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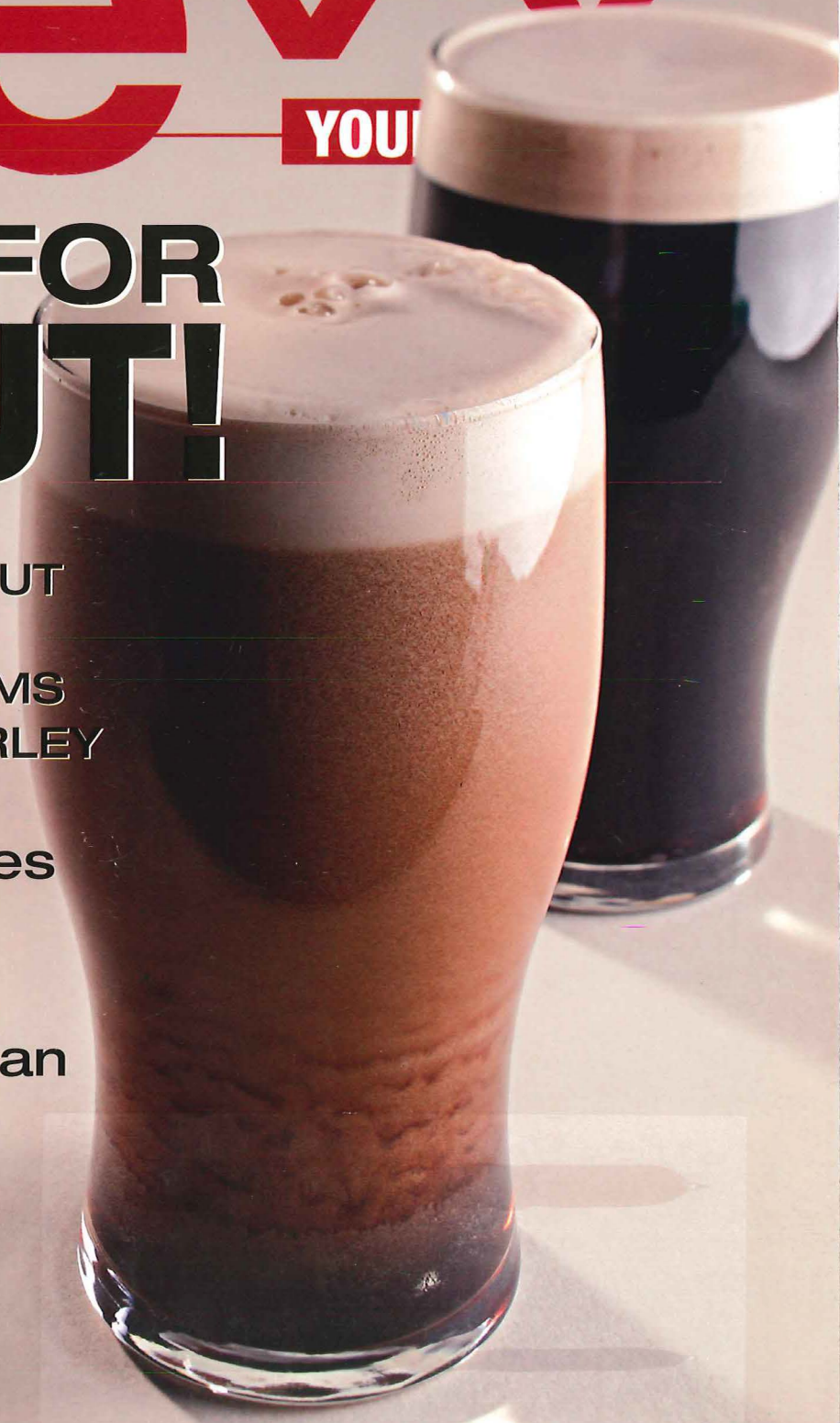

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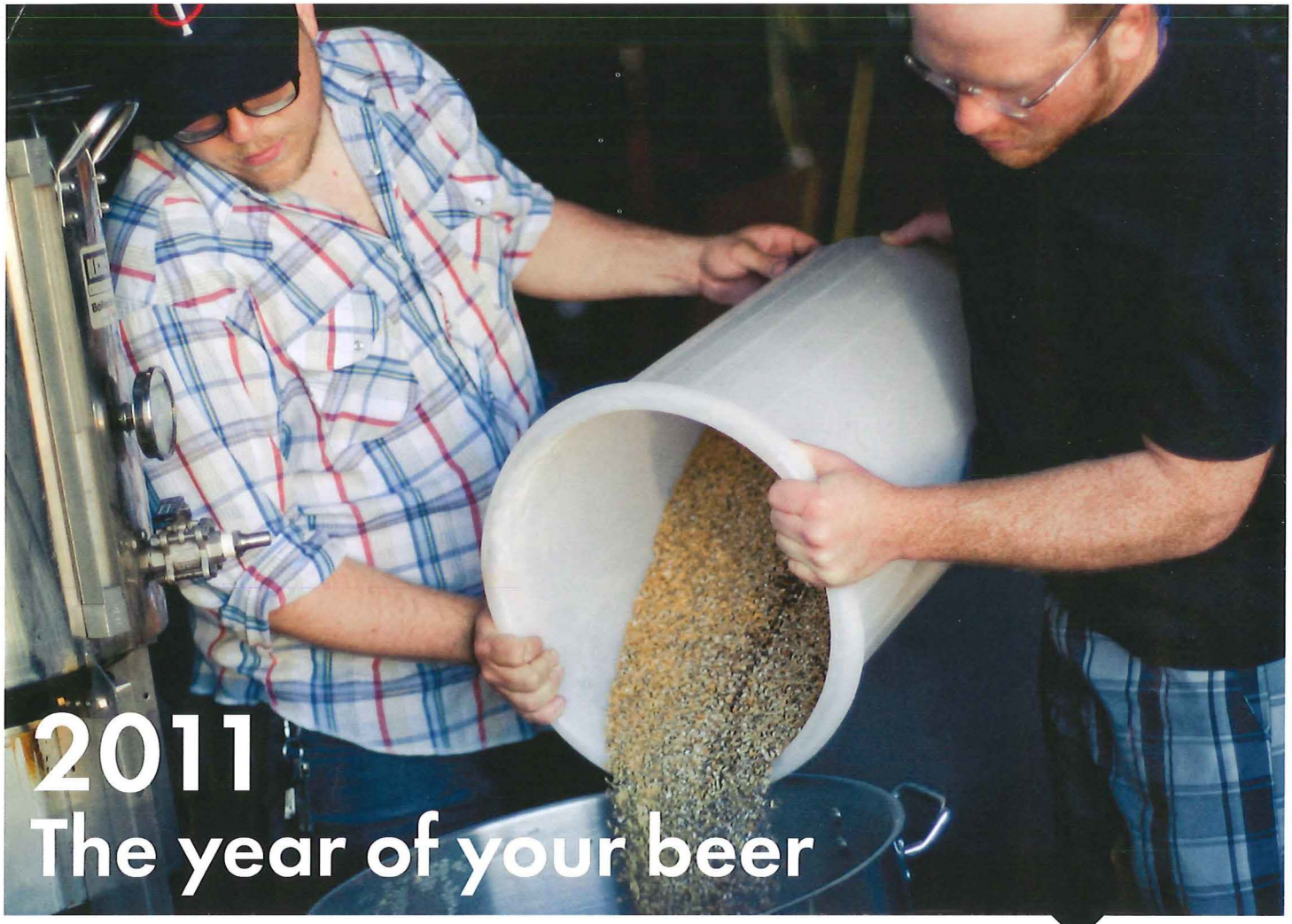

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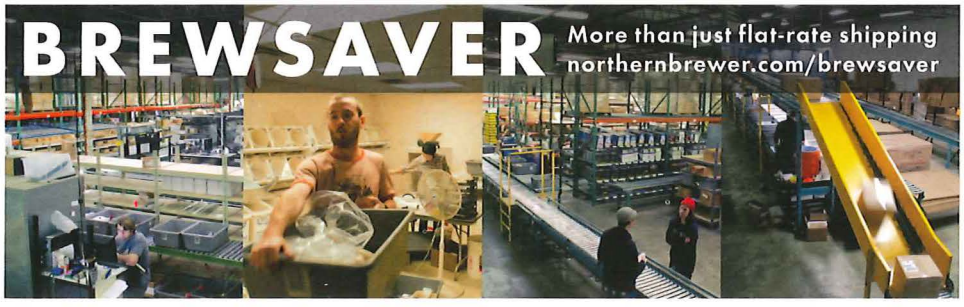

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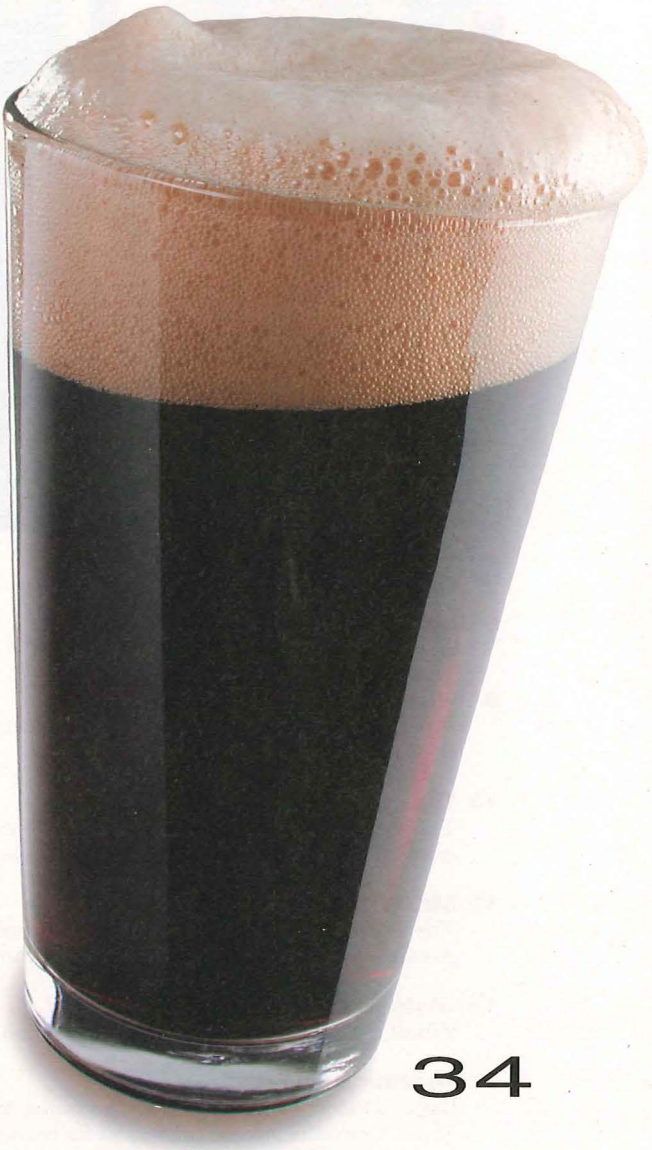

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New hop varieties are being bred all the time. How do they get from birth to your beer? Find out and get to know five new varieties of hops for your homebrew.
by James Spencer

34 Foreign Extra Stout

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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.

