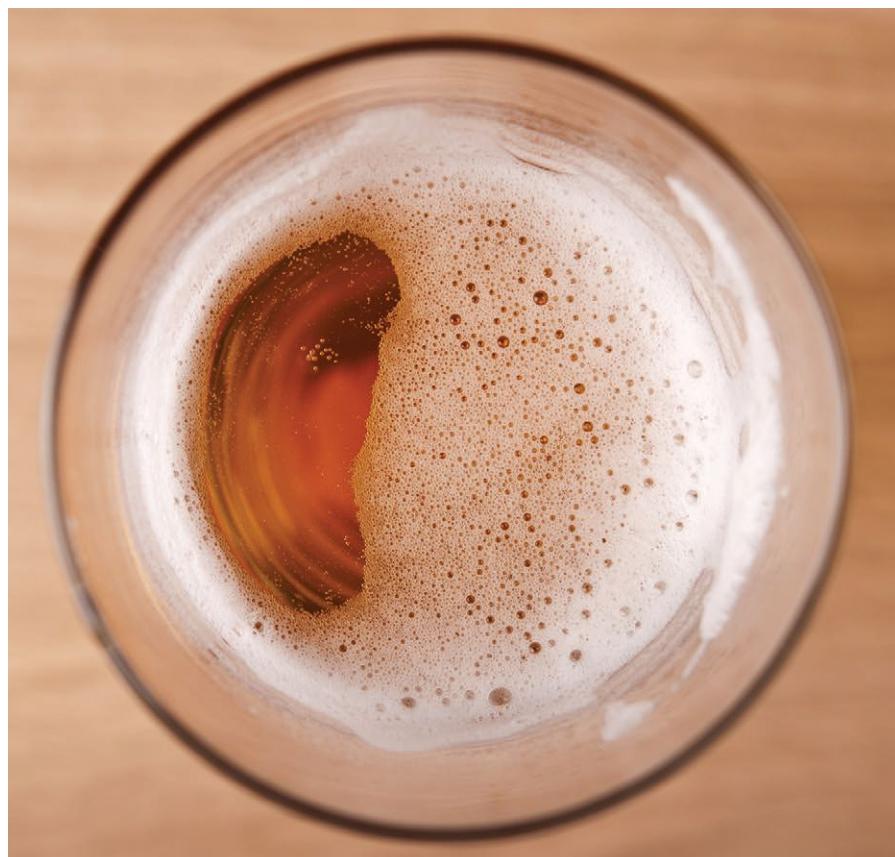
unit (symbol)	unit per bar	bar per unit
bar (bar)	1	1
standard atmosphere (atm)	0.9869	1.01325
kilopascal (kPa)	100	0.01
pound per square inch (psi)	14.50	0.06895
millimeters mercury (torr)	750.1	0.001333
inches mercury (in Hg)	29.53	0.03386

Pressure is usually measured with mechanical gauges that have a piece of metal in the form of a diaphragm, tube, or capsule with the pressure to be measured on one side and a reference pressure on the other. The metal bends when there is a pressure difference on its two sides. Often the reference side is open to the atmosphere, so the gauge responds to the difference between the pressure being measured and atmospheric pressure. This difference is called the gauge pressure. If the reference side is sealed under vacuum, the gauge will not be affected by the local atmospheric pressure. It responds to the absolute pressure, the true pressure as defined above.

## READER ADVISORY: Warning!

These pages are rated XG (eXtra Geeky) by the Bureau of Magazine Mucktymucks. Items in this section may contain raw data, graphic functions, full statistics and undiluted biochemistry. Keep away from poets, squeamish novices and others who may find the joyously technical nature of this prose to be mindbendingly conceptual or socially offensive. Also, because of the complex nature of brewing science, there is no guarantee that you will live longer, brew better or win any awards in the next homebrew competition based upon the conclusions presented here.

Equations involving gases work only with absolute pressure. Because people are used to gauge pressures, some gauges and most carbonation tables provide the absolute pressure minus one standard atmosphere, in the relevant units.



## Dissolving Carbon Dioxide

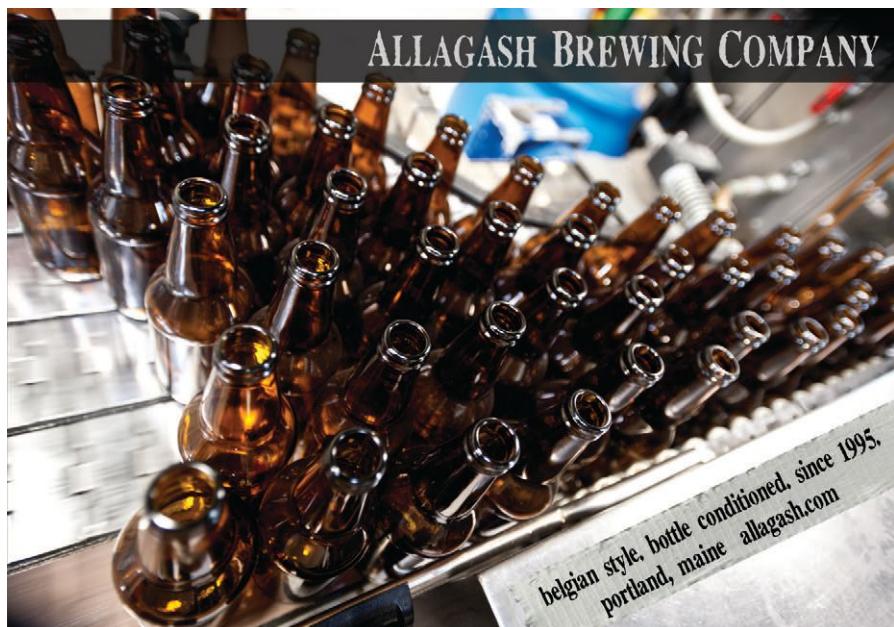
Imagine a tank partly filled with water. We connect the tank to a source of carbon dioxide at a particular pressure. Carbon dioxide molecules strike the surface of the water and some of them enter the water and dissolve. The higher the pressure of carbon dioxide in the gas phase, the more frequently the molecules strike the water surface and the faster they dissolve. As carbon dioxide dissolves, some of the dissolved molecules have enough energy to overcome the grasp of the water molecules and return to the gas phase. The more carbon dioxide is dissolved, the

more will have enough energy to escape to the gas phase.

