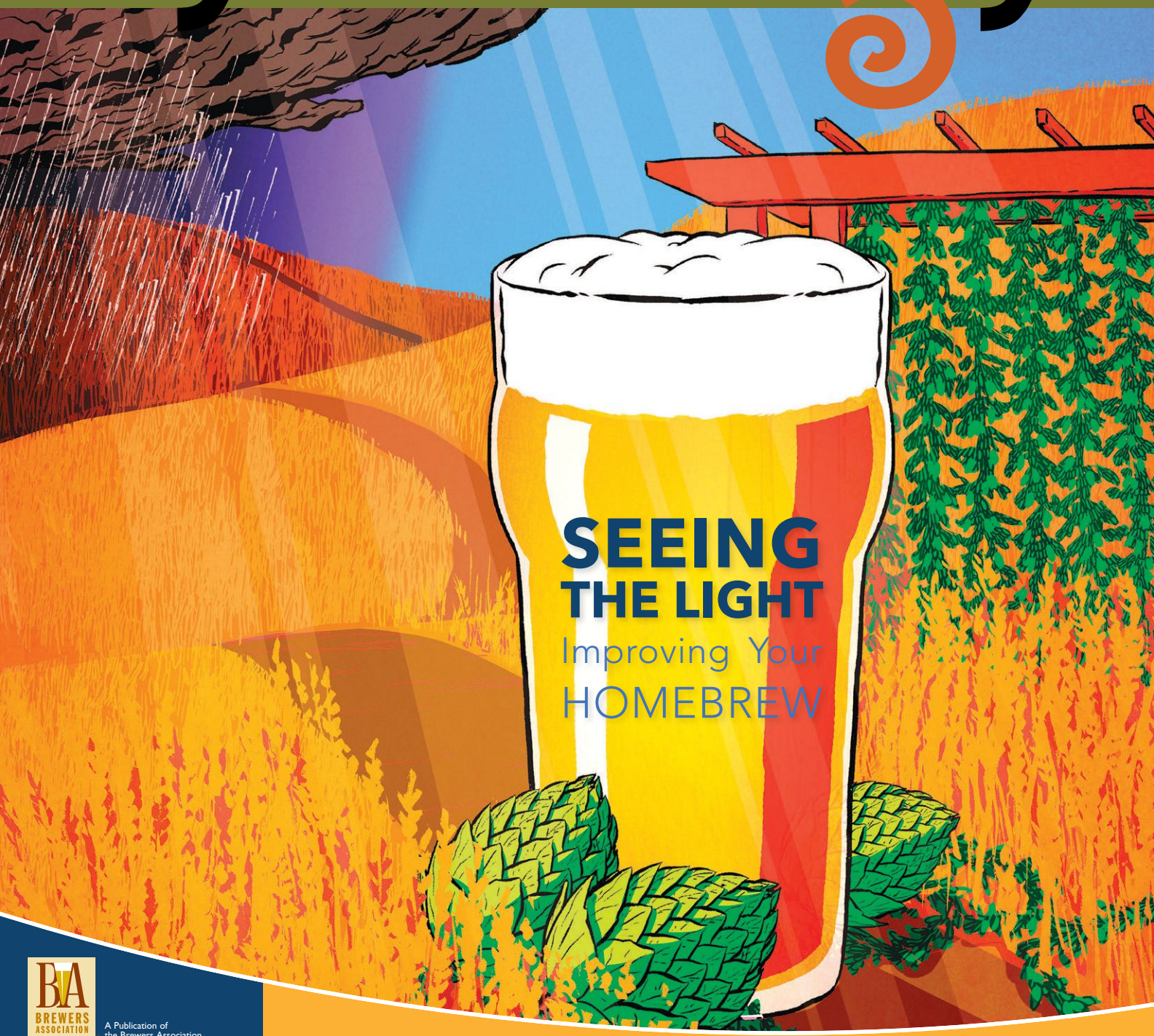
Vol. 38 ✳ No. 3 | May/June 2015

FOR THE HOMEBREWER & BEER LOVER

zymurgy®

The Journal of the American Homebrewers Association®



SEEING THE LIGHT

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ASSOCIATE MEMBER

by Jill Redding

BJCP Style Guidelines

The 2015 BJCP Style Guidelines are the first update of the guidelines since 2008. I asked BJCP president Gordon Strong for the inside scoop.

Zymurgy: What were the main goals in updating the BJCP style guidelines?

Gordon Strong (GS): The biggest goal was to expand the guidelines with modern, popular styles, to include historical styles of interest to homebrewers, and to better reflect world beer styles, not just styles as they exist in the U.S. import market. The BJCP is a global organization and we get requests to make the guidelines more usable in non-U.S. regions. We also wanted to make them more consistent and accurate, refresh and shorten the list of commercial examples, move from ingredient-based descriptions to more sensory-based descriptions, and to include better differentiators between styles. We're trying to make them more usable in competitions, too.

Zymurgy: Describe the process of updating the guidelines.

GS: It's very involved, with research, writing, review, fact-checking, discussions, and decisions. Counting all the reviewers, commenters, and subject matter experts, at least 50 people contributed. The core team was quite a bit smaller, since you ultimately have to make decisions and you can't do that with a huge group. Comments and updates are continuously collected, and we've had some queued up for years. The heavy lifting has been going on for about three years; the last year has mostly been editing and revising.

Zymurgy: Do you have a goal of updating the guidelines every certain number of years, or is the timeline dictated by evolving beer styles?

GS: Our goal is every four to five years. We wanted to have these done around 2012 or 2013, but the BJCP was revamping its exam program, and we couldn't introduce two major changes simultaneously. Going forward, we'll probably look at the guidelines every two to three years and decide if a change is warranted.

Zymurgy: What's the main purpose of the BJCP guidelines?

GS: The main purpose is to provide a reference for brewers and judges in homebrew competitions. However, we acknowledge that the guidelines are used for far more than that. Since the guidelines are so detailed, and are offered free for educational use, we have seen a widespread adoption of our terminology and classification system.

Zymurgy: What are some of the most significant changes for 2015?

GS: Every word has been reviewed. The styles have a standardized format, and consistent language. We have added many new styles, and completely reorganized the groupings. A new Historical category contains many examples that are being rediscovered by craft brewers, such as Gose and Sahti. We've added a number of Czech lagers, and introduced an American Wild Ale category. We've added styles that have either been developed since the last guidelines, or are in more demand, like English Golden Ale, Australian Sparkling Ale, and Wheatwine. The IPA category has been greatly expanded by introducing a range of Specialty IPAs.

We've tried to group the styles for ease of use in competitions, where similar beers can get judged together. But we're also providing alternate grouping methods so that people who want to view by region or by style family will be able to see related styles.

For more on the new BJCP guidelines, go to bjcp.org.

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

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Associate Editor ..... Amahl Turczyn
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Art Director ..... Jason Smith
Graphic Designer ..... Ashley Peck
Graphics/Production Director ... Stephanie Johnson Martin
Sales & Marketing Director ..... Barbara Fusco
barbara@brewersassociation.org
Business Development Manager
for Advertising & Sponsorship (East)..... Tom McCrory
mccrory@brewersassociation.org
Business Development Manager
for Advertising & Sponsorship (West)... Kari Harrington
kari@brewersassociation.org
Advertising & Sponsorship Associate..... Joe Damgaard
Marketing Coordinator ..... Jeb Foster
jeb@brewersassociation.org
Member Services/Circulation Manager .... Dan Goloback

American Homebrewers Association

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

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COLUMNS

DEPARTMENTS




FEATURES

QUICK RECIPE GUIDE

ON THE WEB

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

>> GET THERE!

ALLTECH CRAFT BREWS AND FOOD FEST

Alltech is going for round two, hosting one of the region's largest craft beer and food festivals in downtown Lexington, Ky. on May 16. The Craft Brews and Food Fest features hundreds of craft brews from Kentucky and beyond. Special tappings will be happening every 15 minutes, offering a specialty brew from each brewery. New this year, a craft spirits bar will serve local and regional craft spirits. Food will be available.

The festival will also feature the second Alltech Commonwealth Craft Beer Cup competition and live entertainment. The Alltech Craft Brews and Food Fest will serve as one of the culminating events for the third annual Lexington Craft Beer Week May 9-16, a celebration of Lexington's craft beer culture and best brews.

For more information, go to alltechbrewsandfood.com.

May 1-2
St. Louis Microfest
St. Louis, MO
stlmicrofest.org

May 2
Wild West Brew Fest
Katy, TX
katybrewfest.com

May 16
Sour + Wild + Funk Fest
Indianapolis, IN
uplandsourfest.eventbrite.com

May 16
Hangar 24 AirFest
Redlands, CA
Hangar24airfest.com

May 22-31
Paris Beer Week
Paris, France
laparisbeerweek.com

May 29-June 7
Philly Beer Week
Philadelphia, PA
Phillybeerweek.org

June 5-6
SAVOR℠: An American Craft Beer & Food Experience
Washington, DC
SavorCraftBeer.com

June 11-15
Mondial de la Bière
Montreal, Quebec
http://festivalmondialbiere.qc.ca/

June 19-21
Oregon Garden Brewfest
Silverton, OR
oregongarden.org/events/brewfest

June 20
Boulder Sour Fest
Boulder, CO
averybrewing.com

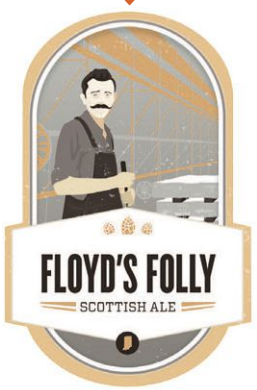
For more craft brewing events, go to CraftBeer.com

>> YOU'VE GOTTA DRINK THIS

CUTTERS FLOYD'S FOLLY

I'd like to share a beer that I thoroughly enjoy. This small brewery in Indiana makes what I consider to be the best Scotch ale available on the market. It has just a hint of smoky flavor and the perfect balance of malt, alcohol, and complex flavors. If you can get it on draft, even better! I'd really like to get the recipe for this one.

Reviewed by Steve Hilla
Raleigh, N.C.



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.

Photos courtesy of Alltech Craft Brews and Food; Cutters Brewing Company

>> BREW NEWS:

AMERICAN CRAFT BEER WEEK
CraftBeer.com

What are your local breweries, brewpubs, and beer retailers doing to celebrate American Craft Beer Week?

For the 10th consecutive year, the Brewers Association presents American Craft Beer Week® (ACBW), a celebration of U.S. craft brewers across the country. Last year, ACBW was celebrated by breweries, brewpubs, and retailers in all 50 states. More than 66,000 beer lovers have joined the Facebook community for American Craft Beer Week, and 2015 will undoubtedly be the largest celebration yet.

From May 11-17, ACBW will provide an opportunity for small and independent brewers, craft beer enthusiasts, and the community of better beer retailers to celebrate the ever-advancing beer culture in the U.S. Events will include exclusive brewery tours, special beer releases, beer and food pairing dinners, collaboration beers, retail promotions, and much more. To find events near you, go to CraftBeer.com/acbw.

>> GREAT PRODUCT

WHAT'S NEW FROM BRIESS MALT & INGREDIENTS CO.

BRIESS MESQUITE SMOKED MALT

Briess Malt & Ingredients Co. added a second smoked malt to its portfolio: Mesquite Smoked Malt. Like its Cherry Wood Smoked Malt, Briess Mesquite Smoked Malt delivers pronounced smoke flavor. It is characterized by upfront earthy mesquite flavor and some sweetness. Mesquite Smoked Malt delivers a mellow mesquite smoke flavor without the harshness that mesquite can deliver. This smoothed-out flavor is achieved through a blend of mesquite and other hardwoods. Mesquite Smoked Malt is less sweet than Cherry Wood Smoked Malt, which is described as smooth and clean with subtle fruity flavor and malty sweetness. Both malts are 5° Lovibond and 140 DP.

Usage rates starting at 5 percent will add noticeable smoke character in Scottish ale and Oktoberfest; pronounced smoke character in these styles at 10 to 20 percent; and pronounced smoke character in darker styles like stout and porter at 30 to 60 percent. The maltster recommends capping usage at 60 percent.

For more information and recipes, visit BrewingWithBriess.com.

Photos courtesy of Briess Malt & Ingredients Co.; James Beard Foundation

>> THE LIST:

JAMES BEARD AWARDS

Six professional craft brewers, and one well-known craft beer bar owner, were among the 2015 Restaurant and Chef Award Semifinalists for the James Beard Awards in the Outstanding Wine, Beer, or Spirits Professional category. Brooklyn Brewery brewmaster Garrett Oliver won the category in 2014.

The craft brewers and craft beer bar owner on the 2015 list include:

Sam Calagione
Dogfish Head Craft Brewery, *Milton, Del.*

Mike Floyd, Nick Floyd, Simon Floyd
Three Floyds Brewing, *Munster, Ind.*

Jim Koch
The Boston Beer Co., *Boston, Mass.*

Tom Peters
Monk's Café, *Philadelphia, Pa.*

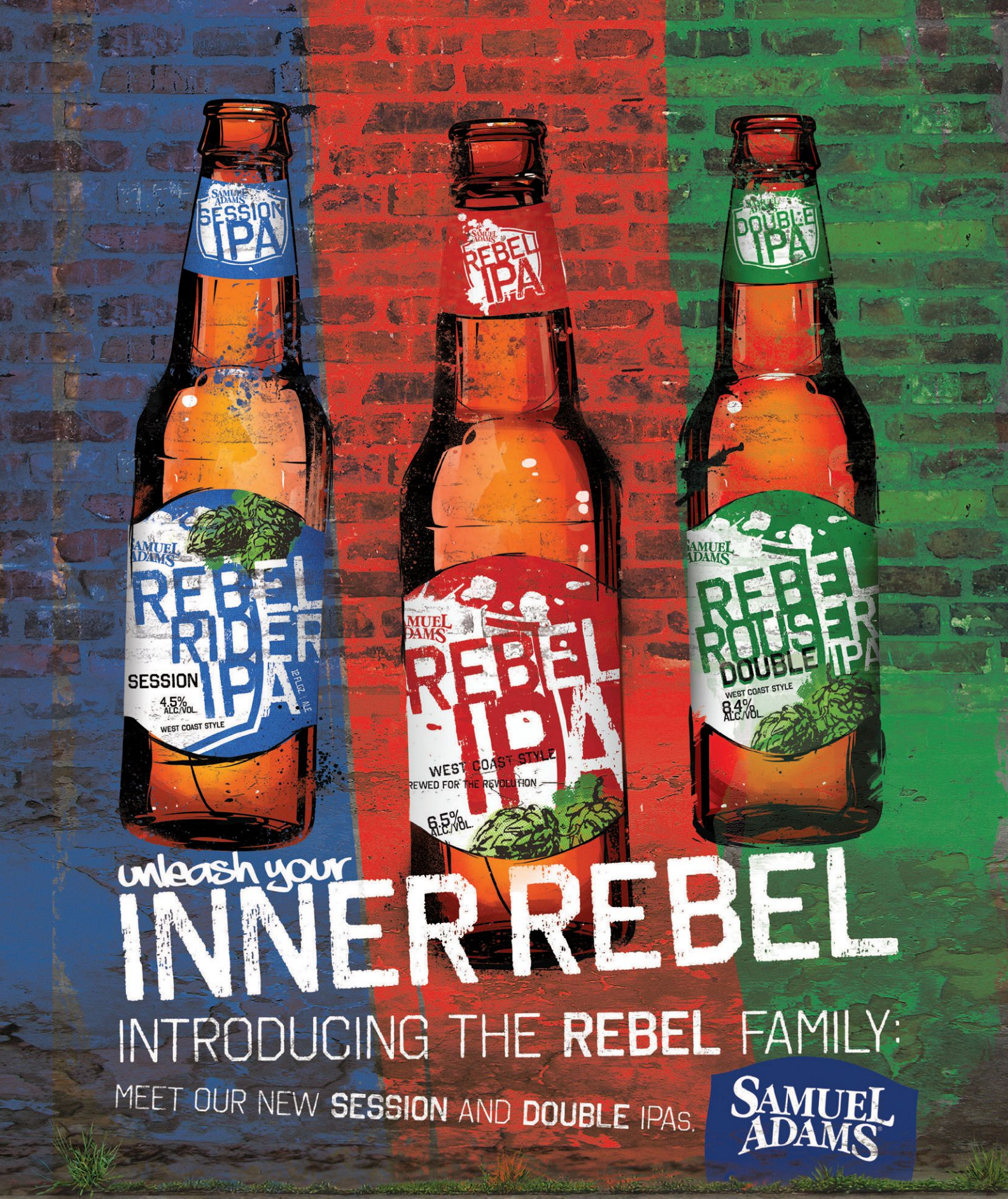
Rob Tod
Allagash Brewing Co., *Portland, Maine*

The awards ceremony will be held May 4 in Chicago. For more, go to jamesbeard.org.

>> BEER QUOTE

"There are only three ingredients in Belgian beers: knowledge, experience, and creativity."

—Peter Bouckaert, brewmaster, New Belgium Brewing



SAVOR THE FLAVOR RESPONSIBLY.®

By Gary Glass

National Homebrewers Conference

Don't miss out on the most epic homebrew event of the year: the 37th annual AHA National Homebrewers Conference in San Diego June 11-13! Just think about it: 3,000+ homebrewers, 54 beer and brewing seminars, and 105 exhibitors showing off the latest in homebrew ingredients, equipment, and more.

Oh yeah, and there will be beer! San Diego County is home to more than 100 craft breweries and they will be coming to you! No need to leave the host hotel; we have arranged for a conference Welcome Reception like no other. Local breweries will be onsite for an evening beer fest held outdoors among the hotel gardens and it is exclusive to conference attendees.

Of course, what would a homebrew conference be without homebrew? (Lame, that's what.) Hundreds of different homebrews will be available for sampling, brought by fellow homebrewers for your tasting delight. During the conference's famous Club Night, homebrew clubs from across the nation will be in full club-themed regalia while serving up an eclectic and tasty mix of handcrafted beers.

With the spectacular backdrop of San Diego, there is plenty to do besides attend the conference: beaches, the world-famous San Diego Zoo, Safari Park, Sea World, and Legoland. Beerwise, it's the home of White Labs yeast (they have their own tasting room!) plus the aforementioned world-class breweries. The local committee has put together a great lineup of events happening around the conference to help you experience San Diego.

Registration is still available, but space is limited. Do not let this incredible event pass you by. Full details on the conference are available at AHAConference.org.

Photo © Brewers Association

Big Brew

Another not-to-be-missed event is happening right around the time this magazine is landing in your hands or on your screen. Every year on the first Saturday of May, the AHA promotes Big Brew, a celebration of National Homebrew Day (which is officially May 7). On May 2, homebrewers around the world will join in a celebration of our favorite hobby by brewing the same recipes at the same time.

Last year, we set a record for the number of locations participating in Big Brew, with 437 registered sites, 17,550 gallons of homebrew, and 8,000 participants from 49 states and 14 countries.

Not only is Big Brew a fun event, it's a great opportunity for the American Homebrewers Association to promote the hobby of homebrewing. The more sites we have, the better the story we can tell and the more likely we are to get media coverage for homebrewing in your community. You don't have to be throwing a giant blowout event to register a site—even if you just have a gathering of a few friends to brew one of the Big Brew recipes, we want to know. Registering a Big Brew site is free, and publicly posting contact info is not required. Find it on the AHA website under the Events tab.

Access to Award-Winning Recipes

In April, the AHA launched a new online member benefit: exclusive access to hundreds of National Homebrew Competition (NHC) medal-winning recipes. These are the same recipes you find in the September/October issue of *Zymurgy*, but more conveniently accessible from a central source that will allow you to search for exactly what you are looking to brew. Where else can you find 350+ recipes, all vetted as medal winners by final round NHC judges, spanning all BJCP categories?

At launch, the recipe archive will include all of the gold medal recipes from the 2008 through 2014 competitions. Be sure to check back frequently, as we will continue to add recipes from previous competitions as well as future competitions. The recipes can be found in the Let's Brew section of HomebrewersAssociation.org or directly at HomebrewersAssociation.org/recipes.

Promoting Homebrew

The American Homebrewers Association does more than publish *Zymurgy* magazine and host events like Big Brew, the National Homebrew Competition, and the National Homebrewers Conference. A big part of what the AHA does is promote the hobby of homebrewing, to ensure people will continue to make great beer at home well into the future.

Part of that effort comes through surveys of members and homebrewers in general. This year we are conducting a two-part research project on the hobby of homebrewing. The first part is aimed at helping the American Homebrewers Association better serve its membership. To this end we conducted interviews and surveys of current and former AHA members, as well as homebrewers who have never joined the AHA. Thanks to the many members who participated in those interviews and surveys! The information we are gathering will help us to do the best we can to serve you.

The second part of our research is to identify how the AHA can help introduce more people to the wonderful world of homebrewing. The information we gather in this project will help the AHA to promote the hobby to the uninitiated, but will also help homebrew clubs and homebrew supply shops promote the hobby locally.

The timing for this research is particularly critical. While the hobby has seen explosive growth over the last several years, signs indicate that growth is slowing. Recent surveys of homebrew supply shops (see "From the Glass" column in the March/April 2015 issue of *Zymurgy*) indicate that growth at retail over the past year was much slower than in previous years, with many, if not most, shops seeing sales flatten or decline. The AHA's research could help turn things around and ensure our beloved hobby continues to grow and reach new people.

No other entity out there is in a position to do this research. The AHA is only able to do these kinds of things because of the ongoing support we get from homebrewers like you. Your membership dollars make this work possible. Thank you!

Until next time, happy homebrewing!

Gary Glass is director of the American Homebrewers Association.

ON THE WEB

To learn about the commemorative beers for the National Homebrewers Conference, go to HomebrewersAssociation.org/HBC15-commemorative

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Sourcing Invert Sugar

Dear ***Zymurgy***,
I enjoyed Ron Pattinson's excellent article on parti-gyle brewing (November/December 2014 *Zymurgy*), but I have one comment. Mr. Pattinson included a recipe for making your own invert sugar because they "aren't readily available." While homemade invert sugar may be the best option for some brewers, there are some good commercial options available.

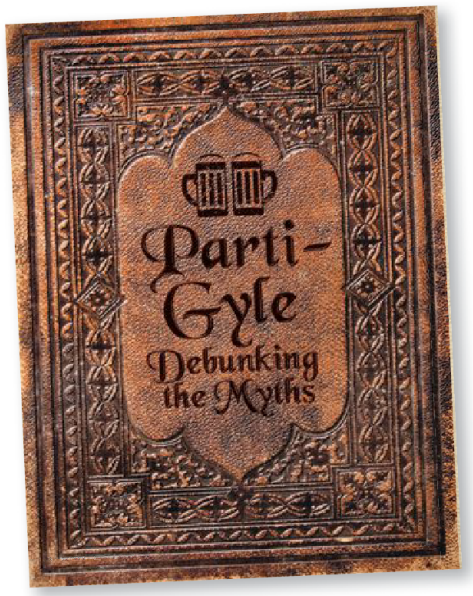
For many years I've been using an invert sugar called Lyle's Golden Syrup from Tate & Lyle's in the UK. They also have a darker version called treacle that is outstanding in mild and old ales and other darker styles. I started using these products when I lived in the UK in the late '90s and was happy to find out they are available in many homebrew shops, gourmet shops, and larger grocery stores in the U.S. A quick online search showed me these and other commercial brands are out there for those who would rather buy invert sugar than make it.

Thanks,
Dave Radomski
Lancaster, Calif.

Alton Brown: Homebrewer?

Dear ***Zymurgy***,
I was happy to see a mention of Alton Brown in the "10 Kitchen Gadgets for Homebrewers" article (January/February 2015) and his dislike of uni-taskers, but I was surprised to see the line, "If Brown were a homebrewer..." As far as I know, he *is* a homebrewer. I don't know if he actively brews, but his Good Eats episode "Amber Waves" was part of the reason I got into brewing.

Karl Fosaaen
Maple Grove, Minn.



National Homebrew Competition

Dear ***Zymurgy***,
I just want to voice my agreement with the issues raised by Paul Dienhart (Dear *Zymurgy,* January/February 2015). There needs to be a mechanism to prevent entries such as Robert Hilferding's Scottish 80 being entered as a Scottish 60. You must realize the unfairness of judging an 80 against a 60.

Before awards are given, the recipes should be examined and disqualified if not to style—something like a drug test for athletes.

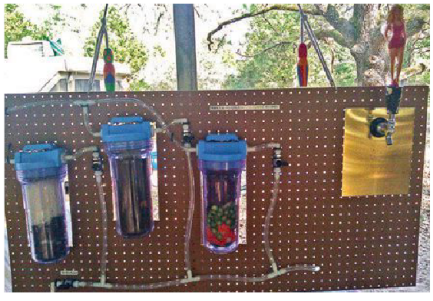
Regards,
Richard Marzec
Kingston, Ontario, Canada

Dear ***Zymurgy***,
In response to the letter regarding the National Homebrewers Competition and the style guidelines, two thoughts/questions come to mind.

1. I wonder what our European counterparts might say about homebrewing competitions and the style guidelines? You'd think that in the land of Reinheitsgebot and with the very restrictive use of the term "Trappist," they might be more particular about contest submissions actually fitting into the category guidelines.
2. Style guidelines exist so that in any competition you are comparing apples to apples (or ales to ales or lagers to lagers). The guidelines aren't very useful if competitors don't follow them. So, in the spirit of continuing the debate, here is a simple proposal. Competitors (whether local or national) must show in their entry form that the beverage meets the style guidelines. If it does not, the entry is tossed. I know this means more work for both participants and organizers, but why have a competition if the end results are not meaningful?

Let the debate begin...

Josh Peacock
Madison, Wis.



Triple Randall

Dear ***Zymurgy***,
After reading the article on making a Randall (January/February 2015), I thought I would send a photo of my triple Randall in action. I made it about five or six years ago. There is a valve on each Randall that allows you to vary the amount of each infusion. In the past I've used different hops (Noble, American,

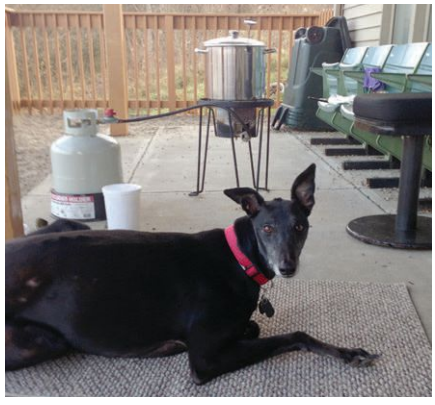
and English, for example) with a pale ale, but my favorite use involves running a hearty stout through Randalls containing chocolate and roasted coconut, various peppers, and espresso.