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what's happening at BYO.COM

Brew the Alaska Way

The Alaskan Gold Rush in the late 1800s brought breweries to the southeastern part of the state to help quench the thirst of the busy miners. Over 100 years later, while most of the gold might be gone, brewpubs, microbreweries, and homebrewers are there to stay.

www.byo.com/component/resource/article/119

Recipe Locator: Stout

Thirsty for more stout? Tour the Stout section of our recipe locator. Devine your next winter homebrew using our collection of step-by-step recipes.

www.byo.com/stories/recipeindex/list/recipes/114-stout

American Grains

Malt	L	G	Description
Black Barley	525°	1.023-1.027	Imparts dryness. Unmalted; use in porters and dry stouts.
Black Patent Malt	500°	1.026	Provides color and sharp flavor in stouts and porters.
Chocolate Malt	350°	1.034	Use in all types to adjust color and add nutty, toasted flavor. Chocolate flavor.
Crystal Malt	40°	1.033-1.035	Sweet, mild caramel flavor and a golden color. Use in light lagers and light ales.
Crystal Malt	90°	1.033-1.035	Pronounced caramel flavor and a red color. For stouts, porters and black beers.
Crystal Malt	60°	1.033-1.035	Sweet caramel flavor, deep golden to red color. For dark amber and brown ales.
Crystal Malt	30°	1.033-1.035	Sweet, mild caramel flavor and a golden color. Use in light lagers and light ales.
Crystal Malt	20°	1.033-1.035	Sweet, mild caramel flavor and a golden color. Use in light lagers and light ales.

BYO Grain Chart

Check out BYO's composite list of grains and adjuncts. The color is listed in degrees Lovibond and the gravity is calculated from 1 pound of the ingredient in 1 gallon of water. Click on the general categories to begin experimenting.

www.byo.com/resources/grains

Cover Photo: **Charles A. Parker**

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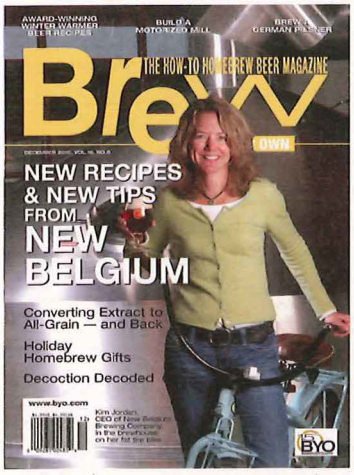
Volume 17, Number 1: January-February 2011



Dude likes decoction

The article about decoction mashing in the December 2010 issue by Horst Dornbusch was timely and well written to explain the history and benefits (and ills) of decoction mashing. I've been using a decoction mash for my German style beers for several years for the same reasons noted by Horst. It is as much about the journey and connection to tradition and venerable ritual as it is about character and extract efficiency. I first got interested in the process after reading one of Greg Noonan's books, "New Brewing Lager Beer," (God rest his soul), and promptly scorched the second batch. Undaunted, I kept decocting and have now seen the light. Seriously, there are benefits whether every brewer wants to concede them or not. Just because there's a cheaper-faster way, doesn't necessarily make it a better way. Some things are traditional for a reason. Good job by Horst identifying these in the light of day for all to see.

Tim Hayner
(Dr. Decoctor)
via email

Glad you enjoyed the article. If there's one thing we have recognized over the years at BYO, *it's that homebrewers brew for a variety of reasons. Enjoy your brewing!*

Open source brewing controller

I was happy to see the article in December's issue about brewing control systems. Perhaps it's just the result of homebrew equipment-itus, but control systems are becoming quite popular in advanced brewing setups. I was surprised, however, that the author did not mention some of the more advanced control systems available today that are designed for homebrewers. I'm the lead developer for the BrewTroller (http://www.brewtroller.com) project, a large and growing open source community of brewers that have developed a control system for all key elements in a brewing setup that adds control and automation of the entire process. Besides temperature monitoring and control, it also has the ability to monitor

contributors

In 2008, Justin Burnsed decided to take a hard look at what he wanted in life. As it turns out, one of the things he enjoyed most was putting together a recipe, brewing it himself and sharing the beer with others. Soon after, he discovered the University of California at Davis Master Brewers program and quickly realized that this could be his shot at getting into the professional side of brewing. Justin blogs about his time at Davis and his brewing experiences after graduating on byo.com.

In this issue, on page 34, he writes about foreign extra stout — a big stout with origins similar to that of India pale ale.

James Spencer is the host of the *Basic Brewing Radio* and *Basic Brewing Video* podcasts, which can be found at www.basicbrewing.com. James also produces several hombrewing DVDs covering both extract and all-grain techniques. He has recorded some homebrewing videos for byo.com and, along with *BYO* Editor Chris Colby, began the ongoing BYO/BBR Collaborative Experiment series, in which brewing questions are put to the test by multiple homebrewers.

In this issue, on page 26, James discovers how new hop varieties are bred and eventually brought to market. He also profiles five of the newer hop varieties — Citra, Palisades, Sorachi Ace, Ahtanum and Simcoe.

In early 2000, Chris Colby was a homebrewer working as a middle school science textbook editor in Austin, Texas. But, he knew he wanted something different in his life. Specifically, he wanted to not be a middle school science textbook editor in Austin, Texas anymore. He still loved science and working with words — he just wanted to pursue these interests with a beer in his hand. As luck would have it, *BYO* was looking for a managing editor and now Chris is celebrating his 10th anniversary with the magazine.

And what better way to celebrate than with a wonderful session beer? On page 40, Chris discusses one of his favorite beer styles — dry stout.

vessel volumes and control pumps and valves to automate every step of the brewing process from filling to chilling. BrewTroller also includes PID capabilities for the HLT, Mash Tun and Brew Kettle heat outputs. By using a single controller for multiple elements, we're able to do things a simple control can't like adjusting the HLT setpoint based on how close the mash tun is to its setpoint, a feature extremely helpful to HERMS users allowing for speedier temp step ups while avoiding an overshoot of the mash temp. Not all of the members of our community are developers either. New users continually join and add suggestions allowing BrewTroller to perform complex control of nearly any type of brewing configuration one can design.

Thanks again for the article and I very much look forward to more articles on the subject!

Matt Reba
via email

Info on Ballantine IPA?

Your article in the May-June 2010 issue of *BYO* by Bill Pierce entitled "Make Mine Ballantine" was exceptionally well done. Ballantine and several other Newark, New Jersey breweries, and the New Jersey Brewers Association were clients of my father's CPA firm for many years. I remember one cold rainy Saturday during WWII when my father conducted the merger between Ballantine and Fagenspon (PON, Pride of Newark) at our home and I met General Ballantine and Mr. Badenhausen and I was probably in the eighth grade in grammar school. After the merger was complete, my father offered them a beer, but all he had was his favorite Kruger Ambassador (another client). But as I remember they graciously accepted. I worked for my father in the 1950s also as a CPA and did the annual audits at Ballantine until I was called into the USAF. Most all taverns in New Jersey served Ballantine lager and XXX ale on tap. I have a "Three Ring" tap on my beer refrigerator. Their India Pale Ale was usually served half and half with ale or lager. It was pretty heavy, aged in wood for one year. Nothing like the IPAs we find today. I would love to find a clone recipe for it. My thanks for the very complete story about a great local brewery that is no more.

Bob Conlin, Col. USAF (Ret)
San Diego, California

At the current time, we don't have any information on how Ballantine's India Pale Ale was brewed. If we find out, we'll publish a recipe. We are always looking for leads to infor-

mation about the beers of yesteryear, including information on favorite regional beers.

Background on Beamish recipe?

I'm writing to ask about some recipes I've read in your magazines. Specifically, I have the original *150 Classic Clone* magazine and read the Beamish Stout Clone. I also have the September 2008 issue of *BYO* that discusses the big three from Ireland and proposes recipes for each. Having recently returned from a trip to Ireland, I decided I wanted to brew a Beamish Clone, in case you didn't figure that out yet. Now, my question is, from where did your recipe in the *150 Classic Clones* magazine come from? It is very different from the recipe for Beamish-Style Dry Stout in the September 2008 article.

Richard Held
via email

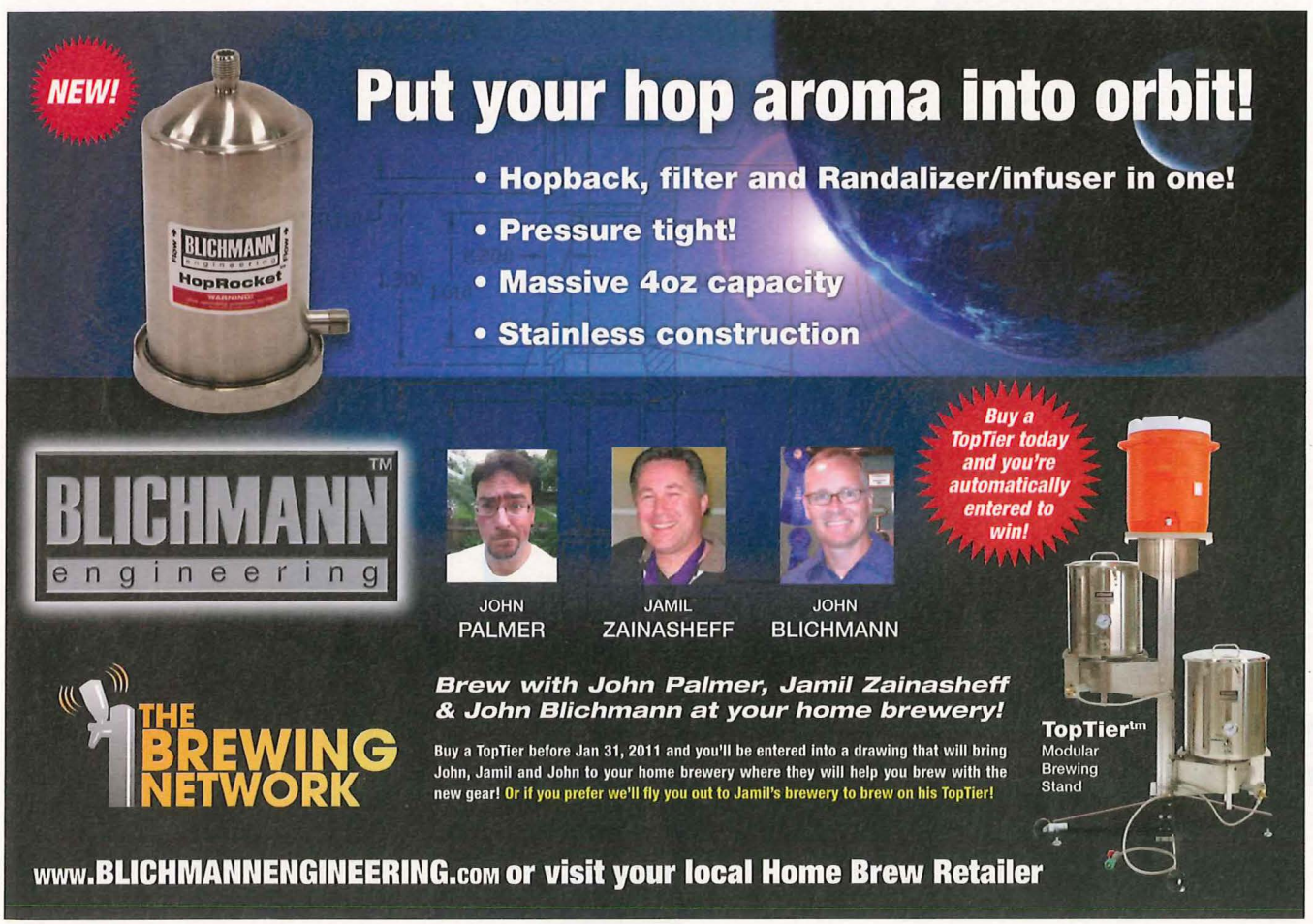
BYO *Editor Chris Colby responds: "Clone recipes in* BYO *come from one of two places, either from information provided by the brewer or from homebrewers who have gathered all the information they could about a given beer and took a stab at brewing a clone. When a professional brewer helps us with a clone recipe, we always acknowledge that brewer in the magazine. However, in the Classic Clone magazines (we now have a* 250 Classic Clone Recipes *issue), this information is not always present. In the case of the battling Beamish recipes, the Beamish-style Dry Stout recipe came from the column's author, Jamil Zainasheff. As the title implies, this recipe is for a dry stout in the style of Beamish, not specifically a Beamish clone. The Beamish Genuine Irish Stout clone from the Classic Clones magazine is mine. The information for the recipe came from reading everything I could on this beer, including everything Michael Jackson had written about it, tasting the 'big three' stouts side by side and brewing many a dry stout."*

Cover clarification

The December 2010 cover photograph of New Belgium Brewing's Kim Jordan was taken by Colorado-based professional photographer Mark Manger. His website is located at manger.us.

