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BrewYour Own

THE HOW-TO HOMEBREW BEER MAGAZINE

MAY-JUNE 2014, VOL.20, NO.3

Pucker Up For SOUR BEERS!

- Berliner Weisse American-Style
- Solera Sour Blending Techniques
- Make Homemade Flavor Syrups
- Brew a Flanders Red Ale

Inside North America's 1st Trappist Brewery (+ a clone recipe!)

Winning Tips for Competitions

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BYO RECIPE STANDARDIZATION

Extract efficiency: *65%*
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one gallon of water, would yield a wort of 1.024.)

Extract values for malt extract:
liquid malt extract (LME) = 1.033–1.037
dried malt extract (DME) = 1.045

Potential extract for grains:
2-row base malts = 1.037–1.038
wheat malt = 1.037
6-row base malts = 1.035
Munich malt = 1.035
Vienna malt = 1.035
crystal malts = 1.033–1.035
chocolate malts = 1.034
dark roasted grains = 1.024–1.026
flaked maize and rice = 1.037–1.038

Hops:
We calculate IBUs based on 25% hop utilization for a one-hour boil of hop pellets at specific gravities less than 1.050. For post-boil hop stands, we calculate IBUs based on 10% hop utilization for 30-minute hop stands at specific gravities less than 1.050.

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what's happening at BYO.COM

Brewing Sour Beers: Tips from the Pros

Want even more tips and insight on brewing sour beers? In 2005 the brewers of Brugge Brasserie, New Belgium and Port Brewing shared their advice for sour brews.
http://byo.com/story307

Trappist Ale

Spencer Brewing just became the 10th Trappist brewery, but the Trappist monks have a long and storied history of making beer. In this story from the archives, learn how to brew like a Trappist (without actually being one).
http://byo.com/story1525

Award-Winning Australian Homebrew Recipes

Homebrewers across the world are churning out amazing homebrew recipes. In 2009 we featured a number of award-winning recipes from Australian homebrewers. Find some bonus recipes that were online exclusives here.
http://byo.com/story1873

Great Grain: Crack the Mystery of the Crush

Whether you are a seasoned all-grainer, a partial masher, or an extract brewer who steeps your grains, the physical condition of the grains needs to be just right to achieve the desired effect.
http://byo.com/story717

Brew Your Own — The How-To Homebrew Beer Magazine

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Cover Photo: **Charles A. Parker/Images Plus**

Induction brewing

I really enjoyed Joshua Weikert's article on induction heating in the latest *BYO* (March-April 2014). He convinced me to ditch the propane. I had just a couple of quick questions. First, the element I'm looking at is 3,000 watts with a diameter of 10.25 inches. My boil pot is a little over 13 inches around, though. Do you think the extra couple inches hanging over could be a problem? Second, you mentioned finding an element sturdy enough to carry 5-gallons (19 L) of liquid. I contacted the seller and asked about weight limits, but they said the unit doesn't have a specific weight limit. My question is, how do I determine if it's sturdy enough? I thought about adding a wood frame around it to help any weight or stability issues.

Thomas Drinan
via email

Story author Joshua Weikert replies: "Hi Thomas. For the diameter, 10.25 inches seems to be pretty standard on the larger single-element induction plates. If you were only getting 1,800 watts *I would say that MAYBE it could be an issue (not an insurmountable one, but probably in need of some insulation on the pot to minimize heat loss). At 3,000* watts, *though, you should have more than enough power to keep your boil going up the middle, even with some heat loss to either side within the pot.*

"As for sturdiness, you can take some simple passive steps. Be sure you're buying an element with a steel frame (some of the cheaper models have a plastic body, though even those had no problem with 3–4 gallons/11–15 L of mash water when I used them), and take a listen when you first put your full kettle over it — if you hear a squealing noise, that could mean there's too much pressure on the element under the glass/ceramic. Worst case, yes, a wood or fabricated metal support that the pot actually rests on is an option; just be sure that you have the pot as close to the surface as possible. It doesn't have to touch, but you'll get better performance if it does. I honestly don't think you have anything to worry about here, though, especially since you're purchasing what is probably an element designed for commercial use."

contributors

Horst Dornbusch is the owner and founder of Cerevisia Communications, a consulting firm that deals with all aspects of the brewing industry. (His website is www.cerevisiacommunications.com.) Horst is the author of several books on beer and brewing and was *BYO*'s "Style Profile" columnist for several years. He was an Associate Editor for *The Oxford Companion to Beer* (Ed. Garret Oliver, 2012 Oxford University Press).

Horst lives in Massachusetts, but was born in Düsseldorf, Germany and visits there frequently. In this issue, on page 42, Horst writes about the latest trend in brewing New-World interpretations of the German classic Berliner weisse.

Peter Symons is a Sydney, Australia-area homebrewer who has been homebrewing for 16 years. He holds a graduate certificate in brewing from Ballarat University, completed the Siebel Institute's WBA Concise Course, and has judged at the state and national level as a BJCP Recognized Judge.

Peter works in project engineering and line management services in railway signaling and control and is a fellow at the Institution of Railway Signal Engineers.

In this issue, on page 60, Peter makes his *Brew Your Own* writing debut by introducing us to some of the newest hop varieties grown in Australia and New Zealand.

Michael Tonsmeire is a homebrewer and fermentation nerd living in Washington, D.C. He has been brewing beer for the last ten years after getting his start by taking a student-taught course his senior year of college. Michael is the blogger behind *The Mad Fermentationist* (www.TheMadFermentationist.com) where he posts about making beer as well as cheese, sake, vinegar, cider, and other fermentables. He is especially passionate about brewing sour beers, both in the tradition of classic European styles and in new directions. He has recently released a book all about his favorite subject, titled *American Sour Beer* (Brewers Publications, 2014), and in this issue he discusses a topic from the book, solera brewing, which starts on page 52.

Induction brewing II

I just read Joshua Weikert's article on induction brewing in *BYO* and it was great! I'm an induction brewer, also. Josh mentioned sourcing an induction cooktop with a temperature probe. I've been looking for such a beast but haven't been successful. Does he know the brand and model? I pump the wort through my mash continuously while it sits on a hot plate regulated by a Ranco controller (induction for strike and boil) but there's too much temperature swing with that kind of burner. I think another induction burner with a temperature probe may be the ticket.

Doug Jordan
Bend, Oregon

Story author Joshua Weikert replies: "Sadly, I don't know of any commercially available units with an integral probe, just those who know a lot more about electrical engineering than me who rigged one up for themselves, including two gentlemen at the National Homebrewers Conference last year in Philadelphia. In any case, have you tried the pre-set intervals to maintain temperature? I found that mine, unlidded, set to 176 °F (80 °C) will keep 5 gallons (19 L) of water pretty much right at 152 °F (67 °C), with maybe a 1.5 degree F (~1 °C) increase over an hour of mashing. I toyed around with it when I was thinking of using brew-in-a-bag rather than a cooler-infusion mash. It might be worth a try for you — you may get lucky!"

Induction brewing III

Out of curiosity, how long does it take to bring 6–7 gallons (23–26 L) of water to a boil using a 3,000 watt induction element?

Stephen Reed
via email

Story author Joshua Weikert responds: "Hi Stephen. Assuming you're starting at better than 150 °F (66 °C) (which should be a safe assumption, coming out of the mash, even with no mash-out addition) you're looking at about 20–25 minutes to bring that volume to 212 °F (100 °C) at 3,000 W and 95% heating efficiency. Insulating the kettle will help, as will keeping the kettle covered through your run-up to temperature (though you should obviously leave it uncovered once you're boiling!). Since you can heat the lauter/sparge output as you're running off, though, most of that time is really spent during lautering/sparging, so you should bring the full volume to a boil much quicker than that, since you're essentially pre-heating the output." BYO

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homebrew nation

READER PROFILE:

Brewer: Kevin Dill

Hometown/State: St. Louis, Missouri

Years Brewing: 8

Homebrew Setup: Nothing elaborate – a two-burner camp stove that can hold two of my 8-gallon (30-L) kettles at the same time, a rectangular cooler mash tun, immersion chiller and plate chiller, and various equipment that fills my garage. I normally brew 5-gallon (19-L) all-grain batches, but have been working on getting up to 10 gallons (38 L) and I'm hoping to move to a nice brewing sculpture soon. I have a 4-tap kegerator in the garage as well. According to BeerSmith, my efficiency has been around 80%.

Currently fermenting: American wheat, Goose Island Green Line clone, and raspberry jalapeño wheat.

What's on tap/in the fridge: Pumpkin spiced wheat, Scottish 60, American wheat, sweet stout, and chocolate hazelnut porter (collaboration with my St. Louis Brews Club). Many other various bottles of homebrew always find their way into the fridge as well.

How I started brewing: My wife, Sue, taught in a high school back in Davenport, Iowa. There was a fundraiser for a teacher who was battling cancer and one of the silent auction items was a cooler, 12 bottles of various homebrew, a cream ale kit, and a year's membership in the MUGZ homebrew club of the Quad Cities. The person who donated that kit, Rich Toohill, had me over to teach me how to brew the kit. It was awesome. I entered that beer into the local homebrew competition, Land of the Muddy Waters, and won a blue ribbon. I have been hooked ever since.

My website: I have a Facebook page for my brewery: Northwest Division Brewing Company. Check it out at www.facebook.com/nwdivisionbrewingco

Favorite/unique recipe: I love American wheat beer because it can be made in so many ways. I love to make a base wheat and then add ingredients to it: Jalapeños, fruits, various spices, etc. Here is a favorite recipe to the right.

byo.com brew polls

Have you ever brewed a sour beer?

No. I like to drink them, but haven't brewed one 42%

No. I don't care for sour beers. 25%

Yes, I love em! 23%

Yes . . . but not intentionally! 10%

reader recipe

Good Measure (Jalapeño Raspberry Wheat)

(5 gallons/19 L, all-grain)

OG = 1.059 FG = 1.013
IBU = 18 SRM = 5 ABV = 6.3%

This is an award-winner a few times over. I tinkered with the ratios of peppers and berries until I came to this version. It seems to be a crowd favorite and I can't keep enough on tap. If you enjoy spice, you will enjoy this beer.

Ingredients

6 lbs. (2.7 kg) 2-row pale malt
6 lbs. (2.7 kg) red wheat malt
5.5 AAU Willamette hops (60 min.) (1 oz./28 g at 5.5% alpha acid)
0.25 oz. (7 g) Centennial hops (0 min.)
~4 lbs. (1.8 kg) raspberries (added to secondary)
~9 jalapeños (added to secondary)
Danstar Nottingham Yeast (rehydrated)

Step by Step

Mash at 154 °F (68 °C) for 60 minutes. I batch sparge at 164 °F (73 °C) and then head on to the boil. Allow 5-7 days in primary. In secondary add up to 4 lbs. (1.8 kg) of fresh raspberries. I smash mine and add to the empty fermenter. Then add up to 9 jalapeños with the stems cut off, and cut the peppers in half (adjust to how hot you want the beer to be). I leave the seeds in. Then I transfer the beer on top of the berries and peppers. Leave it until the berries turn white, usually about 10-14 days. Strain off berries and peppers, and transfer into bottles or keg. Beer will have a nice red tint to it. Carbonate and enjoy!

Extract option:

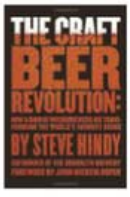
Replace the grains with 8.5 lbs. (3.9 kg) liquid wheat malt extract.

what's new?

Brewer's Best® Brew-in-a-Bag Kits

The new Brewer's Best® BIAB kits offer a complete 5-gallon (19-L), all-grain recipe packaged in a convenient "Ultra Barrier Bag" that is oxygen- and moisture-resistant. The only other equipment needed is a reusable nylon bag and a 42-quart (40 L) or larger brew pot. Setup and cleanup with the BIAB kits is faster and easier than traditional all-grain brewing. Brewer's Best® BIAB will launch with six recipe kits available in homebrew stores nationwide and will retail between $35-$50. Learn more at www.brewersbestkits.com

The Craft Beer Revolution



Brooklyn Brewery Co-founder and President Steve Hindy tells the full story of how craft brewers joined forces to forever change the way the world buys, enjoys and appreciates beer in his new book *The Craft Beer Revolution: How a Band of Microbrewers Are Transforming the World's Favorite Drink*. Between the pages, Hindy brings an insider's account of the personalities, battles, and alliances that colored the early days of craft beer and how the industry has evolved, while profiling several of the key breweries that are still flourishing today. Available at major booksellers.

Brewing Quality Beers

Author Byron Burch has released a third edition of *Brewing Quality Beers: The Home Brewer's Essential Guidebook*, which includes 26 new recipes, updated ingredient descriptions, advice for kegging, step-by-step brewing instructions for all types of beers and more. The book will continue to bring beginners success from their first brew, while gently moving them towards brewing to style, practicing proper cleaning and sanitation methods and brewing with advanced techniques using calculators for IBUs, specific gravities, water treatments and other beer style parameters. Available at major booksellers.

The BeerBox

The BeerBox is a new way to store and serve homebrewed beer. Ted Astolfi, inventor of the BeerBox, designed the portable dispenser made of food grade HDPE plastic to accommodate brewers by including features such as a CO_2 injector, a pour spout, and a flat front that allows space for a 4"x4" label (10x10 cm). The ergonomically designed BeerBox makes 5-gallons (19-L) of your homebrew easily portable and makes cleaning simple with a 1.5-inch (3.8-cm) fill opening. The BeerBox is easy to clean, easy to fill, easy to store, and easy to share. Learn more at www.brewingtools.com.

calendar

May 23-24
Hogtown Brew-Off
Gainesville, Florida

The 2014 Hogtown Brew-Off is an AHA/BJCP sanctioned competition covering every BJCP category. It will be held at the beautiful Kanapaha Botanical Gardens on Friday and Saturday May 23-24. The Wild Boar Keg Competition, a "popularity contest" judged by any Brew-Off participant in attendance, will be held Saturday afternoon, and the gala awards banquet Saturday night. This is a qualifying event for the Florida Circuit. The entry deadline is May 10 and entries will be capped at 400.
Entry Fee: $6 per entry
Web: www.hogtownbrewers.org/Brewoff/index.cfm

May 31
Ohio State Fair Homebrew Competition
Columbus, Ohio

This is an AHA/BJCP sanctioned competition open to all Ohio homebrewers and accepting entries in every BJCP category. First, second and third place winners in each category (or group of categories) shall receive a medal and fourth place winners will receive a ribbon. First-place winners in each category will also receive a $25 gift certificate and the chance to compete in a Best of Show judging. The Best of Show will receive $100 in gift certificates. The entry deadline is May 13.
Entry Fee: $5 per entry
Web: www.ohiostatefair.com/index.php/competitions-37/food-a-beverage/homebrew

June 7
All-American Beers Competition
Appleton, Wisconsin

This event is sponsored by the ALE (Appleton Libation Enthusiasts) homebrew club. All American-style beer entries will be accepted into this AHA/BJCP sanctioned competition from until May 31. Please submit three bottles and the recipe for each entry. Open to all homebrewers.
Entry Fee: $5 per entry
Web: http://www.aleclub.org/?p=1914

homebrew drool systems

The Growling Squirrel

Jeff Kinville • Ilion, New York

I started homebrewing in 1996. In 2000 I switched from extract to all-grain. For several years I used a 5-gallon (19-L) Igloo cooler mash tun and a 6-gallon (23-L) wine bucket converted to a lauter tun. Four years ago I decided to step up to 10-gallon (38-L) batches so I could double my production and split the batch in two separate 5-gallon (19-L) batches and add different hops and yeast to each. All my brews are kegged and on tap at my home bar "The Growling Squirrel," where monthly meetings for our club the Mohawk Valley Home Brewers are held.

My system is a 3-tier gravity-fed unit with a pump for recirculation and transferring wort to the fermenter. It is made from 1-inch (2.5 cm) black pipe and put on wheels for easy maneuvering. Each tier has a burner and the system is run with natural gas to eliminate the need for three propane tanks.

I used 2.5-inch (6.4-cm) aluminum angle iron, bolted to the frame, to support the kegs. The fittings were TIG welded by a friend and are all stainless steel. There is a copper coil that attaches inside the brew kettle with hose fittings to run cold water through for the wort chiller. All kegs were legally obtained.

My home bar used to be part of my garage. This is the room you enter when you walk in my front door. I always keep three homebrews on tap — usually two lighter styles and a darker option (porter is my favorite style). The club members enjoy holding our meetings here. We brew every other meeting and taste test every meeting.

WHAT IS SOUR BEER?

by dawson raspuzzi

Throughout this issue you will find stories, recipes, and tips on brewing sour beer styles. But, for the new homebrewer, or even advanced homebrewer who has limited exposure to sour beer, let's start with a basic question of "What is sour beer?"

The Beer Judge Certification Program (BJCP) lists six sub-categories in the "Sour Ale" category, including Berliner weisse, Flanders red ale, Flanders brown ale/oud bruin, straight (unblended) lambic, gueuze (a style that combines young and old lambics), and fruit lambic.

Sours are typically brewed similar to other ales using an ale yeast in primary fermentation. They are then exposed to souring bacteria and yeasts — typically *Lactobacillus, Pediococcus, Brettanomyces*, or *Acetobacter* — either from commercial culture strains or from natural air exposure, a method used by traditional Belgian brewers. Given the various styles of sour beer, the taste, color and alcohol levels vary — but they share a common theme of tasting, well, sour, tart, and acidic. Many homebrewers can tell you about a batch of beer that became contaminated with unwanted bacteria and turned sour, however the taste of an (intentional) sour beer is much different and should maintain a balance between tartness and the sweetness of the malt character. They often have aromas of fruitiness as well as the "horse blanket" aroma associated with *Brettanomyces*. They have little to no hop characteristics of bitterness nor hop aroma.

Most sour beers are traditionally aged in oak barrels (Berliner weisse is an exception) for anywhere from six months to three years, and sometimes more. Sour beers are known to improve with proper aging as new flavors evolve from the wild yeasts. Tannins from the oak add astringency as well as notes of vanilla. The tannins and complexity inside the glass give sour beers some resemblance to a rich red wine, like a Pinot Noir. Oak chips can be added at the start of secondary fermentation if you do not have an oak barrel to age it in. The colors of sour beers range from a pale straw color in Berliner weisse and some lambics, to a darker gold, to red and brown in some Flanders examples. Alcohol by volume levels vary from as low as 2.8-3.8 percent that is traditional for Berliner weisse to as high as 8 percent in gueuzes, according to the BJCP style guidelines.

Sour beers are not new — in fact they date back many centuries and there was a time before refrigeration and common understanding regarding the importance of sanitation when all beers were sour to some extent. At the time, open fermentations would be contaminated with naturally occurring souring bacteria and yeast. Thanks to advances in technology and the field of science in the middle of the 19th century, brewers came to understand the role *Saccharomyces* yeast plays in fermenting beer and the affect of keeping wild yeast out of fermentation. That led to the near extinction of sour beer (except in some breweries, mostly in Belgium, where the tradition was kept alive.)

Enter the 21st century and sour beers are back. Craft brewers across the United States are releasing sour beers; and homebrewers are right on their heels. When *BYO* Editor Betsy Parks returned from last summer's National Homebrewers Conference in Philadelphia, she noted one of the things that stood out most to her was the number of Berliner weisse and other sour beers being poured at seemingly every club booth. Sour beers are something of tremendous interest among brewers and consumers right now, and the really cool thing is that you can brew these beers at home!

by marc martin

THUNDER ISLAND Brewing Co.

DEAR REPLICATOR,

WHILE HIKING THE PACIFIC CREST TRAIL WITH A BUDDY, WE FOUND THUNDER ISLAND BREWERY IN THE SMALL TOWN OF CASCADE LOCKS, OREGON. ALL THE BEERS WERE GOOD BUT THE VITAMIN K KÖLSCH WAS GREAT. THEY ONLY SELL IT AT THEIR BREWERY AND MY HOMEBREW STORE IN SEATTLE DOESN'T KNOW ANYTHING ABOUT IT. I'M HOPING YOU CAN GET THEM TO GIVE UP SOME DETAILS.

MICHAEL TUCHARDT
BELLEVUE, WASHINGTON

A 45-mile drive east of Portland down the beautiful Columbia River Gorge gets you to Cascade Locks and, as I discovered, a little brewery that is rapidly becoming a beer destination.

Owners David Lipps and Daniel Hynes met in Santa Cruz, California six years ago and discovered a shared passion for craft beers. David eventually migrated to Portland, Oregon and reconnected with Dan, who began homebrewing in 2004. It only seemed natural they would begin homebrewing together in a city known as "Beervana." Cranking out 10-gallon (38-L) batches with their gravity-fed three-tier system they soon began producing more beer than they could drink (to the benefit of friends and neighbors). Eventually they decided to take the jump to a commercial brewpub.

But first, David combined his goal of biking around New Zealand with brewery research. He visited 37 breweries, met the brewers and applied for entry-level jobs at each one. He eventually snagged a job as assistant brewer at Crouchers Brewery in the town of Rotarua on the north island.

Armed with some large-scale brewing experience, he returned to Portland where he and Dan developed a business plan, located a vacant portion of the city maintenance building in Cascade Locks and thus began their official brewery business. The first batch, a nice pale ale, was brewed March 28, 2012.

Their brewing equipment is unique in several respects. The mash and boil kettles are 60-gallon (227-L), steam jacketed, commercial soup kettles. They have had the bottom of the outer jacket wall cut to accommodate a large propane burner. The mash tun has been coated with spray foam insulation to help hold mash temperatures steady. The two fermenters are single-wall soup kettles that have lock down lids to hold pressure. What makes it extra special is that this is the first time the same brew system has twice been featured in my articles. I first wrote about it in November 2010 in conjunction with M.T. Head Brewery in Graham, Washington. Dave and Dan purchased it when M.T. Head Owner Tim Rockey upgraded to a new 7-barrel system.

As one of four beers in their regular lineup, the Kölsch is in high demand. The Kölsch is a straw golden color that displays very good clarity and is a good representation of the style. A bright white head laces the glass all the way to the bottom. Aroma is all light malt with just a hint of sweet fruit. The base malt flavor profile really comes through with the Munich malt providing the extra body. Hop bitterness is almost undetectable but is just enough to offer the needed balance. Dan advises to condition this beer an extra week or two to really allow the flavors to develop.

Now, Michael, you won't have to endure a grueling hike to get your favorite Kölsch because you can "Brew Your Own." For more about Thunder Island Brewing, visit www.thunderislandbrewing.com. BYO

Thunder Island Brewing Company's Vitamin K Kölsch clone
(5 gallons/19 L, extract with grains)

OG = 1.045 FG = 1.010 IBU = 22 SRM = 4 ABV = 4.6%

Ingredients

3.3 lbs. (1.5 kg) Muntons extra light, unhopped, liquid malt extract
0.75 lbs. (0.34 kg) Muntons light dried malt extract
2 lbs. (0.9 kg) 2-row pale malt
8 oz. (0.23 kg) white wheat malt
8 oz. (0.23 kg) Munich malt
8 AAU Magnum hop pellets (50 min.) (0.65 oz./18 g at 12.3% alpha acids)
½ tsp. Irish moss (30 min.)
½ tsp. yeast nutrient (15 min.)
White Labs WLP029 (German Ale/ Kölsch) or Wyeast 2565 (Kölsch) yeast
Priming sugar (if bottling)

Step by Step

Steep the crushed grain in 2.5 gallons (9.5 L) of water at 150 °F (66 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.9 L) of hot water. Add the malt extracts and boil for 60 minutes. Add the hops, Irish moss, and yeast nutrient as per the schedule. When done, add the wort to 2 gallons (7.6 L) of cold water in a sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Allow the beer to condition 1 week and then bottle or keg. Allow the beer to carbonate and age for 3 weeks and enjoy your Vitamin K Kölsch clone.

All-grain option:

This is a single step infusion mash using an additional 6.5 lbs. (2.9 kg) 2-row pale malt to replace the liquid and dry malt extracts. Mix all of the crushed grains with 3.5 gallons (13 L) of 170 °F (77 °C) water to stabilize at 150 °F (66 °C) for 60 minutes. Slowly sparge with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the 50-minute Magnum hop addition to 0.5 oz./14g (6.2 AAU) to allow for the higher utilization factor of a full wort boil. The remainder of this recipe and procedures are the same as the extract with grains recipe.

Expand Equipment

The necessities & the luxuries

tips from the pros
by Dawson Raspuzzi

WHEN IT COMES TO HOMEBREW EQUIPMENT, YOU CAN SPEND AS MUCH (OR AS LITTLE) AS YOU'D LIKE AND STILL MAKE QUALITY BEER. BUT THERE COMES A POINT WHEN EVERY HOMEBREWER DECIDES IT'S TIME TO GET BIGGER AND BETTER EQUIPMENT. WHEN THAT TIME COMES, THERE ARE CERTAIN TOOLS THAT THE EXPERTS RECOMMEND, AND CERTAIN TOOLS THEY WOULDN'T BREW WITHOUT.

I like to make sure people have an understanding of three things before they expand their homebrewing equipment: Fermentation temperature control, bottling or kegging, and the size of their boil.

Fermentation temperature control is key to making consistently good beer. You can do many more things when expanding your brewery, but if you don't plan on having a controllable fermentation temperature, you're bound to have limitations or issues.

For most people, kegging is so much easier than bottling that I encourage new homebrewers to consider it pretty quickly, as anything that makes cleaning quicker keeps people in the hobby longer.

The size of the boil speaks to two main things; full volume boil vs. partial boil, as well as what batch size you make. Full volume boil, which means you need a kettle that can handle your batch size plus 20% (or more), makes the biggest quality improvement for many people. The best time to be thinking what size batch is ideal for you is when you are making this upgrade. If you want to increase your batch size from 5-gallons (19-L), then 10- to 12-gallon (38- to 45-L) final batch sizes are extremely popular for a few reasons. It usually takes the same amount of time while also maximizing your setup and cleanup times. There is also a financial savings because, while making twice as much beer, it usually doesn't cost twice as much; in fact it's usually just a small percentage more (for the equipment). Another fun, added benefit at that size is the potential to split batches and conduct experiments such as using different yeasts, different temperatures, and/or different dry hops to make a base beer taste different.