Eventually the rate of escape catches up with the rate of dissolving, and the number of molecules that dissolve and escape each second becomes the same. The dissolved concentration becomes constant, a condition called equilibrium. The concentration of dissolved material at equilibrium is called the saturation concentration. The relationship between the saturation concentration of dissolved gas and gas pressure is given by Henry's law:  $P = k \cdot c$ , where  $P$  is the absolute

pressure and  $c$  is the concentration. The Henry's law constant,  $k$ , depends on the identity of the gas and liquid, and on the temperature. Henry's law works only with absolute pressure.

As the temperature becomes higher, a larger fraction of dissolved molecules gains enough energy to escape. Suppose that at a certain pressure, 10 units of  $\text{CO}_2$  goes into solution each second. Suppose that at  $0^\circ \text{C}$ , 5 percent of the dissolved  $\text{CO}_2$  has enough energy to escape each second. Saturation would be reached when 10 units a second escapes, which would occur when 200 units are in solution. Suppose that at  $18^\circ \text{C}$ , 10 percent escapes each second. Saturation still occurs when the escape rate is 10 units a second, but with the higher fraction escaping, that happens when only 100 units of  $\text{CO}_2$  are in solution. The result is that the saturation concentration becomes lower as the temperature gets higher, so the Henry's law constant is not really constant. It increases strongly with temperature. In summary, the ultimate amount of carbonation increases with pressure and decreases with temperature. Many books and web sites provide tables giving the saturation concentration of carbon dioxide in beer over a practical range of temperatures and pressures.



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## Degree of Carbonation

Two familiar units of degree of carbonation are volumes and grams per liter. Volumes are the number of liters of carbon dioxide, measured as a pure gas at one atmosphere (1.013 bar) and  $0^\circ \text{C}$  ( $32^\circ \text{F}$ ), dissolved in one liter of beer. One volume of  $\text{CO}_2$  comes to 1.963 grams per liter. Typical American lager is carbonated at about 2.6 volumes, or 5.1 grams per liter. The flavor threshold (smallest concentration the average taster can detect) is about 1 gram per liter (0.5 volumes), so carbon dioxide is typically present at about five times its threshold, or 5 flavor units. In regards to beer, the flavor threshold can refer to both taste (sour/tart) and mouthfeel (fizzy, prickly). Mouthfeel (fizziness) is most likely the factor that tasters can discern at low concentration. The desired degree of carbonation varies with the style. British ales are generally carbonated somewhat lower, around 2.2

volumes, and some lambics and wheat ales are carbonated to 3 volumes or more.

Equilibrium over a range of temperature is governed by the van 't Hoff equation, forms of which are given below. Equation 1 gives the CO<sub>2</sub> pressure in absolute bars when you provide the desired degree of carbonation in volumes (V) and the temperature (t) in degrees Celsius.

#### EQUATION 1

$$P = \frac{6167 \cdot V}{\exp\left(\frac{2505}{t + 273.15}\right)}$$

Equation 2 can be used to determine the degree of carbonation from a measurement of temperature and carbon dioxide pressure.

#### EQUATION 2

$$V = 0.00016215 \cdot P \cdot \exp\left(\frac{2505}{t + 273.15}\right)$$

These equations cover the range from 0 to 30° C and 1.3 to 4.5 bar absolute for carbon dioxide in beer. Calculated volumes are within 0.05 volumes of published tables. Use of (or even knowledge of) these equations will unambiguously establish your beer geek credentials.

Pressure adjustments are appropriate for high elevations. Atmospheric pressure decreases by 0.11 bar for each 1,000 meters of elevation (0.48 psi per 1,000 feet). A gauge pressure reading of 0.96 bar (13.9 psi gauge) in New York (at sea level) would correspond to 1.97 absolute bar, which would give 2.6 volumes of carbonation at 5° C. In Boulder, Colo. (elevation 1,655 meters) the same gauge pressure would correspond to 1.97 bar – (0.11 bar/km × 1.665 km) = 1.79 bar absolute giving 2.37 volumes.

#### Carbonating Beer

The carbonation process familiar to most homebrewers is fermentation. Corn sugar is added to the unfiltered beer and carbon dioxide is produced by the reaction: C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>•H<sub>2</sub>O (glucose monohydrate) 2CO<sub>2</sub> + 2C<sub>2</sub>H<sub>6</sub>O (ethanol) + H<sub>2</sub>O. Beer in the fermenter under atmospheric pressure of carbon dioxide at 20° C (68° F) is saturated with 1.7 volumes. After transfer to the bottling bucket and bottling, perhaps 1.0 volume remains. For

a carbonation level of 2.6 volumes, the bottle fermentation must provide 1.6 volumes, or 3.1 grams per liter. Each gram of sugar provides about 0.44 grams of CO<sub>2</sub>, so 7.1 grams of sugar is needed per liter. For a 5-gallon (19 liter) batch, this comes to 135 grams or 4.8 ounces. The most reliable way to add the sugar is to dissolve it at the rate of about 1 gram of sugar to 3 milliliters of boiling water (1 ounce by weight to 3 fluid ounces) and mix the solution gently but thoroughly into the beer in the bottling bucket. It is important that the sugar solution be evenly distributed in the beer, or some bottles will be under-carbonated and some will be over-carbonated and potentially dangerous.

The disadvantages of bottle carbonation are that it leaves yeast in the bottle and that the bottles need to ferment for a week or more before they are ready to drink. Commercial brewers and homebrewers who keg add carbon dioxide under pressure directly to the beer, a process called force carbonation. Because yeast is not needed for force carbonation, it is removed by sedimentation,

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filtration, or centrifugation. The simplest procedure to force carbonate is to hold the beer at a particular temperature, and provide carbon dioxide at the saturation pressure corresponding to the degree of carbonation desired. It can take several days for complete saturation. Agitation speeds up the dissolving process. To carbonate faster, one can supply the gas at a higher pressure and stop the flow when the carbonation level is correct. The risk is that the beer can over-carbonate if the process is allowed to go too far. It is difficult to remove carbon dioxide without raising unwanted foam. Commercial brewers often introduce carbon dioxide into the bright beer tank through a porous carbonating stone to increase the contact between the gas and liquid. Some introduce the gas as the beer flows through a carbonator. In all cases, care must be taken to avoid admitting air into the beer.