Photo credit

In the October 2010 issue of *Brew Your Own*, the picture of the Spezialbräu glass shown in the table of contents (p. 1) was taken by Corey Wood. The photo was from his blog, which can be found at: http://corey-wood.com/bamberg/bamberg-day-one-040509 BYO



homebrew nation

CLUB PROFILE

Club Name: Ales and Lagers Carbonated with Yeast or ALCY

Hometown/State: Cabot, Pennsylvania

Years brewing: Five

Meeting Location: We meet at a member's house in Cabot

Number of Members: Ten

How it all started: When Ben Knoerdel opened Ben's Homebrew, a beer supply shop, he soon found that he had a handful of customers who wanted to hang out and chat about homebrew. Eventually, they all exchanged contact information and a very loose sort of club was formed, where guys would sit around, drink, and talk about their brewing experiences and techniques. It has been like that for a while, and just this past year we voted in a charter to impart some sense of order and formality.

The sentiment remains much the same, but the feel of a standard monthly meeting makes the endeavor seem more authentic. After discussing club business, we take time tasting and critiquing everyone's homebrew. We are particularly invested in getting members to try different styles, which makes the meetings that much more interesting.

The spring and fall are the busiest times, and the team gets together to brew a big batch of beer in its 45-gallon (170-L) "club rig." Everyone comes up with a recipe, which is then voted on before the big brew day. We usually start early and make a day of it with people both bringing and cooking food all day long. Of course, there is plenty of homebrew and commercial beer to be consumed throughout the day, and everyone who wants to takes at least 5 gallons (19 L) of beer to ferment on their own. When the beer is ready they can bring it to meetings or events.

Contact Info:
www.alcybrew.com
absolutesites@netzero.net (James Sites, President)

CLUB RECIPE

Biere de Mai - 100% Brett Table Beer

(4 gallons/15 L, all-grain)

OG = 1.064 FG = 1.000
IBU = 35

Ingredients

7 lbs. (3.2 kg) Munich malt
2.5 lbs. (1.3 kg) wheat malt
2.5 lbs. (1.3 kg) oats
9 AAU Chinook hops (0.75 oz./21 g at 12% alpha acids) (60 min.)
White Labs WLP650 (*Brettanomyces bruxellensis*) bacteria

Step by step

Use a single infusion mash at 154 °F (68 °C) for one hour. Add Chinook hops at the beginning of a 1-hour boil. Chill to 68 °F (20 °C) and pitch a 0.75-gallon starter of *Brett B.* Ferment at 68–75 °F (20–23 °C) for three months. Bottle and condition for three months.

social homebrews

Join *BYO* on Facebook: www.facebook.com/BrewYourOwn

Follow *BYO* on Twitter at: @BrewYourOwn.

byo.com brew polls

Do you brew stouts?

Yes, sometimes: 54%
No, but I would like to: 22%
Yes, all the time: 16%
No, I'm not interested 8%

what's new?

New White Labs yeast strains

White Labs has announced the first of their 2011 Platinum Strains available this January and February only.

- WLP815 Belgian Lager Yeast: This lager yeast comes straight from Belgium and works well in delicate Pilsners and other light lager styles.
- WLP630 Berliner Weisse Blend: Perfect for a tart Berliner weisse. A blend of traditional German lager yeast and *Lactobacillus*.

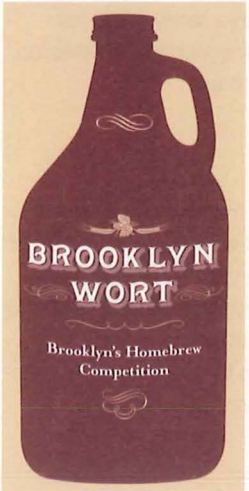
Available at most homebrew retailers. Visit **www.whitelabs.com** for more information.

Hopolate

Hopolate is the invention of Phillip Green - an award-winning homebrewer and craft beer lover. Imagine eating your favorite Imperial Stout, in a beer mug shaped candy. (Candy contains no alcohol). Hop Candy Inc. offers hop flavored milk and dark chocolates, with additional flavors available on request. Check out **www.hopcandyinc.com** for more information.

MoreBeer! Nanobrewery Pump

Designed for the small "nano" commercial brewery where the H315 series is too small but you don't yet need a full on expensive professional brewery pump. The March Nano Brewery Pump features a robust flow rate of 17 GPM with all the benefits brewers have come to expect from March magnetic drive pumps. More information and pricing available at **http://morebeer.com**.



calendar

February 18
America's Finest City Homebrew Competition
San Diego, California

San Diego's Quality Ale and Fermentation Fraternity are organizing their 20th annual AFCHC. Medals will be awarded to the first, second and third place finishers in each category, as well as medals for 'Best of Show', both for beer and for cider/mead, and for the 'Brewing Machine'- the homebrewer with the most awards from all categories.
Web: http://www.kcbiermeisters.org/competition2010.htm
Entry Fee: $6
Deadline: Feb. 5
Phone: (760) 889-4667
Email: psangster@gmail.com

February 19
War of the Worts XVI
Montgomeryville, Pennsylvania

War of the Worts XVI is an American Homebrewers Association sanctioned competition, organized by the Keystone Hops Home Brew Club. Judging is closed to the public, however, all brewers and members of the public are invited to attend the announcement of the winners at Iron Hill Brewery North Wales.
http://www.keystonehops.org/wotw/
Deadline: Feb. 5
Entry Fee: $6 first entry, $5 additional entries
Phone: (267) 255-1406
Contact Email: waroftheworts@keystone-homebrew.com
Organizer: Andy Hejl

February 26
Brooklyn Wort Homebrew Competition
Brooklyn, New York

This event is being held by the Brooklyn Homebrew and Sycamore Flower Shop and Bar. The first competition was such a great success that they decided to make it a bi-annual event, with food, live music and . . . beer.
Web: www.brooklynwort.com
Entry Fee: $17
Deadline: Nov. 31st
Email: sycamorebrooklyn@gmail.com.

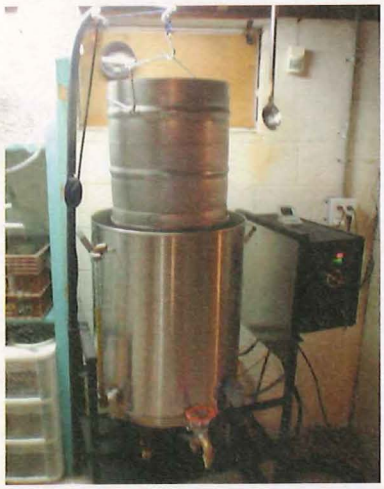
> "My goal was to make brewing as simple and efficient as I possibly could . . . "

homebrew drool systems

Jay's All-Electric Setup

Jay Davis • Gray, Tennessee

This is the complete unit of my homemade electric one-pot brewery system. It runs on 240 and 110 volts. I recycled parts from my old gas 2-tier RIMS system. The frame was an old aluminum baker's rack on rollers that I cut to fit my new design. The pot is a 42-gallon (159-L) stainless sauce pot that I had fitted with stainless nipples to fit the two 5500 watt/240 volt electric elements and thermocouple. The brewery runs off a 60-amp GCFI spa pack that I bought at a local home improvement store.



My goal was to make brewing as simple and efficient as I possibly could using as much equipment and parts that I had already accumulated. The malt tube is what makes my system work, it holds all the grain for the entire batch. The two march pumps cycle up through the grain between two perforated stainless steel filters. The two pumps and two elements are controlled by a Love controller. I use a rope pulley to lift the malt tube out after conversion to finish the sparge before boil.

The wort is being cycled at this stage by using the pumps and electric heat elements that are controlled by the Love controller for starch conversion. The system I constructed started out of a need to safely move my brewery indoors where I can brew in comfort. It takes up very little space and is very easy to use.

Here I am in my small brewery in my basement, very happy to be inside making beer. I am adding the crushed grains to my malt tube. I am a very lucky man to have a daughter that thinks enough of my efforts in this hobby to ask me to make the beer for her upcoming wedding in May. It only seems right to do this because she has been helping me since I started brewing.

hop profile

KENT GOLDINGS

Goldings are a traditional English ale hop. They have flowery tones and a mild, balanced bitterness. This hop is traded as East-Kent Goldings, if grown in East Kent, Kent Goldings if grown in mid-Kent, and Goldings if grown elsewhere. They have an alpha acid between 4-5.5%, and a beta acid between 2-3.5% and can be used for dry hopping and finishing. Possible substitutions are US Golding, Whitbread Golding and UK Progress. Typical beer styles are all English ales and Belgian-style ales.

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beginner's block

CLEANING AND SANITIZING

by betsy parks

Probably the most common set of directions a homebrewer will ever hear is to always clean and sanitize. Yeast require specific conditions to thrive, however, other microorganisms like bacteria and wild yeast also thrive in these conditions.

Clean vs. sanitized

A surface can be clean, but not sanitized; it can also be sanitized but not clean. This is because cleaning and sanitizing are two different actions. Cleaning a surface or a piece of equipment means removing obvious dirt, stains or anything that might be present — such as trub at the bottom of a carboy. Sanitizing means reducing microorganisms on surfaces and equipment to levels that are low enough to not cause problems in the beer, usually done by exposure to heat, hot water, or a chemical agent, such as bleach, Star San, iodophor or peroxyacetic acid.

Sterilizing, in contrast, means killing all life, not just microbes, which is not typically possible, or practical, for homebrewers as it requires boiling for at least 20 minutes, or using an autoclave.

Make it clean

Cleaning your homebrewery is a lot like washing the dishes — all it takes is a good cleaning agent and a little elbow grease. You will need access to a sink, preferably one that is deep enough to submerge some of your bulky equipment. Non-foaming cleaning agents work well, such as 5-Star PBW (Powdered Brewery Wash) or Straight A from Logic. Good old fashioned liquid detergent works well too, just be sure to choose a formula that is perfume-free and be sure to rinse well. Using a dishwasher is convenient, however it's often best to wash most of your equipment by hand as some dishwashers may not be able to fully clean pieces with small openings, such as racking tubes. Invest in some brewery-only sponges and plastic-bristled bottle brushes to make your work easier.

Sanitize it

Once your equipment and surfaces are clean, it's time to sanitize. Homebrewers have lots of sanitizers to choose from, including iodophor and household bleach. Stick with homebrew-friendly phosphoric/anionic surfactant sanitizers such as Final Step from Logic or StarSan from 5-Star however, as they sanitize without impacting the integrity of your equipment. For example, bleach can cause pitting corrosion on stainless steel surfaces. Iodophor is a great, homebrew-friendly sanitizer, but it can also stain some plastics with prolonged exposure.