After the kettle to allow for full volume boils, if you are upgrading equipment on a tight budget, I would encourage you down a path of getting a wort chiller and usually an outdoor burner. After that, a used chest freezer (or refrigerator) and temperature controller can go a long way to ensuring you're making great beer.

If you are trying to go all into the hobby then, again, buy the items to get to full volume, and then buy a temperature controller for fermentation or a temperature controlled conical if you want to have ultimate ease and looks. After that, consider if you want to go all-grain down the road and if so, what kind of control do you wish to have?

> "Fermentation temperature control is key to making consistently good beer."

Other equipment like an oxygenation system, refractometer, and software are usually thought of as more advanced equipment, but shouldn't be overlooked when upgrading. Oxygen is important to yeast health and incorporating this into your brewing is easy at any experience level.

Refractometers allow you to take quick gravity readings at any stage of the brew process (here's a story from *BYO*'s archives for more on how to use them: http://byo.com/story1313). Knowing what your sugar levels are at any stage of the process will help you become a better brewer faster and have a better knowledge of what is going on in the batch.

Software, while it isn't required to make good beer, helps you get better at planning as well as recording results, which means you will more easily remember the details and the process will be more repeatable.

Chris Graham is the Chief Operating Officer of MoreBeer! in Concord, California. Chris has been homebrewing for more than 15 years. Each year he teaches the Advanced Homebrewing class at the Siebel Brewing School in Colorado. He also sits on the Brewers Association's Board of Directors, the American Homebrewers Association's Governing Council, and *BYO*'s Editorial Review Board.

John Blichmann is the President and Founder of Blichmann Engineering. An avid homebrewer for two decades, John "retired" from an engineering supervisor position at Caterpillar to start Blichmann Engineering in 2001 in order to focus on designing and producing homebrewing equipment.

The best investment I have made in my homebrewery is equipment that makes cleaning faster and more convenient. A commercial stainless steel sink with sideboards is an awesome piece of equipment, but a large plastic laundry tub in a convenient area does a fine job at a fraction of the price. Used restaurant equipment houses are a gold mine for homebrewers. The other huge improvement for me was a dedicated area where I didn't need to drag out all my gear each brew day.

The workhorse tools of a brewery are the brew pots and the heating sources (gas and electric). Even budget-conscience brewers should consider the options carefully when getting into the hobby. A saying I've always liked is, "A cheap tool is an expensive tool." If you're already equipped there, identify the things that take the most time or are the most frustrating when you are looking to upgrade equipment. For me, waiting for water to heat and wort to cool were not value added. A fast chiller and an efficient, powerful burner were solid investments. Or it could be a large sink for cleaning, dedicated shelving units, wort pumps, or a kegging system. For those with a higher budget, automated temperature control, brewing stands and moving your brewery indoors are great upgrades.

Before you buy anything, think long-term about what equipment you'll need to support that vision and how much you're willing to invest in your hobby. Specifically, consider batch size and whether you envision all-grain brewing in your future. Answers to those two questions now will steer you away from equipment that will eventually become obsolete.

If you like to build your own equipment there are many sources in the market. But be cognizant of what the real cost is in your time, material, tools, shipping costs, supplies, etc. Often it's more a decision of *wanting* to build rather than saving money in the end. A few great projects are a dispensing chest freezer, immersion chiller, or an efficient brewing area. BYO

Brewing with Fruit

Crisp finishes, storing grains, & chili beer

help me
mr. wizard
by Ashton Lewis

Q I WOULD LIKE TO BREW A BATCH OF RASPBERRY WHEAT BEER WITHOUT USING CONCENTRATED FLAVORING. THE FLAVOR CONCENTRATES WORK WELL, BUT I WOULD LIKE TO TRY BREWING WITH REAL BERRIES.
MIKE CEFARATTI
NATIONAL PARK, NEW JERSEY

A There are obviously two primary methods used to add fruit to beer; to the wort prior to fermentation or to the beer at some point in the fermentation process. In my opinion the best place to add fruit is after the primary fermentation has begun to tail off because the retention of fruit aromas is best if the fruit is not added to the wort. Also, the addition of fruit sugars at the end of fermentation results in an active secondary fermentation that helps dry these beers out.

Many first-time fruit beer brewers are not sure how much fruit to add. Like nearly all brewing topics there are no absolute rules about addition rates, but a good starting point is one pound of fruit per gallon of beer (0.45 kg per 3.8 L). Another question that often arises relates to "sanitizing" the fruit. Since fruit almost always is covered in yeast, brewers are often concerned about contaminating their beers with wild yeast. While this can happen, the thing to keep in mind is beer contains a lot of yeast cells and this yeast population is a formidable hurdle for wild yeast to combat and have much effect on beer flavor. Using quality fruit helps minimize the population of wild yeast because damaged fruit, for example smashed, causes juices to release and this increases the wild population.

Some brewers, including some notable commercial breweries, use a blanching method to reduce microbiological populations on the surface of fruit before adding the fruit to their beer. You can do this at home by bringing a large pot of water to a boil and adding your whole fruit to the pot and holding it for 30-60 seconds after the boil resumes. Immediately transfer the fruit to an ice bath to stop the process. This is made easy if you have a pasta cooker or some sort of cookware that allows you to move the fruit from hot water to ice water without having to dump the pot of water. By using this type of method you can blanch several small lots using the same pot of boiling water. After blanching you can add the fruit to your beer or freeze it in storage bags until your beer is ready for the fruit.

> "In my opinion the best place to add fruit is after the primary fermentation has begun to tail off . . ."

If you are really concerned about wild yeast and do not want to blanch your fruit I suggest taking a lesson from the winemaking playbook and using Campden tablets (potassium metabisulfite) to get control of the wildlife before adding the fruit. If you want to do this, add one tablet per gallon (3.8 L) of juice or crushed fruit and wait 24 hours before adding the fruit to the beer. I have brewed several types of fruit beers with a variety of fruits and have never had any problems when adding the fruit to beer after primary fermentation.

You state in your question that

you are not interested in adding fruit concentrates and I understand that concentrates lack the appeal of fresh fruit. There are fruit concentrates that are simply concentrated fruit juice and there are some advantages to these products. One big advantage is that many of these products have been pasteurized to kill yeast and bacteria. Another fruit option to consider is fruit puree that has been aseptically packaged. There is a wide range of fruits processed in this manner and they have all the qualities of fresh fruit and the benefits of pasteurization.

One thing about brewing fruit beer at home or in a small brewery that some brewers find frustrating is the lack of sweetness. I personally dislike sweet beers so this is not a big source of consternation in my brewing life, but there are some who want to brew a sweet fruit beer. In order to do this you need to retain sweetness in the beer and the challenge is that sweetness is synonymous with fermentable sugars.

Some breweries make sweet fruit beers by leaving fermentable sugars in the beer, or simply "back-sweeting" at the end of the process. Then they pasteurize the beer to kill yeast and prevent the beer from drying out in the bottle and potentially resulting in bottle grenades. Another method used by some, especially winemakers and cidermakers, is adding sulfite or sorbate to kill yeast and preserve the desired level of sweetness. And then there are some brewers who rely on cold temperatures to prevent the residual sugars from fermenting. I would only do this at home when using kegs for these sweeter beers. Bottling sweet beers without the use of pasteurization or the addition of sulfite or sorbate is asking for problems. If you want residual sweetness in your fruit beer, please re-read the above paragraph at least once and consider how you will prevent re-fermentation in the bottle because exploding bottles of homebrew can result in severe bodily harm.

ONE THING THAT I HAVE NOTICED THROUGHOUT THE BEERS THAT I ENJOY THE MOST IS THAT THEY HAVE BOTH A LOT OF FLAVOR AND THEY ALSO FINISH RATHER CRISP. WHAT IS THE BEST WAY TO BREW A BEER THAT HAS A MEDIUM TO FULL BODY BUT ALSO FINISHES CRISP? I KNOW THAT THE HIGHER TEMPERATURE YOU MASH AT, THE MORE BODY YOU WILL HAVE. THE ONLY WAY I HAVE HEARD TO GET MORE CRISPNESS TO BEER IS TO MASH AT LOWER TEMPERATURES. ANY IDEAS?

JIM WILLIAMS
MOUNT PROSPECT, ILLINOIS

Ah, in search of that wonderful crisp finish. I too prefer beers that do not linger on the palate and have a certain zip to them, and I have spent a fair amount of time in pursuit of this quality. I will attempt to address this sequentially with the various things in the brewing process that affect crispness.

The first thing that comes to mind is malt selection. Very pale malts are a good start if you want a base that lacks the rich toastiness of darker selections, including ingredients like ale malt. Under modified malts are also something to consider since malt modification influences the Maillard reaction during malt kilning.

You may even want to play around with diluting the protein content of wort by using adjuncts like corn, rice, and cane or corn sugar. In my experience, any ingredient that reduces "maltiness" is likely to give the finished beer more zip. At Springfield Brewing Company we brew a very sessionable wheat beer and there is no doubt that the addition of wheat malt and raw wheat has a significant influence on this beer's crisp finish.

"It's the water," declared Olympia Brewing Company. When looking at the most influential beer style of the modern history of brewing, Pilsner, water certainly was, and continues to be, key for this style. The water in Pilsen is very soft and, most importantly, very low in carbonate. Most ground water is not great for brewing this type of beer and this is why most of the world's breweries have been treating water since the earliest understanding of water chemistry. In my opinion, the easiest method to use for treating brewing water, especially on a small scale, is reverse osmosis (RO) followed by the addition of whatever minerals are desired for the particular brew.

I like using a blend of calcium chloride and calcium sulfate with a calcium level between 50 and 100 mg/L for crisp ales and lagers. If a beer seems a little "flabby" one thing commonly done is to increase calcium sulfate additions and to decrease calcium chloride additions, while maintaining constant calcium levels. Conversely, beers that are a bit too snappy can be softened by increasing calcium chloride additions and tuning back on the calcium sulfate. These tweaks are easiest accomplished when brewing the same recipe over and over again. Reverse osmosis-treated water can inexpensively be purchased from stores selling water by the gallon from self-serve dispensers.

There is no doubt that mashing temperature is a very useful tool when trying to manipulate wort fermentability and finished beer flavor. I assume from your question that you use the infusion mash method. Conducting your mash at 149 °F (65 °C) usually results in higher fermentability than an infusion mash at 158 °F (70 °C). We use step mashing at Springfield Brewing Company and in some of

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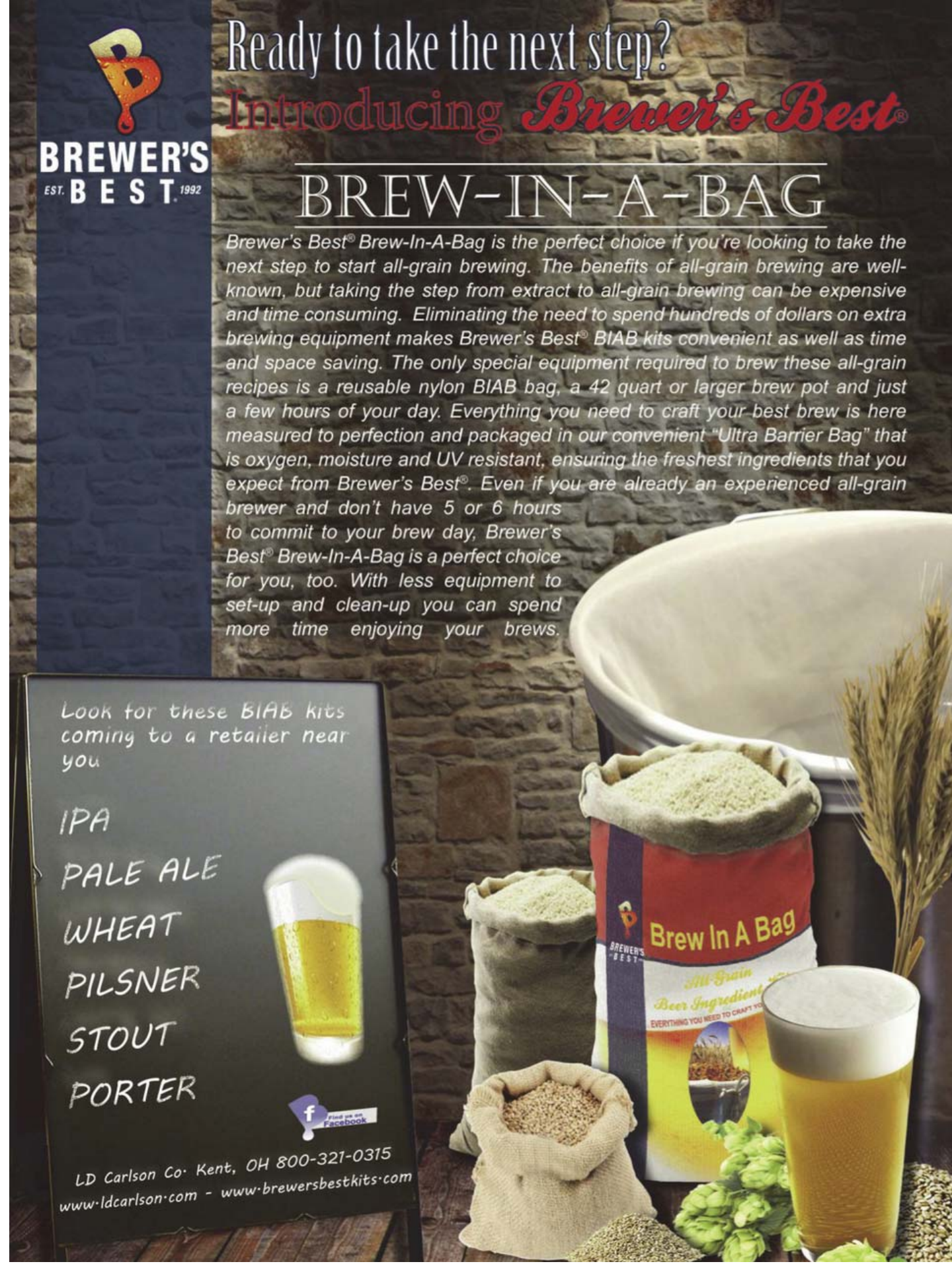

help me mr. wizard

our beers we use a very long (up to two hours), low temperature rest at 144 °F (62 °C) and then we complete conversion at 154 °F (68 °C).

If you use reverse osmosis water with 50-100 mg/L calcium your mash pH will probably be right around 5.4-5.6 for most pale and amber colored worts. If the pH is higher than this you may want to consider adding some food-grade lactic acid to reduce the pH to 5.4. If this does not have the romance you prefer in your craft, you can use the Reinheitsgebot-approved

> "Hop bitterness balances malt sweetness and a little tilt in the balance towards bitterness can add snap to many styles."

method of biological acidification . . . basically a fancy way of describing the addition of a small portion of sour mash to the mash as a way of adjusting mash pH. You can also add a small portion of acidulated malt, also known as sour malt or sauermalz, to the mash.

The next topic to add to this discussion is bitterness level. Hop bitterness balances malt sweetness and a little tilt in the balance towards bitterness can add snap to many styles. To my palate, this is one important reason why Pilsner beers are crisp. And the story is far from over . . . yeast strain, yeast load in the finished beer, carbonation level and serving temperature also affect crispness. Some beer flavors, like diacetyl and dimethyl sulfide, can "round out the palate" and detract from crispness. And other aromas, most notably hydrogen sulfide, can enhance crispness when present in moderate levels.

I hope I have helped scratch the surface of this deep and interesting topic. If there is any "trick" to brewing better beer it is learning how to influence this thing we call "crispness." Happy homebrewing, Jim!

Q I HAVE A NUMBER OF DIFFERENT TYPES OF GRAIN STORED IN CLEAR PLASTIC CONTAINERS THAT I KEEP ON A SHELF IN MY GARAGE WHERE I BREW. THE CONTAINERS ARE NOT IN DIRECT SUNLIGHT, BUT SUN DOES COME INTO THE GARAGE THROUGH WINDOWS. THE GARAGE TEMPERATURE RANGES FROM ABOUT 39-104 °F (4-40 °C) DEPENDING ON THE SEASON. AM I OK STORING GRAINS IN THIS KIND OF ENVIRONMENT, OR IS THERE SOMETHING ELSE THAT YOU WOULD RECOMMEND?

RAY SNYDER
KELOWNA, BRITISH COLUMBIA

A This is a good question, Ray. The most important thing to prevent when storing malt is an increase in the moisture content. When malt is kilned, the moisture content is normally reduced to less than 5%. Since most parts of the world are not nearly this dry, it is important to prevent moisture pick-up over time. The best way to accomplish this important goal is by storing your malt in airtight containers. It sounds like you are doing that.

Storage temperature is a subject that is not as absolute. High temperature accelerates the effects of aging on all ingredients, but quantifying this with malt storage is not something found in the literature. In fact, none of my brewing textbooks make any mention of malt storage temperature.

The fact of the matter is that breweries and maltsters store malt in malt silos located outdoors. Although high-volume breweries do not store malt for a very long time period due to their high production, many smaller breweries store grain for months in outdoor silos while they slowly consume their inventory. Empirically, one could argue that storage temperature is probably not a major concern in most areas, otherwise storage conditions would probably be different than the use of out-

door silos. Even when malt is stored in bags, the bags are usually stored in closed warehouses that become very warm in the summer.

Historically, pests have been a real problem for grain storage facilities. Pests include birds, rodents and insects. All of these creatures could cause problems in a garage environment, especially if malt is stored in bags that have been opened and closed by rolling the open end. Your plastic storage totes should be a suitable solution to prevent pest problems.

The containers do not prevent light from entering. I have not read, heard or had any first-hand experiences to lead me to believe that light presents problems for malt storage. But then again, most breweries store malt in silos and/or bags and these containers do not allow light to enter. To be on the safe side, you may want to consider placing your containers in a box. But if you are not noticing changes with the aroma and flavor of your malt over time in the beers you brew with stored malt, you have no real issues to associate with malt storage and therefore do not have a problem to solve. In other words, don't worry!

> "Empirically, one could argue that storage temperature is probably not a major concern in most areas, otherwise storage conditions would probably be different than the use of outdoor silos."

Q I WOULD LIKE TO BREW A CHILI BEER WITH SOME VERY HOT PEPPERS I HAVE. I JUST TRIED A CHILI IMPERIAL STOUT AND I LOVED IT! I WOULD LIKE TO REPLICATE IT BUT I DON'T KNOW HOW TO USE THE PEPPERS. I THINK THAT I CAN USE THEM IN THE BOIL OR IN THE DRY HOP. WHAT IS THE BEST METHOD? AND HOW MANY GRAMS OF PEPPERS DO I NEED TO USE IN ORDER TO HAVE ONLY A SPICY AFTERTASTE?

NICOLÒ BINDA
VARESE, ITALY

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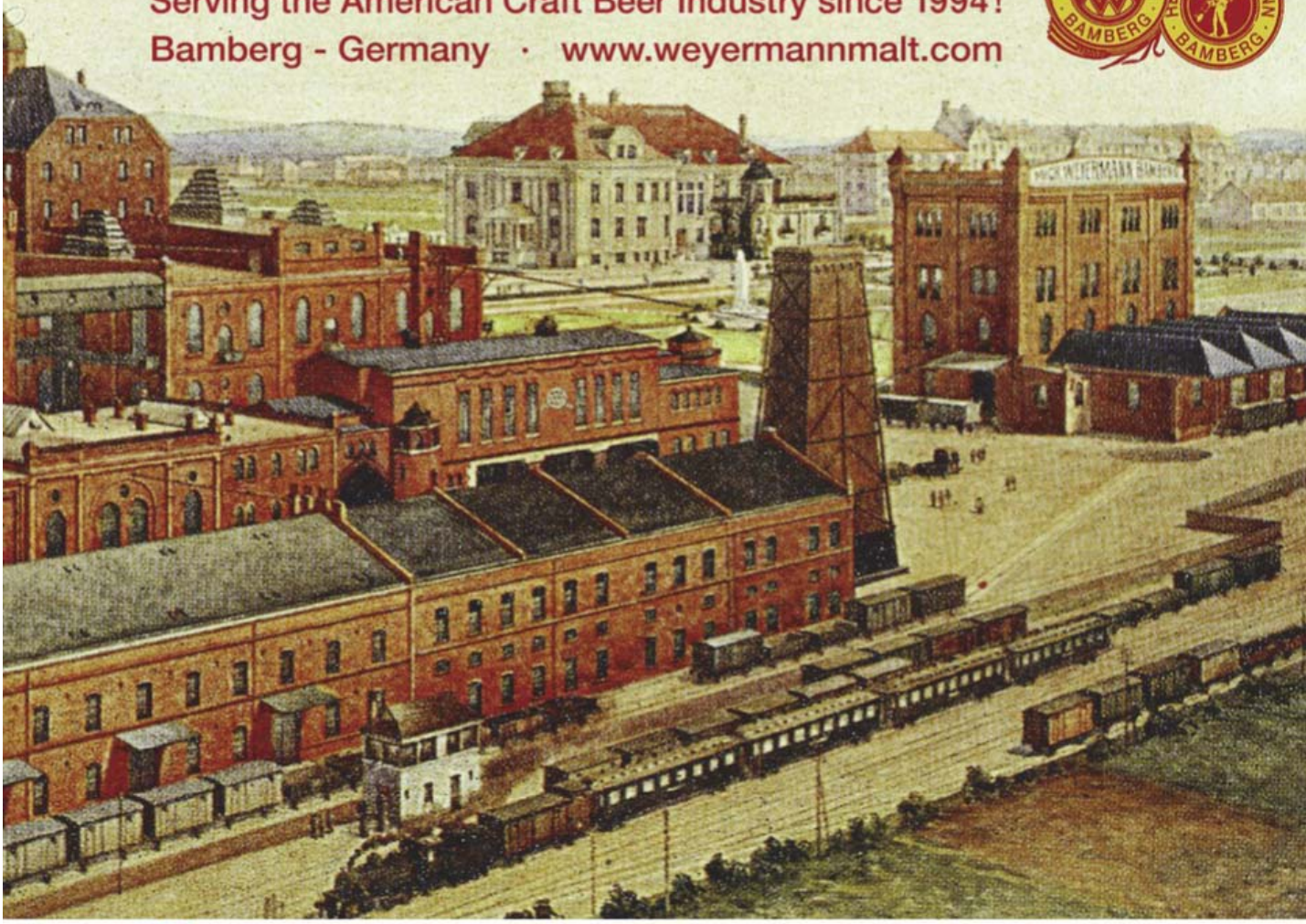

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Nicolò, I first must say *grazie*! I think this is the first question I have answered from an Italian homebrewer and am excited to know that you are reading *BYO* in Varese. Without knowing what beer you sampled I cannot help you replicate the flavor, but I will let you know my thoughts about your question.

When I am considering adding non-traditional ingredients to beer I think about the other flavor compounds present in my idea. As I type this I am drinking an imperial stout and the flavors that jump out of the Tsarry Night in my glass are raisin, fig, cocoa, toffee and a nice punch of alcohol. If I wanted pepper in this beer I would want to avoid veggie aromas associated with fresh peppers and would be drawn to dried peppers or smoked peppers. Since I have brewed stouts with a blend of smoked and dried peppers with great success, I would offer these methods of preservation for you to consider.

The chipotle pepper, popular in Mexico, is a smoked Jalapeño pepper. There are several types of chipotle peppers and I have brewed some nice beers flavored with a pepper known as the meco chipotle chili. I like the combination of smoke and hot present in these peppers. I also like the raisin-like flavors present in dried peppers. The combination of smoke, heat, and raisin marry well with a style like imperial stout.

You are asking me a question about preference, so here is my opinion: Add your peppers to your hot wort at the end of the boil like you would with aroma hops. You will extract the heat, the smoke and the dark fruit flavors from the flesh of the dried pepper. These flavors will not fade during fermentation or aging. When it comes to determining the dosing rate, I have a little more difficulty in offering rules of thumb. The intensity of your peppers play greatly into your recipe and you really must do some trial blends to determine a good dosing rate. If you end up with a beer that is too extreme you can always blend it down by adding some beer that was not exposed to peppers. A good starting point is three grams of peppers per liter of wort (0.1 oz. of peppers per quart of wort). Good luck with your pepper homebrew! BYO

Related Links:

• Want to turn up the heat even more? We delved into brewing various beer styles with a range of peppers from jalapeños to habaneros in this story from May 2000: http://byo.com/story859

• The options for brewing fruit beer are endless, however the techniques are similar. Jamil Zainasheff dissected the category in his "Style Profile" column from December 2008: http://byo.com/story1727

Flanders Red

A complex, fruity sour beer

style profile
by Jamil Zainasheff

Don't tell me you hate sour beers. If you are a regular reader of this column, you know what I am going to say next: You don't like *poorly made* sour beers. I run into lots of people that say they do not like sour beers. When I do, I hand them a well-made, delicately balanced sour beer, with lots of complexity, and wine-like notes. A beer with notes of cherry, caramel, some vanilla, chocolate, an oaky finish, and yes, it even has barnyard notes. What do they say then? "Hey, this isn't like the sours I tried before. I like this."

The same thing goes for IPAs, stouts, brown ales, fruit beers, and every other style that someone declares, "I hate those." Okay, I am sure some people do not like certain flavors; I get it. But more often than not, the reason someone hates a beer style is they have just been fed bad examples. I think that happens way too often with sour beers. So many contaminated beers get entered in competition as "Belgian" or "Lambic" or some other poor excuse to cover the brewer's tracks. Even when the souring is intentional, there are lots of bad examples. Think of it this way: if the base purpose of brewing a pale ale is to have created alcohol, then just because it has alcohol does not mean it is a great pale ale. The same goes for sour beers. Just because a beer is sour, that does not make it a great sour beer.

A great sour beer may not be for every palate, but they are far from nasty. When well made, they are beautifully balanced and supremely drinkable. In a beer style like Flanders red, the sour and the funky are balanced with the malt character and residual sweetness, making an intriguing and enjoyable combination.