Many homebrewers believe that carbonation by bottle fermentation gives superior foam and flavor. If this is true, it is because of the yeast in the bottles, not because of any difference in the carbon dioxide. Carbon dioxide from fermentation is exactly the same in every respect as carbon dioxide from any other source.

#### **Delivering Carbon Dioxide**

Carbon dioxide used to carbonate beer should be beverage grade. CO<sub>2</sub> packaged for use in welding, as a propellant for paintballs, or for other non-food applications may have off-flavor contaminants from the manufacturing process, from packaging, or from plumbing. The beverage industry has standards for CO<sub>2</sub> that apply to anyone who makes quality beer.

Carbon dioxide comes in steel or aluminum cylinders as a liquid whose pressure increases rapidly with temperature but is not affected by the amount of material in the cylinder. At 21° C (70° F) the pressure is 59 absolute bar, or 838 psi gauge. To dispense the gas, a regulator that controls the delivery pressure must be installed on the cylinder. For safety, only a CO<sub>2</sub> regulator (CGA-320) will fit on a CO<sub>2</sub> cylinder. The cylinder must be restrained from falling during storage and the valve and regulator assembly must be protected from damage; uncontrolled vent-

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ing of a CO<sub>2</sub> cylinder can be hazardous. Ventilation should be sufficient to assure that the concentration of carbon dioxide in the air that workers are breathing does not exceed its permissible exposure limit of 0.5 percent by volume. Carbon dioxide cylinders and fittings should only be modified by experts; safety features must never be thwarted. The information provided here is intended to educate readers about carbonation basics and should not be used as training in the safe handling of compressed or liquefied gases of any kind.

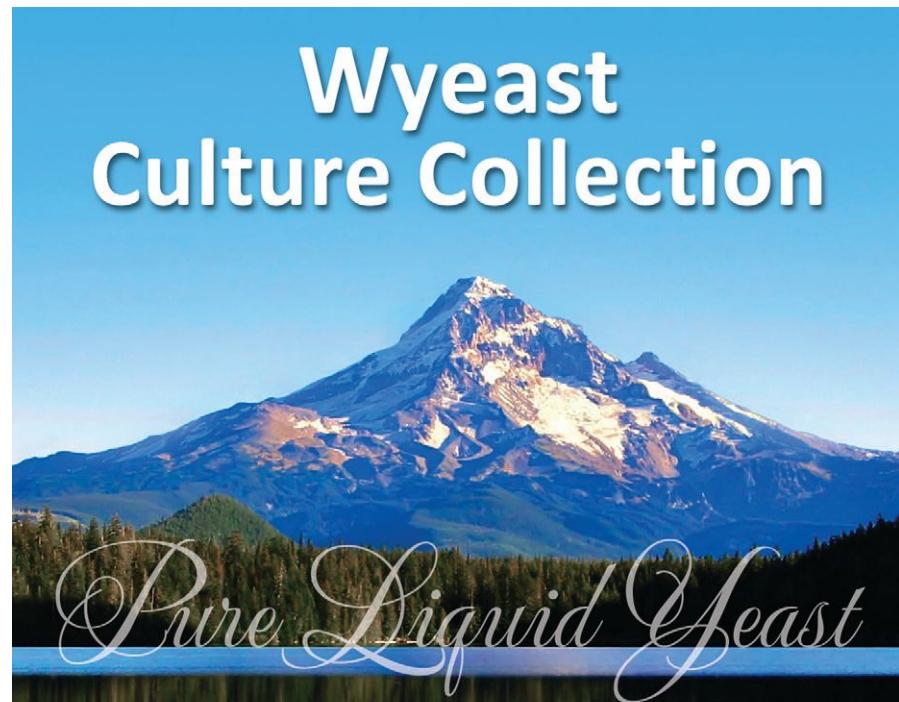
### The Upshot

Carbonation is essentially a physical process. The technical complication is that both in the cylinder and in the beer, the CO<sub>2</sub> forms part of a gas-liquid system that does not even approximate the familiar ideal gas law ( $pV = nRT$ ), which applies to a system with gas only. Another issue is that carbon dioxide is supplied at pressures high enough to be dangerous. The diversity of pressure units and the distinction between gauge and absolute pressure provide rich sources of confusion. Nonetheless, many homebrewers and nearly all commercial brewers force carbonate their beer with a minimum of untoward incidents. Force carbonation can provide bright, yeast-free beer almost immediately after fermentation.

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**Roger Barth is a homebrewer and a chemistry professor at West Chester University in Pennsylvania. He is the author of *The Chemistry of Beer: The Science in the Suds*, published by John Wiley.**



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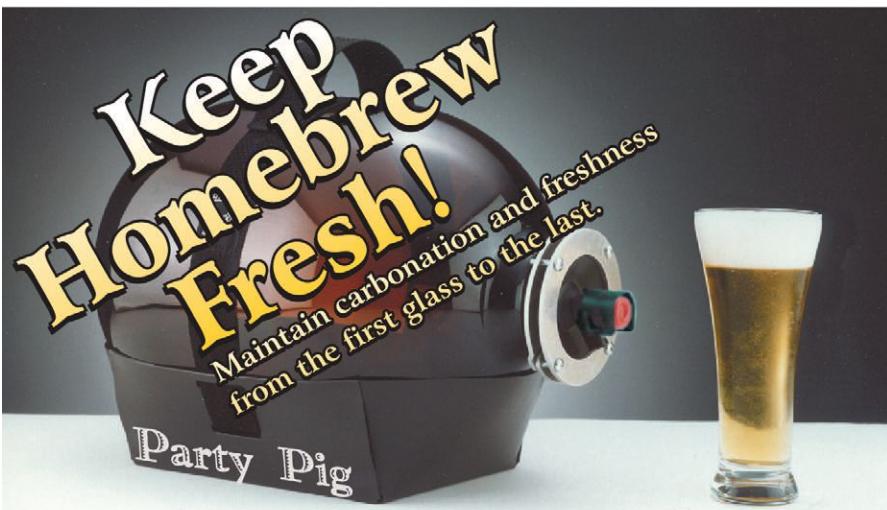
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**T**wo specialty ciders were sent to our judges this issue for their autumn enjoyment.