Cheers,
Stuart West
Austin, Texas

Brew Hounds

Dear ***Zymurgy***,
I would like to introduce you to Archie. He rescued us from his previous halfway house, Austin Pets Alive. He was purported to be a five-week-old shepherd mix found along the side of the road near San Antonio. Our vet said he's a pure blood Black Mouth Cur. (We had to Google it, too.) He's shown here inspecting our newest bourbon barrel.

Larry Falli
Austin Texas



Dear ***Zymurgy***,
I am new to homebrewing and when I brewed my first extract batch, my rescued greyhound Jiminee decided that it looked interesting. I put a mat on the concrete for him and he watched the entire 90-minute process!

Ed Faulkner
Covington, Ky.

Winter Spiced Mead

Dear ***Zymurgy***,
Please clarify the recipe instructions for Ken Schramm's Winter Spiced Mead (January/February 2015). If you use 20 pounds (1.66 gallons) of honey and 5+ gallons of water (the author states one quart more than 5 gallons), the total liquid produced equals 6.66 gallons. If I rack off the primary, I will most likely have a quart of lees remaining (maybe) and better than 6 gallons in the secondary. A 5-gallon secondary will not work. Are the author's water requirements incorrect?

Also, the author states, "Don't be afraid to blow a batch." At $80 to $120 worth of honey, I don't believe you would want to blow a batch. I have been a homebrewer for 10-plus years and a stickler

Winter Spiced Mead

for doing things correctly. I have never "blown a batch," be it beer, wine, mead, or cider.

John Friscat
Bolivar, Ohio

Zymurgy associate editor Amahl Turczyn responds: *I believe that it was Ken's intention to have the mead maker top off the volume to 5.25 gallons in the primary, so that after racking into secondary, the finished volume would be as close to 5 gallons as possible. Ken notes that in order to minimize oxidation in the secondary, one should try to minimize headspace by having the finished volume almost completely fill the secondary carboy. Yes, the honey's volume will take up part of the total volume, so the volume of added water should be reduced to produce the desired target volume. If you are using a 6-gallon conditioning vessel, the finished volume of mead should be adjusted, with the same ratio of honey to water, accordingly.*

As far as "blowing a batch," I don't believe Ken meant to condone poor sanitation technique or sloppy yeast management; rather, we become better mead makers by experimenting with unorthodox ingredients, and sometimes great ideas don't always translate to great meads. So in this sense, a "blown batch" means one you are less than completely satisfied with, not one that was brewed incorrectly. In either case, a less-than-satisfactory result should not stop us from striving to make improvements next time.

Pliny the Elder

Dear ***Zymurgy***,

I have a question about Russian River's Pliny the Elder recipe that is featured in many issues. Specifically, the extract version of the recipe calls for 6.5 lbs of DME which would only yield 46 gravity points in 6 gallons. It seems like you would need about 8.5 lbs of DME. I assume if you substitute 6.5 lbs of DME for say 10 lbs of two-row malt and do a partial mash with the remaining 3.25 lbs of two-row malt and specialty grains, you would get to 1.070. However, the instructions to "steep" at 165° F for 30 minutes don't imply a partial mash. Can you clarify?

Matt Marshall
Tyler, Texas

Zymurgy associate editor Amahl Turczyn responds: *Thanks for your inquiry, and you are correct. To get to 1.072 with this recipe, assuming a 6-gallon batch size (recommended because of hop absorption losses), you would indeed need 8.5 lbs of DME, not 6.5. This recipe was reprinted from the July/August 2010 issue, so I'm surprised we didn't catch this sooner—glad you brought it to our attention!*

Classic American Pilsner

Dear ***Zymurgy***,

The yeast specified for the Noble Cross Classic American Pilsner Recipe (Style Spotlight, January/February 2015) is Wyeast 1007, a German ale yeast. Did Amahl intend Wyeast 2001, a Pilsner lager yeast, or another lager yeast?

Vin Ludwig
Orange, Calif.

***Zymurgy* associate editor Amahl Turczyn responds:** *I actually intended Wyeast 2007, the Pilsen lager strain, not 1007. I have not tried the Urquell strain you mentioned, Wyeast 2001, but it should work fine in this recipe.*

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

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

by Professor Surfeit

No Love for Cloves

Dear Professor,
I've been homebrewing for three years and fortunately have had only one batch go bad, turning my bottles into mini bottle cap rockets (thankfully with no injuries).

However, my most recent batch, a pumpkin dubbel from the Brooklyn Brew Shop, has a stiff flavor of clove and almost no pumpkin; it's drinkable but certainly not what I expected after tasting it coming out of the primary. Going into the secondary fermenter, it was the complete opposite, with a delicious pumpkin sweetness, slight touch of clove, and very nice mouthfeel, exactly as described in the recipe book.

Did the old cloves I used take extra time in the secondary to develop the intense flavor, or did I get an infection? Without knowing any better, I might describe the flavor as phenolic. Has anyone else described phenolic as clove-like?

Thanks,
Judson Wheeler
New Orleans, La.

Hi Judson,
Rocketing bottles is somewhat of a rarity these days, but you obviously had a turn of bad luck. It really sounds to me like you had a wild yeast contamination of some sort in that "rocket" batch, which kept on fermenting sugars that wouldn't normally be fermented by cultured lager or ale yeasts. If it happened once and you didn't know why, then you may not have addressed that issue.

You note how well balanced your pumpkin beer tasted when going into the secondary. I can only imagine it tasted okay going into the bottles. At bottling the balanced level of sweetness and associated full-bodied mouthfeel gave you a great impression of what the beer was going to be. But maybe once again wild yeast kicked in and the normally unfermentables fermented. That could have created the excessive pressure causing your past "bottle cap rockets" and now a very dry beer exposing extreme clove character. Another point to remember is that the clove character wouldn't increase over time.

Sanitation is essential. Be sure you have clean, pure yeast strains. If by chance you used wild yeast strains or Brettanomyces, *they often take a long time to ferment out, so never bottle prematurely with these yeasts.*

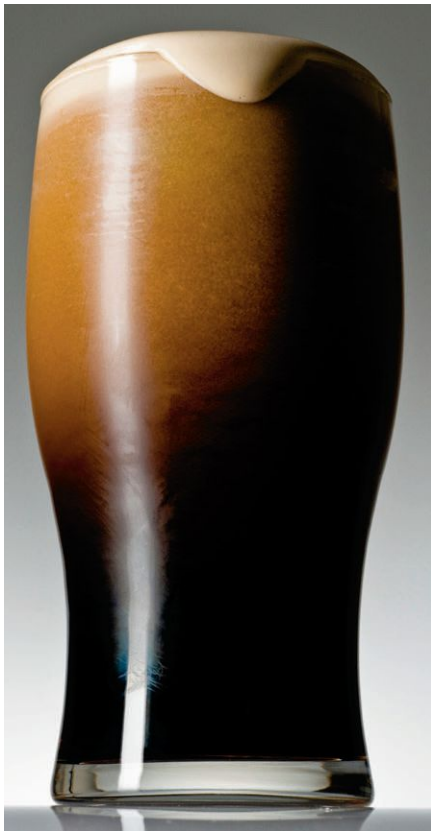
One last thing: clove character can indeed be described as phenolic.

Hold the cloves,
The Professor, Hb.D.

Photo © iStock/egal (cloves); iStock/Camrocker

Not So Nuts about Nitro

The Professor's Note: *"Let the storm rage on; the cold never bothered me anyway." The past few issues of* Zymurgy *have seen quite the discussion on nitrogen gas and beer. Here are a few more contributions from our readers with more details and insight into the most abundant gas on and around our planet. We can learn a lot of other things about our beer and brewing through great conversations that touch on so many different aspects of what we love to do: brew beer.*



Dear Professor,
I would like to comment on your discussion about nitrogen gas (N_2) in beer ("Firestorm Fueled by Nitrogen" in the January/February 2015 issue of *Zymurgy*). I agree with your points and hope to add a few more facts to support you. Nitrogen gas (N_2) is sparingly soluble in water (0.025g/kg water) as compared to the very soluble carbon dioxide (CO_2) (2.5g/kg water) at cellar temperature (50° F/10° C). Simply put, a nitrogenated beer will always be flatter than a carbonated beer as CO_2 is 100 times more soluble than N_2, which for most practical purposes is insoluble. (Note that my esteemed colleague Dr. David Jones, the renowned Welsh biochemist, always reminds me that N_2 is "sparingly soluble" and not "insoluble").

The Guinness brewery has gone to great lengths to develop a "widget" that uses N_2 to push out its carbonated beer. The N_2 quickly escapes, giving a nice creamy head and a flatter beer with a different

taste (less carbonic acid, etc.). This is why they use a nitro tap for their draft beer in pubs. According to the ideal gas law, both will decrease in solubility as the temperature increases, so your beer will get flatter as it warms up. I wish my college chemistry teacher had used carbonation of beer as an example to illustrate the gas laws!

From one professor to another,
Dr. Robert A. Sclafani
Professor of Biochemistry
and Molecular Genetics
University of Colorado School of Medicine

Dear Professor,
I have benefitted greatly from Charlie Papazian's books, enjoy your column, and appreciate the depth of your response to my letter in the January/February 2015 issue. Your points about the effect of not having carbon dioxide in beer are well taken. I've experienced what you describe.

Thanks for all your contributions to homebrewers over the years.

Bruce C. Onsager
President
StratCap Partnership, Inc.

Dear Professor,
I have a stout tap setup; however it is not powered by beer gas or nitrogen. It's entirely CO_2 driven. I use a beer pump to push through a stout restrictor at 25 to 30 psi and carbonate with CO_2 to only about 4 to 5 psi. I get plenty of small bubbles and a long lasting "nitro" head. I have always called into question "nitrogenizing" beer and think the wool has been pulled over our eyes on this. Nitrogen (at kegging pressures and temperatures) simply doesn't dissolve into liquid! If it does, it's on a very small scale. I find it hard to believe that nitrogen causes the effects claimed (smaller bubbles, different flavors, etc.).

In your answers regarding the flavor changes due to nitrogen, you specifically commented, "adding nitrogen and reducing carbon dioxide does dramatically affect the flavor, aroma, and physical experiences." I put it out there that it's simply the removal of carbon dioxide you describe, and not any addition of a miniscule amount of nitrogen. The smaller bubbles come from being pushed through a restrictor plate. The flavor change is from the lack of CO_2. My 100 percent CO_2 stout setup perfectly recreates the "nitro" pour. Nitrogen solubility at 20° C (68° F) and pressure at 1 bar (14.5 psi) is approximately 20 mg/L vs. CO_2 at 1.45 g/L at 25° C (77° F). That's hardly anything, so tell me what I'm missing here. As far as I'm concerned, nitrogen is incorrectly credited with what is achieved via a stout tap or heavy agitation of a beer while pouring.

Mike Baladi

Hi Mike,
Thanks for your contribution to a great conversation. You're right about nitrogen being hardly soluble. You and I are both on the same page regarding being able to make a rich, creamy, attractive head of foam that clings to the sides of the glass. I don't fuss so much with all the CO_2 levels and restrictor plates, but more often than not, when I have the perfect pressure and temperature on my naturally carbonated beer dispensed with CO_2, I get the same attractive results that you do.

To those who enjoy the taste of beer with reduced levels of CO_2, more power to you—just don't mess with my beer. There's a Wisconsin brass band (one of America's hidden gems) called Mama Digdown. One of my favorite songs is called, "Don't Touch My Stereo." They could have just as well sung, "Don't touch my homebrewed beer."

It's a gas,
The Professor, Hb.D.

Send your questions to professor@brewersassociation.org.

Photo © iStock/pagadesign

By Amahl Turczyn

Münster Alt

Quick, what's your favorite German blonde ale? Top-fermented, golden colored, slightly fruity aroma, sweet on the palate with some floral hop notes, but finishing crisp? Well, you'd be forgiven for not guessing this style immediately—it's relatively obscure. In fact, there is only one German brewery that still makes Münster Alt: Pinkus Mueller. This brewery claims to be the oldest organic beer producer in Germany, and was founded, along with an accompanying bakery and chocolate shop, by Johannes Müller in 1816. So where did the name Pinkus come from? Turns out there are a couple of possible answers, the first of which is a bit bawdy.

Photo © Bart Pro/Alamy

According to *The Oxford Companion to Beer,* Müller's great-grandson Carl earned the name as a student. Germany still used gaslights for public lighting at the turn of the century, and apparently young Carl and some friends managed to extinguish one of these lights by urinating on it. "Pinculus," *Companion* contributor Conrad Seidl goes on to say, is vulgar Latin for "little pisser," which Carl later shortened to Pinkus. Roger Protz, however, writes that the Pinkus nickname merely means "the singing brewer" in the local dialect. Regardless of its source, the name Pinkus has been aligned with a top quality range of organic beers for decades, including a banana and cream flavored hefeweizen, an herbal, full-flavored pilsner, a hoppy, pear-scented Special, and of course Münster altbier.

Usually altbier refers to the amber hybrid ales of Düsseldorf; any alt made outside that famous city is referred to as Northern German Altbier. These are also usually amber to brown in color, and both styles, though usually fermented at fairly low temperatures then cold-conditioned, can be quite bitter. Not so with Münster Alt, though geographically the city of Münster is in northwest Germany. This version of alt is much like a Bavarian helles, with a soft, floral, delicate focus.

Many references to the style say it is a sour beer made with a significant proportion (40 percent) of wheat, but the style has evolved over the years: the wheat malt is no longer used, perhaps due to difficulties procuring a consistent organic source. These days only organic Bioland pilsner malt is used, along with spicy, organic Tettnang hops from the Hallertau region. The sourness has also been muted to just the merest hint. In fact, you really have to hunt for the tartness to detect any at all; what little acidity is there serves to balance malt sweetness at the finish, and lends a juicy quality to the fruity notes. This fruit signature, though subtle, is what really sets this beer apart from the cleaner, sweeter, and usually less interesting North American blonde ales: apricot, white wine grapes, even a hint of cherry graces the aromatics and palate.

According to brewmaster Friedhelm Langfeld, these complexities arise from the practice of blending in a small amount of beer that has undergone a lactic acid fermentation. "We control the lactic fermentation by giving it a separate process next to the 'normal' wort production," Langfeld explained. "The lactic beer wort is added to the original wort by a certain percentage, and then both are boiled together."

This of course eliminates any risk of bacterial contamination in the brewery. Noted beer author Michael Jackson once commented on the hint of sourness in

ADVANCED METHOD

If you can't decide between going the quick and easy route or brewing up a several-month-long bacterial culture leading up to your main brew (which may then be followed by a several-month-long cold conditioning period), it may be well worth your time to purchase a bottle of the Pinkus Alt and do your own tasting. If you pick up the fruity complexities, taste the hint of acidity, and decide you just can't rest until you've made something that good yourself, by all means do the advanced version. It takes some nerve to court disaster and host a live bacterial culture in your brewery, but the good news is you can use any part you don't blend into your alt for another sour beer.

Begin the advanced Münster Alt by brewing a small one-gallon Sour Starter batch several months before the larger 5-gallon batch (see the recipe on page 19). This small batch will be inoculated with a bacteria and yeast blend, but you need to be careful selecting the correct one. Most of the popular sour beer blends include *Brettanomyces* and Belgian yeast strains; this will probably result in spicy, clove-like phenols, earthy farmhouse notes, and barnyard/horse blanket funk in addition to the fruity notes and tartness we're after. You'll want to avoid too much complexity and stick to the clean, only slightly tart/fruity profile by looking for a Berliner weisse blend.

I usually advocate Wyeast or White Labs products simply for their availability, but it seems each lab's Berliner Weisse blend is slightly different, so I'm going to recommend going a different route this time. Wyeast 3191 includes a Brett strain along with Saccharomyces and lactic bacteria, which is great for Berliner Weisse, but the Brett note isn't right for a Münster Alt. White Labs offers WLP630, which includes a weizen strain along with the lactic bacteria; the banana and clove notes are subtle, but again, not quite appropriate in our target style. East Coast Yeast's ECY06, however, includes Kölsch yeast as the *Saccharomyces* and a good dose of *L. delbrueckii* and *L. brevis* for the lacto. Bingo! It's difficult to get, and seasonally available only in the spring, but this is the blend you want to most closely mimic Pinkus Münster Alt.

Four to six months before you brew the main batch, brew the 1-gallon starter. No need to dirty the mash tun: it is easiest to simply use 1 lb 6 oz (626 g) pilsner malt extract syrup or 1 lb 2 oz (508 g) dry pilsner malt extract for your 1-gallon batch size to hit the desired 1.049 (12.25° P) original gravity. Add a couple of Saaz hop pellets—not ounces, pellets—and boil 20 minutes. Lactic bacteria aren't overly fond of hops, and *delbrueckii* has trouble with anything over 10 IBUs, so one or two grams of hops is all you need. Chill the wort, pitch your Berliner blend at 72° F (22° C) and keep it at this temperature through the end of fermentation. When things begin to slow down, let the culture fall to around 65° F (18° C) and store for four to six months. Splitting the batch into two half-gallon brown glass growlers fitted with airlocks will minimize light and air intrusion as your sour bugs do their thing.

Begin tasting and smelling the culture after month 4. It should continue to develop a strong acidity and complexity up until six months. When you deem it sufficiently sour, it's time to brew the main batch (see the recipe on page 20). You'll want to decrease the acid malt to 2 ounces (57 grams, about 1 percent of the total grain bill), increase the pilsner malt to 9 lb (4.08 kg) and obviously omit the lactic acid at bottling. Mix in your cultured starter during the boil. The specific volume to be blended in is up to you, since it depends upon how much acid the bacterial culture has been allowed to develop and how tart you want the final beer to taste, but as always, I'd recommend a light hand: maybe 5 percent of the total 5.5 gallon volume for starters, then go from there if you think it needs extra zing.

Chill, oxygenate, pitch your Kölsch yeast, and ferment as you would any German ale. For this version, I'd avoid the colder fermentation temperature ranges. There's little danger of interfering with fermentation because of low pH, unless you go whole hog and add the entire gallon of lactic starter, but along with near lager temperatures, your yeast might struggle.

Pinkus-Style Münster Alt

EASY ALL-GRAIN RECIPE

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

8.5 lb	(3.86 kg) German pilsner malt (organic if possible)
1.0 lb	(0.45 kg) 10° L Munich malt
0.75 lb	(57 g) acid malt
0.75 oz	(21 g) Tettnang pellets, 4.5% a.a. (60 min)
0.75 oz	(21 g) Tettnang pellets, 4.5% a.a. (20 min)
WhirlFloc	(10 min, optional)
1.0 oz	(28 g) Tettnang pellets, 4.5% a.a. (steep 10 min)
White Labs	WLP029 or Wyeast 2565 Kölsch yeast
5 g	calcium chloride (in mash)
1 tsp	88% lactic acid (at bottling/kegging) or to taste

reverse-osmosis filtered (or activated charcoal filtered) water

Original Gravity: 1.049 (12.25° P)
Finishing Gravity: 1.011 (2.75° P)
IBUs: 20 **SRM:** 4.2 **ABV:** 5.1%
Boil Time: 90 minutes
Assumed Brewhouse Efficiency: 72%

DIRECTIONS

Mash in at 149° F (65° C) and hold for 45 minutes. Increase mash temp to 158° F (70° C) and hold for 10 minutes. Sparge enough wort to result in a 5.5 gallon batch size after the boil, taking care wort gravity does not drop below 1.008 (2° P). If pitching onto fresh yeast slurry, chill to 56-62° F (13-17° C), depending upon chosen yeast strain (see text), and commence fermentation. With a pack, vial, or starter, chill to 68° F (20° C), aerate or oxygenate as you normally would, and wait for signs of fermentation to begin before dropping to a minimum of 56-62° F (13-17° C), depending on yeast choice, or as high as 65° F (18° C). Fermentation may take up to two weeks if you choose the colder temperatures, and you may need to allow the temperature to rise slowly into the low to mid 60s toward the end of fermentation to assure complete attenuation. Crash to 35-40° F (2-4° C) and cold condition for at least four weeks, or as long as four months, then blend in lactic acid to taste, package, and carbonate (or bottle and prime). If priming, especially after cold conditioning longer than a month, you will need to introduce fresh Kölsch yeast at bottling or the beer may not carbonate.

EASY PARTIAL MASH VERSION:

Omit acid and pilsner malts. Mash 1 lb (0.45 kg) Munich malt at 155° F (68° C) for 45 minutes. Munich should have enough diastatic power to convert its own starches, but do a starch conversion test if there is any doubt. Rinse grains, dissolve 6.75 lb (3.06 kg) pilsner malt extract syrup thoroughly into wort, and proceed with boil. Note that color may be slightly darker (4.6 SRM) with the partial extract recipe.

Pinkus Münster Alt, and speculated that perhaps a resident lactic culture was lurking in the conditioning tanks at the brewery. But Craig Hartinger at the brand's sole U.S. importer, Merchant du Vin, assured me this was not the case. And in fact, the beer would probably develop a much fiercer tartness if it were true, as it is conditioned at 32° F (0° C) for an astonishing six to seven months. Jackson notes this long conditioning period was done at "natural cellar temperature," so the change in cellaring practice may also partially account for the beer's more modern similarity to an ale-fermented helles. The fermentation takes a little over a week, Langfeld said, with "a top-fermenting Cologne-style yeast." I thought perhaps a strain like Wyeast 1007 German Ale could be coaxed into producing those fruity esters if fermented warm enough, but based on Langfeld's comments, Hartinger guesses it might be closer to the Wyeast 2565 Kölsch strain. White Labs WLP029 also produces hints of grape and white wine, so that might be a viable alternative.

As for fermentation temperature, Langfeld again dashed my speculations, stating that it's held at 12° C, or between 53 and 54° F! That's cool even for Kölsch yeast. While this specified fermentation range may work at Pinkus, unless you consistently have a large volume of fresh, sweet-smelling Kölsch yeast on hand (as they surely do), I would recommend sticking closer to the yeast labs' recommended temperature ranges. Wyeast says the bottom of that range is 56° F (13° C) for 2565; White Labs suggests no lower than 62° F (17° C) for its WLP029 strain. In my experience, both yeasts produce wonderfully clean, lager-like pale beers fermented as high as 65° F (18° C), so in my opinion it's not worth going too cold and tempting a stuck ferment.

Armed with these tantalizing details, we can cobble together a reasonably close recipe, though there is still that bacterial ferment to address. We'll do the non-bacterial "easy" version first (see the sidebar for the advanced method).

To get a crisp, clean Münster alt without messing with live bacteria, use a healthy dose of acidulated or sauer malt in the mash—7 percent of the total grain bill should affect

Berliner Blend Sour Starter (for Advanced recipe)

INGREDIENTS

for 1 U.S. gallon (3.79 L)

1 lb 2 oz	(508 g) dry pilsner malt extract
	or
1 lb 6 oz	(626 g) pilsner malt extract syrup
2.0 g	Tettnang hops, 4.5% a.a. (20 min)

ECY06 Berliner Blend

Original Gravity: 1.049
Finishing Gravity: 1.007
IBUs: ~5 **SRM:** 3.4 **ABV:** 4.9%
Boil Time: 20 minutes

DIRECTIONS

Dissolve extract, add hop pellets, and bring to a boil. Chill to 72° F (22° C), pitch yeast and bacteria culture, and ferment at the same temperature until terminal gravity is reached. Age at 65° F (18° C) for four to six months.

Pinkus-Style Münster Alt

ADVANCED RECIPE FOR LAMBIC BLEND

INGREDIENTS

for 5.5 U.S. gallons (20.82 L)

9.0 lb	(4.08 kg) pilsner malt (organic if possible)
1.0 lb	(0.45 kg) 10° L Munich malt
2.0 oz	(57 g) acid malt
0.75 oz	(21 g) Tettnang pellets, 4.5% a.a. (60 min)
0.75 oz	(21 g) Tettnang pellets, 4.5% a.a. (20 min)
Berliner Blend Sour Starter	(20 min)
WhirlFloc	(10 min, optional)
1.0 oz	(28 g) Tettnang pellets, 4.5% a.a. (steep 10 min)
White Labs	WLP029 or Wyeast 2565 Kölsch yeast
5 g	calcium chloride (in mash)

reverse-osmosis filtered (or activated charcoal filtered) water

Original Gravity: 1.049 (12.25° P)
Finishing Gravity: 1.011 (2.75° P)
IBUs: 20 **SRM:** 4.2 **ABV:** 5.1%
Boil Time: 90 minutes
Assumed Brewhouse Efficiency: 72%

DIRECTIONS

Mash in at 149° F (65° C) for and hold for 45 minutes. Increase mash temp to 158° F (70° C) and hold for 10 minutes. Sparge enough wort to result in a 5.5- gallon batch size taking care wort gravity does not drop below 1.008 (2° P). Blend desired amount of prepared Berliner blend culture (see page 18) into wort during boil. Start with about a quart (0.95 liters), stir in well, then take a small sample, cool, and taste. Add more to taste if necessary. If pitching onto fresh yeast slurry, chill to 55° F (13° C) and commence fermentation. With a pack, vial, or starter, chill to 68° F (20° C), aerate or oxygenate as you normally would, and wait for signs of fermentation to begin before dropping to 65° F (18° C). Fermentation may take up to two weeks. Crash to 35-40° F (2-4° C) and cold condition for at least four weeks, or as long as four months, then package and carbonate (or bottle and prime). If priming, especially after cold conditioning longer than a month, you may need to introduce fresh Kölsch yeast at bottling, or the beer may not carbonate.

PARTIAL MASH VERSION:

Omit acid and pilsner malts. Mash 1 lb (0.45 kg) Munich malt at 155° F (68° C) for 45 minutes. Munich should have enough diastatic power to convert its own starches, but do a starch conversion test if there is any doubt. Rinse grains, dissolve 6.75 lb (3.06 kg) pilsner malt extract syrup thoroughly into wort, and proceed with boil. Note that color may be slightly darker (4.6 SRM) with the partial extract recipe.

neither starch conversion nor fermentation, but will add a brisk, bright, balancing finish. A moderate dose of 88 percent lactic acid blended in at bottling or kegging will augment this. Again, we're not looking for sour, or even tart; rather, just enough acidity to balance sweetness. Organic pilsner malt might be difficult to source in many areas (Bioland organic pilsner malt is available through IREKS), but that would be ideal. Barring that, Weyermann® or Best Malz would certainly be worthy substitutes. Light Munich malt adds a depth of flavor and aroma to the pilsner malt base. While Pinkus has apparently moved to all pilsner malt, you'll notice that their Münster Alt is just a shade darker than a 100-percent German Pilsner malt beer would be (4 rather than 3 SRM). It could be that the organic malt is kilned slightly higher than conventional pilsner. So to compensate, we'll add 10 percent 10° L Munich malt to bring it in line with just the right shade of gold and to augment the malt flavor.