Follow the manufacturer's instructions for mixing the sanitizer with water as well as for use. For example, StarSan is mixed at a rate of 1 fluid ounce to 5 gallons of water, and most come in contact with the surface of the parts to be sanitized for at least 30 seconds. Idophor, in contrast, is diluted $\frac{1}{10}^{th}$ of a fluid oz. per gallon of water, or about 1 tablespoon per 5 gallons, and must come in contact with parts and surfaces for at least two minutes (some homebrewers also prefer to soak equipment for up to 10 minutes).

You can also use a dishwasher to sanitize clean equipment by running it through the full cycle without using detergent (to prevent residue). The steam from the drying cycle will sanitize everything.

When to clean and sanitize

When you are finished brewing, thoroughly clean everything you used, that way when you take it out again all you need to do is sanitize and you're ready to brew. This will also prevent anything from sticking or drying to surfaces. If your equipment is brand new, or you're not sure when you used it last, give it a good cleaning. Once your primary fermentation is active, the yeast will act as a deterrent to many forms of microorganisms, however, keeping your equipment and surfaces sanitized will prevent you from introducing anything into your batch along the way.

by marc martin

DEAR REPLICATOR,

MY TWO FAVORITE HOBBIES ARE BREWING AND HOCKEY. MY WIFE CAN'T DECIDE WHICH ONE I SPEND MORE TIME ON. A NEIGHBOR, WHO HAD BEEN HOMEBREWING FOR MANY YEARS, GOT ME STARTED WITH THE BEER. I AM A LOYAL SUBSCRIBER AND HOPE YOU CAN HELP ME WITH ANY BEER FROM A FAVORITE BREWERY. THE BREWERY, NINKASI BREWING COMPANY OF EUGENE, OREGON, IS RELATIVELY NEW BUT EVERY BEER THEY MAKE IS EXCELLENT. MANY ARE VERY HOP FORWARD BUT I LIKE THEIR MALTY BEERS TOO. I ALWAYS HOST A ST. PATRICK'S DAY PARTY FOR MY BEER AND HOCKEY BUDDIES AND BREW UP A LOT OF BEER FOR THAT.

MIKE O'HERON
BRUSH PRAIRIE, WASHINGTON

My call to Ninkasi was routed directly to Jamie Floyd, the man largely responsible for Ninkasi's success. Jamie, together with his partner, Nikos Ridge, have built one of Oregon's most innovative and popular breweries. Jamie started homebrewing in college. That passion for brewing lead him to a 15-year career with Steelhead Brewery, working his way up from the kitchen to head brewer. Meanwhile, Nikos was learning the financial ropes by spending his college summers interning on the floor of the New York Stock Exchange. The pair combined their knowledge to develop a business plan and in June of 2006 they leased a defunct German restaurant with a 15-barrel brew house. In only four and a half years they grew to be a regional brewery with annual production of over 30,000 barrels.

Jamie transferred me to one of his lead brewers, Ian Fuller, for the information on the Irish Red Ale. Like Jamie, Ian started his career as a homebrewer and worked his way up through the ranks to become a brewer at Steelhead Brewery. With no formal brewing education it was all on-the-job-training apprenticing under Jamie. As business increased at Ninkasi he was hired as their first employee. The Racin' Mason Irish Red Ale was his second opportunity to brew a 60-barrel batch and the recipe came from one of his original homebrews, named for his son, Mason.

The beer is very true to style displaying a deep reddish copper color with ruby highlights. The nose is a careful balance of caramel malt and earthy hops. An off white head is low but firm. IBUs are higher than normal but are offset by a slightly high terminal gravity. This is caused by the lower attenuating Fullers yeast strain.

For further information about Ninkasi Brewing Company and their other fine beers visit the Web site www.ninkasibrewing.com or call the brewery at 541-344-2739. (BYO)

Ninkasi Brewing Co.'s Racin' Mason Irish Red Ale clone

(5 gallons/19 L, extract with grain)

OG = 1.052 FG = 1.014 IBU = 40 SRM = 17 ABV = 5.1 %

Ingredients

3.3 lbs. (1.5 kg) Briess light, unhopped, malt extract
2 lbs. (0.9 kg) dry malt extract
1 lb. (0.45 kg) 2 row pale malt
8 oz. (0.22 kg) Carapils® malt
8 oz. (0.22 kg) crystal malt (40 (L)
8 oz. (0.22 kg) crystal malt (75 °L)
3 oz. (85 g) biscuit malt
2 oz. (57 g) chocolate malt (350 (L)
1 oz. (28 g) black malt (600 °L)
8.3 AAU East Kent Golding hop pellets (60 min.) (1.75 oz./50 g of 4.75% alpha acid)
4.75 AAU Fuggles hop pellets (30 min.) (1 oz./28g of 4.75% alpha acid)
4.13 AAU Perle hop pellets (0 min.) (0.5 oz./14 g of 8.25% alpha acid)
½ Tsp. yeast nutrient (last 15 minutes of the boil)
½ Tsp. Irish moss (last 30 minutes of the boil)
White Labs WLP 002 (English Ale) or Wyeast 1968 (London Ale) yeast
0.75 cup (150 g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 2 gallons (7.6 L) of water at 150 °F (66 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.8 L) of hot water. Add the liquid and dry malt extracts and boil for 60 minutes. While boiling, add the hops, Irish moss and yeast nutrient. Now add the wort to 2 gallons (7.6 L) of cold water in the 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. Allow the beer to condition for one week and then bottle or keg. Allow the beer to carbonate and age for two weeks and enjoy!

All-grain option:

This is a single step infusion mash using an additional 9 lbs. (4.1 kg) 2-row pale malt to replace the liquid and dry malt extracts. Mix the crushed grains with 3.7 gallons (14 L) of 170 °F (77 °C) water to stabilize at 150 °F (66 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the 60-minute hop addition to 1.5 oz. (42.5 g) East Kent Golding hop pellets (7.1 AAU) and the 30-minute addition to 0.75 oz. (21 g) Fuggles hop pellets (3.6 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 grain recipe.

Roasted Barley

Dry roasted bitterness

by Betsy Parks

IT'S THE STUFF STOUTS ARE MADE OF, AND A GRAIN THAT CAN BRING ROASTED COFFEE-LIKE FLAVOR COMPLEXITY TO PORTERS AND OTHER DARK BEER STYLES. IN THIS ISSUE, WE FOUND TWO AWARD-WINNING ROASTED BARLEY BREWERS WHO SHARE THEIR ADVICE FOR USING THIS DARK, UNMALTED GRAIN IN THE BREWHOUSE.

Roasted barley can be used in fairly large amounts. In our oatmeal stout, we use roasted barley for about 8% of the grist. The biggest percentage is, of course the 2-row base malt, then the oats. Then we add a little bit of wheat for head retention as well as a little bit of chocolate malt and black barley.

Roasted barley brings roasted, chocolate-y coffee flavors to a beer. For American-style stout you can use a lot of roasted barley (generally about double what we would use in an oatmeal stout). For this style you want a full-bodied, dry-roasted bitterness in an American-style stout.

However, if you use too much roasted barley, you can wind up with too much bitterness. In addition to the roasted barley, in our American-style stout, I add a little bit of Carapils® for body, as well as a little wheat, and it is mashed with a high temperature alpha rest (158–159 °F/70–70.5 °C) to achieve the full bodiedness.

In contrast, you don't want that dry-roasted bitterness in an oatmeal stout. Oatmeal stout should never finish bitter — it should be roasty with light hints of coffee. In fact, in our oatmeal stout, the first thing you perceive is the roasted flavor, finishing with a hint of coffee flavor. It's not a bitter beer — it brings out the malt flavors.

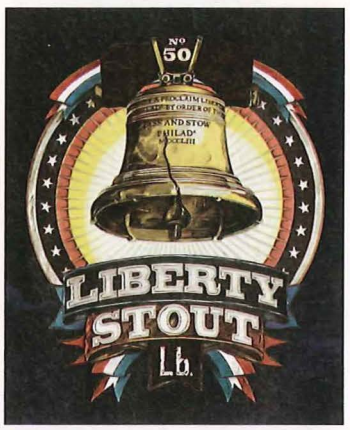
I've tried different malts, but I'm pretty fond of Briess malts. I've brewed with German dark malt as well as British malts, and even though oatmeal stout is a British style, Briess malts make the kind of beer that I was looking for. Their quality is also very consistent — there are no surprises in color or other variations. When you start brewing, try out different malts from various maltsters to find ones you like.

When I developed these beers, I was already very interested in oatmeal stouts and experimented a lot, but it's important to follow the guidelines for these styles first. For both styles of stouts, if you want to experiment at home, my advice is that it is always crucial to brew these beers to style — there's no way to get around that. Brew to style and really research what you're trying to brew. If you are just starting out, or you haven't used roasted barley very much, don't just grab any recipe and brew it. Read about the style and look for recipes that seem to be most like the guidelines. Once you brew it a few times you can always adjust the recipe to fit your taste, or you can try a different recipe if it doesn't seem right.

Otherwise, I don't think there are many other hard and fast rules when it comes to brewing with roasted barley except that you can use too much of it. This rule is also true with black barley — be careful, because you can make a beer too astringent if you use too much black barley. I don't use a whole lot of it, but I do like to use black barley because it helps with the color. I want a beer's flavors to come from roasted barley, however, not the black barley.

(Editors note: for some stellar stout recipes and more stout-brewing advice, turn to page 40 of this issue to read up on dry stout, and page 34 for foreign extra stout.)

> "For both styles of stouts, if you want to experiment at home, my advice is that it is always crucial to brew these beers to style — there's no way to get around that."



Gerald Wyman, Owner and Brewmaster, Gella's Diner and Lb. Brewing Co., Hays, Kansas. Gerald started his brewing career as a homebrewer before co-founding the brewery in 2005. He won the gold for Liberty Stout at the 2010 Great American Beer Festival, and gold for Oatmeal Stout at the 2010 World Beer Cup.

Jay Wince, Head Brewer, Weasel Boy Brewing Company, Zanesville, Ohio. After jumping into homebrewing in 1995, Jay continued to homebrew regularly until starting work on Weasel Boy Brewing Co. with wife and co-owner/co-brewer Lori in late 2006. Jay has earned numerous awards for his Anastasia Russian Imperial Stout including a Bronze Medal in the Imperial Stout category at the 2010 Great American Beer Festival.

We use roasted barley in our Plaid Ferret Scottish, Bitter Sable Imperial Black IPA, Brown Stoat Stout and Anastasia Russian Imperial Stout. In the Scottish and black IPA it contributes hints of roasty dryness and a deep garnet red color. In the stouts it provides roasty, burnt, dry and coffee-like flavors — and even a touch of bitter chocolate. It dries out the finish a bit and at higher rates adds body and mouthfeel.

We use roasted barley 1.5 to 3 percent in the grain bill for color adjustments in the Scottish and black IPA. The stouts use more. Brown Stoat uses about 7% and Anastasia uses 8%, both in combination with chocolate malt for 10–15% of the total bill.

We mostly use Thomas Fawcett and Bairds malts. Experimentation led us to use the lighter Fawcett for some beers and the darker Bairds for others. We use a lighter roast in our Scottish to contribute color with less flavor. In the black IPA we use the darker roast for a drying finish and higher color contribution. In stouts where usage rates are higher we like the lighter roast for the smoother flavor profile.

When experimenting with roasted malt, "test the waters" applies. Using softer water allows a higher percentage of use and smoothes out the bitter, astringent edges of dark roasted grains while allowing the complexities of their flavors to shine. In small pilot batches of our Anastasia we used 100% softened water with dark roasted malts at 19% of our total grain bill. The result was a smooth imperial stout that was black as midnight with a full body and fantastic balance.