Anthem Hops is a dry-hopped cider from Wandering Aengus Ciderworks in Salem, Ore. Crafted with organic Washington-grown Golden Delicious, Fuji, Red Delicious, and Granny Smith from the 2012 harvest, the cider was then dosed with Oregon-grown Cascade hops.

James Kohn of Wandering Aengus recalls sitting at the bar at Naked City Brewing a few years ago discussing a drink he created that he likes to call Hop Blossom, a 50/50 blend of Wandering Aengus Bloom Cider and a hoppy IPA (his favorite is Caldera IPA). “The result of this blend is kind of a hazy grapefruit hefe; the cider cuts the

bitterness and accents the aromatics of the hops,” said Kohn. It was during this discussion that the idea of adding hops directly to the cider was born.

“I went home, got some cider and started experimenting with boiling hops in cider and dry hopping cider in a French press,” said Kohn. “All of them tasted different based on the hops and the method used.” After a few experimental batches, the selected method became dry hopping with Cascade pellets.

“We taste the cider as it is dry hopping to ensure that the hops and cider complement each other and one does not dominate the relationship. Each batch of Anthem Hops is a little different because the apples we use change from batch to batch. And we have found that just as different apples make different ciders, they also interact differently with a variety of hops. The combinations in flavor development are endless.”

Anthem Hops checks in at 5.5 percent ABV.

Another cidemaker helping to redefine the genre of ciders is Alpenfire Orchards in Port Townsend, Wash. Calypso Semi Sweet is a blackberry cider aged in toasted rum barrels. It’s the first flavored cider release from Alpenfire, known for its more traditional offerings including Pirate’s Plank Bone Dry.

Crafted with Northwest blackberries and apples, the cider is aged two months in the barrel. “The rum barrel character is not overpowering,” said Alpenfire’s Philippe Bishop. “It is still a cider first, with a presence of blackberries and rum.”

For the base cider, Alpenfire uses a blend of heirloom apples, “Kings, Burgundies, and Winter Banana, with a tiny bit of high-acid culinary apples to balance everything out,” said Bishop. “Then we add some of our Estate Organic blend of Kingston Black, Fox Whelp, Yarlington Mill, and Dabinette.” The barrels come from Bull Run Distilling in Portland, Ore., and the blackberries are sourced from a farm on the Olympic Peninsula.

Calypso, named after the research vessel of Jacques Cousteau as well as the sea nymph, is 6.9 percent ABV.

## ON THE WEB

**Wandering Aengus Ciderworks**  
[www.anthemcider.com](http://www.anthemcider.com)

**Alpenfire Orchards**  
[www.alpenfirecider.com](http://www.alpenfirecider.com)

**BJCP Style Guidelines**  
[www.bjcp.org](http://www.bjcp.org)

**Commercial Calibration**  
[HomebrewersAssociation.org/pages/zymurgy/commercial-calibration](http://HomebrewersAssociation.org/pages/zymurgy/commercial-calibration)

(Note: This is a Members Only area of the website)

**OUR EXPERT PANEL** includes David Houseman, a Grand Master IV judge and competition director for the BJCP from Chester Springs, Pa.; Beth Zangari, a Grand Master 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 VII judge, principal author of the 2004 BJCP Style Guidelines and president of the BJCP board who lives in Beavercreek, Ohio.

# THE SCORES



Anthem Hops—Wandering Aengus Ciderworks, Salem, Ore.  
BJCP Category: 28D Other Specialty Cider

## THE JUDGES' SCORES FOR ANTHEM HOPS



**Appearance:** Bright yellow color with brilliant clarity. Petillant carbonation. Very nice looking glass of cider. (6/6)

**Bouquet/Aroma:** Low to moderate apple aroma. Very low level of sulfur—OK for this cider. Some perfumey esters. Hop aroma is not noticeable in this sample. No off-aromas. Would have enjoyed the aroma of Cascade hops. Still crisp and inviting. (8/10)

**Flavor:** Crisp, dry with a touch of lingering sweetness showcasing very mild apple flavor. Moderate astringency and mild tartness to balance. Just a hint of sulfur. Medium bodied. Hops are noticeable but not the well-known Cascade flavor, just a low citrus character. Just short of dry finish. Aftertaste is very clean with some moderate lingering bitterness but not the expected hop flavor. Alcohol not evident, except after enjoying a bottle. (19/24)

**Overall Impression:** Anthem Hops cider varies from year to year; perhaps batch to batch. I've had this cider when there was a pronounced Cascade, citrus, hop aroma and flavor, but this bottle was lacking in these characteristics. It was however a very drinkable cider that does exhibit mild hop bitterness and just discernible citrus hop notes. The apple is fresh and crisp. This bitterness and astringency add to the body and dryness, while there is enough sweetness to enjoy the apple character. Great to drink as an alternative to beer and would go well with hors d'oeuvres. Very enjoyable. (8/10)

**Total Score:** (41/50)



**Appearance:** Summer field straw colored with brilliant clarity. A few bubbles rise continually. No foam. (6/6)

**Bouquet/Aroma:** Distinctive citrus and evergreen hop at first dominates an almost perfume-like apple aroma. Fuji apple sweetness is the showcase, with fresh, clean cider following. Hop aroma fades, giving way to moderate level sweet apple. (8/10)

**Flavor:** Well-balanced fruit between light fruit acidity that remains on the lips with the aftertaste, with definable Fuji apple sweetness and Granny Smith tartness most pronounced, with the balance dancing between Fuji sweet and Granny Smith tart/tannic. Hop flavors are the evergreen crispness of Cascades playing on the tongue, and are more expressive as a balancing bitterness that accentuates the peel astringency. Finishes quite clean, with a hint of sweetness. Alcohol presence is subdued. Body is light, and carbonation petillant. (18/24)

**Overall Impression:** The fresh hops and perfume-like green apple are reminiscent of a cologne popular when I was in high school, bringing back memories of clandestine beers consumed while sitting on the tailgate of a pick-up truck parked on the levee on a Saturday night. Just like those nights, the at-first intense hop aroma and flavor fade, leaving sweet memories. The apple flavors are comfortably homey. A perfect beverage when a beer isn't quite right, it satisfies the craving for hops while keeping all components in balance. Ethereal. (8/10)