Hops, as the brewer stated, are Tettnanger, though Saaz has apparently been used in the past, and is probably an acceptable substitute.

Water should be clean and soft, so as not to interfere with any of the style's natural delicacy. Reverse osmosis or at the very least charcoal filtered water should work fine. I also add 1 gram per gallon of calcium chloride in the mash to bring out the malt character along with all the other benefits calcium provides in the mash tun, kettle, and fermenter.

Resources

1. Craig Hartinger, Merchant Du Vin, Seattle, Wash.
2. Friedhelm Langfeld, Brewery Pinkus Mueller, Münster, Germany
3. Oliver, Garrett, ed. Conrad Seidl, *The Oxford Companion to Beer,* Oxford University Press, 2012. p. 655.
4. Jackson, Michael, *The Simon & Schuster Pocket Guide to Beer,* 6th ed. Reed International Books Ltd, 1997. p. 31.
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Amahl Turczyn is associate editor of *Zymurgy*.

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Sweet & Sour

Adding Fruit to Sour Beer

By Kevin Wright

Soured Fruit Beer (28C) will be a new category when the 2015 BJCP Style Guidelines are released this year; however, this style of brewing is anything but new. Some of the first brews concocted thousands of years ago included local and seasonal fruits and most certainly were sour to some degree. Despite its ancient origins, this style is seeing a renewed birth at the hands of creative brewers around the world.

According to the 2015 guidelines, Soured Fruit Beer can be made from any number of base beer styles and any fruit imaginable, but a couple of key characteristics must be present. First, microbes other than *Saccharomyces* must be used to contribute a defining "funk" or acidity. Another key attribute is that the flavors and aromas of the fruit must be identifiable and must complement the base beer flavor.

Brewing sour fruit beer is no more technically difficult than brewing clean beer. Brewing *good* sour fruit beer does take a level of knowledge that can be attained fairly simply. First, sample a number of commercially available sour fruit beers. Think about and record the flavors you taste. Try to identify flavors and aromas in addition to the acidity. Also know that sour is not just sour: acidity can be contributed by a number of different acids, principally lactic acid and acetic acid, in beer.

Lactic acid is produced by bacteria that can survive without the presence of oxygen and has a softer, more pleasant acidity. Acetic acid is produced by bacteria that require oxygen. It is also produced in small quantities by *Brettanomyces* yeast. Acetic acid (aka vinegar) has a harsher flavor than lactic acid. Due to this harsh character, most sour beer brewers strive for very low amounts of acetic acid.

There is an easy way to train your palate on the difference between the two. Purchase some food grade lactic acid (available at most homebrew shops) and some plain white vinegar. Pour two glasses of any neutral flavored clean beer (light lager works very well) and add a drop of lactic to one and acetic to the other. If you can't taste a difference, add another drop and continue until the distinction is clear.

You also will want to have a working knowledge of esters (fruity to paint thinner), phenols (spicy to band-aid), diacetyl (butter), organic acids (horsey, cheesy, sweaty, rancid), and other fermentation byproducts. The biggest challenge for novice sour brewers is distinguishing between good funky and off-flavor funky. Because you will be using microbes other than *Saccharomyces,* the number of flavors possible to produce is immense. Consult resources on beer flavor, such as *Tasting Beer* by Randy Mosher or the Tasting Beer section of CraftBeer.com. Once you have thoroughly educated yourself on the subject of beer flavor, you are ready to start brewing your own sour base beer.

Brewing the Base Beer

There are about as many techniques for producing sour beer as there are different sour beer brewers on the planet. This means that there is no one best way to do it. Excellent sour beer can be produced from a wide variety of techniques, as long as the brewer has a strong understanding of what he or she is doing and a keen palate. The key is to produce an excellent base beer to which you will add your fruit. You cannot transform a bad sour beer into a good one by adding fruit!

At Hangar 24 Craft Brewery, our basic method is to brew a clean base beer that ferments with *Saccharomyces*. When fermentation is complete, we rack it into oak barrels and add our blend of microorganisms. Secondary fermentation with microbes (for us, a combo of *Brettanomyces*, *Lactobacillus,* and *Pediococcus*) takes anywhere from eight to 18 months. Stable gravity and pH tells us fermentation is complete, but your palate will tell you when the beer is ready. If you are interested in gaining a much more in-depth understanding of the many ways of producing sour beers, I recommend two books to get you started: *Wild Brews* by Jeff Sparrow and *American Sour Beers* by Michael Tonsmeire.

Selecting the Fruit

Once your delicious base sour beer is ready, it is time to add fruit. Just as it was important to brew an excellent base sour beer, the fruit must be carefully selected and added to your brew. Some important characteristics of fruit to consider are flavor and aroma, sugar content, water content, acid level, color, and tannin levels. Pectin is not a concern when brewing sour beer as aging will lessen the impact. All of these characteristics can be influenced by the form that your fruit is in.

The flavor of fruit is complex and difficult to quantify. It involves the interaction of a number of flavor compounds such as sugars and acids as well as many volatile compounds including esters, aldehydes, and alcohols. Most of what we describe as "flavor" is actually aroma driven by these volatiles. Because the sugar will be completely fermented out by our microbes (virtually all of the sugars in fruit are simple sugars), we must focus on how these volatiles will contribute to the beer. I refer to this as the "essence" of the fruit.

It is important to think about the overall balance of character for the finished beer. Fruits with lighter, brighter essences (think peaches, apricots, citrus, tropical fruits) will complement beers with lighter, brighter character (light malts, wheat, dry

Collage by Jason Smith; illustration and photo © iStock/simpson 33 (wood)/YuliaShe (blood orange)/Pimonova (beer)

A brewer at Hangar 24 Craft Brewery in Redlands, Calif. adds a fruit concentrate to a sour barrel.

hops). Fruits with darker essences (cherry, fig, plum, pomegranate) will complement beers with darker flavors (caramel or Special B malt, chocolate malt, "sweet" spices such as cinnamon and nutmeg). Identifying your flavor characteristics and envisioning how they will work in a finished beer is something that will take time and experimentation. Look for fruits that have an intense flavor to begin with as this will translate into a more interesting beer.

Unfortunately, most of the fruit we purchase at grocery stores has been bred for appearance, yield, and shelf life and, many times, these qualities have an adverse relationship to flavor. To get truly flavorful fruit, we often have to grow it ourselves from proven heirloom varieties, develop relationships with farmers, or rely on high quality fruit products.

Acid content is another characteristic to keep in mind when creating a balanced fruit beer. Fruits can vary greatly in the types and amounts of acid content. Typically we rely on pH to tell us the acidity of something, but this only paints part of the picture. We also need to look at the Total Acidity, sometimes referred to as Total Titratable Acidity. This is a measure of total acid content determined by titration. Many homebrew shops sell kits for measuring TTA as this is an important attribute in winemaking. Most sour beer has a narrow

pH window—maybe 3.0 to 3.5—but can have a wider TTA window at 0.5 to 2.0 percent.

The predominant types of acids found in fruits are citric, malic, and tartaric, and can range from 0.5 to 3.0 percent total acids. Malic acid is generally considered more intense than citric acid and tartaric acid. When selecting a fruit for sour beer, the level and type of acidity is important, and balance is key. Fortunately, acidity enhances the volatiles and fruit flavors in the beer, but too much can be detrimental. For example, a very sour base beer with a large addition of apricots (high TTA, high malic acid) may become too sour and unbalanced. Peaches might be a better option. If your base beer is a little low on acidity, something like cranberry or sour cherries could provide the punch you are looking for.

Some final fruit characteristics that could impact your finished beer are water content, color, and tannin levels. Fresh fruit is mostly water (75 to 90 percent). Adding fresh fruit can actually dilute your batch of beer. Color pickup will vary depending on the fruit selected and the form it is in. We drink with our eyes first, so keep color in mind.

Table 1: Target Amounts of Fruit to Add to Sour Beer

			EQUIVALENT FRESH WEIGHTS				
FRUIT	LB/GALLON	g/L	FRESH	PUREE	CONCENTRATE	DEHYDRATED	FREEZE DRIED
Apricots	0.25-2.0	30-240	1.00	0.80	0.20	0.25	0.15
Blackberries	0.5-4.0	60-480	1.00	0.90	0.15	0.30	0.10
Blueberries	0.5-3.0	60-360	1.00	0.90	0.15	0.25	0.15
Cherries (Sour)	0.25-2.0	30-240	1.00	0.85	0.30	0.25	0.10
Cherries (Sweet)	0.33-4.0	40-480	1.00	0.85	0.30	0.25	0.13
Citrus	0.25-1.0	30-120	1.00	0.85	0.15	0.25	0.10
Currants	0.33-1.5	40-180	1.00	0.95	0.15	0.25	0.10
Peaches	0.5-5.0	60-600	1.00	0.80	0.20	0.40	0.12
Plums	0.5-2.0	60-240	1.00	0.80	0.20	0.40	0.12
Raspberries	0.25-2.0	30-240	1.00	0.90	0.13	0.30	0.10
Strawberries	0.5-3.0	60-360	1.00	0.90	0.15	0.25	0.15

Finally, fruits contain tannins in varying levels. Apricots, berries, and persimmons have higher levels while citrus, bananas, and watermelon have lower levels. Also, riper fruit will have lower tannin levels. High levels of tannins (grape skins) can make beer taste astringent. High levels of tartaric acid (grape tartness) can also add astringency.

Another key to consider when selecting fruit for your beer is the form it comes in. Each will have a unique impact on your beer. Fresh-picked is the most common form of fruit addition to sour beers. Advantages to using fresh fruit include better knowledge of where it comes from, better access to variety including rarer heirloom types, and the ability to select at peak ripeness and flavor. Some downsides include seasonality, large water content leading to a large volume of fruit needed, and unknown microbes. All fresh fruit will be covered in local strains of yeast and bacteria. Many times these will add an interesting complexity to your beer,

Sour Red with Syrah Juice Concentrate

The accents of blackberry and leather from the Syrah juice match up well with the deep notes of raisin and cherry from the base beer. We use a juice concentrate rather than crushed Syrah grapes to minimize the tannic blast from the grape skins. It is key to use a high quality, 100-percent Syrah concentrate to get the best flavors.

INGREDIENTS for 5.5 U.S. gallons (20.82 L)

7.0 lb (3.18 kg) pilsner malt (60% of grain bill)
2.31 lb (1.05 kg) Munich malt (20%)
1.11 lb (508 g) torrified wheat (10%)
9.0 oz (255 g) caramel-Munich malt (5%)
9.0 oz (255 g) Special B malt (5%)
0.33 oz (9 g) Saaz pellets (4% a.a.) 60 min
Ale or lager yeast of your choice for primary fermentation
Brettanomyces, Lactobacillus and *Pediococcus* blend such as WLP655 or Wyeast 3763 for secondary fermentation
16.5 oz (488 mL) 80 Brix Syrah concentrate (see Directions)

Water
Target ion levels under 100 ppm each. Target mash pH 5.2-5.6.

Original Gravity: 13.5 P (1.055 SG)
Final Gravity: <1 P (<1.004 SG)
%ABV: 7.2
IBU: 4
SRM: 12

DIRECTIONS
Mash at a high temp for a short amount of time: 160° F (71° C) for 15 minutes. The idea is to create a wort with low fermentability and even some starch remaining. Boil 90 minutes. Ferment with primary strain at 68° F (20° C) for ale or 62° F (17° C) for lager. After primary fermentation is complete, rack to your aging vessel of choice (if you choose, target a small amount of oxygen permeability to promote acetic acid production) and add Brett/bacteria blend. Once souring has reached your satisfaction (8-12 months typically), add the concentrate. Allow 1-2 months or until sugars are completely fermented out to package.

PARTIAL EXTRACT VERSION: Reduce pilsner malt to 1 lb (0.45 kg); mash with remaining malts and torrified wheat at 160° F (71° C) for 15 minutes. Drain, rinse and dissolve 4.5 lb (2.04 kg) pale pilsner extract syrup into the resulting wort. Follow instructions as above.

but occasionally they can produce off-flavors. It is also important to make sure that your fresh fruit is free from pesticides and some fertilizers.

Pureed fruit is another popular form. The best purees are made from 100 percent fruit selected at peak flavor freshness. There is typically some loss of material from the fresh fruit—anywhere from 10 to 20 percent depending on how the puree is produced. Advantages of puree are that it is easier to handle than fresh fruit, available year-round, and comes aseptically packaged. You will need slightly less due to the removal of some of the solids. Downsides are that the sterilizing process typically involves heat which can lead to some cooked flavors. It is also expensive. Concentrates can be an option, but be careful to select one that has great flavor and hasn't been overly processed.

Dehydrated fruits are also becoming popular with sour brewers. They contain only about 10 to 15 percent moisture while retaining all of the sugars and much of the flavor (the evaporation process will strip some volatiles). Much smaller volumes are needed to get the desired impact. Always check to make sure that you are getting 100 percent fruit, and that it is not coated in any kind of wax or other anti-clumping agent.

Freeze-dried fruits are becoming more readily available and present an interesting option for adding to beer. These are dropped to a final moisture content of only 1 percent in a process that preserves much of the character of the original fruit. Only a very small amount by weight is needed to get a big flavor impact.

Extracts are a final option but should be explored very cautiously. Extracts can be made in many different ways from simple steam distillation to intense processes involving propylene glycol. If you want to go an extract route, look for something that is as natural as possible and is truly produced from that fruit. WONF is an acronym for "With Other Natural Flavors" and means that other things are added to make it taste like "cherry." I have yet to meet a brewer who uses fruit extracts in sour beer, but that does not mean it can't be done successfully. Always taste anything you are putting into your beer and always objectively taste your finished product.

Adding Fruit to Beer

After selecting your perfect fruit, the last questions involve how to get it into the beer (and out), how much to add, and how long to keep it in the beer. Adding fruit to sour beer to age depends largely on the equipment you have available and the type of fruit you have selected. Purees, concentrates, juices, and extracts can be added without much worry of separating later as they will pretty much completely homogenize with the beer. Whole, dehydrated, and freeze-

Sour Blonde with Apricots

Fresh apricots bring the taste of summer to this bright, sour ale. It is important to plan your brewing and aging correctly to be able to add the fresh apricots at the peak of harvest. Depending on how long your souring process takes, you may need to brew the base beer a year ahead of time. Your patience will be rewarded!

INGREDIENTS
for 5.5 U.S. gallons (20.82 L)

5.11 lb	(2.32 kg) domestic pale two-row malt (45% of grain bill)
2.25 lb	(1.02 kg) unmalted flaked wheat (20%)
2.25 lb	(1.02 kg) white wheat malt (20%)
1.75 lb	(0.79 kg) Vienna malt (15%)
0.25 oz	(7 g) Saaz pellets (4% a.a.) 60 min

Ale or lager yeast of your choice for primary fermentation *Brettanomyces, Lactobacillus* and *Pediococcus* blend such as WLP655 or Wyeast 3763 for secondary fermentation

8.25 lb	(3.74 kg) fresh, ripe, pitted apricots (see Directions)

Water
Target ion levels under 100 ppm each. Target mash pH 5.2-5.6.

Original Gravity (before fruit addition): 13.4° P (1.055 SG)
Final Gravity: <1° P (<1.004 SG)
ABV: 6.6%
IBU: 3
SRM: 4
Assumed Efficiency: 72%

DIRECTIONS
Mash at a high temp for a short amount of time: 160° F (71° C) for 15 minutes. The idea is to create a wort with low fermentability and even some starch remaining. Boil 60 minutes. Ferment with primary strain at 68° F (20° C) for ale or 62° F (17° C) for lager. After primary fermentation is complete, rack to your aging vessel of choice (shoot for as low oxygen permeability as possible to limit acetic acid) and add Brett/bacteria blend. Once souring has reached your satisfaction (8-12 months typically), add the apricots. Select a variety with intense flavor (Blenheim, Golden Sweet, etc.) You can choose to throw a few pits in for character. After 2-3 months, rack off apricot sludge and package.

PARTIAL EXTRACT VERSION: Omit Vienna and wheat malts. Reduce pale malt and flaked wheat to 2 lb (0.9 kg) each; mash these together at 160° F (71° C) for 15 minutes. Drain, rinse and dissolve 3.5 lb (1.59 kg) extra pale malt extract syrup and 2 lb (0.9 kg) wheat malt extract syrup into the resulting wort. Follow Directions as above.

dried fruit will need to have a method of separating solids later. On a very small scale, careful racking to leave the sediment behind can work well. On a larger scale, you may need to add a standpipe or something similar to your aging vessel.

The amount of fruit you add will vary widely depending on the variety and type of fruit product. See Table 1 for

some ranges including a multiplier for "Equivalent Fresh Weight" if you are using other products.

As an example, if you wanted to add blackberries to your beer at a rate of 2.0 lb/gallon (240 g/L) into 5 gallons (18.93 L) of sour beer, using freeze dried blackberries you would need: 2.0 lb/gal x 5 gal x 0.10 = 1.0 lb (0.45 kg) total.

The length of time to leave your beer in contact with the fruit before packaging is also important. Typically, the more processed a fruit product is, the less time you will need to extract the "essence" from it. Extracts can be ready immediately after adding. Freeze dried fruits can have flavor fully extracted in a few days, where fresh whole fruit will need a few months. Sugars also need to be fermented out. A good rule of thumb is to not leave your beer on fruit for more than six months. The longer you go, the more of the fresh fruit character will be volatilized and leave your beer. At Hangar 24, we typically only leave beer on fruit for three months provided we get a stabilization of pH and gravity in that time.

I hope these ideas get your creative juices flowing. Brewing truly excellent sour fruit beer takes a lot of time and patience—not to mention a very high level of palate knowledge—but the rewards can be unbelievable when you have the ability to produce a truly unique brew.

Kevin Wright is director of brewing at Hangar 24 Craft Brewery in Redlands, Calif.

Learning How to *Improve Your Homebrew*

By Gordon Strong

One of the most common requests I get from brewers is for me to taste their beer and then tell them how they can make it better. Every beer is different, of course, yet there is certainly common advice that can be followed. Evaluating the beer is the first step, and that can be done using nothing more than good sensory and descriptive skills. However, without knowing the recipe and process, actually diagnosing the beer would at best be an educated guess—and the person most intimately familiar with the beer is the brewer.

So rather than explaining all the things that could possibly go wrong, let me instead discuss what knowledge and skills I think are relevant to diagnosing a beer, and then talk about how I've used these to improve my own beer.

Sources of Faults

On Beer Judge Certification Program (BJCP) tasting exams and in off-flavor workshops, beers are often selected for (or doctored with) a single technical fault, like diacetyl, DMS, or acetaldehyde. While this is a great way to develop your sensory abilities, it's not always representative of what you encounter in a beer that, well, *just isn't right*. Yet many people who have gone through those exams or training believe, incorrectly, that all problematic homebrew can be characterized that way.

I find that flawed beer tends to have technical faults, stylistic faults, or both. Technical faults are related to the brewing process, while stylistic faults usually involve ingredient selection and recipe formulation. Technical faults are perceived as taught in traditional sensory evaluation classes, allowing for differences in perception thresholds and sensitivities between individuals. Stylistic faults are perceived more through judging skills and beer style knowledge.

To some, *sensory skills* and *judging skills* probably sound like the same thing. After all, isn't the primary job of a beer judge to accurately record beer perceptions? It is, but judging also includes evaluation and assessment to determine whether those perceived attributes are appropriate in beer, and whether they are characteristic of the specific style profile of the beer in question.

As the quantity and quality of homebrewing information increases, it seems like troubleshooting skills are the first victim. Homebrewers are making better beer and reaching more advanced stages earlier in their brewing career than ever before. That's great, but often troubleshooting skills are developed by trial and error. If homebrewers don't occasionally make a bad batch, they may not learn how to identify and diagnose the problem. Then when they do make a mistake, they might not have any idea how to correct it.

Skill Inventory

To properly assess and improve your own beer, there are several helpful skills to master.

Ingredient profiles. Knowing the flavor, aroma, mouthfeel, and appearance contributions from your grains, hops, yeast, water, and other ingredients helps you decide what components to use in your beer. The profile of some ingredients changes when fermented, so it's important to know not only the flavors of the source ingredients, but how they are presented in the final beer. Mapping inputs and outputs will help in both recipe formulation and troubleshooting.

Process control. Manipulating the brewing process to achieve the desired result is the core skill of a brewer. It's not just the knowledge of how to make a beer, but also the ability to select the proper technique to achieve a certain brewing goal, and then to execute it repeatedly and achieve consistent results. Brewing techniques have certain control points that are critical to get right; understanding where to focus your attention to get the best results is a learned skill, as is monitoring and controlling the process. Sometimes this skill isn't fully tested until a process starts to deviate (like overshooting a mash rest temperature); the way in which a brewer responds, and how quickly the problem is solved, is a measure of ability.

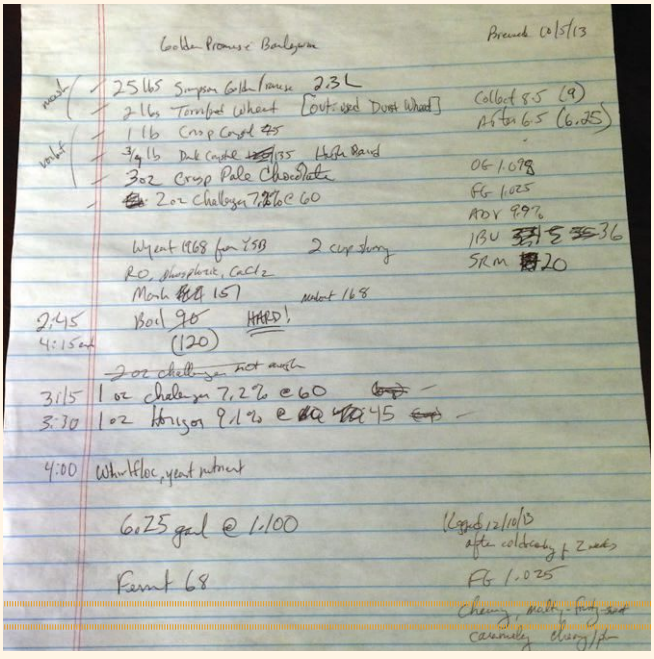
Style understanding. Whether you're brewing for competitions or just for yourself, beer styles are helpful to describe the type of beer you intend to make. Every beer recipe has an implied target, whether a published style, a clone of a commercial beer, or just something that sounds interesting. The sensory profile of the finished beer is a reference, and if the beer is described as an established style, those who try the beer will be comparing your version to their understanding of that style.

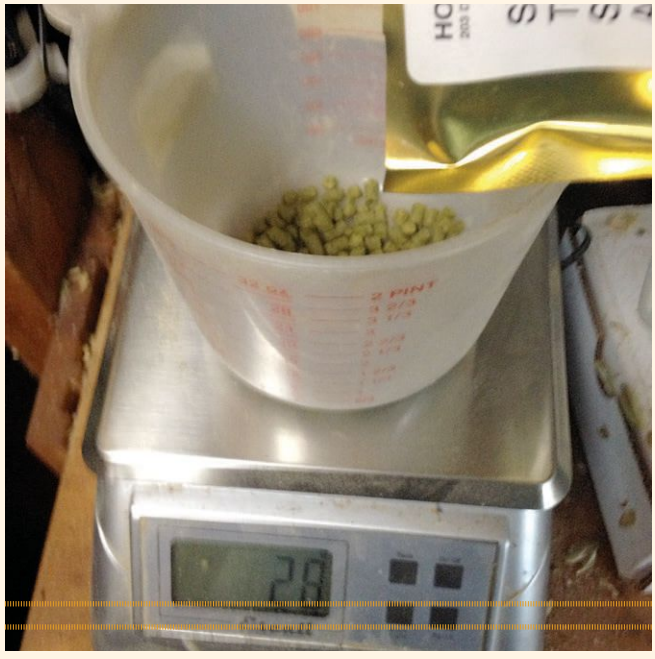
In a competition setting, this process is quite rigorous. Published style guidelines have in-depth information on the various sensory aspects of the beer, including ranges of each component and the overall balance of the beer. For those who don't compete, I think getting the overall balance and impression of the beer is most important. When you first try the beer, it should suggest the targeted style.

The key skills in learning about styles are really about identifying the critical characteristics, and differentiating between similar or related styles. Taken together, these give you a picture of what the style is and isn't. Keep in mind that many beer styles have broad ranges and that a single commercial example rarely defines or typifies a style.

Recipe formulation. Creating a new recipe is an advanced skill for brewers. Simply riffing on an established recipe or making small tweaks to slightly change the outcome is something almost every brewer will do, especially if the exact ingredients in the recipe aren't available. I'm talking about starting with a blank sheet of paper and writing a recipe that hits a mental target you have for a beer. That is an advanced skill that draws upon other areas of brewing knowledge, including style understanding, ingredient profiles, and process control.

It's not just the knowledge of how to make a beer, but also the ability to select the proper technique to achieve a certain brewing goal, and then to execute it repeatedly and achieve consistent results.





Photos © iStock; Brewers Association; courtesy of Gordon Strong

I tend to work backward when formulating recipes. I start by describing the beer I want to brew, including some general parameters (starting gravity, alcohol strength, bitterness level, color). Then I think about the flavor profile and balance of the beer, including the body and attenuation. This overall profile can be based on a style description, or simply on a concept for a new beer.

I then think about selecting ingredients to provide the desired flavor profile, including the relative proportions of the grains. Working in percentages is helpful here, as the quantities can be determined using brewing software. Brewing techniques and more specifics about the mash can be selected next, as these can influence the body and finish of the beer.

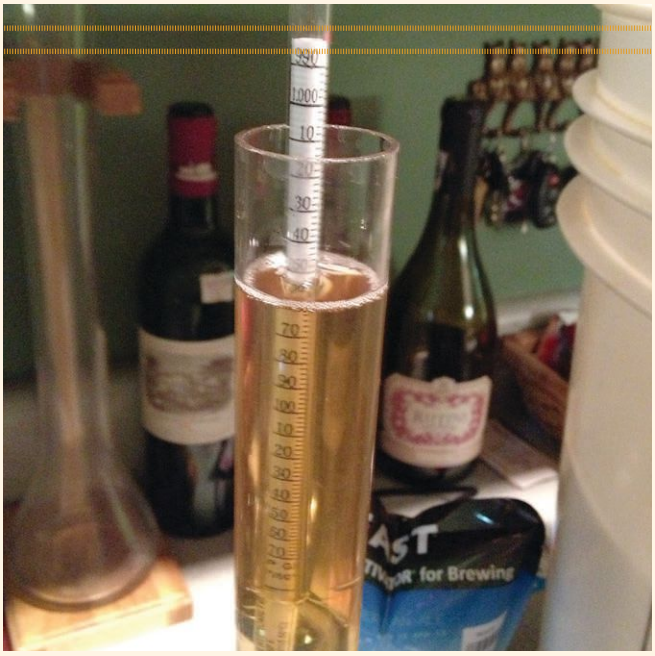
You don't have to take the BJCP exam to be a good beer judge, but you should understand how to tear apart a beer on the sensory level and be able to identify and describe its elements.