At home, substitute roasted barley for black malt. A maltster's color range for black malt and roasted barley is generally the same; roasted barley could contribute a subtle flavor change compared with the black malt. This would allow for direct comparison. Also, throw a bit into a pale beer you make often. Try 0.5 to 1 percent in blonde ale to make a "dirty blonde" or 2–3 percent in an IPA and create a black IPA and see what the roasted barley does to change the base beer. BYO

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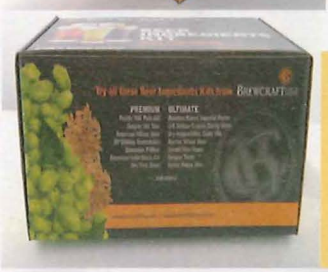

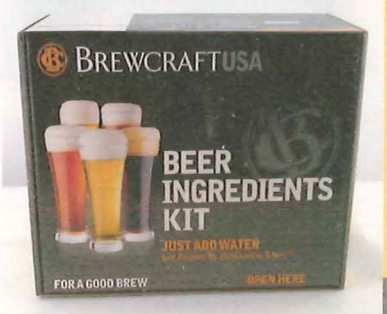

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Beer Foam Facts

Yeast strains, candi sugar

by Ashton Lewis

Q AFTER READING CHRIS BIBLE'S MARCH-APRIL 2010 "ADVANCED BREWING" COLUMN ABOUT BEER FOAM, I AM STILL CONFUSED AND WOULD LIKE SOME MORE PRACTICAL INFORMATION ABOUT GETTING GOOD HEAD. I MADE ONE 5-GALLON (19-L) BATCH OF IPA THIS WINTER, USED 5 OUNCES (141 G) OF HOPS AND IT HAS A GREAT WHIPPED CREAM HEAD THAT STAYS UP. OVER PRIMING IS NOT THE ANSWER FOR SURE, IT TAKES MORE THAN JUST CARBONATION. THERE ARE SO MANY VARIABLES IN HOMEBREWING YOU COULD NEVER TRY THEM ALL SO THERE MUST BE SOME CONSTANTS. I HOPE THAT WITH ALL OF YOUR KNOWLEDGE YOU WILL SHARE THOSE WITH US.

WAYNE NORRIS
LIBERTY, INDIANA

A I'll try to keep my advice about foam brief, but as *BYO*'s Technical Editor and a bona fide beer geek I want to say that I personally thought that Chris Bible's 3-page column on beer foam was really an excellent article. I wasted over 100 pages of space on foam mumbojumbo when I wrote my master's thesis at UC-Davis back in 1994. It takes a lot of research to come up with useful advice and that's one of the main reasons that brewing has a wonderful history in the sciences.

OK, so here is my theory on foam, supported by the type of research cited in Chris' article. If you want great foam begin by brewing all malt beer. Although not a specific requirement, this is a very good start since the malt positive proteins are diluted when adjuncts such as rice, corn or sugar are used. If you really want to mousse up that foam, use malt that has been intentionally lightly modified. Malt described as "Pils malt" or "Pilsner malt" often fits this bill. Specialty malts with names like cara-foam and cara-pils are also used to enhance foam.

The next thing you need to have for great foam is cleanliness from start to finish in the process. Any oils or fat residues on equipment will have a negative effect on foam. This is especially true when beer is dispensed into glassware. Even beer not normally thought to have good foam can demonstrate very appealing qualities when poured into a beer-clean glass.

My next go-to weapon in the pursuit of great beer foam are hops. Hops have constituents, including alpha acids, which stabilize foam and contribute to foam lacing on the glass wall as foam collapses. I also believe, although the literature on the topic is not so convincing, that dry hopping also has a stabilizing effect on foam. Whenever we brew dry hopped beers I notice a different foam appearance. If you want maximum foam stability, use reduced, light-stable products such as tetra-hop and you will have some killer stability.

Finally there is gas. There is no question that highly carbonated beers have persistent foam because the foam continually forms as older bubbles collapse. This is one reason why Belgian ales and weizen beers have such stable foam. Nucleation sights can also be used to cause gas breakout and to help replenish collapsing bubbles with new bubbles. This is why some beer glasses are designed with etched spots on the bottom and also why a few pieces of kosher salt can be used to increase beer foam.

Nitrogen is a tool loved by some and hated by others to increase beer foam stability. Personally, I love brewing beers designed to be poured using mixed gas. I like the appearance of these beers and the foam stability and cling that they have.

There is no silver bullet when it comes to beer foam stability and many different approaches can be taken to brew beer with great foam. I hope my answers are helpful to you!

> "If you really want to mousse up that foam, use malt that has been intentionally lightly modified."

Q I JUST GRABBED WHITE LABS' WLP833 WITHOUT RESEARCH, NOT REALIZING IT WAS A LAGER YEAST. SO FAR ALL APPEARS TO BE FERMENTING WELL, BUT I DON'T HAVE REFRIGERATION SPACE TO FERMENT AT THE REQUIRED TEMPERATURES. MY OG WAS 1.050 AND THE FERMENTATION TEMPS WILL BE 68 TO 70 °F (20 TO 21 °C). CAN YOU TELL ME, HOW LONG UNTIL FINAL GRAVITY, ESTERS, FLAVORS, ABV OR ANY OTHER INFORMATION YOU MAY OFFER AT THESE HIGH TEMPERATURES?

JOHN
MTN. VIEW, CALIFORNIA

A There are many different ideas on how California brewers first started brewing steam beer. The explanation I prefer is that most US brewers in the mid 1800s were brewing lager and many breweries would get yeast from another brewer and go with it. I think you may have just repeated this trend! Expect more sulfur during fermentation compared to the ales you brew. Lager yeast, even when cold fermented, tends to kick out a lot of hydrogen sulfide during fermentation and lend distinctive sulfur, hot-spring aromas to the cellars.

Lagers are known for their "clean" aromas, geek-speak for low esters, and I would expect more esters to be formed during fermentation. In fact, the main reason lagers are fermented cool is that the result is cleaner beer. Lager yeast do just fine in warmer conditions, they just end up producing beer that has ale-like aromas and that is normally not the desired outcome. If I were you I wouldn't worry too much about this brew since there is not much you can do if you are not set up for a cooler fermentation.

In the September 2010 issue of *BYO*, John Mallett (of Bell's Brewery in Kalamazoo, Michigan) compared wort to dinner for the brewer's dinner guest; yeast. This is really an excellent analogy and is one all brewers should not forget. When preparing a dinner for guests it is always nice to know the personal preferences of your invitees before planning your menu.

In the future, however, plan more thoroughly. Yeast is really the most critical thing that must be considered before brewing, especially when using liquid yeast. I always plan for propagation steps when bringing new yeast into our brewery. This takes time and the brew day must be planned around the yeast schedule, not the other way around. It's also pretty important to know what strain you are using so that you make any special planning particular to the strain. Chalk this brew up as a lesson and move on!

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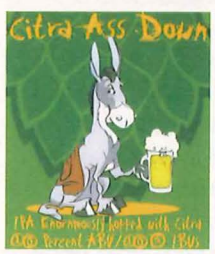
16th Annual Homebrew LABEL CONTEST



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DEADLINE: April 29, 2011

Q I AM GOING TO BE MAKING MY FIRST WHEAT BEER AND WAS THINKING TO TRY AND STEP CULTURE YEAST FROM A BOTTLE OF REALLY GOOD HEFEWEIZEN. HOWEVER, JUST IN CASE I DON'T CULTURE UP ENOUGH I AM ALSO GOING TO USE AN AMERICAN HEFEWEIZEN YEAST STRAIN. I KNOW THAT MIXING YEAST IS OK TO DO, BUT WHAT WILL HAPPEN EXACTLY? WILL THE YEAST JUST SHARE THE SUGARS OR WILL THEY BLEND TO FORM A DIFFERENT STRAIN OF YEAST ALL TOGETHER?

TOR MCKEE
HANFORD, CALIFORNIA

A I know that my conservative brewing advice probably irritates many readers and I am likely going to irritate you with my answer, so please take no offense.

So let me re-state your question. You have never brewed a wheat beer before, have nothing about your subsequent wheat beer to tweak and the first thing that jumps to mind is using the dregs from a really good bottle of hefeweizen to make a yeast starter. That's an interesting idea . . . I suppose. But you need to keep in mind that many German hefeweizen brewers use lager yeast for bottle conditioning and many pasteurize their weizen before adding priming yeast and sugar or speise (wort). So it is possible to unknowingly culture lager yeast from the bottom of the bottle.

But you have a back-up plan; if all starts to go south you are prepared to add an American hefeweizen strain. I assume you mean a neutral ale strain used by American craft brewers to brew cloudy wheat beers without the phenolic, fruity notes associated with German weizen beers. If this were me, my back-up plan would be adding weizen yeast if the goal is to produce weizen. Many beers are fermented with mixed cultures and the result really depends on the cultures in the mixture. Since it is difficult to maintain a consistent mixed culture, most breweries prefer single strain yeast cultures for fermentation. Unless there is a really good reason for using a mixed culture, for example in beers that use a different strain for secondary fermentation, I agree with the modern and easy trend of single strain fermentation.

When I was a student at UC-Davis I decided to do something very similar to your plan for my first attempt at brewing Belgian-style ale. I bought a 750 mL bottle of Chimay, brought it back to the brewing lab and proceeded to streak the sediment from the bottle onto a Petri dish. I logically wanted to isolate the magic Chimay yeast strain from the source. After step one was complete, I propagated yeast from a single colony and anxiously prepared for the big brewing day. What followed was intense disappointment; the beer was so phenolic that the only thing it was good for was to use it as a standard for medicinal in tastings.

Here is my advice to you. Begin your wheat beer brewing career using a known yeast strain. Select it based on some sort of expectation. We brew a pretty tasty hefeweizen at Springfield Brewing Company using White Labs WLP380 Hefe Weizen IV. I like this yeast because it has more clove aromas in the nose than banana. We also brew a pretty tasty American wheat beer that has been our best seller since we opened in 1997. This beer is brewed using White Labs WLP001. Both of these beers are very clean and have short, healthy primary fermentations that are over in about three days. The only way to consistently have these types of fermentation cycles is to use good yeast.

Cut your teeth with a recipe for success and then venture outside of the box once you know what you are seeking from the bottom of that bottle of weizen from across the pond. Otherwise, you really have no idea where your journey may lead!

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Q SOON I'LL BREW A PERSONAL STYLE OF WESTVLETEREN AND I'M A LITTLE BIT CONFUSED ABOUT THE USE OF BELGIAN CANDY SYRUP. FOR A FINAL BATCH OF 23 LITERS (6 GAL.) I'LL USE 1.53 KG (3.37 LBS.) OF SYRUP. I READ TO ADD THE SYRUP IN THREE STEPS: ⅓ AT THE BEGINNING OF BOIL, ⅓ THE LAST FIVE TO TEN MINUTES AND ⅓ IN THE SECONDARY. WHAT ARE THE DIFFERENCES BETWEEN THE TWO DIFFERENT ADDITIONS TO THE BOIL? BECAUSE THE BOILING TIME WILL BE 90 MINUTES, CAN I HAVE CARAMELIZATION PROBLEMS? THE TEMPERATURE OF THE SECONDARY WILL BE 10 °C (50 °F) FOR EIGHT TO TEN WEEKS. WILL THE YEAST BE ABLE TO USE THE CANDY SYRUP?