**Total Score:** (40/50)



**Appearance:** Light to pale straw in color with pristine clarity. The carbonation level is pétillant, with a few steady streams of bubbles rising from the bottom of the glass. (6/6)

**Bouquet/Aroma:** Citrusy hops and apple notes are moderately intense, with the resinous, grapefruit notes of Cascade hops battling with the sweet and sour notes of the apples. Fruity esters including apples, pears, and, interestingly enough, blood oranges add complexity. Low alcohol and peppery notes are also present. (8/10)

**Flavor:** The flavor had a somewhat different profile than the aroma, a bit more intense and leaning toward the tartness of the apples rather than sweetness. Some light apple sweetness up front, definitely not sugary, and enough to support the hop flavor. Citrusy, apple, and grapefruit flavors are in balance but slowly yield to soft tannins and medium acidity in the finish. Yeast esters are subdued and allow the cider and hop notes to be prevalent. The hop bitterness is very low, but does lend some dryness to the finish. Low astringency and a slight chalkiness from the apple tannins and hop resins, along with a low alcohol warmth. The body is light and appropriate for a light specialty cider. (21/24)

**Overall Impression:** The citrusy and piney notes from the hops marry well with the apple notes in both the flavor and the aroma. They also add a little resinous character to the finish that works well with the tannins and acidity of the apples to make the finish thirst-quenching without being too sweet or dry. (9/10)

**Total Score:** (44/50)



**Appearance:** Crystal clear. Pale gold color. Bubbles on the pour, but settled quickly. (6/6)

**Bouquet/Aroma:** Fresh grassy hop aroma—fairly strong, bright, citrusy. Moderate fruity apple aroma. Light acidity. Clean fermentation character. Hops and apples blend together nicely. (9/10)

**Flavor:** Sparkling. Bright, clean, somewhat simple apple flavor with balanced acidity. Semi-sweet. Moderate tannin adds to dryness in the finish. Medium body. Mild hop character—mild vegetal notes, slightly bitter in the finish, oddly. Apple flavor dominates with hops adding an accent note. Clean aftertaste. (18/24)

**Overall Impression:** Apple expression is quite nice, if simple in character. The hop aroma is pleasant but the hop flavor seems understated—more hop flavor would be welcome. The hops and apples do blend well but the bitter note in the finish is a detractor. Very clean and fresh tasting. Acidity level is perfect for the sweetness. Very easy to drink. (8/10)

**Total Score:** (41/50)



## THE JUDGES' SCORES FOR ALPENFIRE CALYPSO



**Appearance:** Pinkish red color. Well carbonated. Hazy clarity detracts from overall appearance. (5/6)

**Bouquet/Aroma:** Buttery notes dominate—perhaps from the rum-barrel aging? No apple aroma. Some alcohol evident. Light fruitiness but not obviously blackberry. Light acetic acid aroma in the background. (7/10)

**Flavor:** Blackberry is prominent in the flavor. Rum flavor is noticeable with a little of the buttery notes. Dry to semi-sweet with some lingering drying aftertaste that adds to the drinkability and balance. Alcohol is evident. Body is medium, aided by some astringency. Fairly tart with hints of acetic acid. Very complex, both up front and in aftertaste. (18/24)

**Overall Impression:** The overall complexity of this cider is very nice but the buttery notes, perhaps a result of rum-barrel aging or yeast-derived diacetyl, was a bit strong as was the acid level, while the blackberry character was somewhat underwhelming, especially in aroma. Dryness made this more drinkable than had it been sweeter. The acetic acid notes, although light, were distracting. However, in the end the sum of the parts made the cider quite enjoyable. It did remind me of a Kir Royale and makes an excellent aperitif. (8/10)

**Total Score:** (38/50)



**Appearance:** Brilliant rose with light golden sunset highlights. Bubbles continually rise lazily, gaining in girth as they reach the surface. A cake of delicate pink foam forms, then quickly falls. (6/6)

**Bouquet/Aroma:** Full expression of cidery apples plays between sweet and tart. Blackberry is a background component, though with the depth and intensity of very ripe fruit starting to dry in the sun with seeds toasting. Low brown-sugary rum aromas back up a subdued wine-like note that intensifies toward the end of the glass. (7/10)

**Flavor:** Medium light bodied with bright acidity and crisp apple peel tannin reminiscent of biting into a ripe Granny Smith apple. Low alcohol warmth is a back note to acidity that lends a refreshing tartness mid-palate and finish. Sparkly, nearly spritz carbonation tickles the tongue. Tart fruitiness and lightly tannic finish linger on the lips, with hints of sweetness. Berry flavors and rich, though subdued, brown sugar rum flavors are present, though less pronounced than in the aroma. Barrel character is even less so mid-palate. Overall balance is towards the apple tartness that lingers into the finish. It was after I poured the rest of the cider into my glass, along with the lees, that I found the intensity of berry I'd missed. The flavor was of fruit leather depth, lightly tart and rich at the same time, with vestiges of oak. It was late summer in a bottle! (19/24)

**Overall Impression:** Labeled as semi-sweet; with the fairly pronounced tartness and hints of berry pits, a little more roundness would enhance the presentation as a solo beverage. Paired with ripe peaches or vine-ripened grapes, semi-soft farmers cheese and some raw almonds, the tartness and acidity are a perfect accompaniment. (8/10)

**Total Score:** (40/50)



**Appearance:** Slightly hazy with suspended yeast (even after allowing to settle for a few days). Reddish-orange color with moderate to high effervescence. A thin ring of bubbles forms a narrow collar around the inside of the glass. (4/6)

**Bouquet/Aroma:** The initial aroma is earthy, with low sulfur and vegetal (cabbage) notes that I often find in fermented beverages that include a large quantity of berries. Blackberries emerge as it warms, giving it a sweet, jam-like character. Low to moderate alcohol notes. The apples give a little acidity, but play second fiddle to the fruit. (7/10)