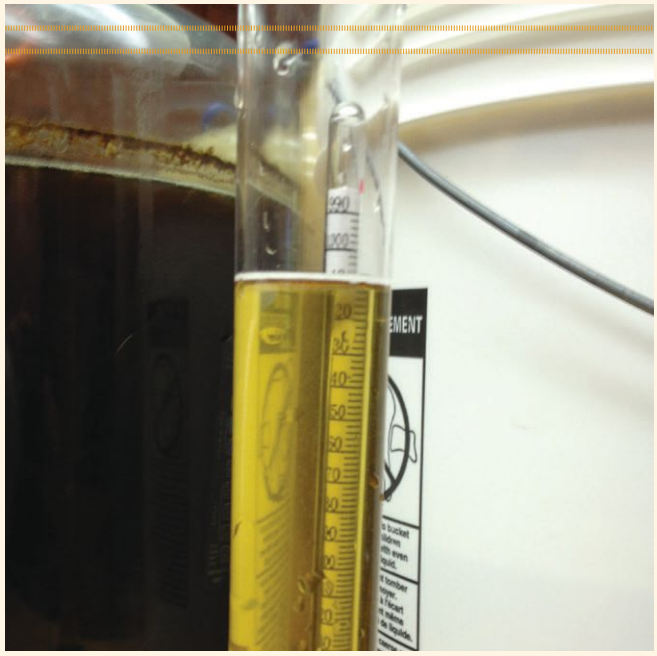
When selecting hops, I normally pick finishing hops first, calculating the IBU contributions. Then I add whatever bittering hops are necessary to hit the final IBU target. Yeast variety and water profile help make up the final flavor profile of the beer. Brewing software gives me a final chance to tweak the quantities, scale the recipe to my system, and validate my decisions.

Judging skills. You don't have to take the BJCP exam to be a good beer judge, but you should understand how to tear apart a beer on the sensory level and be able to identify and describe its elements. This means following a mental checklist every time you taste a beer. Walk through the appearance, aroma, flavor, and mouthfeel, and try to describe each component you perceive. Each description should have an intensity (quantity) and a character (quality). It's not necessary to describe the perception as the source ingredient; simply identify the perception as you recognize it, even if it has nothing to do with brewing. The BJCP publishes a checklist-based scoresheet that is helpful for this exercise since it offers reminders of common attributes to assess.

Once you have the sensory profile of the beer recorded, then you go about determining which of the sensory components are desirable and which are faults. Some faults (like the medicinal chlorophenolic flavor) are not desirable in any type of beer, while others (like fruitiness in an ale) can be acceptable, depending on the beer style. This is where technical and stylistic faults are considered. Generally, the technical quality of a beer reflects on the overall craftsmanship and quality of the beer, while the stylistic quality is how it represents the stated style of beer.

Communication skills. Surprisingly, many brewers are given helpful feedback but aren't always attuned to it. Listening skills are important for any brewer, and often what is not said is more important than what is. If you aren't known for being open-minded, your friends might not give you a full and honest assessment of your beer. If you ask someone what they think of your beer, don't argue with them if they actually tell you what's wrong. Listening





I find that many homebrewed beers have issues with body, sweetness, and attenuation—usually the problem is too much body, too much sweetness, and not enough attenuation. These tend to make a beer fuller, heavier, and harder to drink.

to others is critical whether you have well-developed judging skills or not, since you may have some inherent bias toward your own beer. Stay calibrated by checking your assessments with those of other judges and brewers you trust.

Applying your Skills

The practical matter of using your skills to improve your beer often comes down to target identification—understanding the problem so you can decide on a plan of action. Most homebrews I try today seem pretty good; they generally don't have what most would characterize as "classic" faults, and infections are rare. I see issues that generally fall into a few broad categories: lacking the characteristics of a stated style; unbalanced or having poor drinkability; and mishandled. Technical faults are often related to fermentation or sanitation. Stylistic faults are much more common.

Understanding styles. I see this problem all the time, and it seems like it is usually due to starting out with a bad target for the style. Sometimes people will give me

Belgian Tripel *Before*

Batch size 6.25 gallons (24 L)

16.0 lb (7.3 kg) Belgian Pilsner malt
4.0 lb (1.8 kg) white sugar
1.0 oz (28 g) Hallertauer 3.5% @ 60
1.0 oz (28 g) Tettnanger 4.5% @ 60
0.5 oz (14 g) Styrian Goldings 4% @ 15
0.5 oz (14 g) Styrian Goldings 4% @ 5
Wyeast 3787 yeast
Step mash 145° F (63° C) for 30 minutes
157° F (70° C) for 45 minutes
168° F (76° C) for 10 minutes

Ferment 64° F (18° C)
OG 1.092 @ 65%
FG 1.014
ABV 10.5%
IBU 21
SRM 4

After Belgian Tripel

Batch size 6.5 gallons (25 L)

13.0 lb (5.9 kg) Belgian Pilsner malt
3.5 lb (1.6 kg) white beet sugar
1.5 oz (42 g) Sterling 7% @ 60
1.0 oz (28 g) Sterling 7% @ 15
1.0 oz (28 g) Syrian Goldings 4.5% @ 2

Wyeast 3787 yeast
Step mash 131° F (55° C) for 10 minutes
140° F (60° C) for 10 minutes
145° F (63° C) for 40 minutes
158° F (70° C) for 20 minutes
168° F (76° C) for 10 minutes
Ferment 68° F (20° C)
OG 1.077 @ 70%
FG 1.008
ABV 9.3%
IBU 37
SRM 3

American Pale Ale *Before*	*After* American Pale Ale
Batch size 5.5 gallons (21 L)	**Batch size** 6.5 gallons (25 L)
8.0 lb (3.6 kg) Maris Otter	**6.0 lb** (2.7 kg) two-row malt
8.0 oz (227 g) Munich malt	**6.0 lb** (2.7 kg) Pilsner malt
8.0 oz (227 g) Caravienne malt	**1.25 lb** (0.57 kg) Munich malt
4.0 oz (113 g) wheat malt	
4.0 oz (113 g) Crystal 20 malt	
4.0 oz (113 g) Victory malt	
4.0 oz (113 g) Carahell malt	
0.3 oz (8.5 g) Columbus 16.8% @ 60	**0.5 oz** (14 g) Galaxy 13.7% FWH
0.3 oz (8.5 g) Columbus 16.8% @ 30	**1.0 oz** (28 g) Galaxy 13.7% @ 10
1.0 oz (28 g) Cascade 4.5% @ 10	**1.0 oz** (28 g) Galaxy 13.7% @ 5
1.0 oz (28 g) Centennial 10.3% @ 2	**1.0 oz** (28 g) Galaxy 13.7% @ 0
1.0 oz (28 g) Cascade 4.5% @ 0	**1.0 oz** (28 g) Galaxy 13.7% @ 10 post boil
1.0 oz (28 g) Centennial 10.3% dry hop	
White Labs WLP001 **yeast**	Wyeast 1968 **yeast**
Mash 153° F (67° C)	**Step Mash** 144° F (62° C) 30 min
	153° F (67° C) 30 min
Ferment 68° F (20° C)	**Ferment** 62° F (17° C)
OG 1.050 @ 75%	**OG** 1.050 @ 70%
FG 1.014	**FG** 1.015
ABV 4.9%	**ABV** 4.6%
IBU 37	**IBU** 48
SRM 7	**SRM** 4

a beer and say "this is a pale ale" or "this is a porter," but if I ask them to describe that style, they can't really state what it should be. Sometimes people actually do read a style description, but develop tunnel vision and focus only on a small part of the style. By taking words out of context, a brewer can easily miss the target by disproportionally emphasizing minor components.

Style confusion sometimes comes from brewing a recipe that doesn't really represent a style well, but it can also come from "group think." Those who hang out on brewing forums tend to get similar advice repeated to them, and many start to believe that there is only one true way to brew a style. Nothing could be further from the truth. Do your own research and understand styles well. Don't automatically trust people on the internet simply because they post frequently; unless you've tried their beer, or you know they've won competitions, realize that they might just be trolls.

Understanding balance and drinkability. Balance in beer is a style-specific term; it doesn't mean equal quantities of ingredients. Balance implies that the ratio of sensory components combines in a pleasant, drinkable way that suggests the named style. For many, balance can mean the ratio of maltiness to bitterness in a beer. That's a good start, but many other components could be out of balance for a style. A beer can hit an IBU target for a style but not really taste right because there is too much malt flavor that masks the bitterness.

I find that many homebrewed beers have issues with body, sweetness, and attenuation—usually the problem is too much body, too much sweetness, and not enough attenuation. These tend to make a beer fuller, heavier, and harder to drink. That said, just because a beer seems too sweet doesn't automatically mean that it's underattenuated. It could be mean that it was brewed with too high a starting gravity, so it finished too high. It could also be that the malt isn't sufficiently balanced by bitterness.

Or it could just be sweet. To troubleshoot this issue, I recommend checking the final gravity, attenuation level, dextrin content, yeast variety, and fermentation schedule.

Harshness is a characteristic of beer that I detest. It tends to accentuate bitterness and reduce the drinking enjoyment of beer. It generally involves tannins providing astringency, but it can also come from other sources. I try to seek out and eliminate sources of harshness in my recipes by reducing hot water contact time with dark grains and hops, limiting excessive mineral additions, and trying to have as clean a fermentation as possible.

Clashing flavors can also lend harshness, make the flavor profile seem muddy and indistinct, or provide distracting, unpleasant flavor combinations on the palate. The most common examples I see are sweet, caramelly crystal malts in IPAs, and citrusy/resiny hops with dark malts. More subtle examples can include biscuity base malts in clean American styles (Maris Otter isn't the perfect malt for every recipe), and noble hops used with water high in sulfates.

Understanding conditioning and storage. It breaks my heart when I see a brewer who has made a decent beer, but somehow manages to ruin it because of the way it was packaged, handled, or stored. It's like making a great football play, but fumbling on the goal line. Some of the issues I see most frequently are green beer, hot beer, old beer, and oxidation.

"Green" beer is young beer that hasn't fully finished fermenting or conditioning. Yeast produce many byproducts during fermentation, and will often reduce those components as beer matures. Buttery diacetyl and green apple acetaldehyde are two common examples, but another would be sulfur in under-conditioned lagers. These problems arise from rushing a beer to packaging, prematurely separating beer from the yeast, or not adequately conditioning the beer. Give the yeast time to finish its work before packaging.

"Hot" beer is overly boozy, with an unbalanced alcohol component that provides a harsh burn in the mouth and throat. The alcohol burn can throw off the balance of a beer since it provides the same balance as bitterness or sourness against sweet, malty richness. Rushing a big beer is the most common culprit; I like big beers (I cannot lie), but they need time to come into balance. The alcohol heat will reduce over time.

Old beer is simply stale and dull, with muted flavors. Sometimes acidity starts to develop, and the beer can seem thin. Flavor intensity decays, and the balance might change as different components degrade at varying rates. Oxidation can be part of this problem, but it's not entirely the same. Not all beers age at the same rate, so try to consume your beer before it declines too far.

Many brewers misidentify oxidation because they are expecting wet cardboard, sherry, or paper flavors. That's a specific kind of oxidation, but not the most common. Oxidized beers generally have a dullness of flavor, but also can start picking up a harsh bitterness and additional flavors. Paler beers tend to develop flavors like honey or caramel, increasing the sweetness and ester level of the beer. Darker beers can develop more complex fruity flavors, including those of dark or dried fruits. Many imported beers have these flavors; so American consumers often think they are part of the normal flavor profile of the beer.

Finally, packaging-related problems, including carbonation levels, can appear. Carbonation can be off if the beer was not fully attenuated at packaging, if the beer became infected, or if the package wasn't sealed properly.

Perceiving, recognizing, and identifying technical faults. Some beers have subtle faults that might not be detected by everyone tasting the beer. Other beers can have multiple faults that combine in ways that make the beer hard to diagnose. Some faults can dominate others, and the relative intensities can change over time. As stated earlier, I think the biggest mistake that brewers make in this realm is in oversimplifying homebrew flaws; for example, assuming that a beer is either flawed with a single flaw, or that it is flawless. Beer can have a combination of technical and stylistic faults. Don't stop your sensory evaluation

if you find one fault; there may be others. Conversely, don't get obsessed about finding faults in an otherwise delicious beer. Not every beer is flawed.

Once this model is used, the actual identification of specific faults really does come down to training in off-flavor recognition. Learn the flavor profiles and clues for classic technical faults, including how they interact with other flavors in the beer. A problem I have with many off-flavor workshops is that they use a neutral light lager as a base beer. I recommend learning what common flaws taste like in a variety of base styles so you can see how the beer style might affect the perception of the flaw.

Understanding the source of problems. This is where most brewers fail, generally because they are missing some of the necessary skills I've described. Ingredient selection, recipe formulation, and process control can all be involved, and there are often multiple ways to tackle the problem. Focus on the most likely causes first, since this gives you the greatest chance of fixing your problem. Just as a beer can have multiple faults, realize that fixing a problem can involve multiple improvements working together.

In conclusion, there are no "magic bullets" for improving your beer. Brewing better beer involves:

- Understanding and characterizing your current beer, from both a technical and stylistic perspective;
- Visualizing the target beer profile (which you may have had all along);
- Determining the differences between your current state and your goal; and
- Deducing what changes in your recipe or process will reduce those differences.

Making these changes is often an iterative process, but gaining additional experience tends to reduce the number of iterations needed to converge on your target.

Before and After Recipes

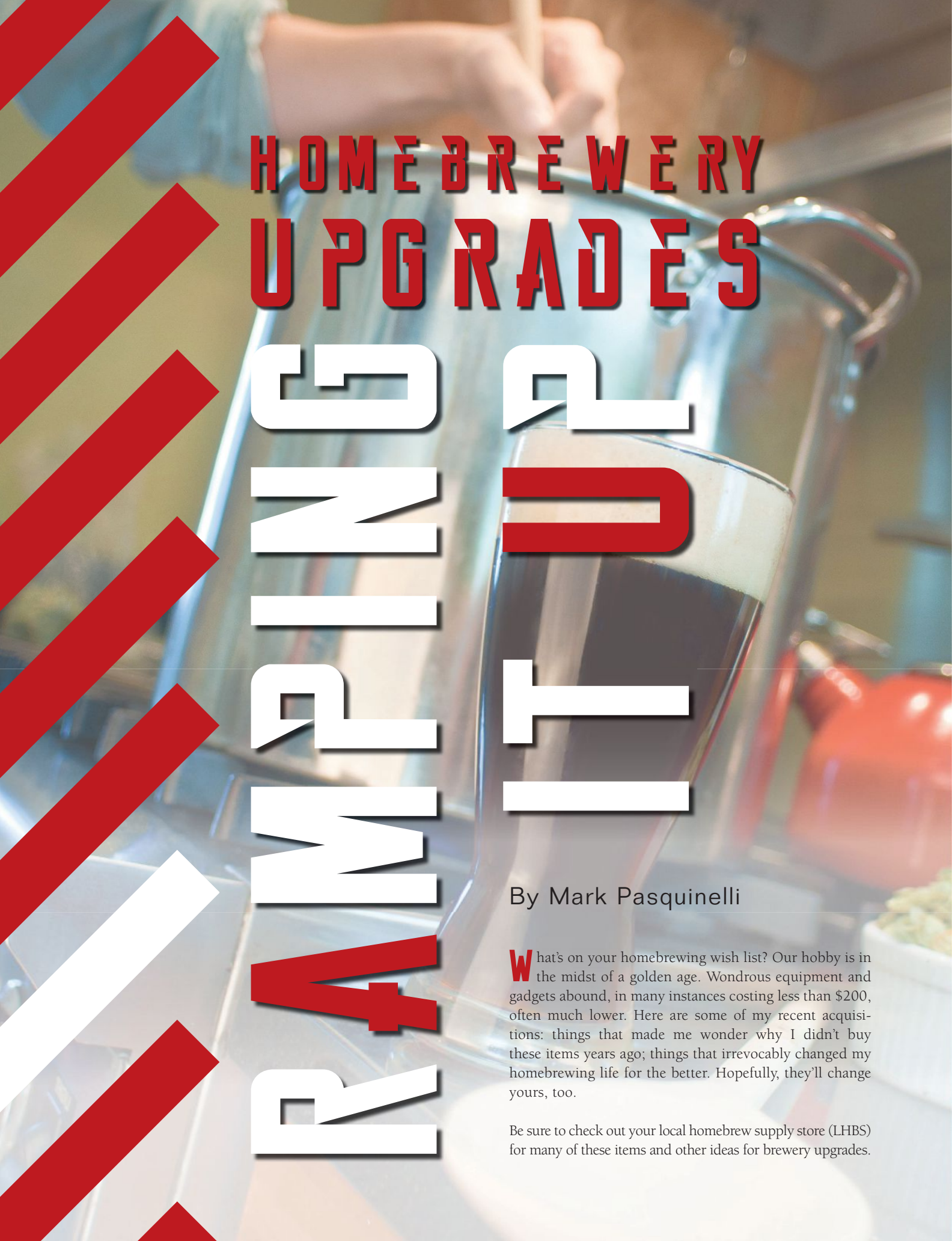
Three examples help illustrate how this approach can be applied, using actual recipes I've brewed as I've worked on different formulations over the years. None of these were bad beers; they just seemed like they weren't quite right, and continued tweaking made them better.

The first one is so easy that I won't use a recipe. To reduce harshness from dark grains, take the same dark grain and crystal malt additions as in the original recipe and move them to the vorlauf (the recirculation of wort over the mash bed to clarify it before running it into the kettle). The recipe looks the same, but the ingredients are added at different times. Giving the dark malts a shorter contact time with hot water reduces the husky qualities extracted from the grains. For example, in an English porter, I removed the chocolate malt and crystal 65 from the mash, leaving Maris Otter, Munich, and brown malt; I added back the crystal and chocolate during the vorlauf.

The second example is a Belgian tripel, where the "before" beer was brewed before I had been to Belgium. The beer was reworked to get a completely different balance with a lighter body, lower alcohol level, higher bitterness, and a much drier finish; the end result is that it tastes less like a pale barleywine with Belgian yeast, and more like the tripels I sampled during two subsequent trips to Belgium. One quality of Belgian beers that I admire is their attenuation, which keeps them easy to drink even when the alcohol level is on the high side.

The final example is an American pale ale. Here I reworked the beer to use a much less complex grist, and to remove grain-based flavors that seemed to be clashing with the hops. The hop varieties were also changed to go with a more tropical fruit theme and to get away from citrusy-resiny flavors. Munich malt adds malty richness without the crystal sweetness, and bready-biscuity flavors have been removed. While the IBUs are higher in the "after" beer, it actually seems to drink smoother since it relies on first wort hopping and hop bursting to emphasize the hop character while reducing hop-derived harshness.

Three-time Ninkasi Award winner Gordon Strong is the highest-ranking judge and current president of the Beer Judge Certification Program, primary author of the BJCP Style Guidelines, and author of *Brewing Better Beer* and the forthcoming *Modern Homebrew Recipes.*



HOMEBREWERY UPGRADES

RAMPING IT UP

By Mark Pasquinelli

What's on your homebrewing wish list? Our hobby is in the midst of a golden age. Wondrous equipment and gadgets abound, in many instances costing less than $200, often much lower. Here are some of my recent acquisitions: things that made me wonder why I didn't buy these items years ago; things that irrevocably changed my homebrewing life for the better. Hopefully, they'll change yours, too.

Be sure to check out your local homebrew supply store (LHBS) for many of these items and other ideas for brewery upgrades.

PUMP UP THE VOLUME

I felt like a professional brewer the first time I turned on my pump. It was a transcendent moment. I was powerful, no longer bound by gravity. Wort either recirculated or effortlessly moved from kettle to kettle at my command. Plus, the safety issue of lifting heavy kettles full of near-boiling wort was eliminated in one fell swoop.

I use the March 809 pump—the homebrewing industry standard. It retails for about $150-$180. Two other pumps are also intriguing: the Chugger and the Steelhead. Both pumps retail in the same price range. Brewers love stainless, and these pumps are available with a steel pump head rather than a polysulfone one prone to breakage and cross threading. And for those who already own a March pump, an $80 Chugger steel pump head will fit as a replacement.

Remember, though, these pumps use electricity—a bad combination with liquids. Safety is paramount; always use a ground fault circuit interrupter (GFCI). These pumps also have magnetic drives; they're not self-priming. Keep the pumps below the liquid level to prevent cavitation and regulate the outlet with a ball valve while leaving the inlet wide open.

HIGH-TORQUE DRILL

My father was notorious for buying cheap tools. Perhaps it didn't matter; he lost half of them, anyway. The other half were either broken or never worked right in the first place. Buy a cheap tool once, buy it twice.

A drill is a must-have tool for crushing grain, especially for all-grain brewers. In my first homebrewing article, I opined about the organic connection of grinding the grain by hand. That connection lasted until my first barleywine. Buy a drill: a good one. It comes in handy around the house, too.

My first drill was a 7-amp, half-inch Black and Decker. It was serviceable, but not really suited to the task. It lasted only a few years. Spend a few extra dollars and buy a high-torque drill.

These drills can be pricey, but I found a Hitachi 9-amp, 1/2" drill with more than 400 inch-pounds of torque for under $90. My Hitachi doesn't even break a sweat crushing the grain bill for those high-gravity brews. And since it's not operating flat-out, the speed is easier to control for a more consistent and reproducible crush. A quality drill is a great investment.

STIR PLATE

Brewing is all about fermentation—lots of healthy yeast. This assures a complete fermentation without off flavors and a fast take-off, when the wort is vulnerable to bacterial contamination. To achieve a high cell count, a starter is required. Making a starter in a growler is a huge improvement over simply pitching the yeast as-is, but the difference in the cell count is markedly improved when the starter is made with a stir plate used in conjunction with a flask.

Stir plates are available for about $100, plus around $20 for a 2L Erlenmeyer flask. Laboratory grade stirrers are easily double the price. Do-it-yourselfers can build one for a fraction of that (see "Increase Your Yeast with a Stirplate" in the January/February 2007 *Zymurgy*). However, I don't have those skills, and I prefer to help the economy. An affordable solution is to buy a stir plate through stirstarters.com for less than $50. They're made by Dan Jeska, an engineer living in Michigan, and come with a lifetime guarantee.

ON THE WEB

Build your own stir plate! Directions @ Homebrewers Association.org/stir-plate

Photos © iStock; Brewers Association; courtesy of Mark Pasquinelli

COMFORTABLE SHOES

No way around it: brewing is a messy business. For reasons unknown, hot wort has a proclivity for soaking my feet. I'd wind up wearing soggy sneakers for the rest of the day. Boots felt restrictive and clumsy—plus my feet roasted inside them. My wife suggested Crocs. I was aghast when I saw her leopard-patterned ones.

Nonetheless, she bought me a pair (dark and manly). I was hooked. They're comfortable, water-resistant, and the soles are non-slip for safety. Models such as the Bistro have an enclosed toe design to protect feet from spills. My Crocs proudly display their wort stains like badges of honor. My pair cost about $40, but there are always deals to be had, especially online.

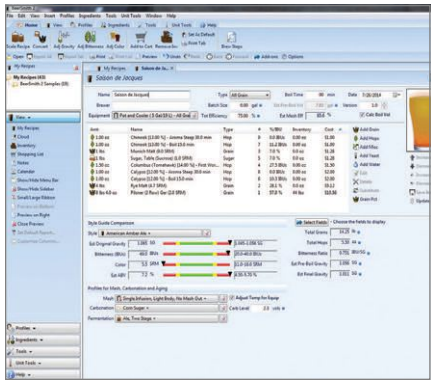
TEMPERATURE CONTROL

Temperature control is the other key to perfect fermentation. Low-tech solutions work well and get you in the ballpark, but they require constant vigilance for the first few days, until the fermentation stabilizes.

It seemed too easy when I switched to automated fermentation temperature control: set it and forget it. These units are available through homebrew suppliers, but I got the best deal and selection by going through a specialty store—etcsupply.com. The prewired single stage unit (Ranco ETC111000) retails for $75, and will either cool or heat when hooked to a refrigerator or space heater, respectively. I recommend the two-stage unit (Ranco ETC211000), which sells for $129. It can switch between heating and cooling as needed. Unwired versions of both are available for do-it-yourselfers, so be sure to read the product descriptions carefully.

For the ultimate in temperature control, a 15" hooded thermowell is available through morebeer.com for $27. The Ranco probe (with a little sanding) fits inside the thermowell and monitors the actual wort temperature directly, eliminating approximations or guesswork.

Granted, a fridge/chest freezer and a space heater are required to use these products. Older fridges and freezers can be purchased for a song. They are less energy efficient than the newer models, but they will work less, running at a much higher temperature than they were designed for, balancing out their lower energy efficiency. Be kind to yourself and your homebrew: automate your fermentation temperatures.



SOFTWARE

Many excellent homebrew recipes are found in magazines, books, and on the internet. Many of these recipes are award winners; they're great for allowing beginning homebrewers to focus on the process rather than fretting about ingredients. The quality of my homebrews took a quantum leap when I began to design my own recipes, often by comparing and contrasting several established recipes and tweaking them to my liking. This taught me how the BJCP styles were created, and how the characteristics of grains and hops affect the flavors and aromas.

Brewing software is indispensable for this task. I use Beersmith—the brainchild of Brad Smith. It's available at beersmith.com for $27.95. Programs like Beersmith are simple to use, yet powerful. As with Adobe Photoshop, I only use a fraction of Beersmith's capabilities. Besides design, brewing software can scale a recipe for larger or smaller batches, adjust specific gravity to make either session or imperial versions of a favorite recipe, calculate IBUs for first wort hopping and hop stands, and so much more.

Smith provides a regular newsletter and is responsive to user feedback. A few years ago, I mentioned recipe printouts weren't organized well. Others must have said something, too, because a newer version fixed the problem.

Mobile versions for iPhone, iPad, Android, and Kindle Fire are available. I don't use it, but the PC version appears better suited for recipe design, while the mobile app is great for changes on the fly and buying ingredients at the LHBS.

CARBOY/KEG WASHER

I'll never forget a veteran homebrewer's response when a newbie asked him what he needed to do to start brewing. "Start cleaning," replied the vet. Cleaning and sanitation take so much of our time and preoccupy our thoughts with anxiety and fears of bacterial contamination.