Flanders red is often a deep red to reddish-brown color. It is a complex beer with obvious fruity notes reminiscent of cherry, currants, plums, figs, and blackberries. From the oak aging, it often has a touch of oaky vanilla and some tannic wood notes. The barnyard-like notes from *Brettanomyces* fermentation adds complexity. One mistake brewers make on this style is fermenting with a phenolic yeast, causing a high level of spicy phenols. At most, any phenolic character should be a restrained background note. The malt character is bready, with a touch of caramel, and has some residual sweetness to balance the tart acidic character, which ranges from just balancing to intense. Bad examples will often have too much of both sour and sweet, becoming cloying. Great examples will have a balance where the combination of sweet and sour never overwhelm the palate. A good example of the style is well-attenuated with no noticeable hop bitterness or hop character. While some commercial examples exhibit a wide range of vinegar and butter (acetic acid and diacetyl), both flavors are only acceptable in very small amounts

> "It is a complex beer with obvious fruity notes reminiscent of cherry, currants, plums, figs, and blackberries."

A good base for Flanders red consists of a large portion of Vienna or Munich malts. You can pair this up with high quality Pilsner malt or you can use all Vienna or Munich. The Vienna and Munich malts give more of a rich bready character, while the Pilsner malt is lighter and grainier.

I consider mid-color caramel malts (30-70 °L) such as CaraVienne® and caramel Munich a requirement for this style. They increase color and add residual sweetness, which helps balance the sourness. You can also use other dark caramel malts, such as caramel Munich 120 °L, to add a raisin-like sweetness to the beer. In

Continued on page 25

Flanders Red
by the numbers

OG:	1.048–1.057 (11.9 – 14.0 °P)
FG:	1.002–1.012 (0.5 – 3.1 °P)
SRM:	10–16
IBU:	10–25
ABV:	4.6–6.5%

Flanders Red
(5 gallons/19 L, all-grain)
OG = 1.057 FG = 1.008
IBU = 16 SRM = 15 ABV = 6.5%

Ingredients
5.3 lbs. (2.4 kg) Vienna malt (4 °L)
5.3 lbs. (2.4 kg) continental Pilsner malt (2 °L)
8.5 oz. (0.24 kg) Aromatic® malt (20 °L)
8.5 oz. (0.24 kg) caramel Munich (60 °L)
8.5 oz. (0.24 kg) caramel Munich (120 °L)
3.5 AAU Kent Goldings hops (60 min.) (0.7 oz./20 g at 5% alpha acid)
Irish moss (15 min.)
1 oz. (28 g) medium toast French oak cubes (added in secondary)
Wyeast 3763 (Roeselare Blend) or White Labs WLP655 (Belgian Sour Mix I) yeast

Step by Step
I currently use Best Malz Pilsen and Vienna, but feel free to substitute any high quality malt of the same type and color from a different supplier. The Aromatic® malt is from Briess and the two types of caramel Munich are from Franco-Belges. My hops are in pellet form and come from Hop Union, Willamette Valley, or Hopsteiner depending on the variety.

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 154 °F (68 °C). Hold the mash at 154 °F (68 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (25 L) and the gravity is 1.044.

The total wort boil time is 90 minutes, which helps reduce the S-Methyl Methionine (SMM) present in the lightly kilned Pilsner malt and results in less Dimethyl Sulfide (DMS) in the finished beer. Add the hops with 60 minutes remaining in the boil. Add Irish moss or other kettle finings with 15 minutes left in the boil if you please. Chill the wort to 68 °F (20 °C) and aerate thoroughly. For this beer, I like a pitch rate of two packages of the liquid yeast blends. I'm not sure what that pitch rate is, given the mixed nature of these cultures, but I like the results.

Ferment around 68 °F (20 °C) until the yeast drops to the bottom and forms a layer. With healthy yeast, this should be complete in two weeks or less, but there is no need to rush it. Rack the beer to a smaller secondary container, add the oak cubes, and close with a very slightly permeable closure, such as a carboy cap. Place in a spot protected from light and check every couple of months to see how your baby is coming along. It can easily take a year or more to fully develop. Be patient. When the beer has developed the character you desire, you can rack to a keg and force carbonate or you can add priming sugar and a fresh dose of yeast to carbonate in the bottle. Be careful, if you bottle too early, there could still be significant sugars present for the *Brettanomyces* to continue to consume. Once the beers are carbonated, store in the refrigerator to prevent bottle bombs. Target a carbonation level of 2 to 2.5 volumes.

Flanders Red
(5 gallons/19 L, extract with grains)
OG = 1.057 FG = 1.008
IBU = 16 SRM = 17 ABV = 6.5%

Ingredients
7.2 lbs. (3.25 kg) Munich liquid malt
8.5 oz. (0.24 kg) Aromatic® malt (20 °L)
8.5 oz. (0.24 kg) caramel Munich (60 °L)
8.5 oz. (0.24 kg) caramel Munich (120 °L)
3.5 AAU Kent Goldings hops (60 min.) (0.7 oz./20 g at 5% alpha acid)
Irish moss (15 min.)
1 oz. (28 g) medium toast French oak cubes (added in secondary)
Wyeast 3763 (Roeselare Blend) or White Labs WLP655 (Belgian Sour Mix I) yeast

Step by Step
There are many Munich extract blends out there. It is always better to choose the freshest extract available. If you cannot get fresh liquid malt extract, see if you can find a dry Munich extract instead. The Aromatic® malt is from Briess and the two types of caramel Munich are from Franco-Belges. My hops are in pellet form and come from Hop Union, Willamette Valley, or Hopsteiner depending on the variety.

Mill or coarsely crack the specialty malt and place loosely in a grain bag. Steep the bag in about 1 gallon (~4 L) of water at roughly 170 °F (77 °C) for about 30 minutes. Lift the grain bag out of the steeping liquid and rinse with warm water. Allow the bag to drip into the kettle. Do not squeeze the bag. Add the malt extract and enough water to make a pre-boil volume of 5.9 gallons (22.3 liters) and a gravity of 1.048. Stir thoroughly to help dissolve the extract and bring to a boil.

Once the wort is boiling, add the hops. The total wort boil time is 1 hour after adding the hops. Add Irish moss or other kettle finings with 15 minutes left in the boil if you please. Chill the wort to 68 °F (20 °C) and aerate thoroughly. Follow the fermentation and packaging instructions for the all-grain version.

Photo courtesy of Rodenbach Brewery

Flanders red is traditionally aged in oak barrels such as these at Rodenbach Brewery, which gives it a touch of oaky vanilla and some tannic wood notes.

general, these sweeter specialty malts should total 5 to 10% of the total grist.

You can use other grains such as wheat, biscuit, aromatic, and others for additional complexity. It can be a way to help differentiate your beer from other entries in competition. I recommend keeping those additional grains to no more than 10% of the total grist. What you want is for the specialty malts to accentuate the malty Pilsner/Vienna/Munich base, not outshine it.

Extract brewers should use Munich malt extract as the base. Most Munich malt extract is a blend of Munich and Pilsner (or other pale malts) in different percentages. The Munich malt in the blend adds a nice bready malt character. All-grain brewers should use a single infusion mash, in the range of 154-158 °F (68-70 °C). If you are brewing a bigger beer, use the lower end of the range. If making a smaller beer, choose the upper end of the range.

Hop flavor and hop aroma are non-existent in Flanders red. Even hop bitterness takes a back seat to the rest of the beer character. You want just enough bittering to provide a slight balance to any residual malt sweetness. Hop iso-alpha acid can also affect the ability of bacteria to replicate. The more hop bitterness in your beer, the more difficult it is for the bacteria to sour the beer. The drier and more sour the finished beer, the less hop bittering required. As far as hop selection, low alpha hops are a good choice. Avoid high alpha or highly pungent American-style hops. I prefer Kent Goldings, but many other hops work well. Just select hops that are more on the flowery or fruity side and low alpha acid. The bitterness to starting gravity ratio (IBU divided by the decimal portion of the specific gravity) generally ranges from 0.2 to 0.4. If this is the first time you are brewing this style, aim for the middle at 0.3. All hop additions should be early in the boil.

Fermentation is where you succeed or fail at Flanders red. I know many people have reported success repitching dregs from their favorite bottles of this and that beer. I have done this as well, and the results can be surprisingly good or surprisingly bad. If you are going to attempt this, try growing up the culture first in a liter of starter wort and see what that tastes like before committing to a full-sized batch of wort.

After some experimentation and fiddling around with blending my own *Brettanomyces* and bacteria strains, I learned that both Wyeast and White Labs have outstanding blends that make excellent Flanders red. As a bonus, they are relatively easy to work with and produce consistent results if you provide a consistent environment. My absolute favorite for this style is Wyeast 3763 (Roeselare Blend). This is a perfect blend of yeast and bacteria intended to produce the distinct flavors of the classic Flanders

red and brown beers. The results are spectacular and can produce exceptionally accurate reproductions of the best commercial Flanders red ales out there. If you prefer White Labs, their WLP655 (Belgian Sour Mix I) produces great results as well.

The two most important parameters in fermenting your Flanders red are oxygen and temperature. Too much oxygen is bad and so is too much heat. Warmer temperatures speed up the process of souring, but can also lead to harsh off-flavors. The temperature where you store your secondary carboy should never exceed 68 °F (20 °C). Ideally, you would keep it in the 65-68 °F (18-20 °C) range for the entire time.

Traditionally, brewers such as Rodenbach have put their beer in large oak foeders (see photo on page 25), which both evens out temperature swings (because of their large volume of liquid) and allow very low levels of oxygen to slowly reach the beer over time. The organisms present take up this micro oxygen and affect the development of flavors important to the style. You want to oxygenate your wort before you first pitch your culture, but after that, keep the amount of oxygen that reaches the beer to a minimum (not zero). A very tiny, slow imperceptible amount. I like to use the soft rubber carboy caps (usually orange or yellow). They do not exclude oxygen very well and if you keep the surface area of the beer small, I have found they let in just about the perfect amount of oxygen. If there is a large surface area of beer present, the beer might take up too much oxygen, resulting in a poor flavor profile full of vinegar and acetone.

The most straightforward way to work with these blends is to oxygenate your wort like any other beer and then add Wyeast 3763 (Roeselare Blend). Ferment it like usual at a temperature around 65-68 °F (18-20 °C). At the end of this initial fermentation, there should be a yeast cake on the bottom of your fermenter. You need to rack the beer off the yeast cake and into a smaller vessel to minimize the headspace. When I do this, I start the process in a 6.5-gallon (25 L) carboy with 5.5 gallons (21 L) of beer and then I transfer to a 5-gallon (19-L) carboy for the second, longer fermentation. I use the smaller carboy so that the liquid portion fills up into the narrow neck of the carboy. This minimizes the amount of oxygen taken up by the beer (and organisms present) during six months to a year or more of time. I like to add some medium toast French oak cubes when I rack to the smaller carboy as a great way to mimic the flavor of the oak and the micro oxygen of the large foeders.

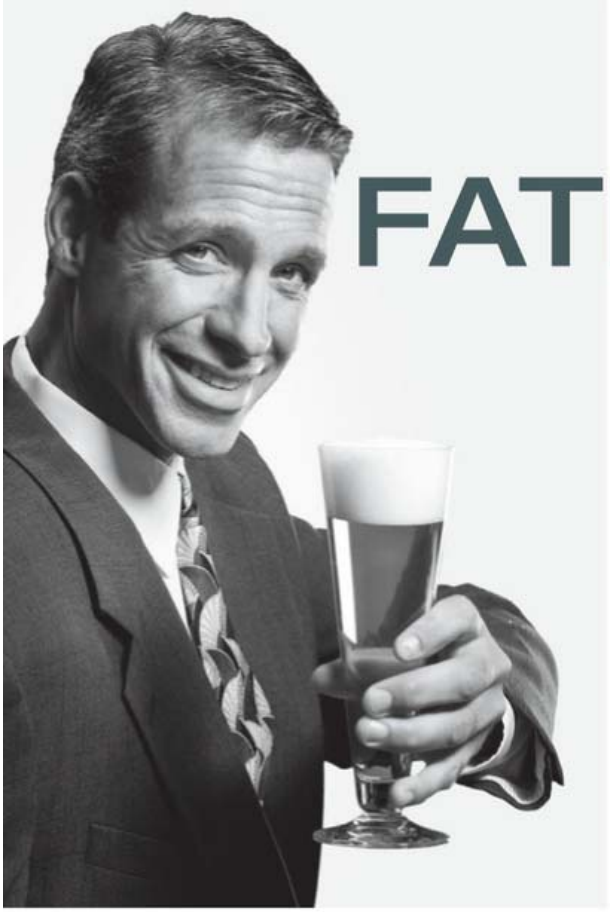
Now, keep in mind, this process will take time. You will probably see a little pellicle form on the surface of the beer. That is generally a good sign of healthy *Brettanomyces* and the slow ingress of oxygen. If you do not see a pellicle form, do not worry. You can

take samples with a wine thief or even an eyedropper to measure the specific gravity and taste the progress of the souring, but do not overdo it. A sample after the first three or four months and thereafter is good. You do not want to keep disturbing the pellicle and you do not want to take so much out that the level of the liquid moves down into the widest part of the carboy. I put my carboy into a temperature stable, dark spot and forget about it for months at a time. Small temperature shifts of a degree or two over the course of a day are not a big deal and the gradual change by a few degrees with the changing of seasons is not a problem. However, large daily swings can negatively affect the results, so try to find the most stable spot in your home. Any part of a building that gets direct sun tends to have a larger temperature swing, so try to pick an interior or basement space. I am sure there are some of you that have heard of breweries making very sour beers in far less time by increasing the temperature and oxygen levels. I would urge you to be patient. Quickly soured beers that contain *Brettanomyces* are often harsh and unpleasant to drink. There is a reason why people covet the best of the complex soured beers. It takes a long time and an artistry to brew them. Be an artist, be patient, and craft a great beer.

Some people like very sour beers and some like the more balanced approach. Count me in on the balanced side when it comes to Flanders red. The best examples have a wonderful balance of sour and sweet. The sourness in the beer helps make up for the lack of hop bitterness, cutting the soft malt sweetness. Traditional Flanders breweries blend young and old beer, seeking to develop a balance. (Unfortunately, some use artificial sweetener to balance their beers. Ugh.) You can do the same at home, brewing a batch every year and blending various vintages to the perfect balance and character. If you are not up for that challenge, it is possible to get a similar, although not as certain, result using other methods.

One method is to brew a bigger beer, where the initial fermentation creates a bit more alcohol and a bit more residual sweetness, which affects the ability of some organisms to work efficiently. You can even start with a clean ale yeast and then pitch your mixed culture once that fermentation has finished.

A second method is to arrest the process of souring once the beer has reached the preferred level of sourness. This method is effective, but I don't always like it because the beer's character may not fully develop by the time the souring has reached the level you like. When the beer seems ready to your taste, move it to refrigeration. If you keep it below 40 °F (4 °C), the process slows down tremendously and the beer should remain the same for some time.



FATHER'S DAY GIFT GUIDE

Sunday, June 15th is Father's Day. Let's face it, your dad already has a closet full of ties, a glovebox overflowing with roadmap atlases and a cupboard full of #1 Dad mugs from Father's Days past. Doesn't he deserve to get some gifts this year that he'll really enjoy?

This Father's Day give him something he'll really use. Imagine his surprise when you show up with some of the fine beer and brewing related items on the next several pages to make him feel extra special. How about also bringing a six-pack, or better yet – a fresh Corney keg, of homebrew to let him know how much he means to you. If you're the homebrewing dad of the family, leave your copy of *BYO* on your wife's desk open to these pages or put them up on the refrigerator. Don't be shy – it's your day. Make sure your family knows what you'd really like to get this year that'll say, "Thanks, Dad," more than anything they might think you want.

So what are you waiting for?! Check out these goodies for great gift ideas for your homebrewing dad or to make your own Father's Day wishlist.

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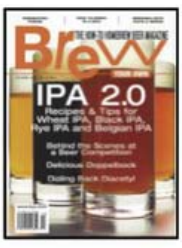

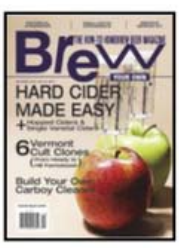

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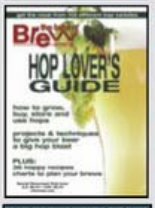

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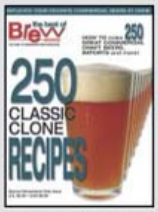

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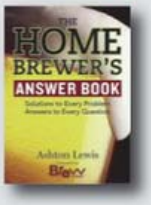

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by Dawson Raspuzzi

AMERICAN TRAPPISTS

Photos by Nick Hiller

Trappist beers have long been associated with tradition, excellence, and the monks who brew them in European monasteries. That changed in January when Spencer Trappist Ale — the first Trappist ale brewed outside of European borders — hit store shelves. Brewed by the monks of Saint Joseph's Abbey in Spencer, Massachusetts with the blessing of — and assistance from — their European brothers, Spencer Brewery is the 10th Trappist brewery certified by the International Trappist Association (ITA).

St. Joseph's Abbey is a contemplative monastic community located about an hour west of Boston where 63 monks of the Order of Cistercians of the Strict Observance (commonly referred to as Trappists) live a quiet life of prayer, meditation and manual labor within the monastery. One of the fundamental rules of Trappists is self-sufficiency. This way of life explains the thinking behind the new state-of-the-art 36,000-square-foot brewery in a time when the aging population of St. Joseph's fight to keep up with the rising costs to maintain the abbey's cobblestone buildings.

The first American Trappist brewery has been a long time coming; it was more than five years ago when planning for its conception began. But Trappist monks are not ones to rush into anything (in fact, they're quite well known for contemplation). The idea to build a brewery at the monastery that sits on more than 1,000 acres of rolling farmland was first met with hesitation by the other Trappist breweries. Their reluctance was to be expected, as the Trappist name in the beer world is held in high regard and just one poor example could damage the Trappist brand. Plus, constructing a Trappist brewery outside of Europe had never been attempted before. However, those concerns were eased as two monks from St. Joseph's moved to Belgium for a year and learned the family business while dividing their time between the six Belgian Trappist abbeys that brew beer.

"They made two requirements of us. They said, one, 'if you're going to do this, we'd like you to commit to brewing one good beer.' Then they said, 'no, one very good beer,'" says Father Isaac Keeley, the Director of Spencer Brewery who has been involved in the process from the beginning.

Photo by Mary Jeffcoat

The second requirement from the ITA was to spare no expense on the brewery. "It was the Belgian monasteries that asked us to do the state-of-the-art brewery because they maintain that their position in the world beer culture is not just because of the tradition, the knowhow, and the expertise; it's also because they have state-of-the-art facilities and they're continually upgrading their facilities. So when we had the discussions about this project, that was one of the things they asked of us if we were going to use the name Trappist, because we all rise and fall together."

A three-person delegation from the ITA (which was founded in 1997 by the eight existing Trappist breweries at the time to protect the use of the Trappist name) inspected every facet of the brewery from equipment to quality control and management operations last November. The final step was for the beer to be approved, which happened with unanimous consent on December 10, 2013. With that approval, Spencer was granted the right to print the "Authentic Trappist Product" logo on the label, which signifies that the beer is brewed within the walls of a Trappist monastery, that the monks brew or oversee the brewing process, and that profits provide for the needs of the monastic community and its charitable outreach.

The monks decline to share what the price tag of the new facility is, however it is the costliest investment in the abbey's history. In addition to high-end brewing equipment, the bottling facility is a model of efficiency in which every step of the process is automated — from the time empty 11.2 oz. bottles are loaded onto the conveyer belt through each step in which they are washed, purged with CO_2, filled, capped, labeled and boxed.

To help the five monks who carry out the day-to-day brewing operations, the monastery has hired Brewing Engineer Hubert de Halleux, who has spent much of his lifetime working in brewhouses across Europe and Africa, to assist them for the first three years. "He brings a tremendous amount of knowledge to this endeavor," Keeley says.

Spencer Brewery — named in monastic tradition for the town the monastery is located — is not open to the public, but during a media tour the monks' enthusiasm over the project is obvious. Keeley's excitement is particularly apparent when he begins explaining the science behind the reactions the barley undertakes in the mash tun, the impact just a few degrees can have on fermentation, and when he explains how the yeast is cultured. In speaking with him, you quickly realize the monks are not simply the public face of the brewery, but that they are vested in all facets.

When asked the question, "Do you enjoy your work?" Keeley throws his head back and erupts in jolly laughter, managing a few words between chuckles. "I do, I do. I hope it's obvious!"

Spencer Trappist Ale

Long before being granted approval, the monks of St. Joseph's had to come up with a recipe to call their own.

Among Trappist breweries "each beer is distinct, so the expectation was that we would do a distinct beer," says Keeley, who is draped in the traditional black and white Trappist robe even on brew days. "We don't need a Rochefort 11, so what we (considered) was, how did they all begin? They all began brewing beer for the monks, so we said the first beer from a new Trappist brewery should be a beer monks drink. That's how we ended up doing a refectory ale — an ale that could be served in our refectory, our din-

ing room, that our monks would really like."

The bottle-conditioned, unfiltered and unpasteurized ale has a golden hue and checks in at 6.5% alcohol by volume with just a hint of hop presence. It was inspired by traditional refectory ales, also known as *patersbier* (which translates to "fathers' beer" in Flemish), that are customarily brewed as sessionable beers for the monks to have with dinner. Many Trappist breweries make a *patersbier* for the monks that is only available at the monastery.

Keeley describes the beer as crisp when it first hits the palate. As it rolls across the tongue, he identifies two significant tastes: Spices, which include clove and pepper (especially when young), and delicate fruit notes such as apricot, mandarin orange, and fresh peach. Most public reviews also identify banana, but Keeley says he doesn't pick that taste up so much. On the backend, the beer finishes dry. Many of the beer's complex flavors are true to the signature yeast characteristics of Belgian Trappist beers, which is predictable because the yeast is a "family strain" from another monastery. With a friendly smile, Keeley politely declines to elaborate on which monastery when asked.

"I can tell you one more thing about the yeast. Listen, this is fun," Keeley says, grinning from ear to ear with exuberance in his voice like a child explaining the intricacies of how his new toy works. "When we were trying to decide what beer we were going to make, in the beginning we just naturally assumed we were going to use family yeast. About half way through, both ourselves and some of our Trappist brothers in Belgium said, 'you know, yeast is so identifiable with a brewery; maybe a new brewery should do a new yeast. At first we thought, 'that's crazy,' then we thought, 'wow, that's interesting.'" In search of the perfect yeast, Keeley and his small research team visited a Belgian university with a leading brewing science program where a professor picked out three yeast strains with degrees of genetic overlap with the "family yeast" at 40, 60, and 80 percent to taste against the family yeast. "We provided the wort and then the university did brews … and then we had a blind tasting with my little crew. None of us knew what was what and we all picked the same beer, and then we emailed the professor to find out what was in what bottle. It turned out to be the family yeast (that was chosen), and we said, 'that's it.'"

> "The complexity of the flavor, Keeley says, comes from the precision in the brewing process."

Keeley describes the recipe for Spencer Trappist Ale as remarkably simple — it consists of just three grains, two hop varieties, water and yeast. That's not to say the ingredients just fell into place; contrarily, the existing recipe is the twenty-fourth take on the original and is the result of rounds of small-scale brewing sessions and tastings that led to minor alteration after alteration.

The complexity of the flavor, Keeley says, comes from the precision in the brewing process. The water also adds a distinct character. During the last ice age, Spencer was covered by thousands of feet of glacial ice. The ice sheet began melting some 18,000 years ago and left freshwater streams, rivers and massive underground lakes in its wake. These ancient, mineral-rich glacial waters drawn from pro-

RECIPES

Spencer Trappist Ale clone
(5 gallons/19 L, all-grain)

OG = 1.058 FG = 1.010
IBU = 25 SRM = 8 ABV = 6.5%

Ingredients

10 lbs. (4.5 kg) North American 2-row Pilsner malt
2 lbs. (0.91 kg) North American 6-row pale malt
4 oz. (0.11 kg) caramel Munich malt (60 °L)
6.4 AAU Nugget hops (60 min.) (0.5 oz./14 g at 12.75% alpha acid)
1.2 AAU Willamette hops (10 min.) (0.25 oz./7 g at 4.75% alpha acid)
1 tsp. Irish moss (15 min.)
Wyeast 3787 (Trappist High Gravity) or White Labs WLP530 (Abbey Ale) yeast
Priming sugar (if bottling)

Step by Step

Use a step-infusion mash starting at 148 °F (64 °C) for 75 minutes, then raise to 162 °F (72 °C) for 15 minutes. Raise grain bed to 168 °F (76 °C) to begin the lauter process. Sparge with enough water to collect about 6.5 gallons (25 L) of wort in the kettle. Boil for 90 minutes, adding the hops and Irish moss at the times indicated. After flameout, chill the wort down to 65 °F (18 °C) and pitch the yeast. You can then place in a warm space to allow fermentation temperature to start to rise to 72 °F (22 °C). Hold at this temperature during active fermentation. When active fermentation begins to settle down (kräusen begins to fall), increase the fermentation to 78 °F (26 °C) to be sure the yeast ferments to completion. After all signs of fermentation have dissipated and final gravity has been reached, place the wort in cool storage at 50 °F (10 °C) for approximately 2 weeks. Carbonate to 2.5 to 3.0 volumes.

Spencer Trappist Ale clone
(5 gallons/19 L, extract with grains)

OG = 1.058 FG = 1.010
IBU = 25 SRM = 8 ABV = 6.5%

Ingredients

6.6 lbs. (3 kg) Pilsen liquid malt extract
1.2 lbs. (0.54 kg) Pilsen dried malt extract
4 oz. (0.11 kg) caramel Munich malt (60 °L)
6.4 AAU Nugget hops (60 min.) (0.5 oz./14 g at 12.75% alpha acid)
1.2 AAU Willamette hops (10 min.) (0.25 oz./7 g at 4.75% alpha acid)
1 tsp. Irish moss (15 min.)
Wyeast 3787 (Trappist High Gravity) or White Labs WLP530 (Abbey Ale) yeast
Priming sugar (if bottling)

Step by Step

Heat 1 gallon (4 L) of water in a kettle. Place the crushed grains in a muslin bag and soak at 160 °F (71 °C) for 20 minutes. Place the bag in a colander and rinse the grains with 2 quarts (2 L) hot water. Top off the kettle with water to get 6 gallons (23 L) total. Add the liquid and dried malt extract off heat and then bring to a boil. Boil for 60 minutes, adding the hops and Irish moss at the times indicated in the ingredients list. The fermentation and packaging instructions are the same as in the all-grain recipe.

tected wells on the abbey's land add another layer of complexity to Spencer Trappist Ale.