**Flavor:** The flavors develop slowly, with sweet apple notes coming through first before giving way to a pronounced explosion of blackberries. The fruit has a jam-like character and also contributes some acidity and tannins to the finish. An earthy, pithy character is related to the vegetal notes in the aroma. The finish is fairly neutral, with the tannins and high attenuation making it more dry than sweet. The alcohol warmth is noticeable but in balance with the other flavors. The apple character is a bit overwhelmed by the blackberries. (19/24)

**Overall Impression:** Making this carbonated was a good choice to enhance the berry aroma, but does require a little more care by the consumer to ensure that excess yeast is not roused when the bottle is opened. Reducing the quantity of berries by about 20 percent or blending with a batch of pure cider should help improve the apple-fruit balance. (8/10)

**Total Score:** (38/50)



**Appearance:** Effervescent. Bubbly pink head, settled to a ring. Rusty purple-orange color. Not totally clear—some haze. (5/6)

**Bouquet/Aroma:** Toasty rum notes initially, mixed with a deep dark fruit note—recognizable as a dark berry; jam-like, suggestive of tannins (mental association), or like a young red wine. Not much apple. Slight age (barrel?) quality. Bright fruit. Light acidity. Slight butter note (rum?). Fairly complex. Not immediately recognizable as a cider (I might have guessed a young wine), but shows the specialty ingredients well. (7/10)

**Flavor:** Sparkling. Semi-sweet. Big blackberry character. Apple is not immediately noted; the blackberry is strong. Apple does add a "broadness" to the palate. Bright juicy acidity. Moderately strong tannin. Toasty barrel notes add complexity. Rum flavor is detected but thankfully not over the top. Has a buttered rum flavor, which actually goes well with the blackberry. Alcohol is subtle. Medium body. (20/24)

**Overall Impression:** Lots of flavor. Blackberries forward. Toasted rum in support, apples in background. Balanced flavors. Bright acidity. Still makes me think of a young, oaked red wine. Toasty rum is unusual but not excessive. Sparkling notes and sweetness give it great drinkability. Just wish it had more of an apple structure/flavor complexity. Great carbonation. (8/10)

**Total Score:** (40/50)

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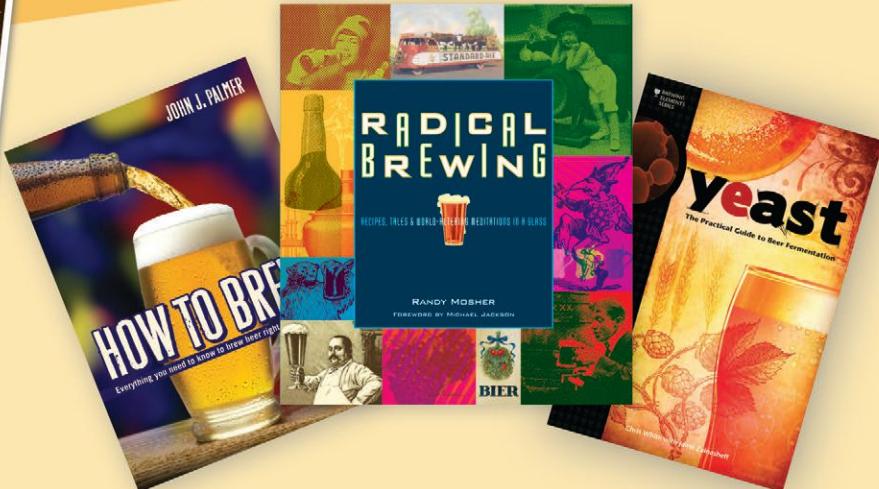
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by Charlie Papazian



# Take Care of Your Craft Beer

[Editor's Note: This article was originally published on BrewersAssociation.org and has been adapted for Zymurgy.]

The American beer business has entered a dynamic era. A short time ago—1978 to be exact—only 89 breweries were producing beer in the U.S. Today there are more than 2,500 breweries making some of the most creative and full-flavored beers this country has ever consumed.

The dramatic shifts in the beer business require craft brewers, beer distributors, retailers, and beer drinkers to reevaluate how craft beer is stored and transported. Beer is a perishable product and craft brewers do their best to ensure that the product is in the most optimal condition upon release from the brewery. From that point on, everyone who touches the beer needs to do their part.

## The Flavor Life of Craft Beer

Beer's flavor begins to deteriorate the instant it leaves the brewery. The chemistry is extremely complex, but there are two general strategies to help slow down the rate of flavor change.

The first approach is to minimize the oxygen level in beer during packaging at the brewery. Homebrewers and any brewers who ferment/bottle condition their beers have a slight edge on preserving the fresh quality of their beer. Live yeast scavenge oxygen while in the bottle and reduce the effects of oxidation.

The second strategy is to maintain the beer at as cold a temperature as possible without freezing it. Heat has a profound impact on chemical reactions. A reaction



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# Silver Dollar Porter

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This is the best porter that either side of a silver dollar can buy—but you can't buy it because it ain't for sale. It's homebrew and it's yours—lucky for you, because there won't be enough to go around as it is.

A full-bodied, bittersweet version of black heaven, this is the homebrewer's best shot at duplicating the famous Anchor Porter of San Francisco fame. It'll bring tears of joy to your eyes.

### INGREDIENTS

for 5 U.S. gallons (19 L)

<b>8.0 lb</b>	(3.6 kg) pale malt
<b>1.0 lb</b>	(450 g) Munich malt
<b>0.5 lb</b>	(225 g) crystal malt (10-15° L)
<b>0.5 lb</b>	(225 g) black malt
<b>0.5 lb</b>	(225 g) chocolate malt
<b>1.0 tsp</b>	(4 g) gypsum
<b>1.0 oz</b>	(28 g) Northern Brewer or Perle hops: 8 HBU (224 MBU)—boiling
<b>0.5 oz</b>	(14 g) Cascade hops: 3 HBU (84 MBU)—boiling
<b>0.5 oz</b>	(14 g) Cascade hops—finishing/aroma
<b>0.25 tsp</b>	(1 g) Irish moss powder
American ale-type yeast or White Labs Cry Havoc yeast	
<b>0.75 cup</b>	(175 ml) corn sugar or 1.25 cup (300 ml) dried malt extract (for bottling)

**Target Original Gravity:** 1.054 (13.5 B)

**Target Extraction Efficiency:** 79%

**Approximate Final Gravity:** 1.014 (3.5 B)

**IBUs:** about 43

**Approximate Color:** 40 SRM (80 EBC)

**Alcohol:** 5.3% by volume

### DIRECTIONS

Add half the gypsum to 10 quarts (9.5 l) of water. Add the crushed malt to 10 quarts (9.5 l) of 143° F (61.5° C) water and mix well. The temperature will stabilize between 130 and 135° F (54.5-57° C). Add heat if necessary and hold the temperature at about 133° F (56° C) for 30 minutes. Don't worry about a 3- to 5-degree F temperature drop during this time.