I always thought I scrubbed my carboys meticulously, yet I was often humbled by spots and specks that appeared in the unforgiving light of day. It was a game-changing moment when I bought a combination carboy and keg washer. My carboy collection sparkled in no time flat. I still give them a quick once-over initial scrubbing. Then I mix a few ounces of PBW with about a gallon of water, plug in the cleaner, and in 15 to 20 minutes, I have a perfectly clean carboy. I then give the carboy a quick rinse, seal it with aluminum foil, and it's ready to go for the next brew day.

The washer, which costs about $100, also works well with corny kegs. An attachment hooks onto the out poppet valve to clean the dip tube.

PUTTING IT ALL TOGETHER

Once you've made some game-changing homebrewery upgrades, it's time to put those purchases to use and brew.

Here's a recipe for a hoppy rye saison inspired by Free Will Brewing's Danae Ale. They were coy about the recipe on both the bottle and their website (no mention of ingredients other than rye, Calypso and Chinook hops), but I like my version. The dryness of the saison pairs wonderfully with the fruity and piney hops. And the

MORE GADGETS

Among the myriad homebrew products available, sometimes there's one thing so profoundly simple and versatile that it makes one wonder, "why didn't I think of that?" Like many homebrewers, I'm a hophead. I generously dry hop my APAs, IPAs, and the occasional saison. Yet I'm always looking for another way to add hops. I found it with keg hopping.

Morebeer.com sells a corny keg lid with a welded tab that can be connected to a mesh bag for keg hopping to give my homebrew that extra bit of aroma. At refrigerator temperatures, grassiness from extended dry hopping doesn't seem to be an issue.

But the tabbed lid isn't just for hops. Extras such as oak cubes, vanilla beans, cacao nibs, and cinnamon sticks can be added and monitored post fermentation. Then just remove the corny lid and replace it with a regular one. For $25, this is a handy and affordable gadget for those who keg their homebrew.

ON THE WEB

Check out our supply shops page @ HomebrewersAssociation.org/supply-shops

Calypso hops, of course, reminded me of Jacques Cousteau. I think he would have liked this one, and it was a big hit at our last homebrew club meeting. Cheers!

Mark Pasquinelli resides in Elysburg, Pa. with his wife, Karol. He somehow finds time to homebrew between his responsibilities as husband and manservant for their six cats.

SAISON DE JACQUES

INGREDIENTS for 6 U.S. gallons (22.7 L) 75% efficiency

8.5 lb	(3.86 kg) Pilsner malt
4.0 lb	(1.81 kg) rye malt
1.0 lb	(0.45 kg) Light Munich malt
1.0 lb	(0.45 kg) table sugar (sucrose)
0.5 lb	(227 g) rice hulls (optional)
1.0 oz	(28 g) Columbus pellet hops, 14.9% a.a. (FWH)
1.0 oz	(28 g) Calypso leaf hops, 15.2% a.a. (15 min)
1.0 oz	(28 g) Chinook leaf hops, 13.0% a.a. (15 min)
1.0 oz	(28 g) Calypso leaf hops, 15.2% a.a. (30 min hop stand)
1.0 oz	(28 g) Chinook leaf hops, 13.0% a.a. (30 min hop stand)
1.0 oz	(28 g) Calypso leaf hops, 15.2% a.a. (7 day dry hop)
1.0 oz	(28 g) Chinook leaf hops, 13.0% a.a. (7 day dry hop)
0.5 oz	(14 g) Calypso leaf hops, 15.2% a.a. (keg hop – optional)
0.5 oz	(14 g) Chinook leaf hops, 13.0% a.a. (keg hop – optional)
Whirlfloc®	
White Labs	WLP565 Belgian Saison I yeast (2L starter)

Original Gravity: 1.066 (16.5° P)
Final Gravity: 1.002 (0.5° P)
IBUs: 69 **SRM:** 5.5 **ABV:** 8.4%

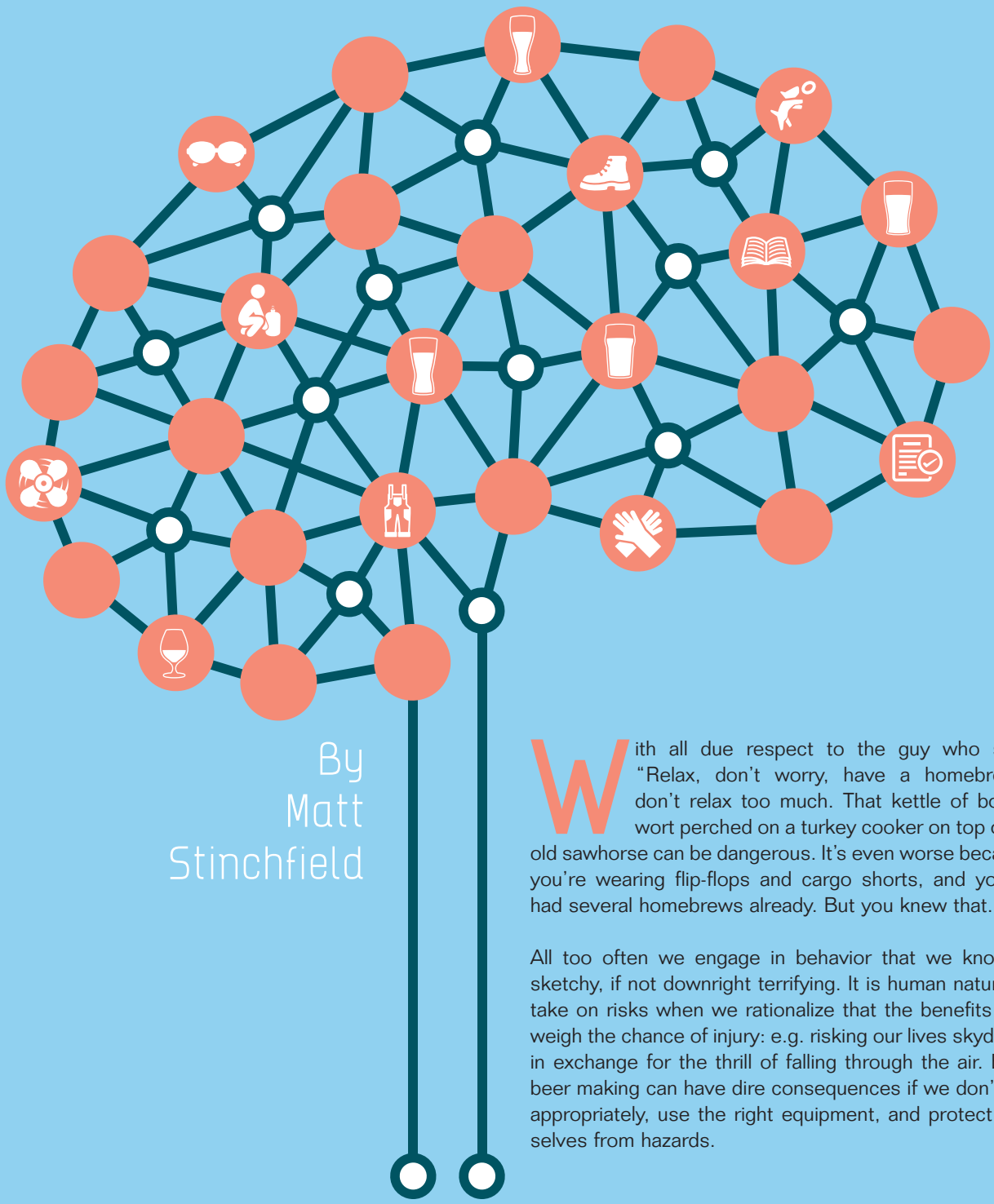
DIRECTIONS: Mashing with rye is tricky, but the results are rewarding. Begin with a thinner mash of about 1.75 qt/lb (1.67 L/0.45 kg) and dough-in for a step mash, starting at 105° F (41° C) for a 30 minute beta glucan rest, followed by a protein rest at 130° F (54° C) for 20 minutes, a saccharification rest at 145° F (63° C) for 60 minutes, an alpha amylase rest at 158° F (70° C) for 15 minutes, and a mash out at 168° F (76° C) for 10 minutes. Sparge to collect 7.5 gallons (28.4 L) of wort, add sugar, and boil for 90 minutes. Add the hops and Whirlfloc as directed.

Chill wort to 85° F (yes, 85° F, or 30° C; that's not a typo) and ferment at that temperature until completion, at least 14 days. The high temperature is required to keep the WLP565 from stalling. (I've fermented WLP565 at higher temps, but my saisons get a nice fruitiness that complements the Calypso hops at 85° F.) I ferment the carboy in an Igloo cooler with a water bath heated by a 100-watt aquarium heater. Be sure to put some blankets on top of the cooler to hold the temperature steady. Keg and carbonate to 3.0 volumes of CO_2, or bottle condition with 6.75 oz (191 g) corn sugar.

EXTRACT VERSION: Substitute 7.0 lb (3.18 kg) liquid Pilsner extract for the pils malt and 2.75 lb (1.25 kg) liquid rye extract for the rye malt. For best hop utilization, perform a 60 minute full-wort boil, and substitute 0.30 oz (8.5 g) Columbus boiling hops at 60 minutes to replace the first wort hops. Follow the rest of the recipe as specified.

SMART BREWING

THE BASICS OF HOMEBREW SAFETY



By Matt Stinchfield

With all due respect to the guy who said, "Relax, don't worry, have a homebrew," don't relax too much. That kettle of boiling wort perched on a turkey cooker on top of an old sawhorse can be dangerous. It's even worse because you're wearing flip-flops and cargo shorts, and you've had several homebrews already. But you knew that.

All too often we engage in behavior that we know is sketchy, if not downright terrifying. It is human nature to take on risks when we rationalize that the benefits outweigh the chance of injury: e.g. risking our lives skydiving in exchange for the thrill of falling through the air. Even beer making can have dire consequences if we don't act appropriately, use the right equipment, and protect ourselves from hazards.

Safe Work Practices (SWPs)

Start with Common Sense

What keeps us from being the safest of all possible homebrewers? It is usually ourselves. Your well-being is best assured by what safety professionals call "safe work practices" or SWPs. You can think of SWPs as the equivalent of common sense. But as the saying goes, common sense is altogether uncommon.

Safe work practices are part of the arsenal of hazard control techniques that safe operators use. Others that we'll discuss in this article include administrative controls (ACs), engineering controls (ECs), and personal protective equipment (PPE).

What makes SWPs so powerful is that they are *preventative* by nature. Most other control methods are mainly *protective*. Prevention means the hazardous outcome can be avoided, but protection attempts to control or restrain an already existing hazard. If a protective strategy fails we can still suffer an accident or injury.

Simply put, safe work practices are the things we do that do not require any special equipment or protective clothing—they are simply *the way* we do our task, a proactive methodology for safe outcome. SWPs are the Zen practice of safety.

From a resources standpoint, SWPs are inexpensive, since they don't rely on equipment or clothing. If you can visualize how a task is to be completed and you can think of a safe way to accomplish it, you are heading in the right direction.

For instance, having kids or pets running around you while you boil your wort could result in a tipped-over kettle of boiling hot liquid. The tragic consequences could be well beyond a ruined batch of homebrew. Instead, make sure there are no distractions near your hazardous activity in the first place. If slippery caustic cleaner is spilled on the patio surface, simply not walking through it prevents the slip and contamination hazards. Cleaning it up before someone else steps in it results in even more preventative safety. Lifting heavy carboys by squatting and bending at the knees, instead of bending at the back, will prevent serious injury. These are all examples of safe work practices: simple, elegant, preventative, and essentially foolproof.

Let's say you brew in your garage and your heat source is a propane burner. In warmer months you can open the door and the resulting airflow prevents any buildup of carbon monoxide. In the winter you might be tempted to brew with the garage door all the way down. A safe work practice approach tells you to either a) not brew in the winter with the door down (more on carbon monoxide in a bit), or b) find a solution to the asphyxiation concern by improving ventilation with the implementation of an engineering control.

Engineer a Safe System

Whenever you control a hazard with a device that physically manages the hazard, you are using an engineering control, or EC. Installing an exhaust fan near the gas burners in your garage setup will pull fresh air into the vicinity and dilute combustion gases that may contain excessive carbon monoxide.

Have you ever brewed with gas burners in an enclosed space because of the weather and noticed you get a bad headache? This could likely stem from the buildup of carbon monoxide, or CO, resulting from poor gas combustion. Carbon monoxide is called "the silent killer." It is colorless, odorless, and accumulates anywhere in the room since it weighs about the same as air. Moreover, CO can first cause sleepiness and headache, then unconsciousness, and ultimately death.

Homebrewers with access to monitoring devices have shown that hazardous levels of CO can accumulate in garage and basement brewing setups. While you might have an exhaust fan over your kettle with which to remove steam, you will want a very high flow rate to be sure to eliminate CO as well. Simply letting the air flow by itself is called passive ventilation, and is an inferior form of ventilation compared to forced air, or active ventilation.

Another way ECs can be a big help in the home brewery is in the transfer of liquids between heavy containers. Lifting injuries, both hernias and back strain, can occur when moving heavy kettles, mash tuns, and carboys. A sturdy kettle containing 11 to 12 gallons of wort can weigh nearly 150 pounds. A sensible system that allows you to fill and empty that kettle by using either gravity or a transfer pump will help you avoid a lifting injury.

Many homebrewers have been injured when glass carboys break. Each time you set a carboy down on a concrete surface, you can scratch the bottom. This weakens the carboy over time. In her book *Sustainable Homebrewing,* author Amelia Slayton Loftus urges brewers to use pieces of thick rug or rubber matting under carboys when agitating them. "A broken carboy full of homebrew is a real tragedy and in the worst-case scenario could cause a serious injury," she writes.

The Fine Print

If all else fails, read the directions. When was the last time you read the small print on a bottle of alkaline cleaner? Do you use concentrated acid to adjust your mash pH or polish your kettles? Did you end up with cracked fingers after the last brew day? All too often we skip the instructions and get right to business. With chemical

Safety isn't something to be embarrassed about. It is a sign of experience and of someone who takes their hobby seriously.

products it is essential that we regularly read and heed the hazard warnings provided by manufacturers and that we pass along this information to those around us.

Labels, instructions, warnings, and printed operating procedures are commonly known as administrative controls, or ACs. Administrative controls are a lot like SWPs that are written down and institutionalized: they are readily available, inexpensive to implement, and prevention-oriented. But just as with SWPs, they are too often ignored. Hint: this article is an AC that you can pin up in your brewing space.

The best ACs for homebrewers include hazard warning labels and written procedures provided by equipment manufacturers and brewing authorities. Most homebrew texts do not discuss chemical safety, instead focusing on low hazard cleaners and sanitizers. However, the notices on these products still merit a thorough read. Burgeoning nanobrewers and over-the-top homebrewers may be using concentrated caustic, acid, and peroxide products. They should realize they are working with an entirely different level of hazardous chemical severity. Label and safety data sheets (SDSs) should be consulted for best practices in use, disposal, and personal protective equipment.

Dress the Part

Wearing rubber gloves and safety glasses while homebrewing shows care and understanding of the hazards that come with the job. Some may think it is uncool to use PPE. Others seem to consider themselves impervious to corrosive chemicals and scalding liquids. My advice: get over it. Hazards know no bounds and brewers of any type are susceptible to exposure or injury.

Chemical Protection

One article of PPE that should be in every brewer's safety arsenal is rubber gloves. Reinforced latex, nitrile, or neoprene gloves are available at hardware stores and online. They offer good chemical resistance against moderate acids and caustics. To protect against hot surfaces choose gloves with a durable, waterproof, and somewhat insulating structure, such as a cloth-lined or multilayer reinforced construction beneath the chemical protective rubber layer.

For eye protection, a simple pair of safety glasses with side shields will go a long way toward reducing or eliminating eye injury in the case of a spray of hot liquid or the failure of a gas line under pressure. To reduce the irritating effects of malt dust,

a simple, disposable dust mask can be used. If you have a beard, don't expect much protection from a dust mask. The finest dust will bypass the mask in favor of the more porous beard. Simply keeping your face away from malt dust during milling and mashing may be an adequate safe work practice for reducing irritation.

Physical Protection

Besides hazardous chemicals, brewing at any scale involves *physical hazards*. These can cause cuts, scrapes, strains, slips, and burns. Injuries from physical hazards are among the most common brewery injuries. The failure to wear the right clothing often makes these injuries much worse than they might be otherwise.

Biochemistry professor and homebrewer Eric Woller knows this firsthand. Even though he is constantly urging his students to wear eye protection in the lab, and even though he normally wears safety glasses when working in his home shop, Eric slipped up and forgot to put his on. While cutting a piece of wood for his home bar, a fragment of wood was ejected from his saw and hit him directly in the eyeball. His eye fully healed, but you might not be so lucky.

Wearing baggy shorts is asking for problems, too. Cargo shorts have actually been the cause of accidents when the loose fabric or pockets catch on valves or burner stands or the like. Open-toed shoes, like sandals or flip-flops, can lead to a disastrous trip and fall or a scalding injury of unprotected skin. Just remember, every activity—ball player, baker, or brewer—has the right uniform, and if you take your well-being seriously, you'll wear sturdy shoes, work pants, and a durable shirt when brewing.

Glass carboy breakage results in many homebrewer injuries each year. Carboys can break because they fall off their place of rest, from thermal shock during cleaning or filling, by slipping from your hands because of slick cleaners or sanitizers, and in many other ways. Rubberized gloves, sturdy pants, and closed shoes can provide enough additional protection to reduce or eliminate lacerations from broken glass. Homebrewer Evan Finney cut his finger while cleaning a carboy, and had to have reconstructive surgery on the tendon.

JT from Baton Rouge was pouring a full carboy into a bucket. It slipped out of his hands, fell to the floor, and shattered. His bare shin received a major gash, and his foot and hand were also cut. "I should have been smarter," he says. "It crossed my mind that I should have been siphoning instead of pouring from the carboy. That would have prevented this 100 percent."

What these homebrewers figured out the hard way is that prevention is better than protection. If you plan your task and prethink the things that can go wrong, you can take steps to avoid the accident before disaster strikes.

Safety isn't something to be embarrassed about. It is a sign of experience and of someone who takes their hobby seriously. Homebrewing is a fun and rewarding activity, but we can only truly enjoy the fruits of our labors when we haven't hurt ourselves or others in the process.

Matt Stinchfield is the founder of Ploughshare Brewing Co. in Lincoln, Neb., and the chair of the Brewers Association Safety Subcommittee. He still uses glass carboys when he brews at home, but hasn't broken one for many years.

Table 1: Homebrewing Hazards and Control Strategies

Hazard	Control Strategies
Precarious setups, risk of falling or spilling, risk of contact with burner	Sturdy supports (EC). Reduce distractions such as kids, pets, roughhousing, excessive drinking. Remove clutter, use good housekeeping (SWP).
Thermal hazards of hot water, hot grain, boiling wort	Reliable plumbing fittings (EC). Rubber gloves, long sleeves, long pants, and close-toed footwear (PPE).
Hernia or back strain	Proper lifting from the knees, buddy lifting (SWP). Pumps and plumbing instead of lifting (EC).
Grain dust exposure during milling and mash in	Keep face away from dust (SWP). Wear disposable dust mask (PPE).
Carboy failure	Use proper lifting technique; don't rely on bolt-on handles; buddy lifting in box or tub; temper glass by rinsing with water of similar temperature prior to filling (SWP). Use rubber or cardboard mats under carboys to avoid scratching glass; fill and empty by gravity or siphon; avoid pouring from or pressurizing carboys (EC). Wear close-toed footwear, long pants, and long-sleeved shirts when handling carboys (PPE).
Injury from corrosive chemicals	Read labels and understand exposures (AC). Store safely to maintain container integrity and keep away from children/pets; use reduced hazard chemicals when possible; wash hands after use (SWP). Wear rubber gloves and splash protection for eyes (PPE).
Asphyxiation from carbon monoxide, i.e. gas burner exhaust	Ample ventilation to bring in fresh air and expel combustion air (EC). Install a CO monitor, available at home stores (PPE). Note that there is no low-cost respirator that protects against CO.
Asphyxiation from carbon dioxide, i.e. gas cylinder leakage	Ample ventilation to bring in fresh air (EC). Avoid sleeping or lying on floor where CO_2 could accumulate, as it is heavier than air (SWP).
High pressure failure of gas systems	Use properly designed and rated hoses, fittings, secondary regulators (EC). Wear eye protection whenever working with pressurized systems (PPE).
High pressure failure of bottles	Avoid bottling beer that is too young and has residual extract (SWP). Store beer in crates in a temperature-controlled environment (EC). Keep brewing and bottling records to avoid future bottle failures (AC).

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HOMEBREW TOXICOLOGY

ARE HIDDEN DANGERS LURKING IN YOUR BREW SYSTEM?

BY PAUL HANLON

HOMEBREWERS DON'T NEED TO LOOK HARD TO FIND ARTICLES WARNING THEM OF HIDDEN DANGERS IN THE BEER THEY DRINK OR THE MATERIALS THEY USE IN THEIR HOMEBREW SETUPS. THE MOST CONVINCING OF THESE ARTICLES WILL LINK BACK TO A SCIENTIFIC ARTICLE OR AN ESTABLISHED NEWS SOURCE, WHICH CAN UNDERSTANDABLY LEAD HOMEBREWERS TO TAKE A SECOND LOOK AT THE BEER IN THEIR GLASS OR THE EQUIPMENT THEY USED TO PRODUCE THAT BEER.

As a toxicologist, I have reviewed a number of these articles and in the vast majority of cases a bit of investigation revealed that the risks from consuming homebrew are not significant enough to discourage anyone from the hobby. In fact, what is almost always overlooked in these articles is that the most significant chemical toxin in homebrew is the alcohol itself! Homebrewers have likely experienced at least some of the toxic effects of ethanol such as nausea, headache, dehydration, and/or disorientation. Furthermore, a scientific study published in 2012[1] describes the long-term health effects of a number of chemicals found in beer and demonstrates that the risk from ethanol is far greater than the risk from other chemicals.

DEFINING RISK

Determining risk (or, conversely, safety) of chemicals is dependent on two variables: hazard and exposure. This is often presented as:

Risk = Hazard x Exposure

This means that risk is dependent on both variables, because if either is zero then the overall risk is zero. A chemical that is not hazardous (zero hazard) and chemicals you aren't exposed to (zero exposure) do not pose any risk to you.

Thus, when evaluating warnings about the dangerous chemicals lurking in homebrew, it is important to investigate both aspects of risk. The critical error behind most of these warnings is that they ignore either hazard or exposure (or both). Additionally, toxicologists (and scientists in general) often have difficulty communicating the importance of both hazard and exposure when determining risk, which likely contributes to the way risk from these chemicals is portrayed on the internet.

Hazard

Hazard is a description of the toxicity of a substance. When performed correctly, a hazard assessment takes into consideration all available information, giving additional weight to the most relevant studies (for example, studies of animals take precedence over studies of isolated cells), and to the studies with the best scientific design (such as those that use appropriate controls and relevant concentrations of the chemicals). Well-controlled, well-designed toxicology studies can be very informative about the hazards associated with chemicals. Unfortunately, due to the cost and resources needed to conduct these studies, they are usually significantly outnumbered by other studies that, while they may be informative about how a chemical *might* be hazardous, lack direct relevance to human health.

Additionally, for many chemicals, the hazard of the chemical is dependent upon the way in which you are exposed to it. For example, asbestos is very hazardous if you inhale it, but not if you were to mix it in a glass of water and drink it. The same has been shown for polyvinylpolypyrrolidone (PVPP), a polymer used as a clarifying agent[2]. PVPP has been demonstrated to have some toxicity when inhaled. However, when PVPP is ingested it takes the express train through your gastrointestinal system, and toxicity is greatly reduced or completely absent. In toxicology terms there is no systemic exposure to PVPP, meaning it isn't absorbed into your bloodstream (a critical step for producing toxicity to any organ, other than your stomach and intestines). Be skeptical if you are being warned about chemicals in beer based on studies in which animals were exposed through inhalation or injection (unless those are ways you typically consume beer).

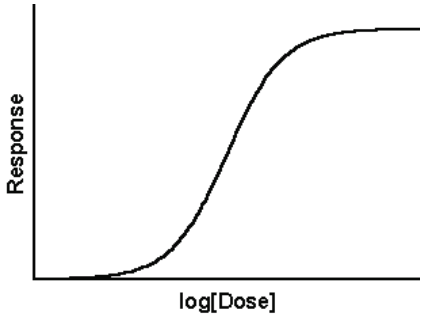
One problem with the hazard assessments in these warnings is the assumption that all study results are relevant to homebrewers. Just because a chemical generates a result in cells grown in a dish doesn't mean that the same thing will happen in your body when you are enjoying your latest IPA. Similarly, a study that uses a concentration of a chemical 1,000 times higher than would ever be present in your award-winning Flanders red is not proof that you are being poisoned without your knowledge. Toxicity is dependent upon the level of exposure.

Exposure

Exposure is a description of the concentration (or dose) of a chemical to which a person is exposed. The mantra of all toxicologists is "the dose makes the poison," a phrase first uttered by Paracelsus in the early 1500s that is still just as true today (side note: ask the next toxicologist you meet to show you their tattoo of this phrase). The human body has a remarkable capacity to detoxify itself, which is why our daily exposure to thousands of chemicals (mostly at very low concentrations) doesn't result in toxicity.

Many internet warnings treat all levels of exposure the same, implying that any amount of exposure to a chemical results in the same amount of risk. This approach ignores the critical component of exposure. Here's a thought experiment to demonstrate the importance of exposure in determining risk. One Saturday night, Bill drinks one 5 percent ABV beer, exposing himself to 17.5 mL of ethanol. The next Saturday, Bill drinks a dozen 5 percent ABV beers, exposing himself to 210 mL of ethanol. Do you think there would be any difference in the amount of toxicity Bill experiences on those two Saturdays? Now imagine Bill drinks only one ounce of 5 percent ABV beer the next Saturday. Does he experience any effects from the 1.5 mL of ethanol?

The same concept is true for all chemicals that could be found in beer. Just because exposure to 210 mL of a compound causes toxicity doesn't mean that exposure to 1.5 mL of the same chemical will also cause toxicity.



What toxicologists have demonstrated through centuries of experiments is that for the majority of chemicals, there is a threshold for toxicity. Exposure to a chemical at a level below that threshold does not result in toxicity. In our example, when Bill drinks only one ounce of beer (1.5 mL of ethanol) he experiences no toxicity, and therefore is below the threshold. Reducing exposure further below the threshold does not make it any "safer." In our example, Bill's risk for ethanol toxicity is no different if he consumes one ounce (1.5 mL of ethanol) or one-tenth of an ounce of beer (0.15 mL of ethanol), because both are below the threshold of toxicity.

ADDING IT ALL UP

So how can we use this information to determine whether or not we are at risk from chemicals in our homebrew? Let's go through a couple of examples.