Spencer Brewery

For the past 60 years St. Joseph's Abbey, which moved to Spencer in 1950 after a fire destroyed their previous monastery in Rhode Island, has relied on profits from religious vestments and homemade jellies for income. But as expenses grow, so too must the thinking, says Father Damian Carr, Abbot of St. Joseph's Abbey. "One of our first business meetings with outside advisors was a banker and he asked me, 'Why are you doing this?' I thought a few minutes and I said, 'survival,'" he says. As is the case for all decisions within the abbey, the brewery was designed with long-term goals in mind.

"Our real commitment is to the brewhouse. We want to be able to say the monks really brew this beer. We see that as something we'll most likely be able to do for the long run. We know we're probably always going to need some help in the packaging hall, but we have this principle of living by the work of our own hands, so that's why we're particularly interested in the brewery," Keeley says.

Additionally, the monks have planted barley over a 10-acre plot that they will tend to and then harvest in the summer. With that plot, Spencer Brewery meets the state designation as a Massachusetts Farmer Brewery — a distinction that requires the brewery itself to grow or buy a percentage of the ingredients from within the state.

At the request from the Belgian Trappists to start slowly, the monks will brew just 4,000 barrels (roughly 56,000 cases) this year. The brewery only operates twice a week to meet that requirement. In five years, Keeley says they hope to expand production to 10,000 barrels a year, which would require brewing four days a week. "That would help us to realize our financial goals."

Even then, the brewery will be underutilized compared to the 40,000 barrels it has the capacity to brew each year. Whether Spencer Brewery will


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ever meet capacity depends on future needs of the abbey. "The production has to be sized to the economic needs of the monastery and its charities. So we don't want to be a big powerhouse brewery. We want to brew really high-quality beer that is great to share with family and friends," Keeley says. Unfortunately, that means Spencer Trappist Ale may not be sold outside of Massachusetts in the near future.

Another decision that will come with time is whether Spencer Brewery ever incorporates additional brews beyond the refectory ale. With the exception of Koningshoeven and Achel, Trappist breweries generally only make one to three beer styles each, which Keeley says is where the monks of Spencer see themselves remaining.

A Change in Culture at St. Joseph's

To anyone who is not a historian or beer enthusiast, the idea of monks brewing beer may seem unusual at first; however monastery brewhouses from different religious orders have been around since the Middle Ages. In fact, just two decades after the Order of Cistercians of the Strict Observance was created in 1664, La Trappe in Soligny, France, had already begun operating a brewery within the monastery. Given the reliance on self-sufficiency, it makes sense that in addition to growing and raising their own food the monks would also brew their own beer; particularly because beer was safer to drink than water at the time.

Brewing — and even beer itself — was, however, very new to the monks of Spencer prior to this endeavor.

Previously the brothers only consumed alcohol on the half-dozen or so major feast days each year, and then they mostly stuck to wine. That changed with the opening of their brewery, at which time the abbot allowed the monks to enjoy beer with supper on Sunday evenings. So you may wonder whether the beer is well-received by a group of (previously) non-beer drinking monks. Keeley says there is no doubt about it. The ale was unveiled to the brothers during a New Year's celebration. "It became really clear pretty quickly that the brothers really liked it because even the non-beer drinkers were coming back for seconds … that was sort of an emotional moment for me because I realized we made it. Not only do we have the brewery, but we have a beer that the brothers really like, and that's hugely important for me," Keeley says, beaming with pride.

Spencer Brewery's greater impact on American Trappists (of which there are a dozen abbeys across the country) will be seen over time. For now, none have expressed interest in following suit. "When they understand what we went through to get to this point, there's not a lot of people lining up to give it a try," Keeley says, erupting into laughter. BYO

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German Funk American-Style

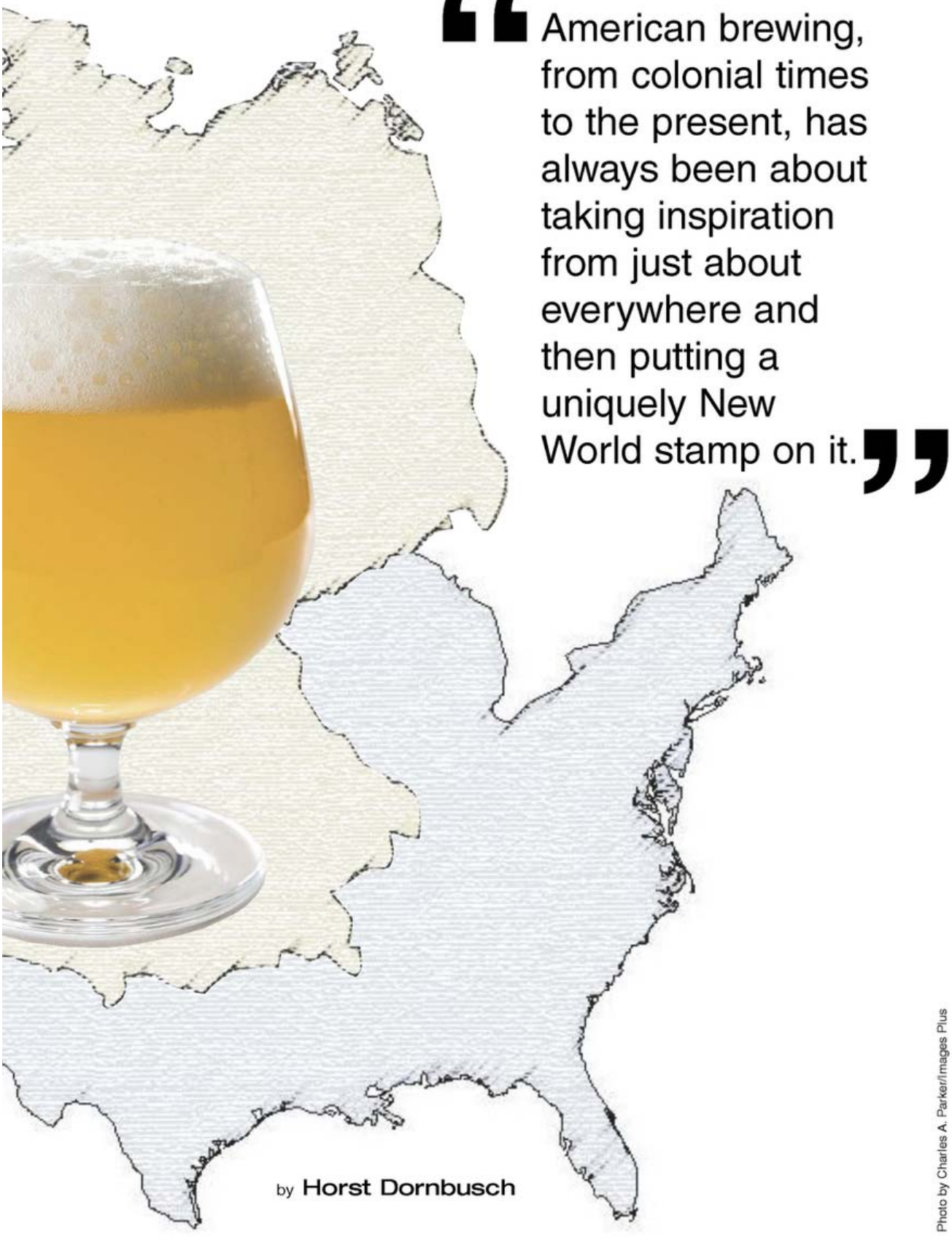
The New World Revival of Berliner Weisse and Its Allies

Achtung! The Germans are coming, the Germans are coming! As Daniel Fromson wrote in the *Washington Post* on August 27, 2013, "For decades, American brewers have infused foreign beer traditions with boldness and innovation — by reimagining the moderately bitter English IPA as the hop-saturated Titan of the U.S. craft-beer pantheon, for example. Now they're doing it again with Germany's little-known sour ales . . . reviving their characteristic lemony acidity and often pairing it with other ingredients, from fresh coriander flowers . . . to passion fruit. The result: Low-alcohol beers whose intensity of flavors are matched only by their ability to refresh."

How true it is! American brewing, from Colonial times to the present, has always been about taking inspiration from just about everywhere and then putting a uniquely New World stamp on it. At the beginning of the North American home- and craft-brew revolution some four decades ago, the focus was mostly on British ales. These were straightforward to make and the results were satisfying. But as the new breed of brewers became more sophisticated and adventurous, they branched out, mostly into Belgian beers in all their varied glory. Next came the extreme wave when brewers pushed the envelope on all fronts: More hop bitterness, different hop varieties, more maltiness, different types of malt, different strains of yeast, alternative microbes, more alcohol, and obscure ingredients from coffee to fruits to vegetables.

In the process, such classic beers as pale ale, IPA, porter, and stout metamorphosed into double, triple, and even quadruple, super-imperialized "Stars-and-Stripes-Forever" brews, in whose flavor profiles you could still detect traces of the originals, but whose character was patterned unmistakably by a flamboyant, non-conformist, often exuberant spirit of brew freedom. The same happened with Belgian ales, which brewers took to new barrel-aged heights of microbial edginess, while pushing the envelope even of barnyard funk. The equipment and processes of these intrepid brewers became more elaborate, too, and some brewers even got into decoction and different fermentation regimens to make both authentic and adapted Czech and German lagers.

Well, after all that boundless experimentation, what's left? Where is the next frontier? Where will experimental brewers look for their next inspiration? Perhaps the *Washington Post* article got it right: The next target of North American brewing seems to be the slew of mostly forgotten, sour, German heirloom brews . . . the sort of brews that were dominant in central Europe up until the Industrial Revolution, that is, during a 3,000



> American brewing, from colonial times to the present, has always been about taking inspiration from just about everywhere and then putting a uniquely New World stamp on it.

by **Horst Dornbusch**

Photo by Charles A. Parker/Images Plus

year-long era when making beer was still haphazard, equipment was primitive, and the microbiology of brewing was a complete mystery.

The category of traditional German sour brews is distantly akin to such Belgian classics as lambics and red ales . . . and it appears as if North American brewers are now discovering these long-buried styles and are taking them into completely new directions. German sours are often mixed-mash brews of barley and wheat malts, as well as oats and unmalted grains. Purely technically, therefore, they are generally not in conformity with the strict dictates of the German Beer Purity Law, the Reinheitsgebot. The best known of these old-style German sour beers is probably Berliner weisse, which the iconoclastic Belgian brewing scientist Jean de Clerck — in Volume I of his seminal work *Cours de brasserie* (Text Book of Brewing); Louvain, Belgium, 1948 — once likened to a witbier/bière blanche . . . even though a Berliner weisse contains neither coriander nor orange peel. Other beers in the German sour category include Leipziger Gose, Broyhan, and Lichtenhainer. As a stand-in for this category of heirloom German funk beers, let's take a closer look at the archetype of them all, the tart and spritzy Berliner weisse.

Getting to Know a Sour Berliner

Berliner weisse is a crisp, highly effervescent, and dry brew — a favored summer drink of many Berliners. It is served in elegant, bowl-shaped chalices that are about double the volume of the beer that is poured into them. This allows for enough head space for the huge head of foam to develop and stay inside the glass. The Berliner weisse's sparkling fizz moved Napoleon to dub the brew *le Champagne du nord* (the champagne of the north) in 1806. At that time, *l'Empereur* and his *Grand Armée* occupied Berlin after winning a victory over the Prussians at the Battles of Jena and Auerstedt. More down-to-earth Berliners, however, just called their beer "the workers' sparkling wine."

In times past, Berliner weisse was made within an extremely wide range of strengths, which some sources suggest could vary from perhaps 2% to 9% alcohol by volume (ABV). Any imbibers who needed more oomph fortified their weisse with a shot of caraway schnapps for a truly hearty concoction. Nowadays, however, the alcohol level of a typical Berliner weisse is more in the vicinity of 2.5% to 3.2% ABV. To ameliorate the brew's exceptionally dry finish, Berliners rarely drink it straight. However, the schnapps has been replaced by sweet syrups — usually flavored with red raspberry, green woodruff, or black currant. This practice is called *mit Schuss*, that is, "with a shot." While raspberry and black currant syrups tend to be readily available in North America, woodruff syrup can usually be found only in specialty food stores or online. Some homebrew shops may carry it as well. (Read about making your own flavor syrups in this issue on page 50.)

To serve a weisse *mit Schuss*, pour the syrup into the glass first, and then mix the Berliner weisse with it. The Berliner-Kindl-Schultheiss brewing group now offers a line of pasteurized Berliner weisse beers, in which the raspberry, woodruff, or black currant syrup is already added at the brewery. This group also offers a pasteurized version of the brew without syrup. I have tried them all and found that these "modified" industrial renditions have less character than the old-fashioned varieties. Berliner weisse has an incredible keeping quality, because of its high acidity (a pH-value of 3.2 to 3.4). In a cool and dark place, it can be stored for up to five years without suffering a loss in drinkability. Berliner weisse is best when it is served at a temperature of 46–50 °F (8–10 °C).

A Brew with an Uncertain Past

It is not entirely clear if Berliner weisse originated in the city of Berlin or was brought there by others. Because wheat beers were particularly popular in the High Middle Ages in Bohemia, an area slightly to the southeast of Berlin and now part of the Czech

Photo by Charles A. Parker/Images Plus

Berliner weisse is often served with a bit of sweet syrup, known as *mit Schuss* — German for "with a shot." When ordering a Berliner you may be asked, "*rot oder grün*?" (red or green?).

Republic, there is speculation that the Berliner weisse — as well as the Bavarian hefeweizen — are modern off-shoots of Bohemian beers that migrated into German-speaking territory. Other historians maintain that the beer was started in Berlin in the late-17th century by Protestant French Huguenots who had escaped religious persecution by the Catholic Sun King Louis XIV. It is true that many breweries in those days were owned by French immigrants, which is why the local beer was also often referred to as Huguenot beer. However, these enterprising Protestants most likely merely joined the weisse brewing trade rather than invented it. One key support for this theory is a remark by a Berliner physician named Johann Sigismund Elsholtz, who, in 1682, wrote a treatise on the health benefits of different foods, entitled *Diaeteticon*, in which he mentioned Berliner weisse as a beer worth brewing.

The early Berliner brew was almost certainly very different from our modern Berliner weisse. In the small brew houses of the day, the wort was prepared with only a little hops and then, on the first day, drained into a cool ship; pitched with yeast on the second day; fermented on the third day; and racked into casks on the fourth day when it was taken to a pub for immediate consumption. This beer did not keep long and, because of the cask's micro-flora, definitely turned lactic, probably even vinegary, after just a few days.

Berliner weisse as an heirloom beer style was around well before glass beer bottles came into wide use in the late 1800s. If not sold in casks, therefore, the effervescent Berliner brew was traditionally sold re-fermented in earthenware crocks that were closed with string-fastened cork stoppers to contain the beer's powerful carbonation. The crocks were often buried in sand for three weeks to three months to keep the temperature constant during the beer's maturation. The sand would also contain any chard shrapnel if a crock exploded from overpressure.

A Standard Berliner Weisse Brewhouse Process

Both the grain bill of a Berliner weisse and the brewhouse process are fairly simple: Mix top-quality pale barley malt with pale wheat malt, whereby the amount of wheat should be less than that of a typical hefeweizen, but more than that of a typical American pub wheat. A modern industrial Berliner weisse usually has about 25% to 30% pale wheat malt, even though in the old days, the wheat portion may have been as much as 70%. A good compromise between an old-fashioned and a current commercial weisse mash is a ratio of 60/40 between pale barley and pale wheat malt. While the malts are always pale nowadays, centuries ago, they were more likely a shade of brown. There are also hints that, until about the middle of the 1800s, the Berliner weisse grist was slightly smoky. Today, however, there is no trace of smoke in the brew.

The barley base malt used in my recipe (on page 47) is a typical Pilsner malt with an SRM of 1.7–2.4 °L. For a super-blond weisse, you could use an extra pale Pilsner malt with a very low SRM of 1.2–1.4 °L. On the other hand, if you prefer a slightly darker shade of pale, you can use a pale ale malt with an SRM of perhaps 2.5–3.5 °L. Alternatively, for an earthier, more traditional flavor, you could use a floor-malted Pilsner malt with an SRM of 1.6–2.3 °L. The pale wheat malt used here has an SRM of about 1.7–2.4 °L. Specialty malts are not required in this brew, and the recipe in this article does not contain any. However, if you wish to give your weisse just a touch more mouthfeel and deeper golden color, you can replace about 3 percentage-points of the pale barley malt with Weyermann Caraamber® with an SRM of 23–31 °L.

Like most German beers, Berliner weisse used to be decoction-mashed, but today a multi-step infusion is more common. Start with a mash-in at 122 °F (50 °C) and finish with a mash-out at 172 °F (78 °C). For proper conversion of all grain compounds, give the mash four rests of 20 minutes each, at 122 °F (50 °C), 144 °F (62 °C), 149 °F (65 °C), and 162 °F (72 °C). Finally, heat the mash to 172 °F (78 °C). Recirculate the first runnings until they run clear. Add bittering hops into the empty kettle in the manner of English first-wort hopping and lauter the wort into the kettle. Stop the run-off when the kettle gravity is roughly at OG 1.028 (7 °P). A traditional Berliner weisse wort is boiled only very briefly

by our standards, about 20 minutes, which is just long enough to sterilize it and to drive off undesirable volatiles, but not long enough to achieve maximum isomerization of alpha-acids and thus hop utilization.

Extract brewers can simply replace the all-grain mash with any unhopped commercial Bavarian weissbier/hefeweizen extract, because such extracts are made mostly from a mix of Pilsner and pale wheat malts. Boil the extract briefly, for 20 minutes, with the hops. For the rest of the procedure, just follow the all-grain instructions.

After the boil, compensate for any evaporation losses by adjusting the net kettle volume for an original gravity of 1.030 (7.5 °P). Rest the hot wort or whirlpool it for 20 minutes for trub sedimentation. Then heat-exchange it to the bottom value of the yeast's activity temperature range (usually around 0 °F or 16 °C). Before pitching the yeast, divert about 2 quarts (roughly 2 liters) of the cooled wort into a sterile container to make a starter for the bacteria; and draw another 2 quarts and refrigerate or freeze this amount as kräusen for later bottle-conditioning. You can skip the kräusen collection if you plan to make a low-gravity, mildly hopped pale brew on bottling day and use part of that wort as kräusen, or if you prefer to prime the brew with corn sugar, instead of kräusen. Alternatively, you can simply carbonate the finished brew with CO_2.

Berliner Weisse Fermentation

Berliner weisse is fermented with both yeast and bacteria, whereby the yeast can be any number of top-fermenting strains. Michael Dawson, Brand Manager for Wyeast Laboratories Inc. says that Wyeast recommends their 1007 (German Ale) strain specifically because of its lower rate of fermentation (which is friendlier to *Lactobacillus*) and its tolerance to low pH. He also reports that Berliner weisse trials with other strains inhibited *Lacto* and resulted in higher finishing pH. However, do not use weissbier yeasts, because the clove, banana, and bubblegum compounds that such strains put into a

Basic Berliner Weisse
(5 gallons/19 L, all-grain)

OG = 1.030 FG = 1.006
IBU = 5 SRM = 3 ABV = 3.2%

Ingredients

3.7 lbs. (1.7 kg) Pilsner malt (2 °L)
2.4 lbs. (1.1 kg) pale wheat malt (2 °L)
2.1 AAU Hallertauer Mittelfrüh hops (FWH) (0.5 oz./14 g at 4.25% alpha acids)
Wyeast 1007 (German Ale) or White Labs WLP036 (Düsseldorf Alt) yeast
Wyeast 5335 (*Lactobacillus*) bacteria
Wyeast 5526 (*Brettanomyces lambicus*) yeast
⅝ cup of corn sugar or 0.5 gal. (2 L) of kräusen (for priming)

Step by Step

This is a multi-step mash. Start with a mash-in at 122 °F (50 °C) and finish with a mash-out at 172 °F (78 °C). Give the mash four rests of 20 minutes each, at 122 °F (50 °C), 144 °F (62 °C), 149 °F (65 °C), and 162 °F (72 °C). Finally, heat the mash to 172 °F (78 °C). Recirculate the first runnings until they run clear. Add bittering hops into the empty kettle in the manner of English first-wort hopping and lauter the wort into the kettle. Stop the run-off when the gravity of the wort in the kettle is 1.028. Boil for 20 minutes.

After the boil, adjust the net kettle volume for an original gravity of 1.030. Rest the hot wort or whirlpool it for 20 minutes for trub sedimentation. Then rapidly chill the wort to the bottom value of the yeast's activity temperature range (usually around 60 °F/16 °C). Before pitching the brewer's yeast, divert about 2 quarts (2 L) of the cooled wort into a sterile container to make a starter for the bacteria; and draw another 2 quarts (2 L) and refrigerate or freeze this amount as kräusen for later bottle-conditioning. You can skip the kräusen collection if you plan to make a low-gravity, mildly hopped pale brew on bottling day and use part of that wort as kräusen, or if you prefer to prime the brew with corn sugar, instead of kräusen.

Pitch the yeast and ferment at 60 °F (16 °C). Add the Wyeast 5335 (*Lactobacillus*) and Wyeast 5526 (*Brettanomyces lambicus*) hours (or even a day or two) after primary fermentation has taken off. Ferment the beer for four to six days and rack it into a secondary fermenter. For a less lactic beer, stop the secondary fermentation by cooling the beer to 50 °F (10 °C) or below for two days. Rack again and allow the brew to warm up to room temperature. For a more lactic brew, skip the temperature drop and maintain the temperature at 60 °F (16 °C). Secondary fermentation should take roughly three weeks.

Bottle or keg as normal, carbonating to roughly 3 volumes of CO_2.

Basic Berliner Weisse
(5 gallons/19 L, extract only)

OG = 1.030 FG = 1.006
IBU = 5 SRM = 3 ABV = 3.2%

Ingredients

3.3 lbs. (1.5 kg) liquid Bavarian wheat malt extract
0.75 lbs. (0.34 kg) dried Bavarian wheat malt extract
2.1 AAU Hallertauer Mittelfrüh hops (FWH) (0.5 oz./14 g at 4.25% alpha acids)
Wyeast 1007 (German Ale) or White Labs WLP036 (Düsseldorf Alt) yeast
Wyeast 5335 (*Lactobacillus*) bacteria
Wyeast 5526 (*Brettanomyces lambicus*) yeast
⅝ cup of corn sugar or 0.5 gal. (2 L) of kräusen (for priming)

Step by Step

Heat 5 gallons (19 L) water in your kettle. When temperature rises to 180 °F (78 °C), remove the kettle from heat and add the extract and hops. Stir until all the extract has dissolved and return the kettle to heat. Boil for 20 minutes. Follow the remainder of the all-grain recipe.

Bavarian top-fermented wheat brew have no place in a crisp-tasting Berliner wheat brew. As for the bacteria, there is some disagreement as to what may or may not go into a Berliner weisse — or into any other German sour ale. However, this ambiguity makes sense, considering that, in the old days, when all inoculations of fermentable liquids were still largely uncontrolled, the micro-flora that was likely to take up a spontaneous residence in a brew was probably a variable mixture of microbes. It is also probable that this mixture was different from one brewery to the next, which gave every Berliner weisse a house character.

Among the most likely bacteria in the brew were some strains of *Brettanomyces* as well as a local *Lactobacillus* strain now called *Lactobacillus delbrueckii*, subspecies *bulgaricus*. This Berliner weisse-specific *Lactobacillus* is named after its discoverer, the biochemist and 1969 Nobel laureate in medicine, Max Emil Julius Delbrück, who isolated it in the 1930s, while he was the head of the *Berlin Institut für Gärungsgewerbe* (Institute for the Fermentation Trade). Professor Delbrück ran the Institute from 1932 until he migrated to the United States, in 1937.

One of the tricks for managing the fermentation of an only mildly lactic beer with funk, such as that of a Berliner weisse, is to ensure that the pitched brewers yeast gets a solid head start. Otherwise, any of the much more aggressive bacteria and wild yeasts will muscle our friend *Saccharomyces cerevisiae* out of contention in the struggle for nutritious saccharides. German sour brews, unlike Belgian lambics and red ales, should not be severely mouth puckering. Instead, their tartness tends to be more restrained, with maltiness and acidity in a pleasing balance. Thus, it is best to pitch the "funk" starter a few hours (or even a few days) after the yeast has commenced its vigorous primary fermentation. Some brewers even pitch the bacteria only after primary fermentation is complete and virtually the only saccharides left are the large-molecular ones, which yeast, especially ale yeasts, cannot metabolize, but bacteria can. Other authors recommend a pitching ratio between bacteria and *Saccharomyces* of 3:1 and 5:1, with simultaneous pitching right after the heat-exchange, to give the yeast the same fermentation advantage as a delayed bacteria pitching. No matter when you add the souring agents, they will eventually scrub the brew clean of whatever sugars the yeast has missed, and make the brew very dry.

As a general rule, the later the bacteria are introduced for feeding on wort sugars (or the lower the ratio of bacteria to yeast cells), the higher will be the finished beer's alcohol content, produced by the yeast, and the lower will be its lactic content. Another way to slow down the sour-making bacterial metabolism, while aiding the alcohol-making yeast metabolism, is to keep the fermentation temperature close to 60 °F (16 °C). This is because microbes like *Lactobacillus* have a preferred activity range of about 60 °F to 90 °F (16 °C to 32 °C), while most ale yeasts, especially altbier yeasts, are much less sensitive to cool temperatures. However, do not reduce the fermentation temperature below 50 °F (10 °C), because this is the threshold when *Lactobacillus* start to become inactive.