FILIPPO FRANZONILSEO
BRESCIA, ITALY

A Candy syrup or candy sugar (usually named "candi" sugar) is a fancy name for beet sugar that has been caramelized into syrup with a dark color and rich flavor. The flavor of candi sugar is definitely rich and I can understand why brewers use it as a source of fermentables and flavors. I personally have used dark candi sugar in Belgian-style dubbels and the beer turned out great. However, I honestly don't know if the candi sugar added color or flavor since I used special malts for the most obvious contributors of flavor. The instructions you describe above have a few details that I question. The first detail is the suggestion of adding the sugar at two different times during the boil. The candi sugar has been caramelized during the manufacture and I do not believe there is a need to boil it for a long time. Also, since browning reactions between sugars and amino acids are favored by higher pH levels, there is really not much browning or caramelization that is likely to occur during boiling.

I would add the sugar towards the end of the boil to make sure that it goes into solution and that it has been exposed to heat to kill anything that may be on the surface. The other detail I question is adding the third portion to the fermenter. While it is true that yeast do metabolize sugars differently and that having too much of these easier-to-metabolize sugars can lead to stuck fermentations, my experience leads me to believe that this is not something that should be a major concern. I would be more concerned about expecting ale yeast to ferment sugar added to beer that is aging at 10 °C (50 °F). I suggest simplicity unless something more complex is warranted. The type of beer you want to brew is one of my favorites when properly brewed and I think you will be happy adding all of your sugar in one addition towards the end of the boil. BYO

German Hefeweizen

Wheat meets yeast

by Jamil Zainasheff

Most people seem to either love or hate German wheat beers and they usually base their opinion on early taste experiences. Those that love hefeweizen probably had the chance to try a great example with the proper level of fermentation-derived esters and phenols. Those who dislike hefeweizen likely experienced some bad examples, where the yeast character was overwhelming or completely out of balance.

When I first started judging beer competitions there were two categories I dreaded, Belgian strong ales and German wheat beers. Back then craft brewers and homebrewers alike often made very poor examples, with the Belgian strong ales like sugary rocket fuel and the German wheat beers similar to banana/clove candy mixed with uncooked dough. A big part of the problem was brewers reading too much into competition style guidelines. When guidelines mention a warming alcohol note, the inexperienced brewer brews a beer that tastes like exhaust from a jumbo jet. We should all remind ourselves from time to time that the descriptions in guidelines often describe things as detected by a very sensitive judging palate, focused on detecting every last little nuance of a beer.

Hefeweizen is a traditional Bavarian wheat beer brewed with at least 50% wheat malt and yeast that produce a signature clove and banana character. The hopping rate is very low, which allows an underlying, grainy, bready flavor from the wheat and Pilsner malt to shine through. It is a light, approachable beer with a hazy appearance and has a soft texture. It has a high level of protein and suspended yeast that makes hefeweizen a cloudy, or at least a hazy, beer. While most brewers are familiar with a cloudy German hefeweizen, there is also a filtered, brilliantly clear version called kristallweizen. Hefeweizen ranges in color from pale straw to dark gold and has a large, dense, creamy white head. The aroma of a good hefeweizen includes moderate spicy clove notes and fruity banana esters. However, one of the most common mistakes in homebrewed weizen-style beers is having too much clove and banana character. Brewers might point to the BJCP style guide which says these phenolic and ester compounds can range up to "strong," but do not think for a minute that it means a clove/banana bomb is acceptable. These fermentation compounds should never overwhelm the other characteristics of the beer. It is critical that a brewer keeps these compounds balanced with the overall harmony of the beer, especially the malts. For new brewers, it might be better to think of the word "strong" as meaning "clearly evident." You should be able to smell and taste a bready, grainy character along with the clove and banana. The balance between bittering and sweetness is usually even, though some examples can have an initial sweetness up front. While I do not think an obvious acidic or tart character is indicative of great hefeweizen, I do think a light citrusy character along with proper attenuation, pH, and hop/malt balance keeps this style refreshing and balanced.

When I was a new brewer, I brewed less-than-perfect hefeweizen and I played around with all sorts of strange malt combinations. It was my dear friend, Harold Gulbransen, who convinced me that simple was better. Use at least 50% wheat malt and the rest high quality continental Pilsner malt. If you wish, a small portion of head or body building dextrin malt is also acceptable. A common hefeweizen recipe would be 50 to 70% wheat malt, 30 to 50% Pilsner malt, and 0 to 5% light colored dextrin malt. That is all you need to brew a great hefeweizen. While you might consider adding some other malts to

Continued on page 21

german hefeweizen by the numbers

OG:	1.044–1.052 (11–12.9 °P)
FG:	1.010–1.014 (2.6–3.6 °P)
SRM:	2–8
IBU:	8-15
ABV:	4.3–5.6%

Photo by Charles A. Parker/Images Plus

Harold-is-Weizen

(5 gallons/19 L, all-grain)

OG = 1.049 (12 °P)
FG = 1.012 (3 °P)
IBU = 13 SRM = 3 ABV = 4.8%

Ingredients

4.85 lb. (2.2 kg) Great Western wheat malt (2 °L) (or similar)
4.85 lb. (2.2 kg) Durst Pilsner malt (2 °L) (or similar)
2.68 AAU Hallertau pellet hops, (0.67 oz./19 g of 4% alpha acids) (60 min.)
Wyeast 3068 (Weihenstephan Weizen) or White Labs WLP300 (Hefeweizen Ale) yeast

Step by Step

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). If you have the ability to do a step mash, start with a rest at 110 °F (43 °C) for 20 minutes and then raise to a temperature of 152 °F (67 °C) until conversion is complete. Otherwise, do a single infusion mash at 151 °F (66 °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 1.038 (9.4 °P).

The total wort boil time is 90 minutes, which helps reduce the S-Methyl Methiomine (SMM) present in the lightly kilned pilsner malt and results in less Dimethyl sulfide (DMS) in the finished beer. Add the bittering hops with 60 minutes remaining in the boil. I skip using kettle finings in this beer, unless making a kristallweizen. Chill the wort rapidly to 62 °F (17 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. The proper pitch rate is 1.7 packages of fresh liquid yeast or 1 package of liquid yeast in a 1.3-liter starter.

Ferment at 62 °F (17 °C) until the beer attenuates fully. With healthy yeast, fermentation should be complete in a week, but do not rush it. The cooler than average ale fermentation temperature can extend the time it takes for complete attenuation. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2.5 to 3 volumes.

Harold-is-Weizen

(5 gallons/19 L, extract)

OG = 1.049 (12.1 °P)
FG = 1.013 (3.2 °P)
IBU = 13 SRM = 5 ABV = 4.8%

Ingredients

4.85 lb. (2.2 kg) wheat liquid malt extract (4 °L)
2.68 AAU Hallertau pellet hops, (0.67 oz./19 g of 4% alpha acids) (60 min.)
Wyeast 3068 Weihenstephan Weizen or White Labs WLP300 Hefeweizen Ale yeast

Step by Step

I have used a number of wheat extracts with good results. The type my homebrew shop carries is a private label made for them. Feel free to use whatever your shop recommends. Always choose the freshest extract that fits the beer style. If you cannot get fresh liquid malt extract, it is better to use an appropriate amount of dried malt extract (DME) instead. My hops are in pellet form and come from Hop Union.

Mix enough water with the malt extract to make a pre-boil volume of 5.9 gallons (22.3 L) and a gravity of 1.042 (10.4 °P). Stir thoroughly to help dissolve the extract and bring to a boil.

The total wort boil time is 60 minutes. Add the bittering hops with 60 minutes remaining in the boil. I skip using kettle finings in this beer, unless making a kristallweizen. Chill the wort rapidly to 62 °F (17 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. The proper pitch rate is 1.7 packages of fresh liquid yeast or 1 package of liquid yeast in a 1.3-liter starter.

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Web extra:

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Photo by Charles A. Parker

develop bready flavors or body, I learned it is much better to focus on your process. Keep in mind brewers craft the world's best examples from this simple recipe.

Historically, most weizen-type beers would have been decoction mashed and Gulbransen is a staunch proponent of decoction for hefeweizen. "I like decoction because it lends a full, toasty maltiness that seems absent in a single infusion mash," Gulbransen said. "Since today's malts are so highly modified, I prefer to start my mash at 130 to 134 °F (54 to 57 °C) to avoid a protein rest. I then pull a single decoction, boiling it for 10 to 15 minutes, before I return it to the mash and raise the entire mash for a rest at 152 °F (67 °C)." I can attest to the quality of Gulbransen's hefeweizen; his methods do work well.

Matthew Brynildson of Firestone Walker Brewing Company in Paso Robles, California has won many awards. Recently they won an amazing six medals at the 2010 World Beer Cup. They also won their third Champion Brewery award and took a gold medal with their hefeweizen. I asked Brynildson what he felt was key to making a world-class hefeweizen. Brynildson favors a step mash and considers a ferulic acid rest very important to the proper development of fermentation flavors for this style.

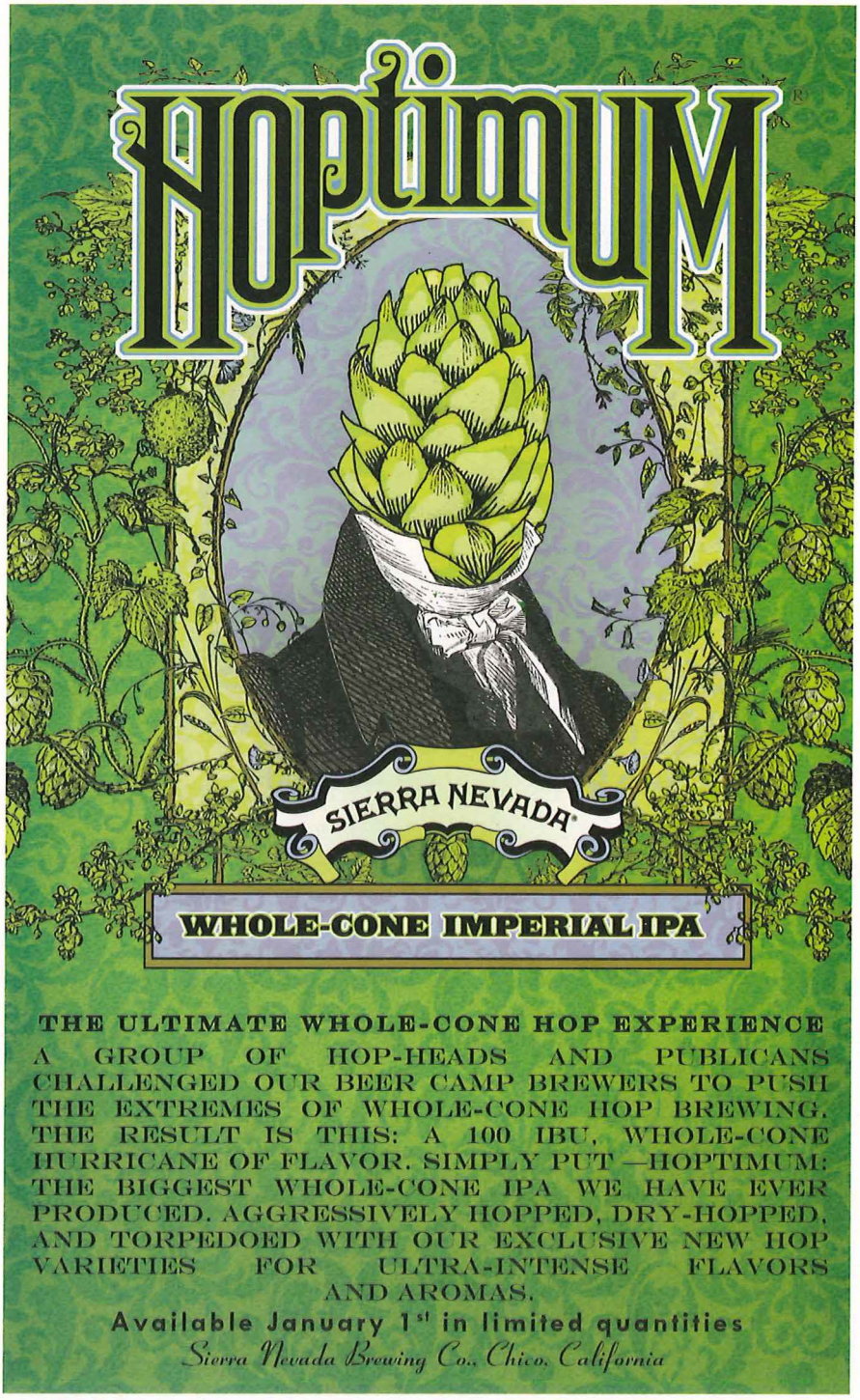
"Mashing at 110 °F (43 °C) aids in the hydrolysis of ferulic acid. The yeast use ferulic acid to produce 4-vinyl guaiacol, which is the phenolic (clove-like) flavor compound that is so important in this style," he said.