Fermcap-S (dimethylpolysiloxane) is a chemical added to homebrew as a foam inhibitor. Toxicology studies have demonstrated that lifetime exposure to dimethylpolysiloxane in rats at concentrations up to 150 mg/kg (or 10,500 mg for an average 70 kg [154-pound] human) produced no toxicity. Compared to other chemicals, the hazard from this compound is very low. We can also calculate exposure based on typical use. For example, let's assume an exposure of approximately two beers (or 700 mL) per day for a lifetime. Fermcap-S is recommended at two drops per 5-gallon (19 L) batch of beer, resulting in a concentration of approximately 25 mg of dimethylpolysiloxane per L of beer. This would result in human exposure of roughly 17.5 mg per day, an amount 600 times lower than that which was demonstrated to be safe in the toxicology study. Therefore, using Fermcap-S as directed is highly unlikely to be toxic (meaning there is low overall risk from this chemical), even if a homebrewer uses it religiously in his or her beer and always has two beers per night.

Lead is a toxic metal that is significantly hazardous. It is also present in many brass fittings, and therefore could be present in

IF YOU ARE LOOKING FOR WAYS TO UPGRADE YOUR BREWHOUSE WITHOUT RELYING ON MATERIALS FROM A HOMEBREW STORE, LOOK FOR FOOD-GRADE MATERIALS AS YOU EVALUATE ALTERNATIVES.

NONE OF THE EQUIPMENT INCLUDED IN A HOMEBREWING STARTER KIT PRESENTS A RISK OF CONTRIBUTING TOXIC CHEMICALS AS LONG AS IT IS USED ACCORDING TO THE INSTRUCTIONS.

a number of items that are part of homebrew systems. However, its presence in brass fittings does not equal significant exposure to a homebrewer using those systems. First, the majority of lead in brass fittings is sequestered behind an oxidized top layer, making only a small fraction of the lead in the fitting available to migrate into the wort. Second, yeast have been shown to absorb many metals during the fermentation process, including lead, further reducing any lead that would be present in the final beer. This is consistent with a study that demonstrated beer contains very low (and in most cases undetectable) amounts of lead[3]. Therefore, even though lead is a hazardous compound, the lead from brass fittings is unlikely to produce adverse effects due to the insignificant level of exposure via homebrew systems.

Bottom line: Risk is dependent upon *both* exposure and hazard. Insignificant hazard (think Fermcap-S) in general means insignificant risk, while at the same time insignificant exposure (think lead from brass fittings) also means insignificant risk. It is only when there is a combination of both hazard and exposure that one needs to worry about risk.

REDUCING RISK

With this concept in mind, how can we as homebrewers reduce the risk from chemicals in our brew systems? While in general, homebrewers don't have to worry about chemicals in their homebrewing systems, here are a few guidelines to reduce risk and stress during the brew day and, more importantly, during consumption of the end product:

1. Remember that ethanol is the most significant naturally-occurring toxin in beer.
2. Use materials for their intended function.
3. Look for food-grade materials.
4. Use common sense.
5. Relax, don't worry, have a homebrew.

Let's take a look at each of these guidelines separately.

1. Ethanol is the most significant naturally-occurring toxin in beer.

In addition to the well-known, short-term effects of ethanol that many of

us are familiar with, ethanol is also associated with a number of long-term effects, including cancer, liver cirrhosis, and reproductive effects. The amount of ethanol that needs to be consumed to produce these effects varies, but studies have demonstrated that chronic alcoholic beverage consumption is the prime contributor to long-term ethanol-induced toxicity.

Alternatively, a number of other chemical compounds are present in beers (and homebrew) in different concentrations. These derive from starting materials such as grains and hops, or occur as the products of fermentation. These compounds include off flavors such as acetaldehyde and diacetyl, flavor esters such as isoamyl acetate (banana) and 4-vinyl guaiacol (clove), and higher alcohols such as ethyl acetate and propanol.

In comparison with ethanol, these other naturally-occurring chemicals are either far less hazardous or are present in significantly lower concentrations (beer can exceed 20 percent ethanol!), or both. The same is true for the other chemicals that can be found in beer (see sidebar on page 58) as a result of the process of brewing, storing, or serving beer. While some of those chemicals are hazardous, exposure to the compounds is low, and the chemicals present at high concentrations are not hazardous. The only chemical that comes to mind that is present in beer at a concentration anywhere close to ethanol is good old H_2O (which is exceptionally non-toxic, although not completely absent of hazard as demonstrated by a well-publicized death in 2007[4]).

2. Use materials for their intended function.

None of the equipment included in a homebrewing starter kit presents a risk of contributing toxic chemicals as long as it is used according to the instructions. As long as this equipment is not exposed to extreme conditions, such as extreme heat or acidity, it should maintain its structural integrity and should not allow excessive amounts of chemicals into your homebrew. This does not mean that using equipment in a different way would

Continued on page 60 >

OTHER POTENTIAL BREWING HAZARDS

Basic Brewing Radio aired a series of three podcasts between November 2013 and February 2014[6] where I discussed many chemicals that might be present in homebrew systems. The podcasts go into additional details, but here are short summaries of some of the examples that I presented.

PLASTIC CONTAINERS (MASH TUNS, PLASTIC FERMENTERS, ETC.)

The plastics used to manufacture food-grade containers have been shown to be non-hazardous. In one example, a well-controlled experiment showed that feeding rats a diet of 5 percent polyethylene terephthalate (PET) for 90 days produced no toxicity[7]. This calculates to approximately 2.8 grams of PET per kilogram of body weight, corresponding to approximately 200 grams (about the weight of a cup of sugar) for a 70-kg human per day. These containers are very resistant to the conditions in which we brew, so no more than a trace amount of those compounds ends up in your beer. If they weren't resistant to these conditions, they wouldn't make very good brewing vessels. General advice is to use containers sold for use in homebrewing, or for use in other food-contact purposes (for example, bakery buckets or water coolers). Stick to clear or white plastic materials, avoiding colored plastics (especially for applications that include exposure to liquids for long periods of time or under harsh conditions such as high heat or low pH). For super high temperature applications (meaning boiling), such as tubing for whirlpool pumps, make sure the plastics are rated for those temperatures. As long as your plastics are not disintegrating during use, you don't have anything to be concerned about.

GARDEN HOSES

Most hardware stores sell hoses specifically marketed for transferring potable water. These are typically white and often make reference to campers or boats. That doesn't mean that your standard green garden hose is not appropriate to use. I have seen warnings about the toxins present in garden hoses and the hidden dangers lurking in our yards. However, the actual studies referenced use unrealistic conditions (such as filling a hose with water and keeping it in direct sunlight for 48 hours) to demonstrate the presence of detectable (although still extremely low) amounts of these chemicals. This is an example where you should use common sense, and your common senses. If you are using a garden hose, consider:

- Running off the first couple gallons to make sure you aren't using stagnant water. After you run a few gallons through that hose, there will be no difference between water from the hose and water directly from the tap.
- Tasting the water before you use it. Your senses will pick up problems with your water (e.g. plastic or mineral taste) at levels that rival most analytical methods, and off-flavors are a bigger concern than toxicity.
- Filtering the water through a carbon filter if you are still picking up off-flavors.

OXIDIZING CLEANSERS

Oxidizing cleansers (like OxyClean) are recommended by many homebrewers as a way to clean brewing equipment such as plastic fermenters. One of my favorite tricks for cleaning my plastic carboy is to fill it a third of the way with hot water, add a quarter cup of OxyClean, and let it sit overnight. This is a cleaning, not a sanitizing, step; therefore, after I'm done with this step I thoroughly rinse away the OxyClean. Even hugely overestimating the amount of OxyClean that would be left on brewing equipment after a rinsing, the amount of chemicals that could be present in the finished beer is exceptionally low. The chemicals in OxyClean (sodium carbonate and sodium carbonate

peroxide) are also non-hazardous. Stay away from "fresh scent" versions, unless you are looking for a unique twist on your latest hefeweizen. Otherwise, typical rinsing is enough to keep you safe.

SANITIZERS

Most no-rinse sanitizers on the market are either iodine based or acid based. These sanitizers are marketed for this specific purpose, which means that application of these chemicals has been evaluated by toxicologists and other scientists and determined to be safe. These evaluations are true risk assessments that take into account both hazard and exposure, which is how agencies develop guidelines about how to use these products. They know that an individual's exposure to these chemicals when using the product as directed will be much lower (with plenty of safety margin built in) than what would produce toxicity. Use these chemicals as directed (more is not always better, especially when talking about toxicity!), and you will have nothing to worry about.

BLEACH

There are a number of reasons to avoid using bleach in your homebrewing system, including the possibility of off-flavors or aromas and the possibility of damaging metal equipment. However, when used according to directions (1 tablespoon in a gallon of water), bleach does not pose a risk for toxicity. While bleach can be hazardous, homebrewers wouldn't be exposed to more than trace amounts under typical use. Use bleach according to directions, which are often listed on the container (John Palmer also recommends a rinse with boiled water). Again, stay away from products with scents or other added chemicals, as your biggest risk from bleach is brewing a batch of beer you wouldn't want to drink.

HOPS

While definitely safe for humans (an army of hop-heads are in the "high dose" group to prove it), hops can be deadly to some of our furry brewing companions. While the mechanism isn't completely understood, the toxicity of hops to dogs has been well documented[8]. So make sure to keep hops away from your dogs on brew day.

result in a risk to safety. But any time that you use something in a way the manufacturer did not intend, you increase the possibility of an unforeseen result.

For example, if you decide to save money and use a bucket from the hardware store instead of buying one from your local homebrew shop, you are introducing an unknown element. The manufacturer of the hardware-store bucket didn't have homebrewing in mind when the bucket was designed, and may use chemicals or dyes that you wouldn't want in your homebrew. So, if you want to reduce the chemical risk in your brewhouse, buy equipment designed with your needs in mind.

3. Look for food-grade materials.

If you are looking for ways to upgrade your brewhouse without relying on materials from a homebrew store, look for food-grade materials as you evaluate alternatives. This may require doing a little investigating by either carefully examining the equipment or by contacting vendors. A good rule of thumb for plastics is to stick to white or clear materials, as they are least likely to be made from recycled materials or contain non-food-grade colorants.

Expert analysis by the United States Food and Drug Administration (FDA) about what is considered safe for contact with food can be found in the U.S. Code of Federal Regulations (CFR)[5]. Most companies use the term "food-grade" to indicate that equipment meets the requirements defined in these regulations. Keep in mind that the regulation does not typically approve the use of a chemical for any and all purposes. Instead, the regulations provide specific conditions in which use of the chemical has been evaluated and determined to be safe. For example, some plastics are acceptable for use "for packaging, transporting, or holding food, excluding alcoholic beverages, at temperatures not to exceed 250° F (121° C)." As well, polyvinylpolypyrrolidone (PVPP) can be used as a clarifying agent as long as it is "followed by removal with filtration."

This does not mean that using these materials in a way other than described is inherently unsafe. In many cases it only indicates that there have never been studies examining whether other uses are acceptable, or that the FDA has never been asked to evaluate that specific use. But if you want to reduce your risk as much as possible, look for food-grade materials and use them according to the conditions listed.

4. Use common sense.

This is possibly the most important and the hardest to define in terms of evaluating risk.

Let your senses guide you: Worried about plasticizers or metals in your brewing water? Smell it and taste it. See if you can detect those flavors/aromas. Your senses are extremely sensitive to these compounds (in some cases more sensitive than even the most technologically advanced instruments).

Take precautions: Worried about chemicals from your well water? Use a carbon filter. Concerned about compounds leaching from your metal or plastic equipment? Do some treatments of your metal objects to stabilize the oxide layer, and do a pre-rinse of your plastic equipment with boiling water to extract any migrating chemicals.

Consider the weight of evidence: Read an article about a toxic chemical online? Look for more information and see if there's another side to the story. Good resources include:

- *U.S. National Toxicology Program (NTP):* http://ntp.niehs.nih.gov/
- *U.S. Agency for Toxic Substances and Disease Registry (ATSDR):* atsdr.cdc.gov
- *European Food Safety Authority (EFSA):* efsa.europa.eu/
- *US Environmental Protection Agency (EPA):* epa.gov/IRIS/
- *Joint FAO/WHO Expert Committee on Food Additives (JECFA):* fao.org/food/food-safety-quality/scientific-advice/jecfa/en/

All of these organizations perform comprehensive searches of scientific information (both positive and negative studies) prior to making conclusions about the safety of chemicals. The weight-of-evidence approach these organizations take is important when determining safety, and they all consider risk to be the product of hazard and exposure, something that many other websites overlook when they make definitive statements about the risk from chemicals.

5. Relax, don't worry, have a homebrew.

Homebrewers perform a risk assessment every time they pour themselves a beer and determine that the risk from ethanol consumption is outweighed by the enjoyment it brings them. Ethanol is known to be hazardous in both the short term and the long term, and is present in beer at concentrations much higher than any of the other chemicals discussed in this article. Since you have already concluded that the risk from ethanol is acceptable, and ethanol presents far higher risk than any other chemical that could be present (based on the combination of hazard and exposure), go ahead and relax: those other chemicals are nothing to worry about.

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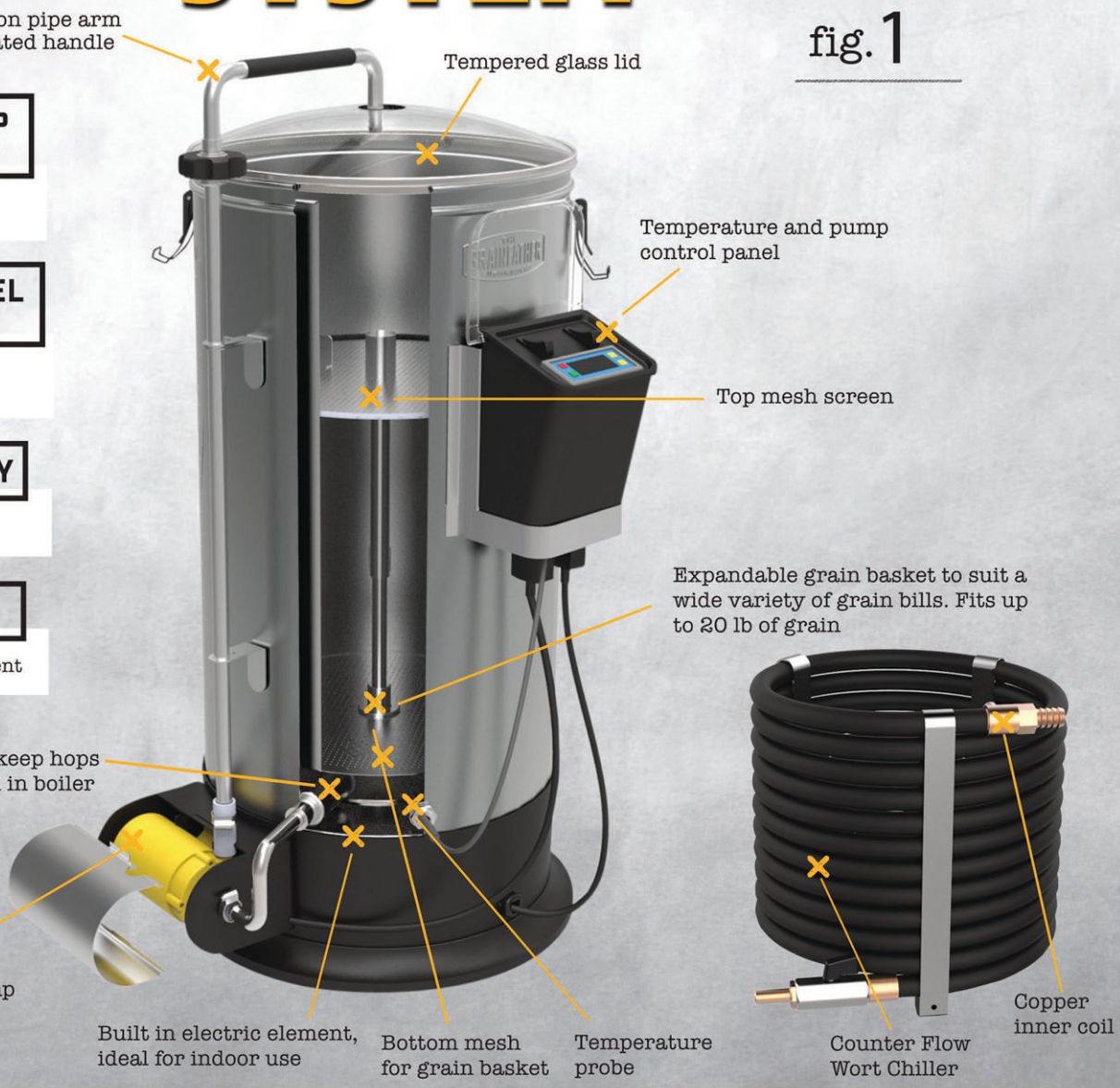
Paul Hanlon is a board certified toxicologist and a member of the American Homebrewers Association. He lives in New Albany, Ohio.

THE GRAINFATHER
ALL GRAIN BREWING

ALL IN ONE BREWING SYSTEM

fig. 1



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by Amahl Turczyn

Big Bend Brew Off

The North Florida Brewers League (NFBL) of Tallahassee, Fla., collaborating once again with Tri-Eagle Sales, HomeBrew Den, and Momo's Brewpub, held their annual Big Bend Brew Off January 16 and 17. Organizer Tom Tracy explained that the competition is small in size, but extremely focused on high-quality judging.

Held since the early 1990s, the event attracts a significant percentage of Certified, National, and Master-ranked BJCP judges. BOS prizes, category prizes, and judge hospitality gifts, all sponsored by Tallahassee's HomeBrew Den, this year included refractometers, temperature control thermostats, hardware and tool sets, cleaning equipment, and customized NFBL and HomeBrew Den gear.

The NFBL will celebrate its 25th anniversary as a homebrew club in 2015. During that time, it's been increasingly active in the local homebrew scene. "The group has been integrally involved with the homebrewing community: hosting the AHA National Homebrew Competition Southeast Regional for three years, serving as the hospitality hosts for the 2006 AHA National Homebrewers Conference, and actively participating in the BJCP Southeast Region," commented Tracy. But the club goes beyond homebrew to the community at large, and has raised approximately $70,000 in the last five years for local charitable organizations.

This year, a member of the Hogtown Brewers of Gainesville, Fla., Jim Barrie, claimed the Big Bend Brew Off's Best of Show victory. His history of competitive spirit has run from a career in football to law school, and now to winning medals for beer championships.

Jim Barrie, a member of the Hogtown Brewers of Gainesville, Fla., claimed the Big Bend Brew Off's Best of Show victory.

Photo courtesy of Jim Barrie

Liquid Gold Helles

RECIPE BY JIM BARRIE, GAINESVILLE, FLA.
BEST OF SHOW, 2015 BIG BEND BREW OFF

INGREDIENTS
for 12 U.S.gallons (45.42 L)

21.0 lb	(9.53 kg) Weyermann® Pilsner malt
0.5 lb	(227 g) Weyermann® Vienna malt
0.5 lb	(227 g) Weyermann® Munich 1 malt
0.5 lb	(227 g) Weyermann® melanoidin malt
3.5 oz	(99 g) Hallertau pellets, 4.8% a.a. (60 min)
100%	reverse-osmosis water with 8 g calcium chloride (mash)
WLP 838	Southern German Lager yeast

Original Gravity: 1.050
IBUs: 25 **SRM:** 4
Est. ABV: 5.1%

DIRECTIONS
Single infusion, batch sparge. Mash at 152° F (67° C). Sparge at 170° F (77° C). Pitch at 45° F (7° C). Ferment at 48° F (9° C) the first week, 50° F (10° C) the second week, and 52° F (11° C) the third week. Lager at 32° F (0° C) for three more weeks.

EXTRACT VERSION: Use 100% RO water, omitting calcium chloride. Reduce pilsner malt to 1 lb (0.45 kg) and mash with Vienna, Munich, and melanoidin malts at 155° F (68° C) for 45 minutes. Drain and rinse grains. Dissolve 15 lb (6.8 kg) pilsner malt extract syrup or 12.25 lb (5.56 kg) dry pilsner malt extract into wort and proceed with boil.

"WHEN AN INJURY NO LONGER MADE THE NFL POSSIBLE, I WAS IN SEARCH OF SOMETHING ELSE. THE FACT THAT I CAN USE MY CREATIVE SIDE AND PLEASE PEOPLE AT THE SAME TIME INSPIRES ME TO BREW."

Considering the passion and dedication, the parallels between competing in professional football and brewing for competitions become clear. "When an injury no longer made the NFL possible, I was in search of something else," Barrie explained. "The fact that I can use my creative side and please people at the same time inspires me to brew." That, and a little help from his friends. "My brewing counterparts have always provided the logic and reason that's enabled us to repair our brewing near-disasters (thanks Rich Yasparro and Derek Miles). I have always been the ultimate researcher and developer (not a bad gig!) and head brewer to see the whole process through."

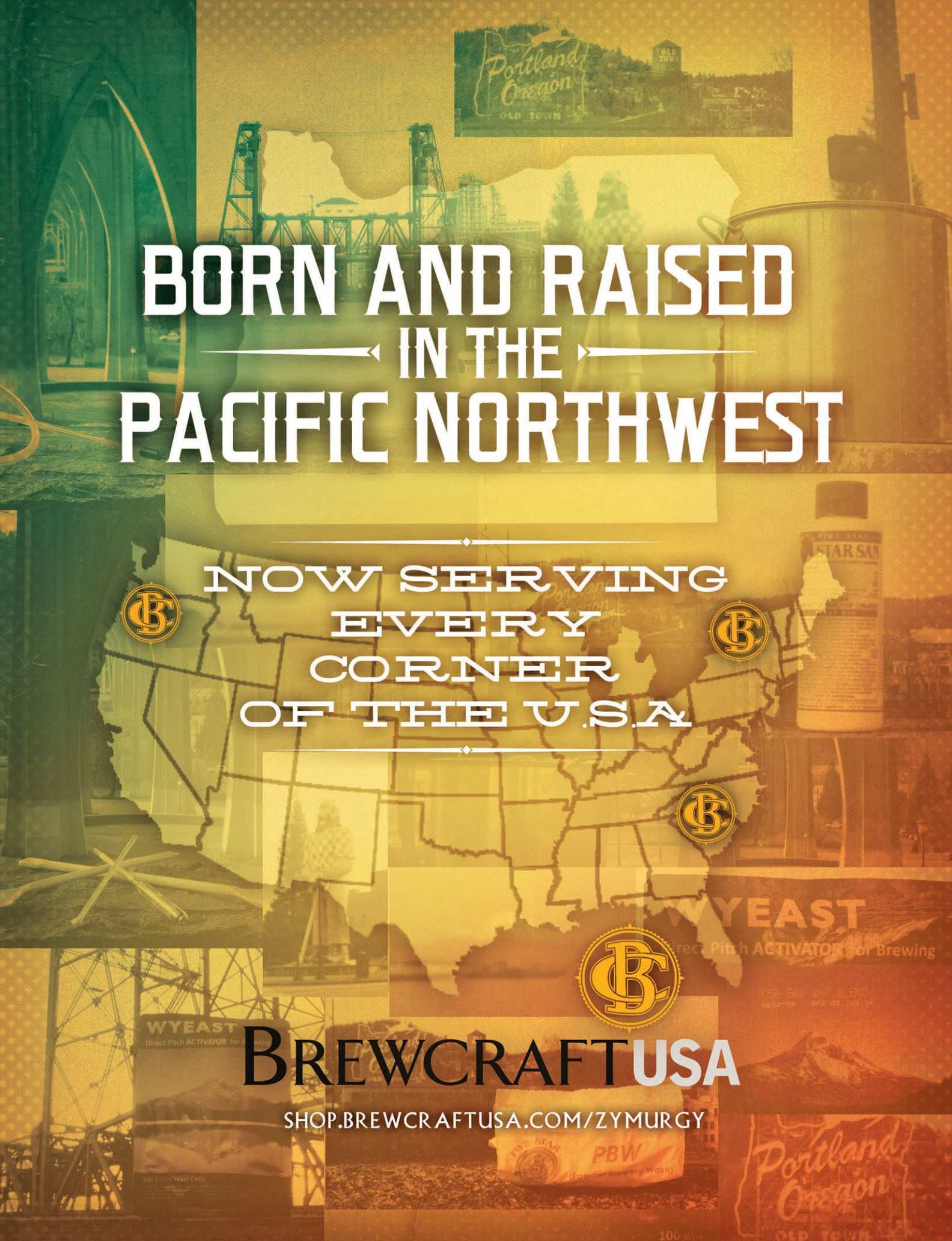
Originally inspired by a documentary film on the American beer industry, he decided to make his own beer. "I watched *Beer Wars* and spontaneously bought a brewing kit," Barrie remembers. "I thought it would be fun to make craft beer. Fast forward approximately six years, and I have now solidified my passion for the hobby." He has met with considerable success. "My proudest moment was winning third place in the 2014 National Homebrew Competition in Category 10A: American Ale for my Prenup Pale Ale—inspired by my wife, of course," Barrie said. "I'm still relatively new to the competition circuit and have entered six so far."

Apart from this most recent best of show, other victories include a first place for an Oktoberfest at BBBO, a first place in the first round of last year's National Homebrew Competition, and two second-place rankings for his Vienna Lager. Lagers are his favorite styles to brew, though he likes "hoppy stuff" as well. Obviously, his lager brewing technique is spot on, which he attributes to some important techniques.

"Pitching cold is important for lagers, and I don't touch them for at least three weeks," he explained. "Trust me: I have tried to rush it without success." Keeping the finished beer oxygen-free is also crucial. "When I take a sample, I purge the carboy or bucket with CO_2."

His helles recipe was inspired by travels in some of the most venerated beer locales in the world. "[Helles] was my favorite beer from our honeymoon in Bavaria and Belgium with my beautiful wife. Specifically, my favorite beer was the Spezial Helles from Kloster Andechs. Remembering the crispness and grainy flavor takes me back to the monastery and the overcast mountaintop—complete with Bavarian pork knuckles and giant soft pretzels. I am proud of my representation of a Bavarian helles."