It follows from the above that there is no single regimen for turning a Berliner wort into a beer. Much depends on how lactic a beer you wish to obtain in the end. Ferment the brew about four to six days and rack it into a secondary fermenter. If you wish to stop the lactic fermentation at this point, reduce the temperature to 50 °F (10 °C) or below and hold the brew at that temperature for about two days to kill the bacteria. Rack again and allow the brew to warm up to room temperature. The yeast will still be active. For a more lactic brew, omit the temperature drop and simply keep the brew at 60 °F (16 °C) throughout, for perhaps three weeks total. In the end, because of the combination of yeast and bacterial fermentations, a Berliner weisse will always finish without any residual sweetness, and at a final gravity that is

New World Berliner Weisse Commercial Examples

Berliner Braun
Jack's Abby Brewing
Framingham, Massachusetts
www.jacksabbybrewing.com

Bonnie The Rare
Jester King Brewery
Austin, Texas
www.jesterkingbrewery.com

Festina Pêche
Dogfish Head Craft Brewery
Milton, Delaware
www.dogfish.com

Framboise Du Nord
August Schell Brewing Company
New Ulm, Minnesota
www.schellsbrewery.com

Guava Berliner Weisse
Cigar City Brewing
Tampa, Florida
www.cigarcitybrewing.com

Hottenroth Berliner Weisse
The Bruery
Placentia, California
www.thebruery.com

Justin Blåbær
Evil Twin Brewing
København, Denmark
www.eviltwin.dk

Leuven
Funkwerks
Fort Collins, Colorado
www.funkwerks.com

Peach Berliner Weisse
Perennial Artisan Ales
Saint Louis, Missouri
www.perennialbeer.com

Solstice D'été Aux Framboises
Brasserie Dieu Du Ciel
Montréal, Quebec
www.dieuduciel.com

Tartuffe
Heretic Brewing Company
Fairfield, California
www.hereticbrewing.com

likely to be in the range of FG 1.006 to 1.008 (1.5 °P to 2 °P), or even less. Now add the optional kräusen or any other priming agent you wish. Then bottle or keg the finished beer immediately. Condition the primed brew at approximately 60 °F (16 °C) for 4 weeks to three months. Alternatively, if you prefer to adjust the beer's carbonation with CO_2, the recommended target for a Berliner weisse is roughly 3 volumes of CO_2 (6 g/L of CO_2).

Now Let the Fun Begin

Now that we understand the foundation recipe for a Berliner weisse, let's inject some New World experimentation into it. Sure, we can drink the Berliner weisse straight, as was the custom in years past, or we can infuse it in the glass, *mit Schuss*, with any number of flavors, from the classic raspberry, woodruff, and black currant syrups to perhaps interesting liqueurs and cordials such as crème de cassis, crème de cacao, crème de menthe, orange liqueurs, coffee liqueurs, dry and sweet vermouth, Irish cream, or herb liqueurs. Or you can make your own flavor syrups at home by following the information in the story in this issue on page 50. There is also the option of fortifying it with a shot of gin or aquavit.

One thing, however, we cannot do is turn a Berliner weisse into a hop bomb. Lactic acid bacteria are highly sensitive to alpha acids and will therefore not do their jobs in worts that contain more than 10 IBU. You could make a hoppy Berliner weiss using hop extracts post fermentation, but the beer will be both bitter and sour.

One of the hints from old texts suggests that some past Berliner beers might have been made with a small addition of oats — malted or not. Compared to other grains, oats have a relatively high percentage of protein, lipids, and beta-glucans. Therefore, replacing about five percentage points of the pale barley malt with oats, oat flakes, or oat malt would give the prickly-effervescent Berliner weisse a smoother texture, similar to the way oats can add balance to the roastiness of an oatmeal stout. Another variation would be the replacement of some of the barley malt with up to 30% rye malt. This would give the finished beer more mouthfeel, some fruitiness, a pronounced breadiness, and a slightly viniferous taste element.

For other variations on the Berliner weisse theme, we can look to other German heirloom sour beers, such as Gose and Lichtenhainer. Lichtenhainer is partially made with smoked malt. For a slight smokiness, you can replace up to 20 percentage points of the barley malt with something like Weyermann's beech wood-smoked barley malt (Rauchmalz); and the pale wheat malt with up to 10 percentage points of Weyermann oak-smoked wheat malt. The all-barley-malt sour Gose is flavored with coriander and salt, which could be an interesting flavor twist in a Berliner weisse, too. Simply suspend about 1 oz. (roughly 25 g) of finely ground coriander plus 0.75 oz. (approx. 20 g) of sea salt per 5-gallon (19-liter) batch in a bag into the boiling wort, about 5 minutes before shutdown. Alternatively, following up on de Clerck's observation, we can replace the salt in the bag with a few grams (perhaps 1 teaspoon to 1 tablespoon) of dried orange Curaçao peel for a lovely hint of spice and citrus, reminiscent of a witbier.

Then there is the possibility of adding a background (perhaps 3 to 4 cups for a 5-gallon or 19-L batch) of puréed or macerated fruit during primary fermentation. Fruit options are cranberries, currants (red or black), elderberries, mango, passion fruit, pomegranates, or watermelon (without the bitter rind). One tip: Most fruits contain high levels of pectin and should, therefore, not be boiled in the kettle. The high heat would cause the pectin to dissolve into the wort.

Finally, the modern Berliner weisse is a low-alcohol beer . . . but is does not have to be. Would it not be fun to try a "Berliner Weisse Wine?" Let your imagination run wild, mash a Berliner weisse grist until your mash tun almost overflows. Then process the high-gravity wort like a hefty barleywine, with yeast and bacteria, but don't forget to be gentle on the hops! BYO

As mentioned in this issue on page 45 of Horst Dornbusch's story, Berliner weisse is a style of beer that is frequently sweetened in the glass with a dash of flavored syrup, which is known as "with a shot," or "*mit Schuss*" in German.

Adding a flavor syrup to Berliner weisse is a German way of lightening up and sweetening the sour beer while also getting around the

Making Flavored Syrups

Photos by Tori Avey, toriavey.com

Reinheitsgebot, which prohibited adding fruit during the brewing process. New World Berliner weisse does not need to adhere to the Reinheitsgebot and can include fruit and other flavors in the brewing process, but it's still fairly common to be offered a shot of flavor syrup when ordering a Berliner at any New-World watering hole.

The most common (and traditional) flavors for these syrups include woodruff, raspberry, and sometimes black currant. If you've seen a beer with a shot of woodruff syrup in it, you'll probably recognize the distinctive bright green of the food coloring often used in the syrup (see a photo on page 46 of this issue). In fact, when you order a Berliner weisse in Germany you will probably be asked if you want red or green — "*rot oder grün*." You can sometimes find woodruff syrup (as well as raspberry and sometimes black currant) in specialty food stores, online and in some homebrew shops — but that's not the DIY spirit, is it? Making your own flavor syrups is very easy, and you can experiment with lots of different flavors — both traditional and offbeat — at home.

Choosing a Flavor

Woodruff is the classic green-colored flavor syrup for Berliner weisse. Woodruff syrup, aka

Top: Flavor syrups can be made from fresh fruit, herbs, tea — you are limited by only your imagination and what flavors you can source.

Middle top: Homemade flavor syrups are made using a simple syrup base, which is a boiled mixture of water and sugar.

Middle bottom: Once the simple sugar is boiled, your flavoring agent is steeped until the syrup has the flavor strength you desire.

Bottom: Once you have reached the flavor you want, the syrup is either separated from the solids, or can be pureed, before using.

by **Betsy Parks**

Waldmeistersirup, is so popular in Germany that it is used not only for beer but also poured over pancakes, on ice cream and added to cocktails and soft drinks. Making woodruff syrup at home can be a challenge if you want to buy the woodruff, as it's not readily available from the grocery store or many specialty food suppliers. The good news is that if you like to garden (or have a friend who does), it's very easy to grow. In fact, many people plant it as a hardy groundcover (and it can take over a garden if not kept in check). Plant a small patch of woodruff this spring and you can make a batch of syrup by June.

If woodruff isn't your thing, however, raspberries also make good flavor syrups, and they are readily available at the supermarket and at farmer's markets in season. Black currants are not as common, but are not impossible to find. And, like woodruff, you can also grow both types of berries at home.

But why stop at three flavors? Jill Ramseier, Executive Chef at the Deschutes Brewery's Portland Public House in Oregon, makes a lot of offbeat flavor syrups for the brewery's Berliner weisse. She draws inspiration for flavors based on what she can source locally or in season. Some of her favorite flavors include a marionberry and thyme combo, and a wild raspberry with lemon balm mix. She's also worked with huckleberries, blueberries, basil, lemon verbena, plums, orange blossoms with green tea, and even stinging nettles (just to name a few). She says that any interesting flavor might make a good syrup — you're only limited by the fruits, herbs or other ingredients you can get your hands on. (TV watchers may have seen Ramseier's syrups featured on the "Portland" episode of the "Brew Dogs" show, which airs on Esquire. Watch a clip of the show at http://tv.esquire.com/shows/brew-dogs.)

Procedure

Making a fresh flavor syrup is not terribly complicated, and there are many variations on recipes. Ramseier has two basic recipe methods for making a flavor syrup using a simple syrup (boiled sugar and water) base: One for fruits and berries that are juicy, and another for things that aren't juicy, such as herbs or tea. The difference is simply more or less water depending on the fruit or herb you are working with. Both recipes involve steeping the fruit, herb, tea or other flavoring, which can be done from a few hours to a few days. For example, woodruff syrups are often steeped for four or five days, while tea might be steeped only for a few hours. Be sure you steep the flavoring agent long enough for the flavor to come through when you mix it with the beer.

Keep color in mind when you are making a syrup. The color and flavor should be in proportion. For example, a blueberry syrup can look hot pink, and that might not be what you want in your beer. However, it is always good to have a bit of color so that you don't end up overdosing your beer if you add syrup by eyeballing the amount. If you are making a traditional woodruff syrup, if you would like you can add a few drops of green food coloring like the Germans do as otherwise it will normally be a light brown color as a finished product. Also, a bit of fresh lemon juice is often added to woodruff syrup to brighten up the herbal flavor; you can experiment with adding a squeeze up to a ¼ cup to taste, depending on your batch size.

When making a syrup remember to be extra careful during the boil as sugar boils at a hotter temperature than water. Also, don't over boil your syrup; if you boil the syrup too long it will reduce and the flavor will concentrate. Sometimes fruits like berries don't have as much water in them as you think they do and the syrup can be too thick. If you add a drop of your syrup into a beer and it goes straight down to the bottom, it is too thick — you want it to mix with the beer. If the finished syrup seems too thick you can add more water to thin it out.

For making a flavor syrup with "juicy" fruit:

Ingredients

2 cups white sugar
1 cup water
3 cups juicy fruit (berries and other fruits)

Step by Step

Bring the sugar, water and fruit mixture to a boil in a saucepan. You can chop or mash the fruit if you would like more flavor and color. Turn off the heat and steep. You can steep anywhere from an hour or two up to a couple of days depending on your flavor ingredient. When you have achieved the flavor you desire, you can use a strainer to separate the liquid from the solids, pushing the solids against the screen for more flavor. Or, you can puree the mixture, which will create a syrup with stronger color and more flavor (but will also create a thicker syrup that may need more water to thin it out).

For making a flavor syrup with non-juicy ingredients:

Ingredients

2 cups white sugar
2 cups water
1 cup chopped herbs or other flavor element (such as woodruff, loose-leaf tea, lemongrass, etc.)

Step by Step

Bring the sugar and water to a boil. Turn off the heat, add the herbs, and steep. You can steep anywhere from an hour or two up to a couple of days depending on your flavor ingredient; for example, woodruff syrup is often steeped for four or five days. When you have achieved the flavor profile you desire, use a strainer to separate the solids from the liquid.

Using Flavor Syrups

To add flavor syrup to your weisse *mit Schuss*, pour a dash of the syrup into the glass first, and then mix the Berliner weisse with it. Add more syrup or beer to taste.

Homemade flavor syrups are also great for pouring over desserts, adding to soft drinks like soda, seltzer or lemonade, and are of course great mixed with cocktails. Try mixing a dash of your homemade woodruff syrup with vodka, soda, and Rose's lime juice. Or, try adding a dash of homemade raspberry syrup to a Manhattan for something a little nontraditional. BYO

BLENDING SOUR BEERS with the SOLERA METHOD

The primary obstacle to dependable home production of perfectly balanced sour beers is limited blending options. Craft brewers capitalize on their size to fill many barrels; they taste and combine these components, allowing them to achieve a beer with their ideal amount of acidity, fruitiness, oakiness, and funky *Brettanomyces* aromatics. Few homebrewers have the fermenter space to replicate this. Fortunately, the solera method can achieve consistently delicious results using far fewer fermenters.

> Rather than blending to taste at bottling, a solera relies on mixing beers of multiple ages together during aging.

Rather than blending to taste at bottling, a solera relies on mixing beers of multiple ages together during aging. When a portion is removed for packaging, the volume is replaced with younger beer. The younger beer can be unfermented, fermented, or even soured. In this way, the solera slowly evolves.

While barrels are the traditional vessel for soleras, glass or plastic carboys and Cornelius kegs are options as well (with or without adding oak cubes or chips) for small-scale brewers. The risk of a poorly sealed lid on a plastic bucket is too great for me to recommend them for long-term aging.

by **Michael Tonsmeire**

The barrels that make up the solera system at Perennial Artisan Ales in St. Louis, Missouri. The solera method is a way of barrel aging beer where each year a portion of the aged beer in the barrel is removed and replaced with fresh beer.

Photos courtesy of Perennial Artisan Ales

Perennial's solera beers are fermented with *Brettanomyces* in Vignoles wine barrels.

> The payoff for the relatively modest effort of maintaining two soleras is a case of eight different beers for each of us every year.

Technically, the word "solera" only refers to the oldest vessels, while "criadera" (nursery) is the collective name for the younger vessels waiting to refill the solera. If you do not have room for multiple levels, beer from a single vessel can be packaged and then the vessel refilled with fresh beer or wort.

While the solera method is closely associated with the artisanal production of balsamic vinegar and Jerez Sherry, don't be intimidated! The same concept is at work at the Tootsie Rolls® factory. A portion of each batch of candy is kept in reserve, to be blended into the subsequent batch of candy (www.tootsie.com/products.php?pid=165). Whatever the product, blending in this way improves consistency by flattening variations in the production process and ingredients.

The blend's average age in years will converge on the inverse fraction of the beer added each year to the total volume. The amount to pay attention to is the new beer added to the fermenter, rather than the amount drawn out for packaging. For example, if you replace half of the beer once per year, the average age at each pull will eventually converge on two years. The same is true if you replace a quarter of the beer twice a year; what matters is the total amount replaced, not the timing. An average age of between one-and-a-half and three years would be a good initial target, but let your palate guide you to what works for your beer and microbes. I created a spreadsheet that calculates soleras' average ages; it is available to download at: http://www.archive.org/details/SoleraAgingSpreadsheet.

Solera is a more organic way to blend beers, but at its core the process reduces a brewer's ability to fine-tune. As a result it may not produce beer as perfectly balanced as traditional blending, but it is much easier and allows for more regular packaging of blended beer. Blending multiple beers together at bottling can result in excess carbonation caused by microbes from one component fermenting residual carbohydrates contributed by another; soleras do not require this consideration.

Solera Barrel at Home

Nathan Zeender, Head Brewer at Right Proper Brewing Company in Washington, DC, and I share two homebrew solera barrels in my basement. A red wine barrel holds a pale lambic-inspired beer and an apple brandy barrel is filled with an orange-hued beer that bears maltiness reminiscent of a Flemish red. The microbes working in each barrel are Bugfarm cultures from East Coast Yeast.

Solera appealed to us because neither had a need for 30 gallons (114 L) of sour beer from each barrel in addition to our other batches. The solera method also means that we do not need to scramble to completely refill the entire volume of a barrel each time, making it an ideal method for homebrewers aging beer in wine or spirit barrels several times larger than their batch volume.

Once a year we pull out 20 gallons

Jonathan Moxey works with the barrels in Perennial Artisan Ale's solera system.

(76 L), replacing it with 22-25 gallons (83-95 L) of wort or beer to account for evaporation. We bottle 5 gallons (19 L) of each pull as is, and use the remainder for three experiments with fruits, spices, flowers, dry hops, and blending. Our favorites so far have been: Dry hopped with citrusy hops (i.e., Nelson Sauvin, Mosaic™, and Citra®), infused with Cabernet Sauvignon wine grapes, and straight-up. The payoff for the relatively modest effort of maintaining two soleras is a case of eight different beers for each of us every year.

All About Consistency

On the unique and ever-changing tap list at Cambridge Brewing Co. in Massachusetts, the most interesting beer process-wise is probably Cerise Cassée. It is brewed with the most authentic solera at any brewery of which I am aware. First brewed in 2004 by Brewmaster Will Meyers, this sour brown ale is fermented on cherries in three sets of five wine barrels. It is easiest to explain the process setup if I start at the end; when the beer in the oldest set of barrels is ready to package, a portion is drawn out from each, and blended in a serving tank. Beer from the middle-aged barrels is then transferred to refill the older barrels and beer from the youngest barrels refills the middle barrels in turn. This leaves empty space in the youngest barrels that is replenished with chilled and aerated wort mixed with 100% sour cherry concentrate.

Once the barrels are again full, they are allowed to ferment until the oldest barrels' contents are ready for the process to be repeated. The beer is fermented by only the microbes now resident in each barrel. Cerise Cassée is worth the effort, with dark fruit flavors galore in addition to the bright sour cherry, a slight acetic bite, and faint yeastiness. Meyers' article "La Método Solera," from *The New Brewer* July/August 2010, is an insightful look at the complete process.

Breweries that age their sour beers in foeders (mammoth vertical oak tanks), like New Belgium Brewing Co. in Fort Collins, Colorado, rarely drain their foeders completely for cleaning. When the brewers at New Belgium blend beer from several foeders to create their flagship sour brown ale, La Folie, at least 10% of the beer is left in each to ensure a vibrant microbial culture. Wort production for the sour beers is squeezed into the tight production schedule of their main brewhouse. To reduce delays in refilling the foeders, they keep a tank filled with the dark base beer (Oscar). While this exact issue does not encumber homebrewers, many of us cannot always brew a batch on short notice. If you keep beer on hand in a carboy it is easy to top-off a solera, or refill when it is time to keg or bottle.

If your goal is consistency, you may need to adjust the base wort/beer from fill-to-fill. The acidity expressed by our apple brandy barrel-aged solera

Photo courtesy of Cambridge Brewing Company

Cerise Cassée from Cambridge Brewing Co. (left) is is fermented on cherries in three sets of five wine barrels and fermented by only the microbes that are resident in each barrel.

was close to excessive already at the first pull. To help counter this, we mashed the replacement beer a few degrees cooler, and fermented with highly attenuative brewer's yeast in carboys, rather than refilling the barrel with wort. Conversely, if the beer is not sour enough, feed the solera with wort high in complex carbohydrates (e.g., use a hotter saccharification rest, or add maltodextrin) to provide more molecules unfermentable to brewer's yeast, but fermentable by lactic acid bacteria. If you allow the solera to age more than a year between pulls and plan to refill with wort, you should add fresh brewer's yeast along with it to ensure there are enough viable cells to complete the initial fermentation.

Rather than rely on a solera for the entire fermentation for their Gose, Troublesome, Off Color Brewing in Chicago, Illinois blends a clean base with 16-18% highly-acidic beer from a solera. The two solera tanks are held at 114 °F (46 °C), with 85% of the 2.9-2.95 pH beer pulled approximately once every two weeks. The fermentation is completed entirely by *Lactobacillus*, which produces lactic acid incredibly rapidly when held at such a high temperature. The acid beer removed from the solera is pasteurized and then combined with the remainder of the batch. The brewers allow time for the brewer's yeast to clean up the fermentables and flavors contributed by the acid beer before bottling. After each pull, the solera tanks are refilled with unhopped 1.020 specific gravity wort produced from Pilsner malt and wheat. Co-founder and Brewer John Laffler related, "The solera method lets us create a nice, consistent acid beer that shows both maturity from the older, longer fermented beer and a quick way to produce the organic acid we need for simple tartness." This method is a great alternative to sour mashes, which are less predictable and often also impart unappealing flavors in addition to acidity.

Consistent Inconsistency

While solera is a great method for improving consistency, that isn't always the goal. You do not need to refill the solera with the same (or even a similar) beer after each pull. Say you've grown bored of a few moderately hopped beers sitting in your kegerator: Combine them, and pitch a microbe blend or bottle dregs from a favorite sour or funky beer. Pull and replace from your new solera the next time you have extra beer you think would mesh with the current flavor profile.

St. Louis, Missouri-based Perennial Artisan Ales' anniversary ale, Anniversaria, is blended via solera. Their goal isn't to release the same beer each year, but as brewer Jonathan Moxey put it, "create a thread that will run through each year's

SOLERA RECIPES

Perennial Artisan Ales Anniversaria clone

(5 gallons/19 L, all-grain)

OG = 1.065 FG = 1.010
IBU = 19 SRM = 8 ABV = 7.6%

Ingredients

12 lbs. (5.4 kg) American pale malt
12 oz. (0.34 kg) Weyermann Abbey® malt (18 °L)
8 oz. (0.27 kg) biscuit malt
6 oz. (0.17 kg) Weyermann Carafoam® malt
5 AAU Nugget pellet hops (60 min.) (0.38 oz./11 g at 13.3% alpha acids)
0.6 oz. (17 g) Liberty pellet hops (0 min.)
White Labs WLP645 (*Brettanomyces claussenii*) yeast
White Labs WLP644 (*Brettanomyces bruxellensis* Trois) yeast

Step by Step

Single infusion mash at 152 °F (67 °C) for 60 minutes. Boil 60 minutes adding hops per schedule. Chill to 65 °F (18 °C), aerate the wort with filtered air or pure O_2 and pitch with a starter of the yeast. Ferment at 70 °F (21 °C) until the kräusen falls. Transfer to a white wine barrel for aging, or age in a secondary fermenter with 1 oz. (28 g) of white wine-soaked oak cubes. Once final gravity is stable, bottle or keg a portion of the batch aiming for 2.4 volumes of CO_2. Refill the barrel with wort or beer, repeating the process.

Perennial Artisan Ales Anniversaria clone

(5 gallons/19 L, partial mash)

OG = 1.065 FG = 1.010
IBU = 19 SRM = 8 ABV = 7.6%

Ingredients

6.6 lbs. (3 kg) light liquid malt extract
2.25 lbs. (1 kg) American pale malt
12 oz. (0.34 kg) Weyermann Abbey® malt (18 °L)
8 oz. (0.27 kg) biscuit malt
6 oz. (0.17 kg) Weyermann Carafoam® malt
5 AAU Nugget pellet hops (60 min.) (0.38 oz./11 g at 13.3% alpha acids)
0.6 oz. (17 g) Liberty pellet hops (0 min.)
White Labs WLP645 (*Brettanomyces claussenii*) yeast
White Labs WLP644 (*Brettanomyces bruxellensis* Trois) yeast

Step by Step

Place crushed grains in a large muslin bag. Heat 1.5 gallons (6 L) water to 165 °F (74 °C) and place the grain bag into the water. Mash the grains at 152 °F (67 °C) for 60 minutes. After 60 minutes, raise the temperature of the grain bed to 168 °F (76 °C) and hold for 5 minutes. Place the grain bag in a colander and rinse the grains with 1 gallon (4 L) hot water, about 170 °F (77 °C) collecting the runoff. Top off to 6 gallons (23 L) adding the extract. Boil 60 min. adding hops per schedule. Follow the rest of the all-grain recipe.

Perpetuum Sour

(5 gallons/19 L, all-grain)

OG = 1.058 FG = 1.002
IBU = 11 SRM = 4 ABV = 7.4%

Ingredients

5.25 lbs. (2.4 kg) German Pilsner malt
4.4 lbs. (2 kg) American pale malt
15 oz. (0.43 kg) rolled oats
13 oz. (0.37 kg) flaked wheat
10 oz. (0.28 kg) wheat malt
2.75 AAU Willamette whole hops (60 min.) (0.5 oz./14 g at 5.5% alpha acids)
East Coast Yeast ECY01 (BugFarm) or Wyeast 3278 (Belgian Lambic Blend) cultures

Step by Step

Mash at 156 °F (69 °C) for 60 min. then raise the temperature to 168 °F (76 °C) for 15 min. Boil 75 minutes adding hops per schedule. Chill to 65 °F (18 °C), aerate the wort with filtered air or pure O_2 and pitch yeast. Primary ferment in a red wine barrel at 68 °F (20 °C) or another fermenter with 1 oz. (28 g) of red wine-soaked oak cubes. Allow to age in the barrel or on the oak at around 70 °F (21 °C) until you are happy with the flavor, and the gravity readings remain stable from one month to the next. Bottle or keg a portion, carbonating to 2.5 volumes of CO_2. Refill the barrel wort or beer, repeating the process.

Perpetuum Sour

(5 gallons/19 L, partial mash)

OG = 1.058 FG = 1.002
IBU = 11 SRM = 4 ABV = 7.4%

Ingredients

3.3 lbs. (1.5 kg) light liquid malt extract
1.5 lbs. (0.68 kg) dried Pilsen malt extract
2 lbs. (0.91 kg) German Pilsner malt
15 oz. (0.43 kg) rolled oats
13 oz. (0.37 kg) flaked wheat
10 oz. (0.28 kg) wheat malt
2.75 AAU Willamette whole hops (60 min.) (0.5 oz./14 g at 5.5% alpha acids)
East Coast Yeast ECY01 (BugFarm) or Wyeast 3278 (Belgian Lambic Blend) cultures

Step by Step

Place crushed grains in a large muslin bag. Heat 2 gallons (7.6 L) water to 169 °F (76 °C) and place the grain bag into the water. Mash at 156 °F (69 °C) for 60 min., then raise the temperature to 168 °F (76 °C) for 15 min. Place the grain bag in a colander and rinse with 1.5 gallons (6 L) hot water, about 170 °F (77°C) collecting the runoff. Top off to 6.25 gallons (24 L) adding the dried and liquid extract while the pot is off heat to avoid scorching. Boil 75 minutes adding hops per schedule. Follow the remainder of the all-grain recipe.

release." Local wine barrels were initially filled with a 100% *Brettanomyces* fermented (*B. claussenii and B. Bruxellensis var. Drie*) variant of Aria, their flagship Belgian strong pale ale. After a year, the brewers pulled 40% of the beer for packaging, refilling the barrels with lower gravity spelt-containing wort from Head Brewer Cory King's side project, Side Project Brewing, which is also in St. Louis, Missouri.

Future pulls may be flavored with dry hops or fruit, but Moxey told me that this would always be done after the beer was removed from the solera because, "Once you put something in [the solera], you'll never get it 100% out." While dry hops can provide a wonderful citrusy or herbal counterpoint to sour beer, long exposure could lead to unwanted flavors.