If you do not have the ability to perform a decoction or a step mash, or are too lazy like me, then do not worry. Yes, a decoction mash will enhance the malt profile and a step mash will ensure enough clove flavors are present, but most important is using the best quality malt or malt extract you can find and fermenting the beer properly. You should be able to make a fantastic example of the style just using a single infusion mash. Once you have mastered that, then you can try the mash techniques of masters like Gulbransen and Brynildson.

For a single infusion mash, target a temperature range of 150 to 154 °F (66 - 68 °C). If you are making a lower gravity beer, use the higher end of this temperature range to leave the beer with a bit more fullness. If you are making a bigger beer, use the lower end of the range to avoid too full of a character, which can limit drinkability. Keep in mind wheat malt is huskless, so if your equipment is prone to stuck mashes, you can add a volume of rice hulls equal to the volume of wheat malt.

This is an easy style for extract brewers. Select a fresh, well-made extract with at least 50% wheat malt and the rest Pilsner malt. Most wheat extracts are approximately half wheat and half Pilsner or two-row malt.

Try to use German hops for German beers, such as Hallertau, Spalt, Tettnang, Perle, Magnum or Tradition. If you cannot source one of those, Liberty or Mount Hood



can be an acceptable substitute. Balance the beer with enough hop bitterness to balance, but not enough to overwhelm the malt sweetness of the beer. The balance should be even, or maybe slightly sweet, but not more. Brynildson also recommends keeping the hopping levels low. He targets less than 10 IBUs in their weiss, which is a bitterness-to-starting gravity ratio (IBU divided by OG) of 0.2. The bulk of the hopping should be as a bittering addition at 60 minutes. Limit late hop additions, if used at all, to a small addition of noble hops near the end of the boil.

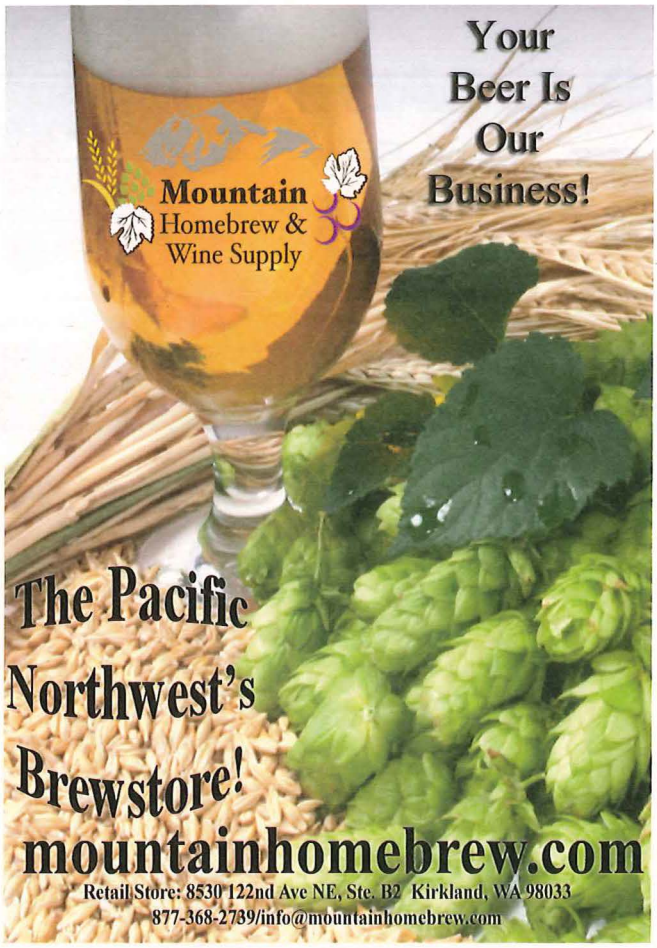
My favorite yeast strains for all weizen-type beers are White Labs WLP300 Hefeweizen Ale and Wyeast 3068 Weihenstephan Weizen. You can try other weizen-type yeasts, and might prefer one strain to the another, so feel free to experiment.

One vital piece of information I lacked when I first started brewing hefeweizen was proper fermentation temperature. I tried all sorts of temperatures with mediocre results before Gulbransen told me to ferment at 62 °F (17 °C). I was skeptical, but the results were spectacular. That temperature will work well in most cases, but keep in mind many other fermentation factors play a role in determining the final flavor profile of the beer. For example, increasing the ratio of glucose to maltose in the wort increases the production of isoamyl acetate (banana flavor), but so does adjusting the pitching rate or other factors that affect growth. Keep in mind that while yeast strain and temperature play a large role in fermentation character, growth rate, pitching rate and other factors all have a significant impact on the types and amounts of esters yeast produce.

While some brewers like to pitch a reduced cell count to increase fermentation characteristics, I am not a big fan of this technique for homebrewing as it can also result in under-attenuation when temperature, oxygen or yeast viability is not carefully controlled. An under-attenuated hefeweizen is far worse than one with a slightly less than ideal ester profile. Brynildson says that he, "found it is best to utilize freshly propagated yeast and to avoid over pitching the wort." So do not over pitch and do not under pitch. You want a certain amount of growth to develop the ideal flavor profile. Do not be afraid to experiment with different pitching rates and oxygen levels, but only experiment with one parameter at a time, until you get the right fermentation character for your brewery.

One last piece of advice is to consume hefeweizen fresh. What many people think is "malt character" in imported examples is often just a form of staling. When your beer lacks that character, be happy and drink lots. BYO

Jamil Zainasheff is the host of "Can You Brew It" and "Brew Strong," both found on The Brewing Network *(www.thebrewingnetwork.com). He writes "Style Profile" in every issue of* Brew Your Own.



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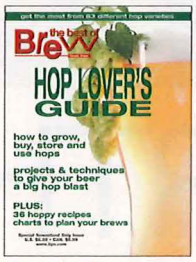

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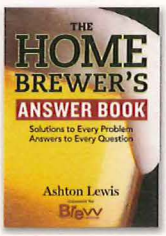

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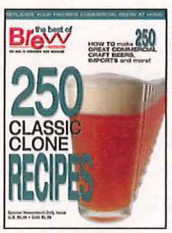

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FROM BIRTH TO MARKET

We homebrewers love our hops. Whether they blast our palates with citrus, fruit and bitterness or tempt our taste buds with flowers and subtlety, hops are the spice of our beers and of our lives. But few of us realize the hurdles that new hops must face before reaching our brewpots.

The explosion in interest for craft beers in the United States is fueling a search for new and interesting varieties. American beer lovers are enjoying new beers and beer styles that could only have been dreamed of just a decade or so ago. And that's where our journey begins.

Photos courtesy of Select Botanicals Group LLC/ Hop Breeding Company, LLC

Story by **James Spencer**

It takes about ten years to get a new hop variety ready for the commercial market in Washington state's Yakima Valley — the most important hop growing region in the United States. When you buy hops to plant in your garden or yard, you'll get a rhizome, which looks like a stick. It is a cutting from an existing plant and essentially a clone of that mother plant. That variety of hops can trace its lineage to a single seed that may have faced long odds when it was first covered with earth.

"The goal is to find a hop that's going to yield well and have all those brewing qualities that brewers are looking for," says Karl Vanevenhoven, director of operations for Yakima Chief, located in Sunnyside, Washington.

According to Vanevenhoven, hop breeding companies may start with 30,000 to 50,000 new varieties to evaluate in the search for new successful strains. These are hybrids of existing varieties, and they're started from seeds that must be put through the paces before being put on the market.

The hop plants that you may have in your yard are female. Unless there is a rogue male hop plant nearby, the cones of the female plant will not bear seeds. However, the hop breeding companies keep male plants and are skilled at matchmaking between varieties.

Of those initial tens of thousands of plants grown from seed, 90% will be failed in the first one to two years. Among the characteristics breeders are looking for is yield. Will the plant produce enough product to be commercially viable? A hop with good flavor and aroma characteristics that doesn't produce a sufficient amount of cones won't be a good investment.

If the hop varieties make the cut within the first couple of years, they will be moved to a single hill full-sized commercial trellis for the next two years. At this stage, yield is still a question for full-sized production because the plant is getting much more special attention than it would in a field of several acres of its sisters.

At this point, the plants will be evaluated for their chemical composition. Alpha acids provide bitterness potential. Cohumulone levels may be an indication of how neutral or strong a hop's character may be. Oil content will contribute to the aroma of the hop. Humulene is the oil described as "elegant," while myrcene is said to give hops more "zing."

At around year five, those plants that make the cut are expanded to several plants, and the breeders begin approaching commercial brewers to gauge interest in the new candidates. If there is no interest, the new hop varieties' five-year mission is over, and their trek is at an end.

Vanevenhoven says those that show promise are distributed to several areas in the Yakima Valley, where they are tested for response to different climates and growing conditions. Once viability is confirmed, and brewer interest is solidified, the new hop variety can be released.

Of course, depending on availability, it may still be a matter of time before those hops make their way into our kettles at home. As we found out during the hop crisis, homebrewers are at the back of the line when it comes to buying hops. We'll have to wait our turn until after commercial breweries take their share.

So, what are brewers looking for? Traditionally, commercial brewers divide hops into three categories: bit-

tering, aroma and dual-purpose. Bittering hops have high alpha acid levels that allow brewers to brew big IPAs and other strongly bitter beers without having a relatively large amount of vegetation in the kettle. Aroma hops are better being added at the end of the boil, where their volatile characteristics won't be stripped away by the heat. Some hop varieties straddle the fence and contribute wonderful flavors and aromas in the kettle and fermenter while still packing a decent punch of alpha acids.

You can find detailed characteristics of hop varieties on data sheets, easily found with a Google search for HopUnion, Yakima Chief, Hopsteiner, Brewers Supply Group, New Zealand Hops or Hops from England. (All of the information available in 2009 is also collected in *BYO*'s special issue *Hop Lover's Guide*, available at most homebrew shops.) However, know that the levels of alpha acids and oils may shift from year to year, so you'll have to keep that in mind while formulating recipes.

Let's take a look at some recent varieties that have made the cut:

CITRA

Over the past ten years, Sierra Nevada Brewing, of Chico, California, has been instrumental in promoting the development of new hop varieties. According to Sierra Nevada's communications coordinator Bill Manley, the brewery guarantees hop breeders that they will purchase a certain acreage of new varieties. A couple of years ago, a new hop caught the attention of the brewers at Sierra Nevada.