Amahl Turczyn is associate editor of *Zymurgy*.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KUDOS—BEST OF SHOW

AHA/BJCP Sanctioned Competition Program

October 2014

Bramwell Oktoberfest KRAZE 2014, 40 entries—*Matthew McIntosh*

December 2014

Humpy's Big Fish Homebrew Competition, 97 entries—*Ted Rosenzweig, Anchorage, AK*

January 2015

Big Beers, Belgians & Barleywines Homebrew Competition, 350 entries—*Chris and Liam Crump*

Heart of Dixie Open, 99 entries—*Patrick Delisle, Woodstock, GA*

Belle City Winter Warmer, 60 entries—*John Blythin, Waukegan, IL*

2014 CRAFT Invitational - Standard Cider and Perry, 8 entries—*Brian Longman, Shelby Twp, MI*

Winterbrew 2015, 177 entries—*Lee Mahony, Odenton, MD*

Mardi Gras Casino 2nd Annual Homebrew Competition, 38 entries—*Invasive Species Brewing Club, Ft. Lauderdale, FL*

21st Annual Boneyard Brewoff, 269 entries—*Joe Formanek, Bolingbrook, IL*

Multi Club Cider, 21 entries—*Matt Bauer, St. Louis Park, MN*

ZZHops Club Only - Pick your Porter!, 18 entries—*Dave Hartwig, Lone Jack, MO*

Biere De Rock, 115 entries—*Torre Ahlberg, Longmont, CO*

2015 Doug King Memorial Homebrew Competition, 182 entries—*Matt Castellino, Thousand Oaks, CA*

Arizona Mead Cup, 47 entries—*Robert Eltringham*

Lancaster Iron Brewer, 156 entries—*Mike Domin, Lancaster, PA*

Bent Brewstillery Basement Brew Project Sponsored by Northern Brewer, 66 entries—*Ben Kiely*

February 2015

Great Northern Brew Ha Ha, 256 entries—*Eric Armstrong, Carter Lake, Iowa*

Groundhogs Day Homebrew Competition, 112 entries—*John Mulligan, Swanton, OH*

10th Annual Peterson Air Force Base Homebrew Competition, 515 entries—*Mark Klever and Matt Campbell, Colorado Springs, CO*

Champion of the Pint, 317 entries—*Andrew Laidlaw, Golden Eagle, IL*

KLCC Microbrew Festival Homebrew Competition, 170 entries—*Tyrone Reitman, Eugene, OR*

Thirsty Boy Homebrew Competition, 65 entries—*Jeff Klino, Reno, NV*

Homebrew Alley IX, 662 entries—*Oskar Norlander, Erik Norlander and Peter Salmond, New York, NY*

17th Annual Domras Cup Mead Competition, 101 entries—*Vince Becker, Savannah, GA*

FeBREWary Homebrew Fest, 26 entries—*Guy Kilmer, Fort Myers, FL*

Oxford Arts Alliance Homebrew Competition, 34 entries—*Michael Mayer, Lafayette Hill, PA*

Romancing the Beer, 241 entries—*Matt Castellino and Todd Slater, Thousand Oaks, CA*

All American Homebrew Competition, 320 entries—*Luke Shropshire, KY*

Maple Syrup Competition, 30 entries—*Mike Hamara, Downingtown, PA*

Coal Country Brewer's Cup, 26 entries—*Bill Metz, Oakland, MD*

War of the Worts, 780 entries—*Mark Livingston, Slatington, PA*

KCBM 32, 491 entries—*Eric Armstrong, Carter Lake, IA*

British Beerfest, 126 entries—*John Mulligan, Swanton, OH*

Bluff City Brewers & Connoisseurs Extravaganza, 291 entries—*Jeff Bergman, Nashville, TN*

Alaska Fur Rondy Homebrew Competition, 67 entries—*Jake and Jed Wade, Wasilla, AK*

Clarens Craft Beer Festival, 19 entries—*Paul ten Hoorn Boer*

Interclub Anglo-French Entente Cordiale, 6 entries—*Brian Mujati and Anthony Baraff, France*

Cowtown Yeast Wranglers Homebrew Roundup, 451 entries—*Paul Heslop, Calgary, AB, Canada*

2015 Bert Grant Competition, 34 entries—*Jim Trimble, Lake Stevens, WA*

March 2015

OC Mash Ups/Barley Forge Brewery GABF Pro Am, 14 entries—*David Hall, Costa Mesa, CA*

Olds College Brewmaster Program Homebrew Competition, 182 entries—*Dave Freeman, Regina, SK*

LIBME March Monthly Pro-Am, 10 entries—*Brian Giebel*


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AHA/BJCP SANCTIONED COMPETITION PROGRAM CALENDAR

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

May 2
Boston Homebrew Competition
Boston, MA. Entry Deadline: 4/17/2015.
bhc.wort.org

May 2
2015 Napa Homebrewers Classic
Napa, CA. Entry Deadline: 4/11/2015.
northnaparotary.org/napa_homebrewers_classic

May 2
4th Annual Lucette Brewing Spring Home Brewing Competition
Menomonie, WI.
facebook.com/LucetteBrewingCompany
SpringHomebrewCompetition

May 2
Brew & Grow's Battle of the Brewers: Beers of the British Isles
Chicago, IL. Entry Deadline: 4/22/2015.
brewandgrow.com/brew-competition

May 2
6th Annual Greg Noonan Memorial Homebrew Competition
South Burlington, VT. Entry Deadline: 4/17/2015.
mashers.org/comp_2015/

May 2
Operation: Fermentation
Katy, TX. Entry Deadline: 4/4/2015.
competition.cialers.org

May 2
18th Annual Cactus Challenge
Lubbock, TX. Entry Deadline: 3/27/2015.
ale-iansociety.org/cactus/

May 3
Lagerpalooza
Salt Lake City, UT. Entry Deadline: 4/25/2015.
saltcitybrewsupply.com

May 3
2015 Marin County Fair Homebrewing Competition
San Rafael, CA. Entry Deadline: 4/24/2015.
meetup.com/Marin-Society-of-Homebrewing

May 7
VanBrewer Awards
Vancouver, BC. Entry Deadline: 5/3/2015.

May 8
Wisconsin State Fair 2015 Homebrew Competition
West Allis, WI. Entry Deadline: 4/15/2015
wistatefair.com/pdfs/competitions/entry_info/homebrew_rules.pdf

May 9
Brew Masters Competition
Beecher, WI. Entry Deadline: 5/4/2015.
czartcf.blogspot.com

May 9
Alameda County Fair Homebrew Competition (BABO)
Pleasanton, CA. Entry Deadline: 4/25/2015.
beercomps.org/babo/

May 9
2015 Grumpy Troll Challenge
Mt. Horeb, WI. Entry Deadline: 5/3/2015.
mhtg.brewcompetition.com

May 9
BrewFest at Mount Hope Homebrew Competition
Manheim, PA. Entry Deadline: 4/25/2015.
parenfaire.com/brewfest/competitions.php

May 9
The Original Wort Transformation Challenge
La Vista, NE. Entry Deadline: 1/31/2015.
nebraskabrewingco.com

May 9
WichCraft Homebrew Competition
Wichita, KS. Entry Deadline: 5/2/2015.
wichitahomebrewers.org/bcoem/

May 9
19th Annual B.E.E.R. Brew-Off
Bay Shore, NY. Entry Deadline: 5/1/2015.
beerhbc.org/NewSite/

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May 10
Expo Peru Beer Cup 2015
Lima, Peru. Entry Deadline: 4/30/2015.

May 11
Joseph James Pro-Am Competition
Henderson, NV. Entry Deadline: 5/8/2015.

May 15
Brew Maui HBC Homebrew Competition
Maui, HI. Entry Deadline: 5/10/2015.
brewmaui.com

May 16
The Art of Beer: Alabama State Home Brew Competition
Gadsden, AL.

May 16
New England Pro Am Beer Festival
Brattleboro, VT. Entry Deadline: 5/2/2015.
newenglandproambeerfestival.com

May 16
OC Fair Homebrew Competition
Costa Mesa, CA. Entry Deadline: 5/1/2015.
ocfair.com/competitions

May 16
Hopfest Homebrewer of the Year
Kansas City, MO.
waldowell.com

May 16
Carolina BrewMasters US Open
Charlotte, NC. Entry Deadline: 5/7/2015.
carolinabrewmasters.com

May 16
War of the Wort
Starkville, MS.
wickdawg.com/warofthewort

May 16
2015 GEBL IPA Bracket Challenge
Everett, WA. Entry Deadline: 5/9/2015.
gebl.org/articles/2015-gebl-ipa-bracket-challenge/

May 16
Ocean State Homebrew Competition
Warwick, RI. Entry Deadline: 5/1/2015.
oshc.brewcomp.com

May 16
33rd Oregon Homebrew Festival
Albany, OR. Entry Deadline: 5/2/2015.
hotv.org

May 16
Brewnosers Homebrew Competition 2015
Halifax, NS. Entry Deadline: 5/8/2015.
brewnosers.org/competition

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May 16
RiverRoots Brew-Off
Madison, IN. Entry Deadline: 5/8/2015.
riverroots.org

May 17
20th Annual Big Batch Brew Bash
Houston, TX. Entry Deadline: 5/1/2015.
thekgb.org/Big-Batch-Brew-Bash/Current-News

May 17
Battle of the Bubbles V
Frederick, MD. Entry Deadline: 5/9/2015.
bob.brewcomp.com

May 17
Monterrey IPA
Monterrey, Mexico. Entry Deadline: 5/8/2015.

May 18
Aurora Brewing Challenge
Edmonton, AB, Canada.
abc.ehg.ca

May 22
Competencia Amateur - Cerveza Mexico (1er Ronda)
Mexico City, Mexico. Entry Deadline: 5/9/2015.
copacerveza.mx

May 23
Venice Brew Bash Home Brew Competition
Venice, FL. Entry Deadline: 5/9/2015.
venicebrewbash.com

May 23
Hogtown Brew-Off
Gainesville, FL. Entry Deadline: 5/9/2015
hogtownbrewers.org/Brewoff/

May 23
1° Concurso de Cerveja Artesanal do Distrito Federal ACervA Candanga
Brasília, Distrito Federal; Brazil. Entry Deadline: 5/15/2015.
acervacandanga.com/concurso/

May 23
Modern Times Beer GABF Pro-Am Competition
San Diego, CA. Entry Deadline: 5/17/2015.
moderntimesbeer.com

May 23
Meadllennium
Winter Springs, FL. Entry Deadline: 4/27/2015.
cfhb.org

May 23
Garden County Brewers American Ale Competition
Bray, Wicklow; Ireland. Entry Deadline: 5/9/2015.
gcbrewers.wordpress.com

May 23
Sonoma County Home Brewer's Competition
Petaluma, CA. Entry Deadline: 4/13/2015.
petalumadowntown.com/schbc.html

May 23
Sasquatch Brewfest Homebrew Competition
Eugene, OR. Entry Deadline: 5/22/2015.
northwestlegendsfoundation.com

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AHA/BJCP SANCTIONED COMPETITION PROGRAM CALENDAR

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

May 23
Hogtoberfest Home Brew Competition
Punxsutawney, PA. Entry Deadline: 5/16/2015.
groundhog.org/things-to-do/hogtoberfest/

May 24
Vista Strawberry Festival Homebrew Competition
Vista, CA. Entry Deadline: 5/15/2015.
vistastrawberryfest.com

May 28
California State Fair Homebrew Competition
West Sacramento, CA. Entry Deadline: 5/2/2015.
northerncalbrewers.com

May 29
San Diego County Fair Homebrew Competition
Del Mar, CA. Entry Deadline: 3/8/2015.
sandiegobeerfestival.com

May 30
3rd Annual Hop Blossom Homebrew Competition
Winchester, VA. Entry Deadline: 5/16/2015.
shenbrew.org/hop_blossom_14/

May 30
8 Seconds of Froth, 21st Annual
Cheyenne, WY. Entry Deadline: 5/16/2015.
highplainsdrafters.com

May 30
Kohler Festival of Beer - Homebrew Competition
Kohler, WI. Entry Deadline: 5/8/2015.

May 30
2° Copa Cervezas de Chile
Santiago, Metropolitana, Chile. Entry Deadline: 5/23/2015.
minicerveceria.cl/sitio/index.php

May 30
Ohio State Fair Homebrew Competition
Columbus, OH. Entry Deadline: 5/12/2015.
ohiostatefair.com

June 2
North American Beer Awards
Idaho Falls, ID. Entry Deadline: 5/15/2015.
northamericanbrewers.org

June 4
X Concurso Nacional das ACervAs
Porto Alegre, RS, Brazil.
https://concurso-bjcp.org/nacional/

June 6
LMHBA
Willoughby, OH. Entry Deadline: 5/16/2015.
lmhba.com/kingofthemountain.htm

June 6
2nd Annual Steel City Homebrew Competition
Pueblo, CO. Entry Deadline: 5/29/2015.
brewscene.com/competition/?competition_id=131

June 6
Bluegrass Cup
Lexington, KY. Entry Deadline: 5/28/2015.
bluegrass-cup.bockbrew.com

June 7
Barley's 20th Annual Homebrew Competition
Columbus, OH. Entry Deadline: 5/23/2015.
barleysbrewing.com

June 11
California State Fair Commercial Competition
West Sacramento, CA.
northerncalbrewers.com

June 11
AHA National Homebrew Competition Final Round
San Diego, CA. Entry Deadline: 6/2/2015.
HomebrewersAssociation.org

June 13
The Beer Project
St Petersburg, FL. Entry Deadline: 5/8/2015.
fine-arts.org/beer-project/

AHA/BJCP SANCTIONED COMPETITION PROGRAM CALENDAR

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

June 13
The Home Brew Festival Competition
Market Bosworth, Warwickshire; United Kingdom.
Entry Deadline: 5/31/2015.
thehomebrewfestival.co.uk

June 20
COHO's Spring Fling Homebrew Competition
Bend, OR. Entry Deadline: 6/13/2015.
cohomebrewers.org/SpringFling

June 26
Red River Valley Fair Home Brew Competition
West Fargo, ND. Entry Deadline: 6/24/2015.
redrivervalleyfair.com

June 27
Go for the Glory Bracket Competition
Sacramento, CA. Entry Deadline: 6/19/2015.
newglorybeer.com/gofortheglory

June 27
Because Beer 2015
Hamilton, ON. Entry Deadline: 6/19/2015.
becausebeer.ca/competition/

June 27
Walk on the Wildside
Tampa, FL. Entry Deadline: 6/12/2015.
specialhoperations.org/wildside/

July 11
Amador County Fair Homebrew Competition
Plymouth, CA. Entry Deadline: 6/27/2015.
brewangels.com/Frame1.html

July 11
Indiana State Fair Indiana Brewers' Cup Competition
Indianapolis, IN. Entry Deadline: 6/27/2015.
in.gov/statefair/fair/contests/2554.html#in.gov/statefair/fair/contests/2554.html

July 11
Sunshine Challenge
Winter Springs, FL. Entry Deadline: 5/28/2015.
cfhb.org

July 11
2015 Ohio Brew Week Homebrew Competition
Athens, OH. Entry Deadline: 6/26/2015.
obw.brewcomp.com

July 18
Antelope Valley Fair
Lancaster, CA.
avfair.com

July 18
Deer River Bar-B-Que & Brewfest
Deer River, MN. Entry Deadline: 7/17/2015.
deerriver.org/events/event.php?number=116

July 25
German Fest Stein Challenge
Milwaukee, WI. Entry Deadline: 7/10/2015.
steinchallenge.com

July 25
Crystal Coast Brew Off - CCBO
New Bern, NC. Entry Deadline: 7/18/2015.
atfhomebrewclub.com

July 25
Hail the Ale
Manhattan, KS. Entry Deadline: 7/22/2015.
rhythmandbrewsmhk.org

July 31
Denver County Fair Home Brew Competition
Denver, CO. Entry Deadline: 7/30/2015.
denvercountyfair.org

ON THE WEB

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

by Chris Bible

Troubleshooting the Brewing Process

Beer contains hundreds of different compounds and the associated flavors and aromas span a broad range of human perception. The ingredients used to produce beer are complex. Dozens of different kinds of malted barley range in flavor and aroma intensity from subtle, light, pale malt to intense, rich, acrid, black patent malt. An estimated 180 different hop varieties contain compounds with myriad bittering, flavor, and aroma characteristics. Descriptors such as floral, earthy, citrus, bitter, and many others are used to describe the contributions of hops to the flavor and aroma of beer.

The dozens of available brewing yeast strains are responsible for the conversion of fermentable sugars in the wort to ethanol, but may also produce many flavor and aroma compounds on their own, depending upon the specific strain and the variables of fermentation.

Even the water used to brew beer can be complex. The pH and specific dissolved mineral content of the water used in the brewing process can have a direct impact on mashing efficiency and the extraction of flavor and aroma compounds from barley and hops. Brewing water can have a noticeable impact on the flavor and aroma profile of the finished beer.

OUR GOAL AS HOMEBREWERS IS THE SAME AS IT WAS FOR THE BREWMASTERS OF YORE: TO BREW GOOD BEER.

Although the process of brewing beer is nearly as old as human civilization, the way beer is brewed today is very different from how it was done 6,000 years ago, or even 100 years ago. As homebrewers, we are free to make our personal brewing process as simple as possible, or as complicated as modern technology allows.

In a complex process like brewing, there are many opportunities to make a mistake. Some mistakes may not dramatically alter

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Photos © iStock/zmurciuk_k

Table 1: Troubleshooting the Brewing Process

Process Step	Failure Mode	Effect of Failure	Impact on Beer	Mitigation Steps
CLEANING	Failure to properly clean brewing equipment.	Contamination by ingredients from previous batch.	Beer characteristics not as desired.	Properly clean brewing equipment.
SANITIZING	Failure to properly sanitize brewing equipment (fermenter, aeration equipment).	Bacterial contamination of wort.	Beer flavor is not as desired (likely sour, acetic acid/ vinegar flavors).	Properly sanitize all equipment that will be in contact with wort.
	Failure to rinse sanitizer from brewing equipment (fermenter, aeration equipment).	Contamination of wort by sanitizer.	Beer flavor is not as desired (phenolic, chlorine or chemical flavors possible depending on type of sanitizer used).	Properly rinse sanitizer from brewing equipment using sterilized water or use a no-rinse sanitizer.
			Sanitizer could kill yeast if concentrations are very high.	

Table 1 continued on page 76 >

Process Step	Failure Mode	Effect of Failure	Impact on Beer	Mitigation Steps
MILLING	Milled grain too coarse.	Extract efficiency reduced; fermentables not fully extracted from grain.	Lower than anticipated original gravity and alcohol content and malt flavor intensity.	Mill grains to proper coarseness (husk loosened and grain broken but not powdered).
	Milled grain too fine.	Possible stuck mash. Possible extraction of tannins from grain husk.	Astringent flavor due to tannins. Possible darkening of color.	
MASHING/STEEPING	Temperature too hot.	Enzymes unable to function properly (no starch conversion).	Lower than anticipated original gravity and alcohol content.	Control temperature(s) to within ±1°F. Higher mash temperatures produce a more dextrinous, fuller-body wort.
		Possible extraction of tannins from grain husks.	Astringent flavor due to tannins. Possible darkening of color.	
		Extraction of phenol compound precursors.	Smoky, clove-like or plastic flavor.	
		Higher than desired dextrin content in wort.	Higher than desired viscosity.	
	Temperature too cold.	Enzymes unable to function properly (low starch conversion).	Lower than anticipated original gravity, therefore lower than anticipated alcohol content.	Control temperature(s) to within ±1°F. Lower mash temperatures produce a more fermentable, lower-body wort.
			Chill haze.	
		Higher than desired level of fermentables in wort.	Higher than anticipated original gravity, therefore higher than anticipated alcohol content.	
		Lower than desired dextrin content in wort.	Lower than desired viscosity.	

Process Step	Failure Mode	Effect of Failure	Impact on Beer	Mitigation Steps
MASHING/STEEPING *(CONTINUED)*	Duration too long.	Possible extraction of tannins from grain husks.	Astringent flavor due to tannins. Possible darkening of color.	Check wort for starch conversion using iodine test and end mashing when conversion is complete.
		Increased potential for bacterial growth and contamination.	Sour flavor.	
		If too long at 122-131° F/50-55° C (protein rest), reduced protein content in finished beer.	Reduced head retention.	Ensure that duration of protein rest is not excessive.
	Duration too short.	Incomplete starch conversion.	Lower than anticipated original gravity, therefore lower than anticipated alcohol content.	Check wort for starch conversion using iodine test and end mashing when conversion is complete.
			Chill haze.	
	Steep water volume too high.	Possible extraction of tannins from grain husks.	Astringent flavor due to tannins. Possible darkening of color.	Use 2-3 quarts of water per pound of grain to steep.
	pH too high.	Possible extraction of tannins from grain husks.	Astringent flavor due to tannins. Possible darkening of color.	Adjust mash/steep water to ensure pH doesn't exceed 5.6.
	pH too low.	Extract efficiency reduced; fermentables not fully extracted from grain.	Lower than anticipated original gravity, therefore lower alcohol content and malt flavor intensity.	Adjust mash/steep water to ensure pH doesn't fall below 5.2.
WHIRLPOOL	Whirlpool not vigorous enough or too vigorous.	Particulate matter fails to accumulate in center of vessel; carries over to fermenter without additional filtration.	Possible off-flavors associated with excessive trub in fermenter.	Minimize particulate carryover to fermenter.

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Process Step	Failure Mode	Effect of Failure	Impact on Beer	Mitigation Steps
WORT COOLING	Wort not cooled from near-boiling temperature prior to pitching yeast.	Yeast die. Increased risk of bacterial contamination.	Potential bacterial contamination when wort eventually cools.	Cool wort to a temperature that is optimal for the specific yeast strain prior to pitching yeast.
	Wort cooled too slowly.	Potential formation of dimethyl sulfide (DMS) if using very pale malts.	Corn-like aroma or flavor.	Cool wort to proper pitching temperature as quickly as possible.
		Potential diacetyl formation (if cooling overnight).	Buttery or butterscotch flavor present.	
		Increased risk of bacterial contamination.	Off-flavors associated with bacterial contamination.	
	Wort chiller not sanitized properly.	Bacterial contamination of wort.	Off-flavors associated with bacterial contamination.	Sanitize wort chiller prior to use.
	Wort chiller cooling water too hot.	Wort not cooled to proper temperature or cooled too slowly.	Risk of bacterial contamination if forced to wait for additional cooling; risk of off flavors if yeast pitched at too-high temperature.	Use cooling water that is as cold as possible to ensure fastest possible wort chilling rate.
	Cooling water leaks into wort.	Contamination of wort by cooling water.	Potential bacterial contamination of wort; increased liquid volume in fermenter (decreased OG).	Allow cooling water to flow through wort chiller immediately prior to use. Ensure no leaks are present.
OXYGENATION OF WORT	Too little oxygen in wort.	Slow initial fermentation and production of higher alcohols and fusel oils.	Off-flavors and aromas associated with less than optimal yeast metabolism: solvent or nail polish.	Adequately aerate/ oxygenate wort prior to adding yeast. Target equilibrium O_2 saturation in wort solution. Agitate wort to rouse yeast.
		Greater potential for bacterial contamination.	Off-flavors associated with bacterial contamination.	
	Too much oxygen in wort.	Too vigorous initial fermentation; possible excessive ester formation; possible issues with blow-off.	Minimal, but possible beer loss from blow-off or too-estery flavor/aroma.	Ensure fermenter is properly ventilated and that water lock is functioning correctly.
	Oxygenation equipment not properly sanitized.	Bacterial contamination of wort.	Off-flavors associated with bacterial contamination.	Sanitize oxygenation equipment that will contact wort prior to use.
	Failure of sterile air/O_2 filter in system.	Bacterial contamination of wort.	Off-flavors associated with bacterial contamination.	Inspect sterile filter prior to use. Replace as needed.
FERMENTING	Temperature too high.	Yeast metabolic rate increases. Increased production of fusel alcohols and ester compounds.	Alcoholic "hotness" due to fusel alcohol presence. Ester flavors (fruity, banana) present. Decreased head retention.	Maintain fermentation vessel temperature within optimal temperature range for yeast strain.
		Yeast produces excessive diacetyl.	Buttery or butterscotch flavor present.	
		Vigorous fermentation causes increased likelihood of blow-off due to foam ingress into water lock.	Loss of beer. Potential for off-flavors associated with bacterial contamination.	Ensure fermenter is properly vented and that water lock is operating properly.
	Temperature too low.	Yeast metabolic rate decreases. Yeast go dormant if temperature is excessively low. Incomplete fermentation.	FG higher than desired. Higher than desired sweetness due to presence of unfermented sugars.	Maintain fermentation vessel temperature within optimal temperature range for yeast strain.
		Yeast does not have opportunity to absorb diacetyl.	Buttery or butterscotch flavor present.	For lagers, raise temperature to 60° F (15° C) for 1-2 days at end of primary fermentation prior to lowering to lagering temperature. Agitate to re-suspend yeast.

Process Step	Failure Mode	Effect of Failure	Impact on Beer	Mitigation Steps
FERMENTING (CONTINUED)	Pitched yeast cell count too low.	Slow initial fermentation or premature cessation of fermentation (stuck fermentation). Higher ester levels likely.	Ester flavors (fruity, banana) present.	Ensure enough yeast is pitched into fermenter. Use a 1-2 liter yeast starter. Agitate fermentation vessel contents to re-suspend settled yeast.
		Greater potential for bacterial contamination.	Off-flavors associated with bacterial contamination (sour).	Ensure enough yeast is pitched into fermenter. Use a 1-2 liter yeast starter.
	Pitched yeast cell count too high.	Yeast do not need to divide more than once to complete fermentation.	Possible increased likelihood of yeast flavors present. Possibly too-clean ferment; no yeast-specific characteristics imparted to beer.	Don't pitch excessive yeast. A 1-2 liter yeast starter should be sufficient.
	Yeast strain flocculated early.	Incomplete fermentation.	FG higher than desired. Higher than desired sweetness due to presence of unfermented sugars. Acetaldehyde produced (green apple flavor).	Agitate fermentation vessel contents to re-suspend settled yeast.
	Beer racked to secondary fermentation vessel too soon.	Yeast did not have opportunity to absorb diacetyl.	Buttery or butterscotch flavor present.	Allow beer to remain in primary fermenter until initial fermentation is complete.
	Beer packaged before fermentation complete.	Overcarbonation.	"Prickly" sensation. Possible "gusher" when bottles are opened. Worst case: dangerous bottle bombs.	Do not package beer until specific gravity of beer remains unchanged for 2 days.
PRIMING	Too much priming sugar.	Overcarbonation.	"Prickly" sensation. Possible "gusher" when bottles are opened. Worst case: dangerous bottle bombs.	Ensure proper amount of corn sugar or DME is used to prime. If adding to fermentation vessel, ensure that priming material is well mixed into beer. This will prevent stratification and reduce variation in carbonation levels between bottles.
	Too little priming sugar.	Under carbonation.	Carbonation levels lower than desired. Reduced head retention.	
PACKAGING (BOTTLING)	Bottles/bottle caps not sanitized prior to filling.	Bacterial contamination of finished beer.	Beer flavor is not as desired (likely sour).	Sanitize bottles using chemicals or wet heat (dishwasher w/o detergent) prior to use. Sanitize bottlecaps by placing in no-rinse sanitizer solution or boiling water 3-5 minutes prior to use.
	Excess oxygen introduced into beer during packaging.	Oxidation of beer.	Wet cardboard/paper or sherry-like flavors and aroma in beer.	Minimize agitation of beer during packaging.
			Reduced shelf life.	
	Too little beer in bottle.	Lower than desired carbonation level in finished beer.	Carbonation levels lower than desired. Reduced head retention.	Prior to capping, visually verify that beer level is 1-1.5 inches (2.5-3.8 cm) below top of bottle.
	Bottle cap not secure.	CO_2 escapes.	Flat beer.	Visually inspect bottle after capping to ensure that cap is secure.