Rather than a set of barrels, the brewers at Sante Adairius Rustic Ales in Capitola, California maintain their solera in a single 660-gallon (2,498-L) "oval" oak fermenter. The resulting beer is dubbed "Cask 200," a reference to the plaque that came affixed to it. As Co-Owner and Brewer Tim Clifford related, the solera concept was initially, "a pure logistical solution." Their brewing system produces only 200 gallons (757 L), so filling the entire vessel quickly after packaging would be difficult.

The brewers initially filled Cask 200 with a blend of saisons, and pitched their house souring microbes (*Lactobacillus* and *Brettanomyces*). The three refills since have each been with saison, but not the same recipe. The trend they have witnessed has been towards higher acidity. Far from being a problem, Clifford says that, "We want people to be able to taste the differences from batch to batch."

When to Reset

Sadly there comes a time for many soleras when a vessel needs to be drained completely. This can be taxing both mentally and physically. It is easy to become attached to the solera still containing some of the initial batch five or ten years later (after 10 pulls of 50%, less than 0.1% of the original fill remains). Physically, where are you

going to move so much beer? A few situations where the effort is justified include:

1. A fermenter needs to be replaced.
2. A large barrel needs to be moved.
3. Autolysis-related (meaty/rubbery) off-flavors.
4. Acetic acid (vinegar) or ethyl acetate (nail polish remover) aromatics.

Cambridge Brewing Co.'s barrel-fermentation for Cerise Cassée causes trub to slowly accumulate. Refilling with bright beer, for example, by fining, cold crashing, or filtering (in New Belgium's case), extends the time possible between cleanings. Meyers also blamed beerstone (calcium oxalate) accumulation on the oak for reducing its oxygen permeability, eventually killing aerobic microbes such as *Brettanomyces*.

Because of the way they were initially stacked, Meyers was unable to remove the Cerise Cassée barrels for cleaning. To remedy this, he blended the beer from the oldest barrels with stainless-steel fermented beer to balance its high acidity. He moved the beer from the younger barrels to a tank to allow him to clean and rearrange the barrels. Meyers then refilled the oldest barrels with the young beer in the tank, and finally refilled the younger barrels with fresh wort.

Conclusion

Depending on your choices, a solera is capable of either improving consistency or creating an ever-evolving unrepeatable blend. The same concept and techniques can be applied to non-sour beers as well (for example, Placentia, California-based The Bruery's anniversary strong ales — Papier, Coton, Cuir, Fruet, Bois), but requires heightened vigilance to sanitation as spoilage microbes can be introduced on any fill, ruining the solera. For more on the science, process, and artistry of sour beer production in America, read my newly-released book: *American Sour Beers: Innovative Techniques for Mixed Fermentations* (Brewers Publications 2014). BYO

by **Peter Symons**

HOPS DOWN UNDER

Hops have been grown in New Zealand and Australia since the early 19th century. Until the late 1950s, Australian beers mainly used English-bred Whitebine Grape, Kent Goldings and Fuggles from Tasmania, and American-bred Golden Clusters from Tasmania, Victoria, and the Nelson area of New Zealand.

New varieties of hops have been progressively developed in Australia and New Zealand over the years, however, in New Zealand, they have been developed mainly in response to solving the probem of black root rot affecting Clusters, as well as a growing need for more alpha-acid and seedless hops. The release in Australia of Pride of Ringwood (POR) in 1965 was, at that time, the highest alpha hop (~11%) in the world. It is considered to be the signature hop for Australian beers (see the article on Australian brewing in the March-April 2009 issue of *Brew Your Own* for more info about the Australian brewing scene), and is mainly used for bittering and imparts a distinctive earthy flavor.

Coming to the present time, Australian and New Zealand hops have continued to be bred for alpha. But as the market for hops is dominated by German and US growers, the local growers in Australia and New Zealand (a combined 2% share of the global market) have sought to differentiate themselves by producing high alpha hops but with distinctive flavors and aromas; i.e. not like US pale ales using piney and citrusy hops or British beers with earthy and floral hops.

This article will provide you with some insights into how some of the newer Australian and New Zealand hop varieties can be used to create your own distinctive beers. It draws on the experience of the hop growers and practical application by some leading craft brewers. The general characteristics of these newer hops are tropical fruit and, dependent on use, can lead to beers with very intense flavors.

Photo courtesy of New Zealand Hops

Photos courtesy of Hop Products Australia

> "As the market for hops is dominated by German and US growers, the local growers in Australia and New Zealand have sought to differentiate themselves by producing high alpha hops but with distinctive flavors and aromas."

Australian and New Zealand Hop Combinations to Try

Shawn Sherlock from Murray's Craft Brewing Co. in Port Stephens, New South Wales, Australia is a true believer in blending hops to give a unique complexity to a beer. The Murray's Angry Man IPA, for instance, brings together British and German malts, an assertive multistrain British yeast blend, along with a blend of Kiwi hops for a distinctive take on an IPA. Enjoy using and experimenting with these new distinctive Australian and New Zealand hop varieties to create unique flavors in your beers.

Australia Galaxy®	Summer	Summer in support of stronger flavored hops can fill in the flavor profile, can add apricot and fruit
Ella	Vic Secret	Careful not to overdo either hop in any one area of bittering/flavor/aroma
Galaxy®	Vic Secret	Complements Galaxy® with clean citrus and passionfruit
New Zealand Pacific Jade	Pacifica	The different flavor and aroma characters play well off each other
Rakau	Motueka	The different flavor and aroma characters play well off each other
Motueka	Pacifica	Late hopping, in boil, whirlpool and/or dry hop
Riwaka	Pacifica	Late hopping, in boil, whirlpool and/or dry hop
Motueka	Riwaka	Late hopping, in boil, whirlpool and/or dry hop

AUSTRALIA

Let's look at some recent new and noteworthy hop varieties from Australia first, from Hop Products Australia (HPA) a subsidiary of Barth-Hass, who have hop gardens at Bushy Park in the Derwent Valley in Tasmania, and Rostrevor in the Ovens Valley in North East Victoria. Owen Johnston from HPA was most helpful in the preparation of this article. Visit http://www.hops.com.au/pdf/hop-flavour-spectrum.pdf for a HPA Hop Flavour Spectrum chart, which gives a view of each variety.

The newer hops from Australia are: Ella (was Stella for a while but changed because of possible confusion with a certain Belgian lager), Summer, Galaxy®, Topaz, and Vic Secret, (not to be confused with Victoria's Secret, as this hop is named after the state of Victoria where it was bred, and it was an in-house HPA secret during its breeding program).

All of these hops have come through HPA's breeding program. So while parentage may have come from US or European land race varieties, e.g. Saaz, once crossed with other cultivars, the hops are now all distinctively Australian.

For hops of the same genetics, the effects of different microclimate,

Ella hops (above) are an Australian dual purpose variety that can display floral and spice notes in low doses and grapefruit and tropical flavors in higher doses. Originally named "Stella," the name of the hop was changed to prevent confusion with the beer Stella Artois.

length of daylight, and soils, combined with no diseases, and very limited problems with pests, means very robust and vigorous plants. So the crossing of known plants from HPA's large genetic catalog creates unknown unknowns, some of which may be selected for further development. The breeding program is a long process and may result in two or three new varieties in a decade. The hop breeder for HPA has a few of his own hectares set aside as a "skunkworks," which is sufficient to grow ~100 kg — enough for brewing trials before the fate of a hop is decided.

The new Enigma hop is an interesting case study, bred in part from a Swiss Tettnang, grows very robustly, which is strange considering where the hop has come from, with a flavor that is hard to pin down. With alpha acid around 13.5–16.5% and total hop oils of 2.4 to 3 mL/100 g, early indications are of a strawberry/red berry/red currant flavor. However, you should not hold your breath for supplies of Enigma to get to homebrewers as the 2014 crop will be released only to selected brewers for trials.

Here is a summary of some of the flavors that you can expect from these new Australian hops that you can get your hands on.

Ella: Dual purpose. Alpha acids: 13.3–16.3; Total oils (mL per 100 g): 2.4–3.4
In lower doses, Ella can display floral and subtle spice notes, such as star anise, which is best appreciated in lagers or Pilsners. With larger additions or when dry hopping, Ella imparts distinct grapefruit and tropical flavors which can be used to offset robust malt and yeast characters in many styles.

Galaxy®: Aroma. Alpha acids: 11–16; Total oils (mL per 100 g): 3.0–5.0
Galaxy® is used in Stone and Wood Brewing Co.'s Pacific Ale (Byron Bay, New South Wales), Bridge Road Brewers Galaxy® IPA (Beechworth, Victoria) and in numerous craft beers around the world. When used late in the kettle, the whirlpool, or for dry hopping, Galaxy® contributes a

> So the crossing of known plants from HPA's large genetic catalog creates unknown unknowns, some of which may be selected for further development.

pungent and striking flavor best described as a combination of passionfruit and citrus. The fruit characters are modulated by different hops, malts, yeasts and dosing, however a late addition of Galaxy® into the brew is always distinct.

Summer: Aroma. Alpha acids: 5.6–6.4; Total oils (mL per 100 g): 1.4–2.0
Summer is a hop variety formerly known as Summer Saaz. Compared to Galaxy® and Ella this hop is much more subtle; it's a gentler, floral aroma, slightly earthy. When used in dry hopping, expect distinctive apricot and stone fruit notes.

Vic Secret: Aroma. Alpha acids: 14.0–17.0; Total oils (mL per 100 g): 2.2–2.8
New in 2013, Vic Secret was destined for the chopping block from HPA's hop breeding program until it was featured in the Bridge Road Brewers 2011 Harvest Ale and turned out to have unexpected potential. Resinous, grassy and mild fruit flavors are characteristics of this hop variety. Whirlpool and dry hop additions of Vic Secret introduce appealing clean and distinct pineapple and pine characters to the beer. It is lighter and less dominant than Galaxy®.

Topaz: Dual purpose. Alpha acids: 13.7–17.7; Total oils (mL per 100g): 1.7–2.2
Dry hopping with Topaz can result in a beer with resinous, grassy flavors; however, with later additions and in higher gravity brews, light tropical fruit flavors (some say lychee) can become more pronounced.

Australian Hop Recipes

As to the way the hops perform in the brewery, we can take a tip from the way Bridge Road Brewers do it. Bridge Road has created a "Beer School Hop Pack" collection consisting of four IPA beers with the same malt recipe, brew schedule and yeast strain, with the same alcohol by volume (ABV) of 4.8%, each beer showcasing a single new hop variety; Ella, Galaxy®, Summer and Vic Secret.

Ben Kraus from Bridge Road Brewers in Beechworth, Victoria provides the key attributes for his base India pale ale recipe, which is suitable for hop experimentation:

• Aiming for 5% ABV, use more base malt to raise the ABV to your desired strength.

• 80% Maris Otter malt (or similar 2-row pale ale malt).

• 15% pale crystal malt

• 5% pale wheat malt

• 2.5 L/kg mash liquor

• Use a single infusion mash at 146 °F (63 °C). Aim for the final gravity (FG) to be below 1.010. Bridge Road beers are normally 1.007. The drier the better. Sparge at 171 °F (77 °C)

• Hops: your choice
1 gm/L at 10 min. remaining
3 gm/L at whirlpool
5 gm/L dry hop last day of fermentation, added when SG is below 1.015.

• Yeast: Wyeast 1056 (American Ale)

• Allow a couple of days at ~64 °F (18 °C) before chilling.

• Rack off hops/yeast after 5 days at 32-36 °F (0-2 °C). Bottle, or lager for a couple of weeks.

New Zealand

Moving on to New Zealand, there has also been a shift from growing hops for alpha as a commodity, to growing and developing aroma varieties, usually with attributes of high alpha and low co-humulone. New Zealand Hops is a grower-owned cooperative based in the Tasman District within New Zealand's South Island, with Nelson Province situated at approximately 41 degrees south. New Zealand Hops has a unique range of varieties due to commitment to research and development for breeding new hop cultivars, with the most recently released varieties being Kohatu, Waiiti, and Waimea.

So what makes a hop rhizome from, say, the German Hallertau region, which is genetically the same plant, different when planted in New Zealand? New Zealand Hops Chief Executive, Doug Donelan explains, "We grow some northern varieties for the domestic market such as Cascade and Fuggle, and these are the same varieties; however they do produce hops with different characteristics than their sisters grown in the USA and UK. Nobody has yet determined with any certainty why that is but it stands to reason that if you change the environmental growing situation it's going to have some impacts. The vast majority of hops we grow aren't these northern varieties, with all our 15 commercial cultivars being unique to New Zealand, having been developed through our own breeding program."

Some hops like Nelson Sauvin are not particularly new, Doug continues. "It was released from the breeding program as Nelson Sauvin about 20

Australia and New Zealand Hops Recipes

AUSTRALIA

Brown Dog Ale
(5 gallons/19 L, all-grain)
OG = 1.051 FG = 1.014
IBU = 42 SRM = 22 ABV = 5%

This recipe was the basis of the joint brew that Barry Cranston did with Bridge Road Brewers in 2012, using only Australian malts and hops, as a prize for being Australian Amateur Brewing Championship (AABC) Champion in 2011. It was on tap in Melbourne during the Great Australasian Beer SpecTAPular (GABS) in 2012. Note on the name, "It would kill a brown dog, but this tasted so bad it could" is an ironic Australian expression about potency, as it is well known that brown dogs are virtually indestructible. Barry says, "It was fairly bitter, I like it that way, so the bittering hops can be reduced if desired."

Ingredients
8.4 lbs. (3.8 kg) 2-row pale ale malt (Australian if possible)
7 oz. (0.19 kg) crystal malt (20 °L)
7 oz. (0.19 kg) crystal malt (60 °L)
7 oz. (0.19 kg) crystal malt (120 °L)
7 oz. (0.19 kg) chocolate malt (348 °L)
7 oz. (0.19 kg) Castle Chateau Abbey® (amber) malt (18 °L)
2.9 AAU Pride of Ringwood pellet hops (90 min.) (0.3 oz./8 g at 9.6% alpha acids)
5.8 AAU Galaxy® pellet hops (40 min.) (0.43 oz/12 g at 13.5% alpha acids)
2.9 AAU Pride of Ringwood pellet hops (40 min.) (0.3 oz./8 g at 9.6% alpha acids)
4.1 AAU Galaxy® pellet hops (10 min.) (0.3 oz/8 g at 13.5% alpha acids)
0.3 oz (8 g) Galaxy® pellet hops (0 min.)
Whirlfloc (10 min.)
Yeast nutrient (10 min.)
White Labs WLP009 (Australian Ale) or WLP001 (California Ale) or Fermentis Safale US-05 yeast
Priming sugar (if bottling)

Step by Step
Use an infusion mash at 153 °F (67 °C) for 45 minutes then raise to 162 °F (72 °C) for 15 minutes and sparge at 168 °F (76 °C). Boil for 90 minutes add the hops per the ingredients list, and whirlfloc and yeast nutrient at 10 minutes. Chill the wort rapidly to 60 °F (16 °C) and pitch the yeast. Ferment at 63 °F (17 °C). Carbonate to 2 volumes.

Brown Dog Ale
(5 gallons/19 L, extract with grains)
OG = 1.051 FG = 1.014
IBU = 42 SRM = 22 ABV = 5%

Ingredients
5.9 lbs. (2.7 kg) Coopers light liquid malt extract
7 oz. (0.19 kg) crystal malt (20 °L)
7 oz. (0.19 kg) crystal malt (60 °L)
7 oz. (0.19 kg) crystal malt (120 °L)
7 oz. (0.19 kg) chocolate malt (348 °L)
7 oz. (0.19 kg) Castle Chateau Abbey® (amber) malt (18 °L)
2.9 AAU Pride of Ringwood pellet hops (90 min.) (0.3 oz./8 g at 9.6% alpha acids)
5.8 AAU Galaxy® pellet hops (40 min.) (0.43 oz/12 g at 13.5% alpha acids)
2.9 AAU Pride of Ringwood pellet hops (40 min.) (0.3 oz./8 g at 9.6% alpha acids)
4.1 AAU Galaxy® pellet hops (10 min.) (0.3 oz/8 g at 13.5% alpha acids)
0.3 oz (8 g) Galaxy® pellet hops (0 min.)
Whirlfloc (10 min.)
Yeast nutrient (10 min.)
White Labs WLP009 (Australian Ale) or WLP001 (California Ale) or Fermentis Safale US-05 yeast
Priming sugar (if bottling)

Step by Step
Heat 3 gallons (11 L) water in your kettle to 160 °F (71 °C). Place all the crushed grains in a muslin bag and soak in the hot water for 20 minutes. Rinse the grains with 0.5 gallons (2 L) hot water. Top off kettle with water to 6.5 gallons (25 L). Just as water starts to boil remove from heat and add liquid extract. Return the wort to heat after all the extract has dissolved and bring to a boil. Total boil time is 90 minutes, adding whirlfloc and yeast nutrient with 10 minutes left in the boil. Chill the wort rapidly to 60 °F (16 °C) and pitch the yeast. Ferment at 63 °F (17 °C). Carbonate to 2 volumes.

Tips for Success: Sydney water is quite soft, so for this size batch add 0.1 oz. (3 g) calcium chloride to the mash. If you can get your hands on a bottle of Coopers Sparkling Ale, you can re-culture the yeast from the bottom of the bottle.

Young Henrys Real Ale clone
(5 gallons/19 L, all-grain)
OG = 1.040 FG = 1.012
IBU = 47 (measured) SRM = 12
ABV = 3.7%

Richard Adamson of Young Henrys based in Newtown, Sydney, says that this recipe is one of their core offerings. It's an Australian take on a very sessionable English best bitter, but with a distinctive Australian hop profile giving spicy and orange rind aromas, integrating well with toffee and caramel flavors, with a long bitter finish. For those who happened to be in the UK at the right time, this beer was part of the Wetherspoons 2014 Real Ale Festival.

Ingredients
3.5 lbs. (1.6 kg) 2-row pale ale malt (Australian if possible)
3.5 lbs. (1.6 kg) Bairds Maris Otter pale ale malt
11 oz. (0.31 kg) Simpsons dark crystal malt (80 °L)
11 oz. (0.31 kg) Weyermann Caramunich® I malt
2.5 AAU Topaz pellet hops (FWH) (0.14 oz./4 g at 17.8% alpha acids)
15 AAU Ella (formerly Stella) pellet hops (5 min.) (1 oz./28 g at 15% alpha acids)
13.25 AAU Galaxy® pellet hops (5 min.) (1 oz./28 g at 13.25% alpha acids)
8.9 AAU Topaz pellet hops (0 min.) (0.5 oz./14 g at 17.8% alpha acids)
Whirlfloc (15 min.)
Yeast nutrient (15 min.)
50/50 combination of White Labs WLP001 (California Ale) and WLP017 (Whitbread Ale) yeasts
Priming sugar (if bottling)

Step by Step
Infusion mash at 153 °F (67 °C) for 60 minutes, sparge at 172 °F (78 °C). Boil for 60 minutes, adding the hops per the ingredients list, and whirlfloc and yeast nutrient at 15 minutes. At the end of the boil, let wort stand for 10-15 minutes before beginning the chilling process. Chill the wort rapidly to 65 °F (18 °C) and ferment at 65 °F (18 °C). Carbonate to 2 volumes to serve on hand pump Australian style with a CO_2 blanket - Ssshh don't tell CAMRA! Or if kegging carbonate to 2.5 volumes.

Australia and New Zealand Hops Recipes

Young Henrys Real Ale clone

(5 gallons/19 L, extract with grains)

OG = 1.040 FG = 1.012
IBU = 47 (measured)
SRM = 12 ABV = 3.7%

Ingredients

4.8 lbs. (2.2 kg) Maris Otter liquid malt extract
11 oz. (0.31 kg) Simpsons dark crystal malt (80 °L)
11 oz. (0.31 kg) Weyermann Caramunich® I malt
2.5 AAU Topaz pellet hops (FWH) (0.14 oz./4 g at 17.8% alpha acids)
15 AAU Ella (formerly Stella) pellet hops (5 min.) (1 oz./28 g at 15% alpha acids)
13.25 AAU Galaxy® pellet hops (5 min.) (1 oz./28 g at 13.25% alpha acids)
8.9 AAU Topaz pellet hops (0 min.) (0.5 oz./14 g at 17.8% alpha acids)
Whirlfloc (15 min.)
Yeast nutrient (15 min.)
50/50 combination of White Labs WLP001 (California Ale) and WLP017 (Whitbread Ale) yeasts
Priming sugar (if bottling)

Step by Step

Heat 3 gallons (11 L) water in your kettle to 160 °F (71 °C). Place the crushed grains in a muslin bag and soak in the hot water for 20 minutes. Rinse the grains with 0.5 gallons (2 L) hot water. Top off kettle with water to 6 gallons (23 L). Just as water starts to boil remove from heat and add liquid extract. Return the wort to heat after all the extract has dissolved and bring to a boil. Boil for 60 minutes, adding the hops per the ingredients list, and whirlfloc and yeast nutrient at 15 minutes. At the end of the boil, let wort stand for 10–15 minutes before beginning the chilling process. Chill the wort rapidly to 65 °F (18 °C) and ferment at 65 °F (18 °C). Following packaging instructions per the all-grain version.

Tips for Success: Sydney water is quite soft, so adjust mash to pH 5.5 and aim for a finished beer at pH 4.3. Yes I know that when you plug these numbers into BeerSmith or ProMash the IBU number is a lot less than 47. The final Topaz addition at flameout or in the whirlpool adds considerable bitterness and Young Henrys brewers have developed a spreadsheet that more accurately reflects their brew house experience. Young Henrys use a proprietary blend from White Labs, so I suggest a 50/50 combination of White Labs WLP001 (California Ale) and WLP017 (Whitbread Ale) yeasts. Two vials in this batch size would give a good approximation and it should flocculate well.

NEW ZEALAND

Bacchus Wai-iti IPA clone

(5 gallons/19 L, all-grain)

OG = 1.063 FG = 1.010
IBU = 92 SRM = 9 ABV = 7.1%

Ross Kenrick of Bacchus Brewing in Brisbane says that this delicious IPA showcases the high oil and low alpha Wai-iti with its unique really intense aroma characters of citrus made up of mandarin, mango, lemon and lime zest. The low cohumulone adds to the overall quality of the finish, which is soft, making this an extremely easy drinker. This recipe can also be used to showcase any single hop, just adjust the bittering addition to maintain approximately 90 IBUs.

Ingredients

11 lbs. (5 kg) 2-row pale ale malt
10 oz. (0.28 kg) dextrose sugar
8 oz. (0.22 kg) Weyermann Caramunich® I malt
8 oz. (0.22 kg) Weyermann Carapils® malt
20.5 AAU Waimea pellet hops (60 min.) (1.3 oz./38 g at 15.8% alpha acids)
3.4 AAU Wai-iti pellet hops (20 min.) (1 oz./28 g at 3.4% alpha acids)
3.4 AAU Wai-iti pellet hops (10 min.) (1 oz./28 g at 3.4% alpha acids)
3.4 AAU Wai-iti pellet hops (0 min.) (1 oz./28 g at 3.4% alpha acids)
2.1 oz. (60 g) Wai-iti pellet hops (dry hop)
Whirlfloc (15 min.)
Yeast nutrient (15 min.)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast
Priming sugar (if bottling)

Step by Step

Use an infusion mash at 149 °F (65 °C) for 90 minutes. Boil for 60 minutes add the hops per the ingredients list, and whirlfloc and yeast nutrient at 15 minutes. At the end of the boil, let wort stand for 10-15 minutes before beginning the chilling process. Chill the wort rapidly to 66 °F (19 °C) and pitch the yeast. Ferment at 66 °F (19 °C). Carbonate to 2 to 2.5 volumes.

Bacchus Wai-iti IPA clone

(5 gallons/19 L, extract with grains)

OG = 1.063 FG = 1.010
IBU = 92 SRM = 9 ABV = 7.1%

Ingredients

8 lbs. (3.6 kg) Coopers light liquid malt extract
10 oz. (0.28 kg) dextrose sugar
8 oz. (0.22 kg) Weyermann Caramunich® I malt
20.5 AAU Waimea pellet hops (60 min.) (1.3 oz./38 g at 15.8% alpha acids)
3.4 AAU Wai-iti pellet hops (20 min.) (1 oz./28 g at 3.4% alpha acids)
3.4 AAU Wai-iti pellet hops (10 min.) (1 oz./28 g at 3.4% alpha acids)
3.4 AAU Wai-iti pellet hops (0 min.) (1 oz./28 g at 3.4% alpha acids)
2.1 oz. (60 g) Wai-iti pellet hops (dry hop)
Whirlfloc (15 min.)
Yeast nutrient (15 min.)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast
Priming sugar (if bottling)

Step by Step

Heat 3 gallons (11 L) water in your kettle to 160 °F (71 °C). Place the crushed grains in a muslin bag and soak in the hot water for 20 minutes. Rinse the grains with 0.5 gallons (2 L) hot water. Top off kettle with water to 6 gallons (23 L). Just as water starts to boil remove from heat and add liquid extract. Return the wort to heat after all the extract has dissolved and bring to a boil. Boil for 60 minutes add the hops per the ingredients list, and whirlfloc and yeast nutrient at 15 minutes. At the end of the boil, let wort stand for 10–15 minutes before beginning the chilling process. Chill the wort rapidly to 65 °F (18 °C) and pitch the yeast. Ferment at 66 °F (19 °C). Carbonate to 2 to 2.5 volumes.

Web Bonus:

Looking for something more traditional from Down Under? Try a recipe for a pre-WWI sparkling pale ale with a Goldings and Clusters mix, which includes a good percentage of sugar, leading to a signature profile which typifies many 20th century Australian ales, stouts, and lagers. http://byo.com/story2983

> "These hops had parentage in Saazer and Hallertauer Mittlefruh but in some instances it may be as far back as great grandmother or further removed."

years ago . . . it appears to some markets that it is new, but New Zealand brewers have been brewing with it for the past two decades, it actually epitomizes some New Zealand beer styles and when selected, nearly 30 years ago, the interest was in its alpha content of 12%. It wasn't until it went through brewing trials and found to have some extraordinary aroma qualities that its designation shifted to dual purpose.