Add 5 quarts (5 l) of boiling water to this mash. This will raise the temperature to about or just below 155° F (68° C). Hold at this temperature for 45 minutes, stirring occasionally. Complete conversion by raising the temperature to 158° F (70° C) and holding for 10 to 20 minutes or until an iodine test indicates complete conversion. Add more heat to raise the temperature to 167° F (75° C). Pour your mash into your lauter tun and sparge with 3 gallons (11.5 l) of hot water (add the other half of the gypsum to the sparge water) at 170° F (76° C).

Bring the sweet wort to a boil, add the boiling hops, and boil for 50 minutes. Add the Irish moss and boil for 8 more minutes. Add the finishing/aroma hops and boil a final 2 minutes. Cool the wort to about 70-75° F (21-24° C). This can be done simply by immersing the brewpot (with lid on) in a bath of cold running water for about 45 minutes. Other means of chilling can be used if desired.

Strain, sparge, and transfer immediately to your primary fermenter. The final batch size is 5 to 5.5 gallons (19-21 l). If necessary, add cold water to achieve this volume.

Add yeast when the temperature of the wort is about 70-75° F (21-24° C). Preferably ferment at 70-72° F (21-22° C) for four to six days or until fermentation is complete and the beer appears to clear and darken. At this point, transfer the beer into a secondary fermenter and let the fermentation complete and settle in the secondary fermenter for seven days. For best results "cellar" or age at 50° F (10° C) to help drop yeast out of suspension, but this is not at all crucial to the quality. Bottle with corn sugar. Age and carbonate/condition at temperatures at about 70° F (21° C).

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will go two to three times faster for every 18° F (10° C) increase in temperature. Put into the context of flavor life, a beer that will last three months at the "classic" room temperature of 68° F (20° C) will last only one month at 86° F (30° C).

Cold storage is a cornerstone of any quality program. A brewery's highest priority is to maintain product quality during distribution and at retail, and to help beer drinkers maintain quality at home. Yes, even ales should be stored as cold as possible to maintain freshness. Bringing them back up to your favorite ale serving temperature will bring back the flavor experience. Back and forth temperature fluctuations can damage the freshness and other qualities of beer.

The Brewers Association (BA) recommends the following parameters for beer storage and shipping:

- Draught: 33-40° F (0-4° C)
- Packaged: 33-49° F (0-9° C)

### **Importance of Cold Temperature Storage (below 50° F)**

Craft beer has greater malt and hop character, in addition to many flavor nuances not found in lighter styles. Fresh, consistent beer expresses the complexities that beer drinkers expect. Distributors, retailers, and beer drinkers can improve their experience and relationship to quality beer by keeping all craft beer refrigerated according to specifications. Cold storage and shipping temperatures preserve the taste qualities of all beer, but it is even more important with full-flavored craft beers that are not usually flash or tunnel pasteurized.

### **Detriment of Warm Temperature Storage (above 50° F)**

The staling process is a series of organic chemical reactions that compromise desired flavor associated with fresh beer. Staling is a function of time and temperature. Warm temperatures promote staling reactions and increase the rate at which they occur. Cold temperatures protect beer from staling by retarding the reaction. Beers with pronounced malt and hop character suffer most from warm storage. Desirable flavors decrease and negative flavors begin to manifest, namely cooked cereal and sherry-like notes. Compared to beers stored in accordance with the BA recommendations, beer stored at 68° F will have roughly half the shelf life. If stored at 86° F, flavor will be noticeably degraded in a couple of weeks.

Beer is usually stored at a retail location for a week or less, while it can be stored for up to a month in a distributor's warehouse. There is usually less control of the beer environment at retail storage temperatures. Wherever the beer spends more time, it is more imperative that it is stored cold there. For beer drinkers who have just bought the perfect craft beer, placing beer in a very warm or hot environment,

even for short periods, can have devastating effect on quality. Store your beer in a fridge or the coolest place in your home. If you don't have access to a cool environment, it is probably not a good idea to stockpile any beer in quantities that you can't enjoy within a week or less.

Many challenges are faced at the retail level. Trying to design and integrate a quality-minded presentation that gives the consumer variety while promoting beer is a challenge. Keeping the themes of quality and freshness in mind at all levels is vital: at distribution, at retail, all

the way to the consumer. Craft beer is enjoying an era of consumer discovery and appreciation. Homebrewers and beer enthusiasts are the vanguards of this craft beer excitement. The better we handle our cherished beers, the more our beer experience will be improved. No matter who makes the beer, we all want to see craft beer succeed. At the same time, placing an IPA on a warm shelf, in direct sunlight in the delivery alley, or in the trunk of your car is not the long-term answer.

So what should we brew now? In July, I led five intrepid beer seekers on

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## Sparrow Hawk Porter

MALT EXTRACT RECIPE

If you'd like to treat yourself to a gloriously bittersweet black porter, your heart will "soar like a hawk" when you part your lips for this treat. Sparrow Hawk Porter is brewed in the tastefully done tradition of the Anchor Brewing Company's world classic Anchor Porter. Its character is complex: wonderfully black and bitter, yet sweet, medium-bodied, rich, and quenching. Served cold, the bitterness will be enhanced; served at temperatures above 50° F (10° C), its sweet character will take the forefront. Its distinctly bitter bite does not linger long enough to be cloying. Its sweetness is like an impatient songbird, hidden in the darkness of midnight. As Sparrow Hawk lingers it becomes more enjoyable.