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Process Step	Failure Mode	Effect of Failure	Impact on Beer	Mitigation Steps
LAGERING	Beer not racked to secondary fermentation vessel prior to lagering.	Beer left in contact with trub for extended period of time.	Possible yeast autolysis flavors (burnt rubber) in finished beer.	Rack beer to a secondary fermentation vessel to ensure beer is not in contact with trub for longer than 1 month.
	Lagering temperature too hot.	Ineffective lagering.	Flavor profile not as clean and smooth as desired.	Lager at a temperature of 30-32° F (-1-0°C).
	Lagering temperature too cold.	Possible freezing of beer in bottles.	Lost beer due to broken bottles. Possible yeasty flavors if yeast cells rupture due to freezing.	
	Lagering duration too long.	None.	None unless duration is so long that oxidation occurs (see Storage failure mode).	For dextrinous beers, lager for 7-12 days per 1.008 original gravity units (e.g. for 1.056 OG, lager for 49-84 days). Lager 3-7 days per 1.008 original gravity units for lighter-bodied beers.
	Lagering duration too short.	Incomplete effects of lagering.	Flavor profile not as clean and smooth as desired.	
STORAGE	Bottles stored in brightly lit area.	Beer exposed to light.	Skunky flavor due to isomerization of hop compounds.	Package beer in brown bottles or keg. Store beer out of direct light (in a cool, dark place is ideal).
	Storage temperature too high.	Beer shelf life decreased. Oxidation rate of flavor compounds in beer increased.	Oxidized off-flavors (cardboard/paper/sherry) present.	Store beer at 32-50° F (0-10° C), ideally below 40° F (4° C).
		Yeast autolysis. Sulfur compounds (H_2S and others) released into beer.	Rotten egg/burnt rubber taste and aroma.	
	Storage temperature too low.	Frozen beer.	Broken bottles. Possible yeasty flavors if yeast cells rupture due to freezing.	
	Beer storage duration too long.	Oxidation of beer becomes noticeable/unpleasant.	Oxidized off-flavors (cardboard/paper/sherry) present.	More intensely flavored, higher-alcohol-content beers often improve with age. Beer with a lighter flavor profile and lower alcohol is best when fresh (< 3 months old).
		Some ethanol converted to higher alcohols.	Solvent-like off-flavors.	
		Dextrins break down.	Reduced body.	

the finished beer, and might even result in a delicious surprise. Most, however, can cause an otherwise noble brewing attempt to fail miserably and produce an unpleasant or undrinkable product.

Anyone can make beer, but it takes knowledge and skill to make good beer. Historically, brewers learned the craft of brewing from other brewers. Knowledge and skills were passed from master to apprentice through on-the-job training. Knowledge about how to fix problems within the brewing process and correct mistakes with the finished beer included guarded secrets that were protected by the brewing masters and shared only with trusted apprentices.

Our goal as homebrewers is the same as it was for the brewmasters of yore: to brew good beer. To be able to do this, we must be able to learn from our mistakes and use the knowledge available to improve our personal brewing processes. Table 1 is intended to help you brew better beer. It provides the cause and effect of many of the key variables within the brewing process, and offers guidance about how to prevent or correct brewing mistakes. The information has been compiled from a variety of sources and is provided with sincere thanks to the great brewers who have gone before us. May we learn from them and brew great beer!

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

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

Our judging panel continues to dive into the 2015 BJCP Style Guidelines with this issue, exploring Category 28C: Soured Fruit Beer. (For more information and tips on how to brew this style, see page 23).

First up was Dogpatch Sour from Almanac Beer Co. in San Francisco, Calif. This barrel-aged wild ale is named for Almanac's San Francisco neighborhood and pays tribute to the Flanders red style. Aged in wine barrels for eight months, this lightly tart ale is brewed with California Rainier cherries using a house blend of wild yeasts, bacteria, and San Francisco sourdough yeast. It checks in at 7.5 percent ABV.

Dogpatch Sour is part of Almanac's Farm to Barrel series, beers that are "alive in the bottle" and will continue to mature gracefully for up to three years, according to the brewery.

Next up was Cascade Apricot Ale from Cascade Brewing Barrel House in Portland, Ore. Also known as the "House of Sour," Cascade Brewing Barrel House features more than 18 rotating taps with a predominately sour lineup at any given time. The brewery has more than 750 French oak, Kentucky Bourbon, and Northwest wine barrels in its arsenal.

Apricot Ale is a Northwest-style sour blonde ale that was barrel aged for up to nine months, then aged on fresh apricots for an additional six months. It checks in at 8.5 percent ABV.

ON THE WEB

Almanac Beer Co.
www.almanacbeer.com

Cascade Brewing Barrel House
www.cascadebrewingbarrelhouse.com

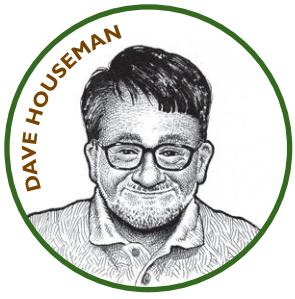
BJCP Style Guidelines
www.bjcp.org

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

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

Dogpatch Sour—Almanac Beer Co., San Francisco, Calif.
BJCP Category: 28C, Soured Fruit Beer

THE JUDGES' SCORES FOR DOGPATCH SOUR



Aroma: Complex aroma with acetic sourness, fruity esters, and wine-like alcohol. A low level of cherries comes through as the beer warms along with notes of oaky tannins. Malt backbone is supportive but not particularly distinguishable. No hop aroma. A bit of barnyard funk. No off-aromas of DMS or diacetyl. (10/12)

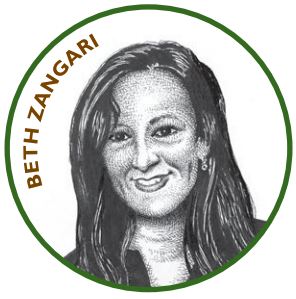
Appearance: Amber-orange color, not the red hues expected from cherries. Quite hazy. Highly carbonated initially. Initially poured with a small, beige, rocky head. (2/3)

Flavor: Very sour with both lactic and acetic acid notes. Oaky tannins are supportive but malt plays only a minor role in the background. No hop flavor. Low hop bitterness. Cherries are not pronounced within the fruity fermentation esters. Alcohol is evident but overpowered by the acidity. No DMS or diacetyl. The finish is dry and tart with a lemony note, almost like lemon Sour Heads. (13/20)

Mouthfeel: Medium to medium-thin body. Lingering acidic astringency in mouthfeel. Carbonation was high at pouring but it and the head dissipated rapidly, leaving a somewhat flat experience. Moderate alcohol warming. (4/5)

Overall Impression: A very sour beer that would benefit from less acidity and more emphasis on cherries and malt backbone. It's somewhat one-dimensional. The oaky tannins are a nice contribution. Additional unfermentable dextrins would add malty characteristics and complexity. Seems that lactobacillus just got carried away and consumed any dextrins that would have added to body, mouthfeel, and balancing sweetness. (6/10)

Total Score: (35/50)



Aroma: Clean lactic sourness dominates upfront. Cherry aroma with an almond stone fruit character comes forward, with whispers of wine. A hint of *Brettanomyces* emerges with a swirl. (9/12)

Appearance: Golden reddish amber; no head formation or retention. A fine, off-white foam appears on the surface. Slightly hazy. (2/3)

Flavor: Clean, though sharp, lactic tartness dominates the first sip. Flavor follows aroma with cherry and almond characters at moderate levels, and whispers of Brett. Midway the spicy and vinous oak barrel character emerges to dominate. Cherry character fades to an afterthought. Balanced toward tannins and tartness. (15/20)

Mouthfeel: Light bodied. Soft carbonation, with a tang of tartness and light tannin astringency. Alcohol is not hot, but the overall sensation is slightly tongue-numbing. (4/5)

Overall Impression: Wine varietal in the barrel was not indicated, but leaves the impression of Chardonnay. Sharp and edgy, the lactic tartness dominates the cherry character but opens the oak barrel character. After making my tasting notes I shared the rest with some friends. We finished the bottle with some briny, pungent, locally produced Point Reyes blue cheese and rustic crackers, which opened up the funk, oak, and cherry characters. (7/10)

Total Score: (37/50)

Aroma: Assertive lactic aroma underpinned with a lemony, citrus character. Soft wheat malt backbone. Barrel aging gives oak/wood/cork notes. A little barnyard character underneath with some almond notes that add complexity. Moderate level of cherry esters, both sweet and sour, plus dark fruit esters underneath from the yeast and aging. The toasted wood character grows as the beer warms and breathes. (9/12)

Appearance: Copper color with ruby highlights. Light haze is acceptable for the style. The head creams up when the beer is swirled but vanishes rather quickly. (2/3)

Flavor: Predominant flavor is lactic sourness, which wakes up the taste buds but disrupts the balance. It does mellow with subsequent sips, but the profile is still a bit one-dimensional. Soft malt character branches out into earthy and woody notes from the Brett and barrel aging. Cherry and other stone fruit flavors add complexity. Residual tannins help dry out the rather tart finish without being harsh. (16/20)

Mouthfeel: Body is light but not watery, with some low metallic and astringent notes from the wild yeast. Carbonation is moderate but enough to pull some fruit esters into the aroma and provide some liveliness. (4/5)

Overall Impression: Solid example of the newly-defined American Wild Ale style. The combination of the wild yeast, cherries, and barrel-aging works pretty well but some aging may help mellow out the sourness and improve the balance. (8/10)

Total Score: (39/50)

Aroma: Moderate sourness with a balanced funk and a tart, fruity impression. The fruit and funk blend well. Hints of wood. The funk is well-developed and not off-putting. Moderate complexity. Cherry notes evident amidst the fruit. Woody notes grow as it warms. (10/12)

Appearance: Hazy. Rusty orange color. Low beige head settled fast. Color is more in the amber family; no reddish hues suggestive of cherries. (2/3)

Flavor: Bracingly sour. Very tart and dry. Lemony taste in the finish. Cherry flavor noted mid-palate and in the aftertaste but lemony finish is stronger. Low bitterness, with some woody taste and sourness providing balance. The palate is better than the aftertaste; that's where the sharp lemony character really kicks in. (15/20)

Mouthfeel: High carbonation. Medium body, seemingly more from tannins than dextrins. The combination of the carbonation and tannins gives it a somewhat mouth-filling texture. High sourness evident; prickly-sharp. Alcohol hard to detect in the presence of sourness. (4/5)

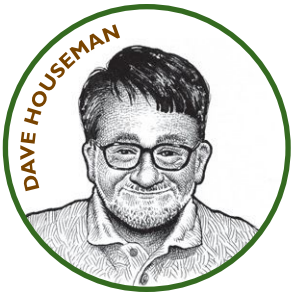
Overall Impression: Lemony flavor (from the sourdough yeast?) tends to step on the cherries in the flavor. Strong sourness overshadows the fruit flavors; maybe age would smooth it out. Tannin/barrel qualities are generally balanced. Aroma was more complex than the flavor. Shares some flavors in common with a Flanders red. Would like to see more cherry and less lemon, as well as lower sourness in the balance to improve drinkability. (7/10)

Total Score: (38/50)

Illustrations by Terry McNerney

Cascade Apricot Ale—Cascade Brewing Barrel House, Portland, Ore.
BJCP Category: 28C, Soured Fruit Beer

THE JUDGES' SCORES FOR CASCADE APRICOT ALE



Aroma: High fruity aroma of apricots up front with a Pils malt supporting base. Woody notes that could be from the oak barrel or apricot pits. Alcohol is not readily apparent. Only a hint of lactic acidity. No hop aroma. No DMS, diacetyl, or other off aromas. Nicely balanced aroma. (10/12)

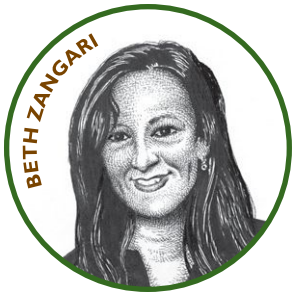
Appearance: Golden color matches expectations from the fruit, but the beer is hazy to cloudy. Dense, white, long-lasting head. (2/3)

Flavor: Apricots dominate flavor. This beer certainly captured the essence of the fruit. Some malt sweetness in the background helps to accentuate the fruit. A moderately high lactic sourness nicely balances the beer toward a fairly dry finish. No hop flavor. No DMS, diacetyl, or other off flavors. Alcohol is not readily noticeable under the esters and acidity. (17/20)

Mouthfeel: Medium bodied. Highly carbonated. Dry, fully attenuated but with a residual softness to the palate. No overt astringency. (5/5)

Overall Impression: A very drinkable beer that belies the alcohol content. The hallmark is a nice balance of malt, acidity, and a great presence of apricots throughout. A hint of oakiness from barrel aging complements rather than detracts from the balance. Excellent beer to serve with cheeses, especially Brie and Camembert, or with a salad of fruit and Gorgonzola cheese. (8/10)

Total Score: (42/50)



Aroma: Apricot dominates first impression as the bottle is opened, even before it is poured in the glass. A hint of earthy funk follows, along with a faint note of acetobacter. (9/12)

Appearance: Golden, but cloudy with a light white foam that falls quickly and leaves a cloud of tiny bubbles on the surface. (2/3)

Flavor: A moderate lactic character blends with fruit acidity, well-balanced in both characters. Mid-palate to finish, a sweetness emerges like SweeTARTS candies, but with fruitiness of dried apricots. The earthy character plays in the background, and supports the tartness and acidity. Again just a hint of acetobacter. Finishes with honey sweet, almost floral notes, with oak and hints of *Brettanomyces* playing in the background. (16/20)

Mouthfeel: Spritzy carbonation. Light bodied with a tart tang in the middle of the tongue. Finishes lightly, creamy with hints of tannic astringency. Alcohol is low though evident. (5/5)

Overall Impression: Well-balanced among the sourness and fruit characters. The hints of oak and Brett add complexity and interest. The sweetness has an artificial sweetener character I have associated with some fruit beers and meads, and even my homebrewed ginger ale. An addition of tartaric acid (cream of tartar) would balance the acids for a true ripe fruit character without the artificial sweetener notes. A bit of good chèvre provides the balance I'm looking for. (7/10)

Total Score: (39/50)

Aroma: Apricots lend their characteristic sweet fruitiness to the initial aroma. The oak adds vanilla and toasted notes to complement the fruity esters. Some sourness toward the end, but the level of funkiness is pretty tame for a wild beer. It becomes more complex as it breathes, exposing low levels of horse blanket and leather. (9/12)

Appearance: Exceptional conditioning produces a creamy white head with very good retention. Amber in color, with suspended particulates giving a slight sheen. (3/3)

Flavor: Light, bready malt notes are sustained throughout without fading too quickly. Apricots come through nicely and are enhanced by the vanilla and toasted notes from the oak aging. Low to moderate levels of horse blanket from the Brett merge into a moderately sour finish. Mostly lactic acid, but acetic character becomes more intense as the beer warms and breathes. Finish is long and dry. (17/20)

Mouthfeel: Excellent conditioning and carbonation, which helps expand the flavors. Tannins lengthen out the finish without adding harsh notes, with enough residual sugars (low-medium) to balance. (5/5)

Overall Impression: The base beer is low key in terms of complexity but provides an adequate pedestal to support the apricot, funkiness, and oak-aged flavors. The wild yeast was more evident in the flavor than the aroma and seems to be leaning toward the acetic side, which gives a little harshness as the beer warms. Nicely done! (8/10)

Total Score: (42/50)

Aroma: Strong, sharp aroma, with wood, fruit, and a light funk. The aroma has an herbal hoppy note with a peach or apricot ester, as well as fresh-cut wood. Light alcohol. Hints of pale citrus. Additional fruit emerges as it warms. Interesting complexity. (10/12)

Appearance: Medium-sized rocky white head with good persistence. Hazy. Medium gold color, but appears darker due to the haze. (2/3)

Flavor: Fairly sour initially with a moderately strong, fresh apricot flavor. Impression of fruity sweetness but bone dry. Medium-low bitterness. Light wood flavor, fairly clean. Aftertaste is sourness, apricots, and a little wood. Base beer is unobtrusive and matches well with the apricots. A slightly funky complexity to the sourness. Light herbal flavor. (17/20)

Mouthfeel: Very high carbonation. Moderately sharp acidity. Moderate tannin adds to the mouthfeel. Full impression at start but sourness brings it back to more of a medium-light body. (4/5)

Overall Impression: Apricots are well handled: distinctive, clean, and fresh. Sourness is at the high end for my taste. Oak adds complexity. The level of funk pairs well with the fruit—it doesn't overshadow it. Strong but not boozy at all, but I would still like to see this aged more to allow the tannins to become more velvety and to give the chance for the sourness to blend in better. However, the fruit character is great; good job with a subtle fruit. (8/10)

Total Score: (41/50)

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BSG HandCraft is proud to be a sponsor of the National Homebrewers Conference in San Diego, CA. We invite you to visit our booth, learn about our unique malts and sample beers made with our supplier's ingredients. Cheers!

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by Charlie Papazian

Let it Go Lager

It's happening. Perhaps not on a massive scale, but "session" beers are trending. Brewers across the U.S. are scaling down their IPAs, pale ales, brown ales, red ales, bock beers, saisons, and other brews usually north of 5 or 5.5 percent alcohol by volume to more "sessionable" 3.5 to 4 percent ABV brews that still account for the impression of flavor and mouthfeel.

As I've mentioned in this column, I'm frequently asked, "Charlie, what's the next trend?" A common response of late is, "Sessionable versions of more traditional styles of stronger beers that have an alcohol content of 4.5 to 5 percent ABV or lower."

I challenged myself to walk the walk and not just talk the talk. I've been on a roll at my 5-gallon homebrewery and have been very pleased with the results of my sessionable lagers and ales. In the January/February and March/April 2015 issues of *Zymurgy*, you've seen tales of two successful beers, Blinky Session IPA and Gunnawanna 'Toberfest.

Let it Go Helles

ALL GRAIN RECIPE

INGREDIENTS for 5.5 U.S. gallons (21 L) yielding 5 gallons (19 L)

6.5 lb	(3 kg) Bohemian pale Pilsner floor malt
12.0 oz	(340 g) Belgian aromatic malt
12.0 oz	(340 g) Gambrinus honey malt
4.0 oz	(113 g) German sauer malt
0.5 oz	(14 g) Mt. Hood hops 5% alpha (2.5 HBU/70 MBU) 60 min
1.0 oz	(28 g) German Hallertauer Mittelfrüh hops, 2.5% a.a. (2.5 HBU/70 MBU) 60 min
1.0 oz	(28 g) German Hallertauer Mittelfrüh hops, 1 min
0.5 oz	(14 g) Santiam hop pellets, dry hop
0.25 tsp	(1 g) powdered Irish moss, 10 min
White Labs	Cry Havoc yeast or German or Bavarian type lager yeast
0.75 cup	(175 ml) corn sugar (priming bottles) or 0.33 cup (80 ml) corn sugar for kegging

Target Original Gravity: 1.040 (10 B)
Target Extraction Efficiency: 80%
Approximate Final Gravity: 1.011 (2.75 B)
IBUs: about 21 **Approximate Color:** 6 SRM (12 EBC)
Alcohol: 4.1% by volume

DIRECTIONS

A step infusion mash is employed to mash the grains. Add 8.5 quarts (8.1 L) of 140° F (60° C) water to the crushed grain, stir, stabilize, and hold the temperature at 132° F (56° C) for 30 minutes. Add 4 quarts (3.8 L) of boiling water and add heat to bring temperature up to 155° F (68° C). Hold for about 30 minutes. Raise temperature to 167° F (75° C), lauter and sparge with 3.5 gallons (13.25 l) of 170° F (77° C) water. Collect about 5.5 gallons (21 L) of runoff. Add 60-minute hops and bring to a full and vigorous boil.

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

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

Let it Go Helles

MASH/EXTRACT RECIPE

INGREDIENTS for 5.5 U.S. gallons (21 L) yielding 5 gallons (19 L)

5.0 lb	(2.3 kg) light malt extract syrup or 4.3 lb (1.9 kg) dried malt extract powder
12.0 oz	(340 g) Belgian aromatic malt
12.0 oz	(340 g) Gambrinus honey malt
0.6 oz	(17 g) Mt. Hood hops, 5% a.a. (2.5 HBU/70 MBU) 60 min
1.0 oz	(28 g) German Hallertauer Mittelfrüh hops, 2.5% a.a. (2.5 HBU/70 MBU) 60 min
1.0 oz	(28 g) German Hallertauer Mittelfrüh hops, 1 min
0.5 oz	(14 g) Santiam hop pellets, dry hop
0.25 tsp	(1 g) powdered Irish moss, 10 min
White Labs	Cry Havoc yeast or German or Bavarian type lager yeast
0.75 cup	(175 ml) corn sugar (priming bottles) or 0.33 cup (80 ml) corn sugar for kegging

Target Original Gravity: 1.040 (10 B)
Target Extraction Efficiency: 80%
Approximate Final Gravity: 1.011 (2.75 B) **IBUs:** about 21
Approximate Color: 6 SRM (12 EBC) **Alcohol:** 4.1% by volume

DIRECTIONS

Heat 2 quarts (2 L) water to 172° F (77.5° C) and add crushed grains to the water. Stir well to distribute heat. Temperature should stabilize at about 155° F (68° C). Wrap a towel around the pot and set aside for about 45 minutes. Have a homebrew.

After 45 minutes, add heat to the mini-mash and raise the temperature to 167° F (75° C). Pass the liquid and grains into a strainer and rinse with 170° F (77° C) water. Discard the grains. Add more water to the sweet extract you have just produced, bringing the volume up to about 2.5 gallons (9.5 l). Add malt extract and 60 minute hops and bring to a boil.

The total boil time will be 60 minutes. When 10 minutes remain add the Irish moss. When one minute remains add the one-minute hops. After a total wort boil of 60 minutes turn off the heat and immerse the covered pot of wort in a cold water bath. Let sit for 15-30 minutes or the time it takes to have a couple of homebrews.

Strain out and sparge hops and direct the hot wort into a sanitized fermenter to which 2.5 gallons (9.5 L) of cold water has been added. If necessary add cold water to achieve a 5.5 gallon (21 L) batch size. Aerate the wort very well.

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

Photo © iStock/LICreate

For my third brew, I concocted (and am currently enjoying) Let it Go Helles. While the traditional version of German-style Münchner helles is already considered a sessionable beer at 4.8 to 5.6 percent ABV, I've taken it down to 4.1 percent. Yet it still retains the mouthfeel and flavor contribution of malt and hops. It's a beer I'll brew again and again, especially in the global warmup of 21st century summers.

Dried homegrown Mt. Hood hops provide a smooth bitterness and floral hop foundation. Late hopping with German Hallertauer Mittelfrüh imparts a deep sense of German bred noble hop flavor and aroma that is fundamental for this beer. Other noble breeds could be substituted with varying results. If I would have had German Hallertauer Mittelfrüh hop pellets, that's what I would have used to dry hop. I achieved a degree of traditional finesse by using Santiam hop pellets in the lagering dry hop stage. Bohemian pale Pilsner floor malt, Belgian aromatic, and Canadian honey malt built a rich foundation that isn't lost with the lower original gravity and lower alcohol levels.

One final note: my four-year-old daughter supervised this batch. "Daddy, the thing stopped spinning." "Dad, the pot is getting too full." "Is it time to put the hops in yet?" "Watch me dance." Her supervisory role came with the stipulation that she could name the beer. Officially, it's Carla and Charlie's Let it Go Lager. If you hang out with girls her age, you know what "Let it Go" is all about.

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

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

ADVERTISERS INDEX

By Mike Baccaro

Sharing the Passion of Homebrew

In May 2014, we were finishing up the second day of judging for the Orange County Fair Homebrew Competition when I overheard a discussion taking place.

Renee Fontes, culinary coordinator for the Orange County Fair, was explaining that the fair wanted to expand its homebrew exhibit and needed someone to work onsite. I noticed that her discussion partner, Spencer Colman, director of judging, was looking right at me.

"Let me get this straight," I responded. "You want to pay me to talk about beer all day? Let me think about it. OK, I'm in!"

Spencer made a phone call to Rob Arbagey, manager of MoreBeer in Riverside, and he was happy to loan us a Digital Tippy-Dump system to put on display. When we went to pick it up, I mentioned to Rob that it would also be nice to show folks a more affordable way to enter the hobby. He promptly picked up a starter kit and said, "Look around and grab whatever else you want." We left with half a dozen different grains, a few hop varieties, and some liquid and dry yeast.

The exhibit almost put itself together. In the past, we simply had a static display of the competition winners. Now we had that plus everything one would need to begin their journey to homebrew happiness, as well as an eye-catching brew sculpture!

When the fair began on July 11, the Tippy-Dump system attracted a lot of attention as the most complex piece of equipment on display. It generated a lot of brewing discussion and photo-taking. Chuck West, former QUAFF president, came by on opening weekend. He introduced himself and mentioned, "We don't have anything like this at the San Diego County Fair!" High praise, indeed.

I quickly realized people wanted something informative to take away with them, so I made handouts of homebrewing resources. These flew out of the building. Newbies and experienced brewers alike stopped by our expanded exhibit. Providing grains and hops to touch and smell and showcasing essential equipment helped me explain the brewing process to thousands of people.

It also occurred to me that it would be great to have local professional brewers spend some time talking about our favorite pastime. I enlisted former homebrewers Evan Price from Noble Ale Works and Jerrod Larsen from Tustin Brewing Company. I can't thank them enough for taking the time to chat with folks. People really liked the opportunity to talk with a pro brewer one-on-one. This year, even more pro brewers want to get involved.

Many thanks to MoreBeer for their generous contributions and to Spencer and Renee for letting me help expand our homebrewing horizons at the fair. In sharing my passion, I was able to light a few fires of passion in others.

Mike Baccaro is a member of the AHA and the Barley Bandits, Orange County's oldest homebrew club. He has been homebrewing for seven years and judges several Southern California homebrew competitions. He is a part-time bookkeeper for Out of the Park Pizza, a 33-tap craft beer restaurant in Anaheim Hills.

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