"Some varieties have been rebranded but all of the hops listed in this story are unique to New Zealand. Motueka was previously called 'B-Saaz' and Riwaka 'D-Saaz,' the same for Pacifica, previously 'Pacific Hallertau' and Wakatu 'New Zealand Hallertau Aroma.' These hops had parentage in Saazer and Hallertauer Mittlefruh but in some instances it may be as far back as great grandmother or further removed.

"The name changes were made to identify these hops as New Zealand varieties while also removing the old-line European names, which actually have appellation. Kohatu and Wai-iti were released in 2011 and Waimea in 2012. All the names are hop-growing areas in the Tasman district, except for Wakatu, which is the Maori name for the Nelson region.

"These new varieties, Kohatu, Wai-iti and Waimea were all fast tracked, so it was only eight years from selection to release . . . this would at best, normally be 12 years however it could actually be longer. There is much to be considered before releasing a commercial variety and it takes several years of growing trials. It's not just a matter of whether they are good to brew with, there are extensive criteria that must also be met.

"We have a new trial variety going in for brewing trials out of our research program and eight varieties have come up from seedlings to be selected for further trial work. That's out of over 2,000 seedlings that we produce annually through the program."

Nelson Sauvin: Dual purpose. Alpha acids: 12–13%; Total oils (mL per 100 g): 1.1

The essential oil profile displays "fresh crushed gooseberries" a descriptor often used for the grape variety Sauvignon Blanc. The fruitiness may

be a little overpowering for the uninitiated, however, those with a penchant for bold hop character will find several applications for this true brewer's hop. Quintessentially New Zealand. Use in an imperial Pilsner with a small first wort hop (FWH) addition, then mainly whirlpool and dry hopping.

Kohatu: Aroma. Alpha acids: 3%; Total oils (mL per 100 g): 4.37
High essential oil content with big aroma with pine needles and tropical fruit. This is a big aroma hop with intense floral characters of pine needles and tropical fruit. Trial brews made with this hop were only moderately hopped and displayed great quality of bitterness and well-rounded fruity hop characters.

Wai-iti: Aroma. Alpha acids: 3.4%; Total oils (mL per 100 g): 1.24
Lots of the essential oil Farnesene at 12.9%, similar level to the noble hop Saaz. This hop has a reasonable weight of oil, which is further enhanced as a ratio to alpha based on this variety being selected as a low alpha type to showcase its aroma characters. Wai-iti has a startlingly citrus aroma made up of mandarin, lemon and lime zest. Low cohumulone adds to the overall quality of the finish, which is soft. Use in golden ale/blond ale.

Waimea: Dual purpose. Alpha acids: 16–19%; Total oils (mL per 100 g): 2.1
Latest release with high alpha but also lots of oils giving fresh tangelo and citrus fruit aroma with pine needles. Use in IPA or imperial lagers.

Orbit: Lower alpha finishing hop. Alpha acids: 5.3% for Crop 2012
Orbit is a proprietary blend of hops specially selected out of the New Zealand "Hops with a Difference" breeding program each year. Stringent selection processes and long-term growing trials can result in some really excellent hops being rejected on agronomic performance or other plant management issues.

You can find data sheets with more details of the characteristics of hop varieties at http://www.hops.com.au/ and at http://www.nzhops.co.nz/.

Thanks to Doug Donelan of NZ Hops, Owen Johnston of Hop Products Australia, Shawn Sherlock of Murrays Brewing Co, Ben Kraus of Bridge Road Brewers, Richard Adamson of Young Henrys, Ross Kenrick of Bacchus Brewing, Dave Richardson of The Brew Shop and Barry Cranston.

Related Links:

• Show off a favorite hop by using a hop stand — allowing the boiled wort an extended contact period with the flameout hops prior to chilling the wort. While the buzz around hop stands mainly revolves around highly hopped beers, there is a lot more to this technique than just trying to crank your DIPA up to an 11.
http://byo.com/story2808

wild critters unleashed: Brewing All-*Brett* IPA

Beer historian Ron Pattinson, of the blog *Shut Up About Barclay Perkins*, is famous for writing about the longevity of ideas in the brewing community. His research provides some necessary grounding to the lofty ambitions of today's inventive craft brewers, who are fond of re-inventing the wheel and then arguing about what to call it. As Pattinson often points out, there are very few concepts in beer you could come up with that weren't already being brewed a couple hundred years ago.

But I would like to issue a bit of a challenge to Mr. Pattinson, or any other beer historians, for there is a realm of beer that I believe has never bubbled inside any historic fermentation tank — those fermented *exclusively* with *Brettanomyces*. When it comes to 100% *Brett*-fermented beers, we may be dealing with the only style of beer truly invented by modern brewers during the craft beer revolution.

Most readers of *BYO* have probably heard the "British fungus" origins of *Brettanomyces* from its discovery in 1904 by N. Hjelte Claussen, at which point it became synonymous with the characteristics of aged beer. Historic brewers utilized *Brettanomyces* regularly, but unknowingly, and as a secondary fermenter during a beer's long aging process. *Brettanomyces* tends to grow its numbers much slower than familiar *Saccharomyces* strains (a fact that's important to note when building up your yeast starter, as we'll get to later in this story.) Without modern yeast isolation techniques, *Brettanomyces* would soon fall behind other competing strains, reduced to its natural state as a scavenger alongside bacteria and other wild yeast — an important component of beer character, but not the sole primary fermenter.

The knowledge and technology to base a recipe exclusively around *Brettanomyces* possibly didn't exist until recent decades. Is it impossible that some remote farmhouse brewery in a valley of Lithuania happened upon a pure-culture *Brettanomyces* strain, aggressive enough to dominate the competition and win out generation after generation? Certainly not — while thus far undocumented, anything is possible. If such a case were to be found, it would make for a fascinating chapter in the history of yeast culturing. (And personally, I would be ecstatic to see my humble challenge shot down.) Until then, it's all the more reason to celebrate the boon of modern yeast culturing techniques.

by **Derek Dellinger**

Photo by Charles A. Parker/Images Plus

New Yeast, New Potential

Almost every season sees the major yeast companies promote special-edition yeast strains and blends, usually based around brewing styles for the coming weather. But it's not often homebrewers are offered a brand new strain of *Brettanomyces* — in previous decades, few strains were commonly known or used beyond the classic *bruxellensis*, *lambicus*, and *claussenii*. That changed in 2012 when White Labs released *Brettanyomces bruxellensis* Trois (WLP644) as a Platinum strain, then quickly brought it back at the beginning of 2013 as a new year-round offering. The release was a landmark moment for brewers of the funk.

Chris White, founder, president, and CEO of White Labs, reports that Trois came to White Labs through a "well-known" sour production brewery in the US, after originally being acquired from Belgium. Previously known as *Brett* Drei (and yes, the recurring "3" motif is a hint as to its origin), the strain was already popular with pioneering *Brett* brewers like Crooked Stave's Chad Yakobson.

"A new strain is tested for many different things once we receive it," White said. "The most important factors we're looking at are performance, desirable flavor, aroma characteristics, and uniqueness. This involves performing both multiple lab-scale fermentation trials, as well as 5-gallon (19-L) trials at our small onsite brewery. The process takes months."

White Labs found that the sensory profile of Trois, as well as its performance as a primary yeast, made it a strain deserving of close attention.

"Because of its vigorous performance rates, it has a faster turnaround time for fermentation than some of the other *Brett* strains available," White added. "The flavor profile it provides is tart without being overly solventy or phenolic/band-aidy."

Photo by Derek Dellinger

Thanks to modern yeast culturing, it is possible to brew beers with 100% *Brettanomyces* fermentations. Many new cultured strains can produce flavorful, aromatic beers without also creating the undesirable phenolic flavors often associated with *Brettanomyces*.

Our knowledge is a gift granted to modern brewers, and with the power to harness wondrous new strains of yeast, we are only now learning what to do with them. As newly-discovered and surprisingly versatile strains of *Brettanomyces* slip out of their oaken Belgian breeding grounds, onto the agar plates of intrepid yeast ranchers, and into the vials of brewers across the world, never-before-seen styles like *Brett* IPA are finding their place.

Gimmicky Experiment, or Noble Explorer?

The first question you should ask is: Why? Fermenting a beer entirely with *Brettanomyces* would be no more than a fascinating science experiment if the results were not delicious.

Given the number of unknown yeast floating around in the wild, *Brettanomyces* presents a very wild frontier, but many of the strains available commercially today are capable of producing flavorful, aromatic beers — beers that can stand apart from their domesticated cousins without opening up the full barnyard. Some *Brettanomyces* strains favor phenolics, but others will create suggestions of exotic tropical fruit that are perfect to pair with today's popular hop varieties.

And as *Brettanomyces* can act as an oxygen-scavenger during aging, a *Brett*-fermented IPA will seem to remain fresh and vibrant longer than its peers. Many *Brett* strains offer high attenuation when given the opportunity for a healthy, vigorous fermentation. Building up a starter is vital, however, and should be done at least a week in advance, as *Brett* is slower to grow than its cousin *Saccharomyces*. Use lager rates, rather than ale pitching rates, when fermenting with strains

like White Labs *Brett* Trois, and you will see a fermentation that wraps up in three weeks — not the eight months you might expect. (Be sure, however, that your fermentation has truly stopped before bottling to prevent explosions and gushers.) *Brett* is also more forgiving when it comes to warmer fermentation temperatures. A range between 68 °F and 74 °F (20 and 23 °C) should result in a clean fermentation, though cross too far below that threshold — into the low 60s — and you risk putting the yeast to sleep.

Find Your *Brett*

Unlike straight-up sour beer, which can find sourness and bitterness clashing unpleasantly, *Brett*'s funk tends to play well with hops. It's important to note that *Brett* rarely creates as intense of a flavor profile when used as a primary, 100% fermenter — those characteristics generally require a long secondary aging process alongside *Saccharomyces* to emerge (and, in fact, many speculate that the original India pale ale was infected and refermented by *Brettanomyces* during its voyage to India.) However, even as a primary yeast, *Brett* flavors can range from funky to spicy to fruity. Among the thousands of Brett strains lurking out in the wild, there's all the variety of brewer's yeast — and given the more sophisticated genetic makeup of *Brettanomyces*, probably more.

Matt Walsh, head brewer at Modern Times Beer in San Diego, California, has overseen the release of three *Brett* IPAs since the brewery opened in summer 2013. While the brewery's first *Brett* IPA, Neverwhere, was based on a homebrew recipe from Michael Tonsmeire (author of the blog *The Mad Fermentationist*, and fellow *BYO* contributor — see his story on the solera method on page 52),

Cairn 100% *Brett* IPA
(5 gallons/19 L, all-grain)

OG = 1.057 FG = 1.010
IBU = 62 SRM = 5 ABV = 6.2%

Ingredients

7.25 lbs. (3.3 kg) 2-row pale malt
3.5 lbs. (1.6 kg) white wheat malt
1 lb. (0.45 kg) Weyermann Carahell® malt
4.3 AAU Northern Brewer hops (60 min.) (0.5 oz./14 g at 8.5% alpha acids)
28 AAU CTZ hops (0 min.) (2 oz./57 g at 14% alpha acids)
10 AAU Centennial hops (0 min.) (1 oz./28 g at 10% alpha acids)
2 oz. (57 g) Centennial hops (dry hops)
2 oz. (57 g) Citra® hops (dry hops)
½ tsp. yeast nutrient (15 min.)
1 tsp. Irish moss (15 min.)
White Labs WLP644 (*Brettanomyces bruxellensis* Trois) yeast
⅔ cup (140 g) corn sugar (for priming)

Step by Step

Mill the grains and dough-in with 15 qts. (14 L) water, for a mash ratio of about 1.25 quarts per pound of grain. Target a mash temperature of 155 °F (68 °C) and hold for 60 minutes. Sparge with 170 °F (77 °C) water. Collect approximately 6.3 gallons (23.8 L) of wort runoff and bring to boil. Add bittering hops and boil for 60 minutes. After adding the 0-minute hop additions, turn off heat and let steep for half an hour before you begin cooling the wort. This "whirlpool" hop addition can be calculated as somewhere between a 10–5 minute addition for alpha acid utilization. Pitch a 2 qt. (2 L) yeast starter and ferment at 68–72 °F (20–22 °C). Fermentation should take two to three weeks, but keep an eye on your gravity. Following fermentation, dry hop for one week, then bottle or keg.

Cairn 100% *Brett* IPA
(5 gallons/19 L, extract with grains)

OG = 1.060 FG = 1.013
IBU = 60 SRM = 6 ABV = 6.2%

Ingredients

6.6 lbs. (3.0 kg) Pilsen light liquid malt extract
1 lb. (0.45 kg) wheat dried malt extract
12 oz. (0.34 kg) crystal malt (20 °L)
4.3 AAU Northern Brewer hops (60 min.) (0.5 oz./14 g at 8.5% alpha acids)
28 AAU CTZ hops (0 min.) (2 oz./57 g at 14% alpha acids)
10 AAU Centennial hops (0 min.) (1 oz./28 g at 10% alpha acids)
2 oz. (57 g) Centennial hops (dry hops)
2 oz. (57 g) Citra® hops (dry hops)
½ tsp. yeast nutrient (15 min.)
1 tsp. Irish moss (15 min.)
White Labs WLP644 (*Brettanomyces bruxellensis* Trois) yeast
⅔ cup (140 g) corn sugar (for priming)

Step by Step

Steep the crushed grain in 2.0 gallons (7.6 L) of water as it warms until a temperature of about 150 °F (65.5 °C) is reached, or approximately 20 minutes. Remove grains from the wort and rinse with 4.0 quarts (3.7 L) of hot water. Add the liquid to reach a total of 3 gallons (11.3 L) and bring to boil. Turn off heat, add malt extract, and stir until completely dissolved. Return to heat and add 60 minute hop addition, then continue boil for 60 minutes. At flameout, add final hop additions and turn off heat. Let hops steep (whirlpool) for 30 minutes before cooling.

Cool the wort to 72 °F (22 °C), then top off with cold, filtered water to reach 5 gallons (19 L). Pitch 2 qts (2 L) yeast starter and ferment at 68–72 °F (20–22 °C). Fermentation should take two to three weeks, but keep an eye on your gravity. Following fermentation, dry hop for one week, then bottle or keg.

Photo by Derek Dellinger

Modern Times Southern Lands IPA clone
(5 gallons/19 L, all-grain)

OG = 1.065 FG = 1.008
IBU = 60 SRM = 5 ABV = 7.8%

Ingredients

10.7 lbs. (4.9 kg) 2-row pale malt
2 lbs. (0.9 kg) white wheat malt
6.4 oz. (0.18 kg) acidulated malt
6.4 oz. (0.18 kg) dextrine malt
2 oz. (57 g) crystal malt (60 °L)
3 ml HopShot™ extract (60 min.) (~30 IBU)
20 AAU Centennial hops (1 min.) (2 oz./57 g at 10% alpha acids)
14 AAU Calypso hops (1 min.) (1 oz./28 g at 14% alpha acid)
2 oz. (57 g) Centennial hops (dry hops)
1.5 oz. (43 g) Calypso hops (dry hops)
½ tsp. yeast nutrient (15 min.)
1 Whirlfloc tablet (15 min.)
White Labs WLP644 (*Brettanomyces bruxellensis* Trois) yeast
⅔ cup (140 g) corn sugar (for priming)

Step by Step

Mill the grains and dough-in with 16 qts (15 L) water, for a mash ratio of about 1.25 quarts per pound of grain. Target a mash temperature of 156 °F (68.8 °C) and hold for 60 minutes. Sparge slowly with 170 °F (77 °C) water. Collect approximately 6.3 gallons (23.8 L) of wort runoff and bring to boil. Add bittering hops and boil for 60 minutes. After

boil, add flameout hops and whirlpool for 30 minutes before cooling. Cool to room temp, pitch yeast and ferment at 68–72 °F (20–22 °C). Dry hop for seven days before bottling or kegging.

Modern Times Southern Lands IPA clone

(5 gallons/19 L, extract with grains)

OG = 1.065 FG = 1.010
IBU = 60 SRM = 5 ABV = 7.4%

Ingredients

3.3 lbs. (1.5 kg) Pilsen light liquid malt extract
3 lbs. (1.4 kg) golden light dried malt extract
1.5 lb. (0.68 kg) wheat dried malt extract
4 oz. (0.11 kg) crystal malt (60 °L)
3 ml HopShot™ extract (60 min.) (~30 IBU)
20 AAU Centennial hops (1 min.) (2 oz./57 g at 10% alpha acids)
14 AAU Calypso hops (1 min.) (1 oz./28 g at 14% alpha acid)
2 oz. (57 g) Centennial hops (dry hops)
1.5 oz. (43 g) Calypso hops (dry hops)
½ tsp. yeast nutrient (15 min.)
1 Whirlfloc tablet (15 min.)
White Labs WLP644 (*Brettanomyces bruxellensis* Trois) yeast
⅔ cup (140 g) corn sugar (for priming)

Step by Step

Steep the crushed grain in 2 gallons (7.6 L) of water as it warms to about 150 °F (65.5 °C) is reached, or approximately 20 minutes. Remove grains from the wort and rinse with 4 qts. (3.7 L) of hot water. Add the liquid to reach a total of 3 gallons (11.3 L) and bring to boil. Turn off heat, add malt extract, and stir until completely dissolved. Return to heat and add 60-minute hop addition, then boil for 60 minutes. At flameout, add final hop additions and turn off heat. Let hops steep (or whirlpool) for 30 minutes. Cool the wort to room temperature, then top off with cold, filtered water to reach 5 gallons (19 L). Pitch yeast and ferment at 68–72 °F (20–22 °C). Dry hop for seven days before packaging.

Photo by Derek Dellinger

Fermenting an IPA with all *Brett* (as compared to fermenting with *Saccharomyces* strains of yeast) requires adjusting the beer recipe, especially the grain bill, to keep it in balance.

Modern Times' brewers have rolled with the concept ever since, branching out into new hop varieties and SRM shades. Despite that, Walsh says, Trois remains their ideal strain for the style, with an attenuation similar to California ale yeast that results in the dry, clean profile preferred for an IPA.

"The beers we fermented with [Trois] all had a common trait that we referred to as 'juiciness'," Walsh said. "Basically this 'juiciness' presented itself as perceived sweetness with notes of tropical and citrus fruits. Mango, pineapple, and guava being the most prominent."

Sound like flavors you might want in your next IPA?

Building Body, and Balance

With *Brettanomyces* adding a whole new dimension to a beer, brewers need to keep their IPA from tipping off-kilter in some unexpected direction. An overly rich malt base can become cloying faster than in a traditional resin-bomb IPA, with too many flavors playing against each other. Regardless, you won't have to worry about keeping it light bodied. *Brettanomyces* cannot produce the compound glycerol, which adds to the perception of body in *Saccharomyces*-fermented ales. As a result, low-ABV, 100% *Brett*-fermented beers can feel watery without the right grain bill in place. A significant percentage of wheat or oats will help to counteract this thinness, as will a higher mash temp.

Jeff "Chief" O'Neil, former brewmaster at Ithaca Beer Co. and now-brewmaster for Peekskill Brewery in Peekskill, New York, was an early adopter of *Brett* IPA. After O'Neil

Brett IPA Commercial Examples

3767 Belgian-style IPA
Midnight Sun Brewing Co.
Anchorage, Alaska
www.midnightsunbrewing.com

***Brett* Liquor IPA**
Surly Brewing Co.
Brooklyn Center, Minnesota
www.surlybrewing.com

Eight Point IPA
Devils Backbone Brewing Co.
Roseland, Virginia
www.dbbrewingcompany.com

Femme Fatale *Brett*
Evil Twin Brewing
København, Denmark
www.amsterdambeer.com

Mikkeller *Brett* IPA
Mikkeller
Copenhagen, Denmark
www.mikkeller.dk

Neverwhere
Modern Times Beer
San Diego, California
www.moderntimesbeer.com

Southern Lands
Modern Times Beer
San Diego, California
www.moderntimesbeer.com

Super Friends IPA
Ithaca Beer Company
Ithaca, New York
www.ithacabeer.com

Wicked Weed *Brett* IPA
New Belgium Brewing Co. with Wicked Weed Brewing
Asheville, North Carolina
www.wickedweedbrewing.com

Wild Devil
Victory Brewing Company
Downingtown, Pennsylvania
www.victorybeer.com

W.W.B.G
Crooked Stave Artisan Beer Project
Denver, Colorado
www.crookedstave.com

Note: Not all examples are 100% Brett

pitched the idea of a 100% *Brett* fermented IPA as a collaboration with other New York-area breweries back in 2010, the beer known as Super Friends IPA helped to define the style.

O'Neil's most recent take on the style, the aptly named Awesome Sauce, pours as pale as any other IPA from Peekskill Brewery, but O'Neil also recommends making sure the *Brett* has enough to work with.

"I've found that making the malt bill a little more complex can give the *Bretts* a challenge, more than with a simpler recipe," said O'Neil. "You might have to allow for an extra week of primary fermentation, but the trade-off can be a finished beer with more depth."

Don't Forget the Hops

Only when paired with something as potent as *Brettanomyces* could a discussion of IPA wait to address hops as a final factor. To be fair, the hop bill might be the easiest factor in formulating a *Brett* IPA recipe, especially if you already have a handle on a few favorite combinations. Hops are a familiar element compared to *Brett*, and a variety of approaches should all produce pleasing results.

For fans of explosively tropical IPAs, you won't go wrong pairing two fruity elements together. However, keep in mind the alchemy induced by fermentation — *Brett* is notorious for rearranging flavor compounds, and hops don't always come out the other end of a fermentation tasting like you remember. In other words, it's easier to fit a beer around *Brett* than it is to fit *Brett* into a beer. In my experience, *Brett* overwrites much of the flavor from high-impact flavor hops used in the boil, and I've begun focusing on aggressively dank/fruity combos like Columbus, Centennial and Citra® to make sure they shine through. If you want to make sure you get every dollar's worth out of that ounce of Amarillo®, push more of your hops to the dry-hop stage, after fermentation has finished and much of the *Brett* has flocculated out.

This, too, will favor a less bitter IPA — perfect for a light and fruity beer. O'Neil believes that bitterness can be dialed back significantly to maintain balance in this rearranged style. "Given enough time, the fermentation will be more complete than with an ale yeast, and this drier beer will need less bitterness to achieve balance," he said.

Walsh notes that Modern Times bitters primarily with hop extract, and keeps the kettle hopping conservative. "We do fairly heavy dry-hopping to complement or contrast with the tropical notes of the *Brett*," he said. As for hops: "Citra®, Centennial, Motueka and Calypso have been the main players so far."

Ready to make your own history by brewing this exciting new style in your homebrewery? Check out the two *Brett* IPA recipes on page 74 and 75! BYO

Preparing for Competition

techniques

by Terry Foster

What you need to know before you enter

Some people want to enter competitions to win medals, others simply want to find out the judges' opinions on what they think is a great beer. I remember a time when the latter was the only reason for entering a competition, largely because almost all homebrewers were just beginning to learn about brewing and were eager to find out what made a good beer. I'll deal with that first, since that's a simple matter — you already have the beer, and all you have to do is to send it off to the competition and await the results.

Entering for critique

But it isn't that simple at all, because the first thing to do is select which competition you want to enter. There are quite a number of them out there, ranging from club competitions right up to the American Homebrewers Association National Homebrew Competition. What you have to decide is how much feedback you want from the judges. The most complete assessments will come from those competitions sanctioned by the AHA and the BJCP (Beer Judge Certification Program), and you can look up schedules of these on the two organizations' websites. Other competitions may be less rigorous in their judging, but still give you the information you want. Some of these may be local, which can be a big plus in that your beer would not have to travel far and be subjected to rough treatment — best would be one where you can deliver the beer directly yourself.

Once you select a competition the next thing to do is to check out their guidelines on the various styles. Do this very carefully, because you have to select which category is best suited for your beer. That means you may have to enter a class other than what you intended the beer to fit. You thought you made a brown porter, but it came out at 8% ABV so it might be best entered as an imperial stout. The point about this is that judges will quickly reject a beer that does not fit the class they are looking at, which will mean you will get relatively little feedback. Perhaps the biggest point about entering homebrew competitions is that the judges sample only a small amount of your beer, and they are doing it blind without any knowledge of what you were trying to do.

Once you have decided which class to enter, make sure you complete all registration requirements precisely. Send or deliver your beer as required, making sure you send the required number of bottles, and that these are properly labeled. Remember you can't use the US Postal Service as they will not ship alcohol, so you will have to go with services like UPS and so on. Do pack the beer very carefully, since the package may be handled in a cavalier fashion during and after the trip. It might be a good idea to incorporate two or three of the freezer packs used to ship perishable goods as well. And do send in your samples early enough for them to arrive several days before judging so that they can rest and clear properly before being poured. You would also be well-advised to keep a few bottles back, and to drink the beer critically as you read the judges' remarks to see how well they correspond with your own view of the beer's flavor and appearance.

> "... judges will quickly reject a beer that does not fit the class they are looking at ..."

Entering to win

If your goal above all else is to to win a medal in whatever category, then

Photo by Gordon Strang

study winners from previous years in that competition, and choose one or more of the categories with the least number of entries. That done, proceed as you would for the first approach by deciding what style of beer you want to enter. Then read the competition guidelines very carefully, and it will also be useful to read the appropriate book in the Brewers Association *Classic Styles* series (disclaimer: I wrote two of them!) and Jamil Zainasheff's "Style Profile" column in *BYO* on the style. It will also be useful to check the successful recipes in the previous year's competition if you can. Not all competitions publish these, but the National Homebrew Competition winners are published in *Zymurgy*.

Once you have done this you have to formulate a recipe using this information. But that entails some choices, for the competition guidelines will give only a range of original gravities (OG) and final gravities (FG), as well as color and international bittering unit (IBU) levels. So bear these points in mind:

1. You want to make your beer stand out, so go for the higher end of the OG range.
2. Similarly, with a hoppy beer, aim for the top of the IBU range. Consider where the competition is held and whether the judges might have a bias, say for brutally-hopped West Coast IPAs over more balanced East Coast versions.
3. Use hop varieties you know and trust — a good guide for aroma hops is to use a variety that you know to be used in a commercial craft version of this style.
4. You do not want your beer's FG to be too low, as that may mean it tastes thin and may easily be pushed aside by the judges. Look for the middle of the FG range for the style, but be careful not to under-attenuate it either!
5. Consider point 4 when choosing your yeast, which usually means selecting a strain with medium attenuation (65-70%).
6. It is not mandatory, but it is probably best to use an English ale yeast for English-style beers, an American yeast for American-style beers and so on.
7. Again, keeping point 4 in mind, do consider adding specialty malts to improve the body of the beer. But do not overdo this, and use only malts that match the flavor you are after. For example, low roast caramel can work well in an IPA or pale lager, but Belgian Special B® might give too much malt flavor and color in such beers.
8. Whatever you do, do not throw in every kind of malt or spice that you can think of; you want to get a balance in the beer so think your combinations through carefully. Remember that some flavors mask others, and that too many flavors can make the beer taste "muddy" and not at all distinctive.