### INGREDIENTS

for 5 U.S. gallons (19 L)

<b>4.5 lb</b>	(2 kg) German or other light or amber malt extract syrup
<b>3.3 lb</b>	(1.5 kg) plain dark malt extract syrup
<b>1.0 lb</b>	(450 g) black malt
<b>1.5 oz</b>	(42 g) Northern Brewer hops (boiling): 13 HBU (360 MBU)
<b>1.0 oz</b>	(28 g) Tettnang or Santiam hops (aroma)
<b>0.25 tsp</b>	(1 g) powdered Irish moss American Ale yeast or White Labs Cry Havoc yeast
<b>0.75 cup</b>	(175 ml) corn sugar or 1.25 cup (300 ml) dried malt extract (for bottling)

**Target Original Gravity:** 1.060 (14.7 B)

**Approximate Final Gravity:** 1.016 (4 B)

**IBU:** about 38

**Approximate color:** 50 SRM (100 EBC)

**Alcohol:** 5.8% by volume

### DIRECTIONS

Add the crushed black malt to 2 gallons (7.5 l) of water and let steep at 150-160° F (65-71° C) for 30 minutes, then remove the grains with a strainer. Add the malt extracts and boiling hops and boil for 60 minutes. Add Irish moss for the last 10 minutes of the boil. Add the aroma hops for the final few minutes of the boil. Strain, sparge, and transfer immediately to 2 gallons (7.5 l) of cold water in the fermenter. Top off with additional water to make 5 gallons (19 l). Add the yeast when cool and ferment to completion. Bottle when fermentation is complete.

Whitehead Island off the coast of Maine for my annual "The Art of Craft Beer and Brewing" class. It was a five-day sojourn that led us to taste more than 100 beers. This year was the fifth time I have embarked on discovering the unknown with the group.

The beers were primarily brewed by American brewers. Most of the beers were specialties, unusual releases, or hard-to-find collectibles. I found that the beers were leading the class instead of me. We tasted one beer at a time and paced ourselves as best we could. Our palates were bombarded with an out-of-bounds range of beer flavors. During the down times between sessions, a wide variety of mostly session-like, lower-alcohol beers were available to enjoy at a more reasonable "island" pace.

After a week of so many beers, I found myself migrating toward heritage style brews—beers that reflected the original foundation of where homebrewers and craft brewers first discovered their mojo. It's in that direction that I'm taking the recipes for this issue. I'm going back in the way-back machine and suggesting we revisit two recipes that have flourished from my *Complete Joy of Homebrewing* for more than 30 years. They are the all-grain recipe Silver Dollar Porter and its "cousin" malt extract recipe Sparrow Hawk Porter.

So let's cut the shuck and jive and get on with the recipes.

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



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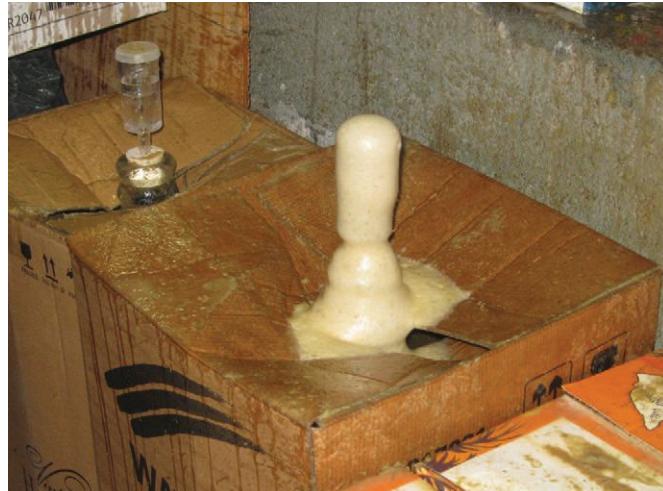
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# Brewing Misadventures



**E**ver since I began homebrewing, I've dreamed of trying my hand at a barleywine. Described as "the drink of the gods" by some and capable of being aged for years, barleywine is a test of a brewer's mettle. And with an original gravity of as much as 1.120, it's about as big as beer gets.

Of course, to make a beer that big requires a lot of ingredients. Malt is often doubled, as are hops. And, in order for the yeast to have a chance to get through all that sugar, I've heard it's best to pitch at least a pint of healthy yeast slurry in a five-gallon batch.

I recently had the fortune of meeting the brewmaster of my local brewery, Aloha Beer Company, and when I mentioned making a barleywine, he offered to give me as much yeast as I could carry. I ended up walking out of there with two quarts—more than I needed, but that's the size of the container I'd brought, and he filled it almost to the brim.

It was lively yeast too, coming straight from a 20-barrel vat, raring to get back to

work. In the few minutes we stood there chatting, the yeast swelled to fill the container. A few minutes more and the sides of my plastic container had begun to bend outward from the pressure.

The whole ride home I was on edge, wincing at every bump in the road, afraid the yeast would go off like a bomb. But I made it and got the yeast in the fridge without incident.

The next day's brew went fine. I started with 10 pounds of Maris Otter in the mash and boiled the wort for an hour. I took the kettle off the burner, mixed in four pounds of pale malt extract and three pounds of honey, and brought it back to a boil for 30 minutes. I wound up with about four-and-a-half gallons with an original gravity of 1.095—not as high as I wanted, but still within style guidelines.

Once the wort had cooled, I pitched the yeast. I wasn't crazy enough to add all of it, so I split the difference and threw in half. If a pint was good, I reasoned, a quart would be twice as good.

In all of my research about barleywines, however, I'd somehow failed to take in the importance of a blow-off tube. I figured a six-and-a-half gallon carboy and an airlock would be good enough. About two hours after pitching the yeast, my girlfriend and I heard a percussive sound, a mix between a pop and a thud. "What was that?" she asked. I was afraid I knew.

I ran to the basement. It sounded like it was raining in there. The top of the airlock had blown off, and my carboy had become a beer fountain. A mighty stream of liquid shot straight up and splattered against the ceiling before raining back down.

I was able to jerry-rig a blow-off tube pretty quickly and ended up saving about three-and-a-half gallons of the beer. While it's true I ended up losing almost a quarter of the batch and several hours cleaning up the mess, I gained something from the experience—a name for my barleywine, Kilauea.

**Marcos Soriano lives in Hawaii and blogs about his brewing misadventures at [homebrewhawaii.blogspot.com](http://homebrewhawaii.blogspot.com).**



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