When you are working out the recipe it is useful to use

a spreadsheet, or a proprietary brewing program, such as BeerSmith. This will allow you to do "what ifs" and to see the effect on OG and color of any given ingredient before doing any brewing.

Brewing the entry

I cannot do a step-by-step procedure here because I do not know exactly what beer you are planning to brew. But there are some major points to be made, attention to which will help you to put your best beer forward.

First, be as clean as you can. Scrub and sanitize as you have never done before! I know this advice is given and re-given by every professional, every expert and every writer, but cleanliness is even more important than ever in this case. Your entry may have to travel long distances, be exposed to varying temperatures and generally bounced about. In other words, a slight infection that may not even be noticeable to you will have time and conditions allowing it to develop into its own particular nastiness. Again, if your entry is infected the judges will kick it out of consideration quickly and will not give you much positive feedback.

Second, pitch the right amount of yeast. Under-pitching is the biggest problem, and the best comment I can make is from the September 2010 issue of *BYO* by Garrett Oliver, Brewmaster at Brooklyn Brewery: "The most important factor to brewing any style, at home or professionally, is making sure you start from the very beginning with a healthy population of yeast. You should see the fermentation take off sooner rather than later. For example, for most ales, you ought to see a very active fermentation in under twelve hours. A beer from a struggling fermentation has a certain flavor. It's one of the main things that tends to distinguish what a professional might say is a homebrew flavor."

Over-pitching can also be a problem. Among other things, it can result in over-attenuation and a low FG, which I pointed out above is not at all desirable. The proper pitching rate will vary according to what beer you are making. For more detailed advice, look at Michael Dawson's article "Homebrew Pitching Rates" in the September 2013 issue of *BYO*. Note that Michael quoted Garrett Oliver before I did, but the point is so important I make no apology for repeating it.

Third, you must incorporate a diacetyl rest; for a regular ale fermentation allowing the beer to rest 2-3 days in the fermenter after fermentation is complete should be fine. But in the case of a cold lager fermentation, once that first stage is complete you should take the beer back to 65-70 °F (18-21 °C) for 2-4 days before cooling for racking to secondary. Judges will be looking for any hint of diacetyl (a buttery or butterscotch taste and aroma) and will severely mark the beer down if they detect any hint of it.

Fourthly, do not over-age the beer. Months and months of storage may be okay for an imperial stout, but the same with a big hoppy beer will result in significant loss of hop aroma and character. Most beers are best consumed while still fresh, which is within a few weeks of brewing at most. Try to plan your brewing so that when the beer is ready to drink it is time to ship it. When it is ready you should check out its taste and your brewing notes. If you haven't quite got the flavor and balance you were looking for, or if you missed your gravity targets, do not hesitate to enter it into another class more suitable to what the beer is rather than what it should have been!

Filtration?

A question you need to answer is whether you ship the beer with sediment and risk losing marks because the judges find it cloudy, or whether you should filter it to ensure it is brilliant when it comes before them. If you do decide to filter it you should design the recipe to allow for this — for further advice see the May-June 2013 *BYO* "Techniques" column. You might be better off allowing the beer to clear in a keg, then bottling from that using a counter-pressure filler. You must, of course, ensure that both this and the bottles are clean and sanitized. One advantage of this technique is that some fillers permit you to purge the bottle with CO_2 before filling, thus helping to limit the presence of oxygen in the beers, which can easily cause off-flavors, especially during rough transport conditions. And, of course, for similar reasons you should use oxygen scavenging caps when sealing the bottles.

Finishing

When the beer is ready, pack it carefully and ship it as discussed in the first part of this column. Register it carefully, and provide any recipe information required, set out in a clear and easily legible manner. After all your efforts, you don't want your beer to be rejected simply because you were sloppy with the paperwork.

Final words

My advice may seem a little long-winded and make you think that entering a competition is complicated and difficult, and perhaps not worth your time. Well, most of the points I have made are really what you should be doing in trying to brew good beer consistently anyway. But if your beer is rejected and marked down for any of the reasons I have mentioned, I can assure you that you will be devastated. Whereas, if you follow these strictures and your entry achieves a medal that you can proudly display to your friends and even any craft brewers you know, you will be extremely satisfied. Go for the gold, and if you win it send me one of those bottles! BYO

Beer Flavor Origins

The chemistry of characteristics

Beer is comprised of hundreds of different chemical compounds that contribute to the overall flavor and aroma perception of the beer. Different styles of beer have different flavor and aroma characteristics that vary depending upon the many factors associated with the production of the beer. The specific types and amounts of taste and aroma compounds within a particular beer depend upon the types and amounts of raw materials used in making the beer, the strain of yeast used to produce the beer, and how the important processing variables are managed during wort production, fermentation and post-fermentation processing and packaging.

Although there are myriad potential taste and aroma nuances within beer, there are several broad flavor descriptor categories in which we have an understanding at the molecular level regarding the compounds that are responsible for producing the associated flavor perceptions.

Broad flavor compound categories include fruity/ester-like, floral/sweet, citrus/terpenic, grassy, spicy/herbaceous, caramel/nutty, woody/smoky, and roast/burnt. Details regarding the compounds associated with these taste and aroma families will be discussed in this story and also summarized in Table 1 on page 85.

Fruity/ester-like aromas

Fruity/ester flavors and aromas are common in many beer styles including English ales and wheat beers. Fruity/ester-like aromas are commonly characterized as being similar to the sweet aromas generally occurring in ripe fruits such as apples, bananas, pears, melons, etc. The typical chemical families for compounds that produce these aromas are esters and lactones, but ketones, ethers and acetal compounds are also contributors to these aromas.

Fruit-specific aroma compounds include isoamyl acetate, which is responsible for a sweet (and banana) aroma, 2,4-decadienoic acid ester which has the characteristic aroma of pears, and 3-methylthio propionic acid esters which have the characteristic aroma of pineapple. Some tropical fruits contain specific sulfur compounds (such as the methyl and ethyl esters of 3-methylthio propionic acid) that impart an "exotic" fruity aroma at appropriate concentration levels. These fruity/ester-like aroma compounds can also work in combination with other compounds to impart different flavor characteristics. Other compounds with non-specific fruity characters but generally described as sweet and fresh (e.g., lactones, aromatic aldehydes, and terpenoids) can also provide additional fruity notes.

> "Citrus/terpenic and piney flavors are typically derived from hops used to make beer."

Floral/sweet flavors

Floral flavors are characteristic of the compounds emitted by flowers. These sensations also typically include a sweet, green, fruity or herbaceous character, and are potentially derived from hops used to make beer. Compounds contributing these characteristics are not all associated with a particular family of compounds, but rather may include substances from different chemical classes. Important compounds that contribute to a floral/sweet flavor include phenyl ethanol, geraniol, beta-ionone and some esters such as benzyl acetate and linalyl acetate. At higher concentrations these compounds may produce an unwanted perfume-like flavor perception.

Citrus/terpenic flavors

Citrus/terpenic and piney flavors are

> "Caramel and nutty flavors are typically developed within barley that has been kilned as a part of its processing."

typically derived from hops used to make beer. Citrus-like perception is associated with the typical flavor and aroma occurring in citrus fruits and plants (e.g., lemon, orange, grapefruit), but there are also certain terpenoid components associated with these fruits. One terpenoid component with a very strong aroma impact is called citral. Citral is a mixture of geranial and neral. Another important terpenic component is nootkatone. Nootkatone is perceived as very bitter. It is found in grapefruit and is associated with their very bitter taste and aroma character.

Grassy, spicy and herbaceous flavors

Grassy flavor and aroma is associated with the smell of freshly-cut grass, ground leaves or vegetable matter. Typical substances that impart grassy flavors include short chain, unsaturated aldehydes and alcohols such as trans-2-hexenal and cis-3-hexenol. Esters and heterocycles such as alkyl-substituted thiazoles and alkoxy pyrazines also belong to this group. Other esters, acids and terpenoid compounds such as hexyl 2-methylbutyrate and alpha-pinene also contribute additional green, piney notes to flavor and aroma.

Spicy/herbaceous flavors are characteristic of specific spices and herbs. Aromatic aldehydes, alcohols and phenolic derivatives are typical constituents with their strong flavor impact effects. Specific compounds include anethole (anise), cinnamaldehyde (cinnamon), estragole (fennel), eugenol (clove), d-carvone (dill), and thymol (thyme).

Caramel/nutty flavors

Caramel and nutty flavors are typically developed within barley that has been kilned as a part of its processing. These flavors are developed during heating when chemical and physical changes occur to sugars, starches, amino acids and proteins. These changes are the results of the formation of Maillard reaction products. The slightly bitter and burnt flavor of roasted nuts can also be produced. Compounds such as corylone, maltol and furanol are contributors to a caramel/nutty flavor profile.

Woody/smoky flavor

Woody and smoky flavors and aromas are caused by substituted phenol compounds (e.g., guaiacol), ionone derivatives

Table 1: Flavor and Aroma Compounds

Compound	Flavor and Aroma
Fruity/Ester-like	
trans-2, cis-4-deca-dienoic acid ethyl ester (pear ester)	fruity, pear
isoamly acetate	fruity, sweet (banana)
6-undecalactone (peach lactone)	fruity, creamy
hexyl acetate	fruity, "tuti-fruiti"
3-methylthio pro-pionic acidtester	fruity, pineapple
4-(p-hydroxyphenyl)-ethyl 2-butanon (raspberry ketone)	fruity, floral
acetaldehyde diethyl acetal	fruity, refreshing
Floral/Sweet	
Phenylethanol	floral, sweet
geraniol	floral, flowery
p-lonone	floral, fruity, berry
benzyl acetate	floral, fruity
linalyl acetate	floral, fruity, citrus
geranyl acetate	floral, sweet, fruity
Citrus/Terpenic	
Geranial/Neral mixture (citral)	lemon
Trans-alpha-Sinensal	orange
Nootkatone	grapefruit, bitter, fruity
Octanal (orange aldehyde)	orange, sweet, fruity
Decanal	orange, bitter
Linalylacetate	citrus, fruity, floral
Grassy	
cis-3-hexenol	green, grassy
trans-2-hexenal	green, fresh
cis-3-hexenal	green, leafy
trans-2-hexenol	green, fruity
2-sec.butyl-3-methoxy-pyrazine	green, earthy
2-pentyl-4,5-dimethyl-thiazole	green, floral
Spicy & Herbaceous	
trans-anethole	herbaceous, sweet, anise
trans-cinnamaldehyde	spicy, warm, sweet, cinnamon
estragole	herbaceous, warm, fennel
eugenol	spicy, warm, buring, clove
thymol	herbaceous, sweet-medicinal, warm, spicy, thyme
Caramel/Nutty	
2-hydroxy-3-methyl-2-cyclopenten-1-one	nutty/maple-like

> “Compounds such as corylone, maltol and furanol are contributors to a caramel/nutty flavor profile.”

and, if in relatively low concentration, by some aldehydes (e.g., trans-2-nonenal). These compounds contribute warm, woody, sweet and smoky flavors. Other compounds that contribute to woody taste and aroma perception include vanillin and lactones.

Roasty/burnt flavor

Roasty and burnt flavors within beer are usually derived by using highly-kilned malt (e.g., unmalted, roasted barley or black patent malt) to make the beer. Roasty or burnt flavors are generally the result of compounds in the pyrazine family. A broad range of roasty/burnt flavors result from having different combinations of alkyl, acyl or alkoxy functional groups on the base pyrazine ring structure. Burnt, roasted, green, earthy or musty aromas and flavors may be produced, depending upon the specific combinations of functional groups.

Practical conclusions

Brewing is both an art and a science. Knowledge of the chemical basis for flavor in beer, although interesting, is not enough to enable a brewer to make good beer. To make the best beer possible, a brewer should not only have a working knowledge of the chemical basis for flavor in beer, but also the cause and effect relationship between ingredients and the finished beer. A brewer must also understand how ingredients interact with each other and within the brewing process to produce a specific taste and aroma profile in the finished beer. As homebrewers, we should care about the chemical basis for flavor because it helps us have a deeper understanding about how our ingredients affect the finished beer. BYO

Reference:

Kuentzel, H. & Bahri, D., “Food Flavorings”, 1991, p.115-157

Related Links:

• Add a little too much crystal malt to your IPA and you will have a darker beer with more caramel flavors, but add too little yeast (or worse yet, contaminated yeast) and you may end up with something really awful. Learn more about the science of brewer’s yeast:
http://byo.com/story1498

Motorize Your Mill

Making your grain crush a whole lot easier

projects
by Chris Denny

Crushing grain immediately prior to mashing is one of the hallmarks of homebrewing at its finest and is well documented in numerous articles. I have used a drill-powered mill for years, but recently undertook the challenge of motorizing my grain mill.

In milling, the roller speed and gap between the rollers are of utmost importance. Too slow and it takes a very long time to mill the grain. Too fast and the grains will not be crushed for optimum efficiency in the mash.

By doing some simple calculations, we can determine the correct pulley size based on the motor's revolutions per minute (RPM). Electric motors are built with standard speed ratings. Most are either 1,725 or 3,450 RPM. Unless you are using a jackshaft arrangement with four pulleys, the 3,450 RPM motor is too fast.

Another consideration is motor horsepower. If the horsepower is too small it will have problems running the mill, but the cost goes up considerably with the more horsepower you have, so there is no need to overdo it either.

For this project, I decided to use a ½ horsepower motor that runs at 1,200 RPM and it is under slung on a table, thus allowing additional workspace for a scale, etc. This motor is also TEFC (Totally Enclosed Fan Cooled), meaning grain dust cannot get into the motor and possibly ignite.

Parts and Materials

Motor
Pulleys – McMaster-Carr
www.mcmaster.com
1 ½-inch pulley
9-inch pulley
Cord
Switch
Plug
Angle steel and rod
⅝-inch bolts

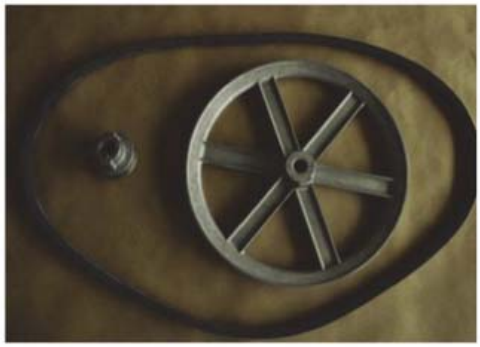
If you are like many homebrewers and enjoy fabricating your gear, no worries; motors can be salvaged from many sources such as washers, garage door openers and HVAC blowers to name a few. Many times these items can be found for free, but may require some work to remove them from their original mounts. If you don't have an old, out of commission electronic to take a motor from, they can often be sourced online from sites offering free classifieds or at yard sales.

The under mounting design keeps belts and pulleys safely hidden, which is important for safety reasons, as I really want to keep all of my fingers.

There are a few things that will not be covered in this article simply because of the space limitations on these pages … namely building a cabinet, frame or another structure supporting the motor and mill. The options for these features are endless, and good designs are available on various Internet sites. For this project, I will focus on mounting the motor, the pulleys (sheaves), belt sizing and speed requirements.

> "… motors can be salvaged from many sources such as washers, garage door openers and HVAC blowers to name a few."

Before we get started; one word of safety. If you are not absolutely comfortable working with electrical connections, find a friend that is comfortable working with electricity or contact an electrician. Perhaps you are a member of a local homebrew club and can ask for members' assistance. Our Internet-based club (www.brewcommune.com) sees this type of posting on our website regularly and many members are more than glad to help … possibly in exchange for some homebrews.



1. CALCULATE MOTOR REQUIREMENTS

To determine pulley sizes, final mill RPM is needed. The manufacturer for my mill recommends between 150-250 RPM for best results. I chose 200 as a nice round number and a 1 ½-inch drive pulley. Then I used these equations to determine the diameter:

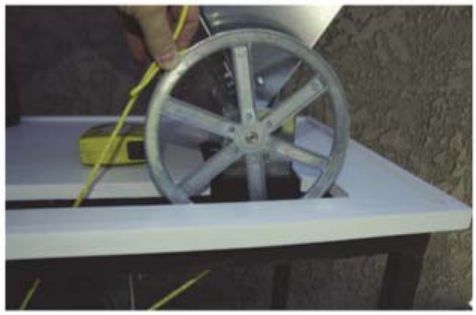
Motor RPM / Mill RPM = Total speed reduction requirement (1,200/200 = 6)

Drive pulley diameter x Speed reduction = Large pulley diameter (1.5 x 6 = 9)

This will yield a final drive speed of 200 RPM using a motor that runs at 1,200 RPM.

2. DETERMINE BELT LENGTH

We could use a piece of string wrapped around the pulleys to determine the required belt length (as pictured), but the following formula determines the exact length.



d = Small pulley diameter = 1.5 inches
D = Large pulley diameter = 9 inches
C = Shaft center to center = 15 inches
π = 3.1416

Belt length = $2C + \pi/2\ (D+d) + [(D-d)2]/4C$
so
$2(15) + \pi/2(9+1.5) + [(9-1.5)2]/4(15) = 47.42$ inches

If the resulting length is a fraction, round up to nearest inch (in my case I rounded up to a 48-inch (122-cm) belt). Make sure you measure shaft dimensions when the motor is somewhere in the 30-50% of travel range or the belt will be too tight.

3. MOUNTING THE MOTOR

The motor I chose weighs around 35 pounds (16 kg) so a stout hanger was needed. The mounts are 1-inch x 1.5-inches x 0.065-inches cold rolled rectangular steel tubing. Two solid attachments to the motor are the minimum. These should be ¼-inch to ⅜-inch or larger bolts. The mount was constructed using hangers, a motor base mount (⅛ x ¾ x ¾ angle and ⅛ x ½ flat) and a hinge pin (⅜ round with washer welded on one end and reusable cotter pin on other end). These dimensions will vary based on your motor and mount arrangement.

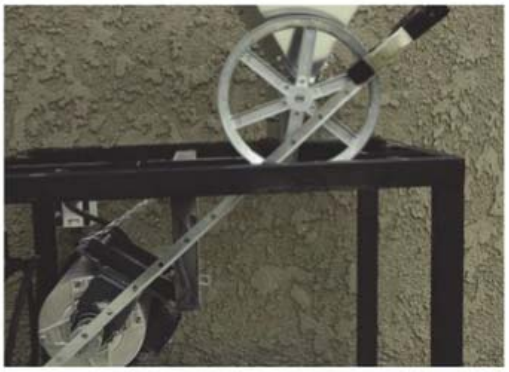
Weld the flat and angle stock forming motor base mount and then mark and drill bolt rotating rod holes. Next, carefully mark, center punch and stack drill the hangers. Stack drilling insures proper alignment of the four holes. Securely attach hangers to your mill stand or cart and attach the motor. Notice the safety chain (in Step 5 picture) on top preventing the motor from swinging down unexpectedly in the event of a belt failure.

4. ALIGN THE SHAFTS AND PULLEYS

Care must be taken to properly align shafts and pulleys when welding or bolting hangers. The motor and mill shafts must be parallel. Both pulleys must be aligned so the belt runs true. If not done properly, the belt will begin to wear prematurely and possibly cause small bits of material to fall into the grist. The extra time it takes to align everything will certainly pay dividends in the future.

For shaft alignment, use one edge of the table or stand as a reference point. Make shafts perpendicular to this edge or marking and double check everything.

Pulleys can be set to run true by using a straight edge placed against the outside edge of the large pulley. Move either, or both, pulleys until the straight edge touches both pulleys on the outside edges.



5. ELECTRICAL

Since grain dust can ignite, I chose an outdoor switch; meaning it is sealed much like the motor so that dust cannot enter.

Amperage is the volume of electricity that a given appliance will consume. This motor running on 120 volts requires 9 amps. In order for the motor to run properly, I chose 12 gauge wires. If smaller wire is used, the motor may work for a while, but it will more than likely overheat and result in premature failure. Lower amperage motors can use smaller wire gauge (perhaps 14 ga) provided the amperages are also lower. Check online for amperage capacities of various wire diameters.

If your motor is reversible, and again you are comfortable with electrical wiring, plug it in and check that it is running in the correct direction. If not, look on the nameplate for proper wire connections to change rotation.

6. INSTALL BELT AND MILL SOME GRAIN

If rotation is correct, good news, you are almost ready to run the mill. Make sure all nuts and bolts are secured, put the belt in place and grab about 1 cup of grain for a test run and check for proper crush. BYO

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last call
by Marcos Soriano

Yeast Explosion

My misadventures in yeast propagation

Although a lot of homebrewers are hop crazy, and some hydro-nerds get totally wrapped up in attempts to replicate brewing water from famous places, I find that the yeast most captures my imagination. For me, yeast is the single ingredient most responsible for the mystery and magic that makes beer such a special drink.

There's a saying, "Man makes wort, but yeast makes beer." Brewers can encourage yeast to behave in certain ways, but yeast is something we can never completely control. It is a living thing with its own prerogatives, its own motivations, its own will. It may not have a physical brain, but I believe it has a consciousness — however different it may be from our own.

One of the ways I like to explore this fascination with yeast is by experimenting with recipes, swapping one yeast strain for another while keeping every other part of the recipe the same. It's an excellent illustration of how important yeast can be to every quality of the beer.

Currently, my yeast fascination is manifesting in a desire to propagate yeast on my own. A little while ago I helped my friend, Scott, bottle a hefeweizen, and after crimping on the last cap, I decided I'd try to harvest the fluccolated yeast that remained at the bottom of the secondary fermenter. We mixed it in with a cup of simple wort (made from dried malt extract), threw the whole mix into a sanitized bottle, and fitted an airlock on top. Hopefully it'll reproduce cleanly, with no contamination. If things look good after a couple of days, we may give it another meal of wort in hopes of building it up to a pitchable size for a new batch.

Scott also remembered an earlier attempt we'd made to harvest yeast, over a year ago. Our procedures were slightly less fastidious with that attempt — we basically just sloshed some of the yeast/trub/hop-remnants/gunk from the bottom of a primary fermenter into a 12 oz. bottle, crimped a cap onto it, threw it into Scott's fridge, and forgot all about it. One year later, it was still in there, resting in a corner and looking evil.

Probably the wisest course of action would have been to throw the bottle away and wash our hands of the whole affair. But we were curious. What would it smell like if we opened the bottle? We had to find out.

Scott did the honors since we were at his place. He put the bottle in the kitchen sink, eased the bottle opener under the rim of the cap, and lifted it gently. It hissed like a rabid cat and started flowing thick foam out the side. Once the foaming died down Scott gave the opener a little more force to try to let out a little more pressure. Sometimes even a little is too much. The bottle went off like a flash grenade! In a fraction of a second — so fast the human eye had no hope of following it — the kitchen transformed from fairly clean to low-level biological disaster. Every surface above the height of the sink — including the walls, the windows, the ceiling, the clean dishes in the dish rack, the stove at the opposite side of the room, ourselves, etc. — got spackled with foul-smelling brown goo.

For another fraction of a second Scott and I were shocked stupid. And then we started cracking up. I laughed so hard I started getting cramps, and Scott laughed so hard he cried. Or maybe he was just crying. It was his kitchen, after all.

The bright side — beside it being his kitchen and not mine — is Scott's girlfriend was in Mexico for a week, so she wasn't there to see the state of her kitchen. Another good thing: now I know that sponge mops work on the ceiling as well as the floor. BYO

Marcos Soriano lives in Hawaii and blogs about his brewing misadventures at homebrewhawaii.blogspot.com

"The bottle went off like a flash grenade! In a fraction of a second — so fast the human eye had no hope of following it — the kitchen transformed from fairly clean to low-level biological disaster."

Photo courtesy of Marcos Soriano

Marcos Soriano (right) stands beside his friend Scott Mackell, whose kitchen doubles as a science lab.


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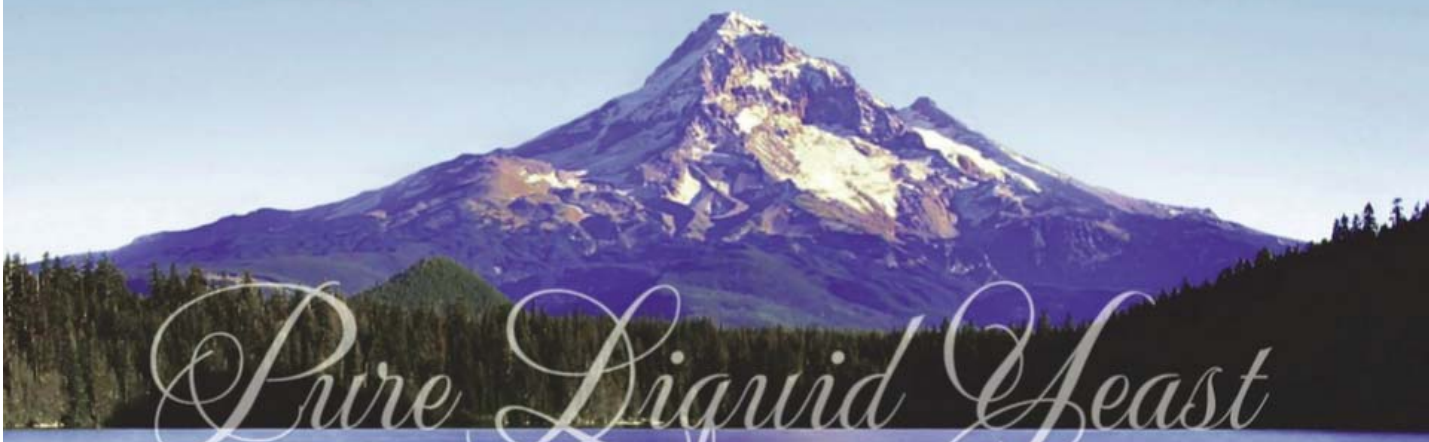

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