"Citra really has something a little bit different," says Manley. "It has those kind of bracing, bright notes, but a stronger flavor – more of a southeast Asia kind of mango mixed with the standard-issue citrus."

The Sierra Nevada brewers chose Citra along with Magnum and Crystal as aroma hops in their Torpedo Extra IPA. The beer is brewed with the torpedo device — a stainless steel vessel designed to hold eight pounds of whole hop cones. Beer is run cold through the torpedo and back into the fermenter to maximize the tropical fruit notes. Citra has a myrcene level of 60–65% of the total oil, on par with many of the so-called "C" hops (including Cascade, Centennial, Chinook and Columbus), which may account for its strong flavor and aroma characteristics.

Citra is also a high alpha hop, with alpha acid percentages ranging from 11–13%, but Manley says it takes on a different character in the kettle. "If you use Citra as a bittering hop, it really has a very different flavor," he says. "It becomes more 'catty,' I find, in the boil than it does as a late hop or straight aroma hop."

Citra is a low-cohumulone hop, with 22-24% of the alpha acids being co-humulone.

Citra is growing rapidly in the marketplace. Manley says two years ago, when Sierra Nevada first used the hop,

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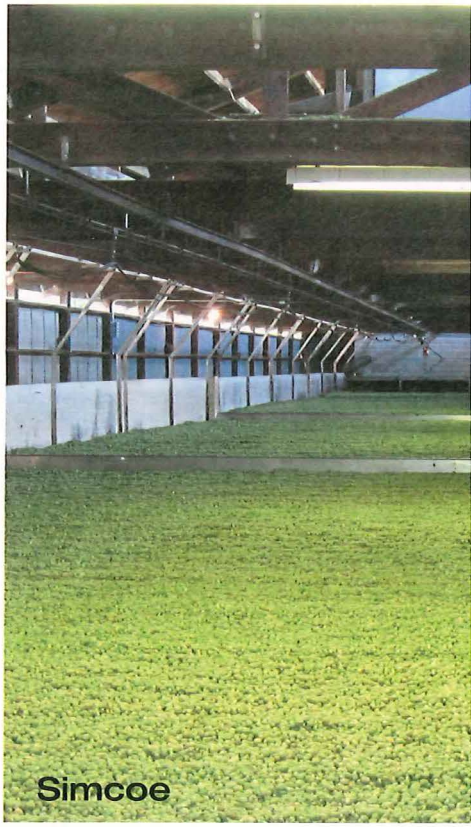


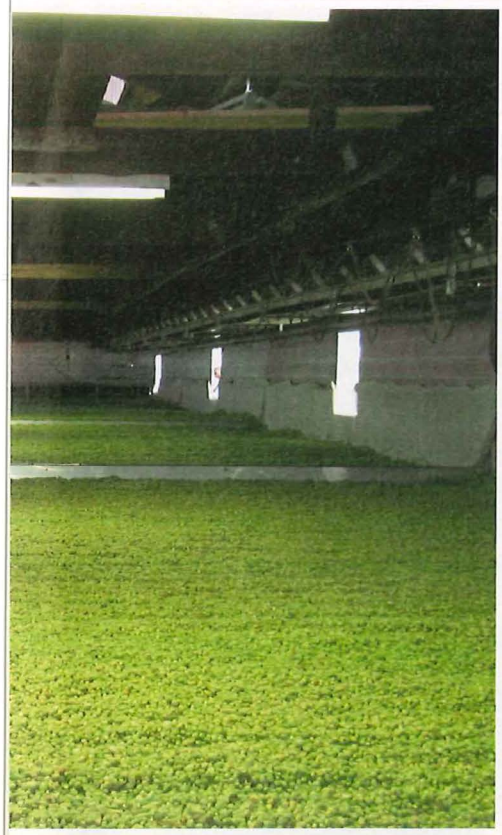
there were four acres planted. Now, he says 140 acres are dedicated to this variety. Look for Citra to be featured in January in a new Sierra Nevada beer called Hoptimum, which also employs several experimental hops that don't even have names yet.

SORACHI ACE

In 1988, Sorachi Ace was bred in Japan by Sapporo Breweries from Brewer's Gold, Saaz and male Japanese variety. It is a high alpha variety — 10–16% apha acids, low (~23%) co-humulone — but its citrus characteristics and unique lemon-like character also make it a good flavor and aroma hop as well.

Brooklyn Brewery, of Brooklyn, New York, features the hop in a saison named for it: Sorachi Ace. Originally a part of the Brewmaster's Reserve series, Sorachi Ace will be a year-round release beginning in February.

Brooklyn brewer Garrett Oliver decided to use Sorachi Ace as the only hop in its namesake. "The unique flavor of Sorachi Ace was bypassed by the big brewers, but we think it's pretty cool," Oliver says. "We ferment it with our special Belgian ale strain, and then add



more Sorachi Ace hops post-fermentation. After the dry-hopping, the beer emerges with a bright spicy lemon zest aroma backed by a wonderfully clean malt flavor."

If a lemony IPA sounds tasty to you, you might want to snag some Sorachi Ace while you can. According to Oliver, production of the hop is limited to a single farm in Oregon.

AHTANUM

If Sorachi Ace straddles the line between bittering and aroma, Ahtanum bridges the divide between American and English character – at least according to Mitch Steele, head brewer and production manager for Stone Brewing.

If you look at the HopUnion data sheet for Ahtanum, it says it is "quite similar to Cascade," with Cascade and Amarillo as possible substitutions. That's not how Steele sees it.

"It's got some citrus character," Steele says, "but I think it's also got some of that English kind of earthiness character that I think is really nice."

Ahtanum is the signature flavoring hop for Stone Pale Ale. It doesn't pack

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Ahtanum

much bittering bite, weighing in at only around 5.7–6.3% alpha acid, with 30–35% co-humulone (a bit lower than Cascade). In Stone's Pale Ale, Columbus takes the bittering burden.

According to Steele, Stone's brewmaster Steve Wagner chose Ahtanum in 1996 to contrast their inaugural beer with San Diego local favorite Sierra Nevada Pale Ale.

Steele says Ahtanum is a good substitute for British hops for homebrewers. "It's not going to work real well in an IPA," he says, "but if you want something that's got some flavor balance and a nice unique character that's not overpowering, it's a great hop."

By the way, Ahtanum's pedigree is listed as open pollination, so Mother Nature gets partial credit for the success of this cross.

PALISADE

Megan Parisi, lead brewer for Cambridge Brewing Company, in Massachusetts, paired Ahtanum with Palisade to feature in her Spring Training IPA. Being a spring seasonal beer, Parisi wanted to find hops that were reminiscent of the season. She made her selection after experimenting with several hop varieties.

"The Ahtanum are really super floral," Parisi says, "but that kind of real essence of spring – fresh cut grass, fresh cut flowers. The Palisade is a little floral, but a little more grassy with a little bit of spice – almost a hint of the Tettnang kind of spice."

Both hops are added to the boil equally in late hop additions for Spring Training. Parisi uses 1.5 lbs. of hops per barrel (the equivalent of 3.9 oz./110 g per 5 gallons/19 L), dry hopping with whole Ahtanum cones in the fer-

menter. A small bittering addition of Galena is added for balance.

With an alpha acid range of 5.5–9.5%, and a co-humulone level between Citra and Ahtanum, Parisi believes Palisade would be more versatile than Ahtanum in hopping beer styles other than IPAs.

"Anything where you're looking for a little more alpha, a little more grass," she says. "It's not quite as distinctive."

SIMCOE

Simcoe has been around for a couple of years, and it has risen to be one of homebrewers' new favorites. My first experience as a homebrewer with Simcoe involved a wheat beer that I wanted to be a showcase for the new generation of American hops. Paired with Amarillo at the end of the boil, the Simcoe brought a piney aroma to the grapefruit flavor of the Amarillo. An ounce of each at the end of the boil for the 5-gallon (19 L) batch did the trick well.

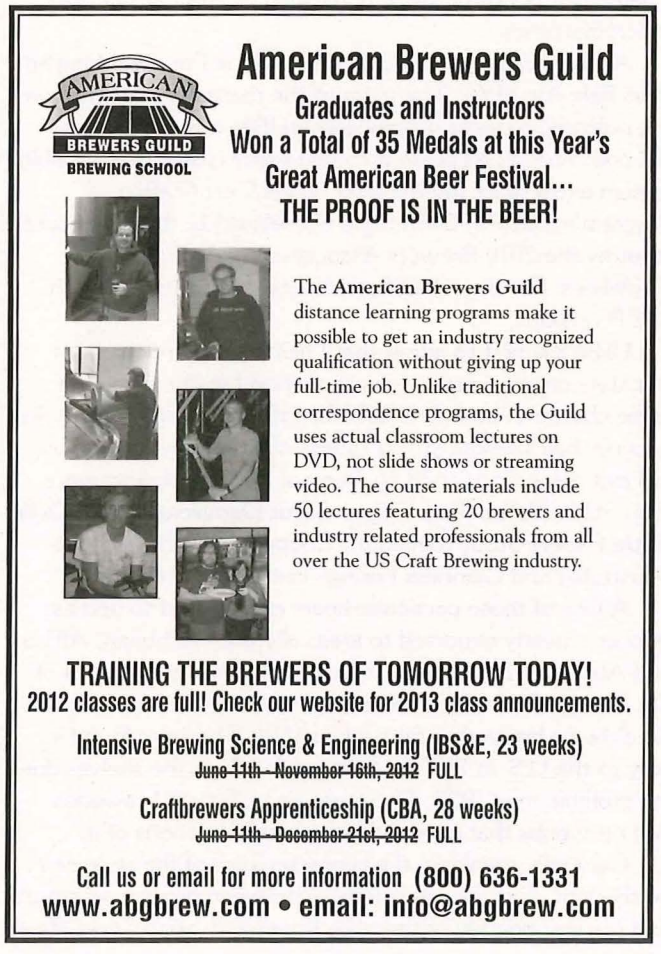
Added earlier in the boil for a double IPA, Simcoe showed off its ability to add a nice level of bitterness. Simcoe's alpha acid level range is 12–14%, making it flexible for both hopping purposes. *BYO* Editor Chris Colby designed a double IPA for use in one of our *Brew Your Own/ Basic Brewing Radio* Collaborative Experiments. His recipe called in an army of American hop stars: Magnum, Simcoe, Centennial, Cascade, and Amarillo, with additions throughout the boil period and Cascade for dry hopping. Colby says, "Simcoe's piney flavor complements the American 'C' hops well. Plus, as a high-alpha, low-cohumulone (15–20%) variety, you can blend it with high co-humulone bittering hops to get the right amount of co-humulone 'bite' in your big IPAs."

Summing Up

Just a few years ago, homebrewers were limited to a handful of traditional hop varieties, if they could find them at all. However, now craft brewers are driving the development of new varieties that challenge our expectations of beer character and styles. The only limit is our willingness to think outside traditional boundaries and play with our hops.

For the homebrewer, evaluation of new hop varieties can begin by tasting commercial examples that use the hops. For better information, experimentation is key. Choose a new variety that you haven't played with, check the characteristics, and substitute it in your favorite pale ale or other hoppy beer style. Better yet, brew a single hop beer and taste it side by side with the same beer made from your favorite hop or hop blend. Taste critically and take good notes to guide your formulation of your next brew. (BYO)

James Spencer, host of Basic Brewing Radio, *thanks Ralph Woodall of HopUnion for contributing to this story.*



Foreign Extra Stout

Story by
Justin Burnsed

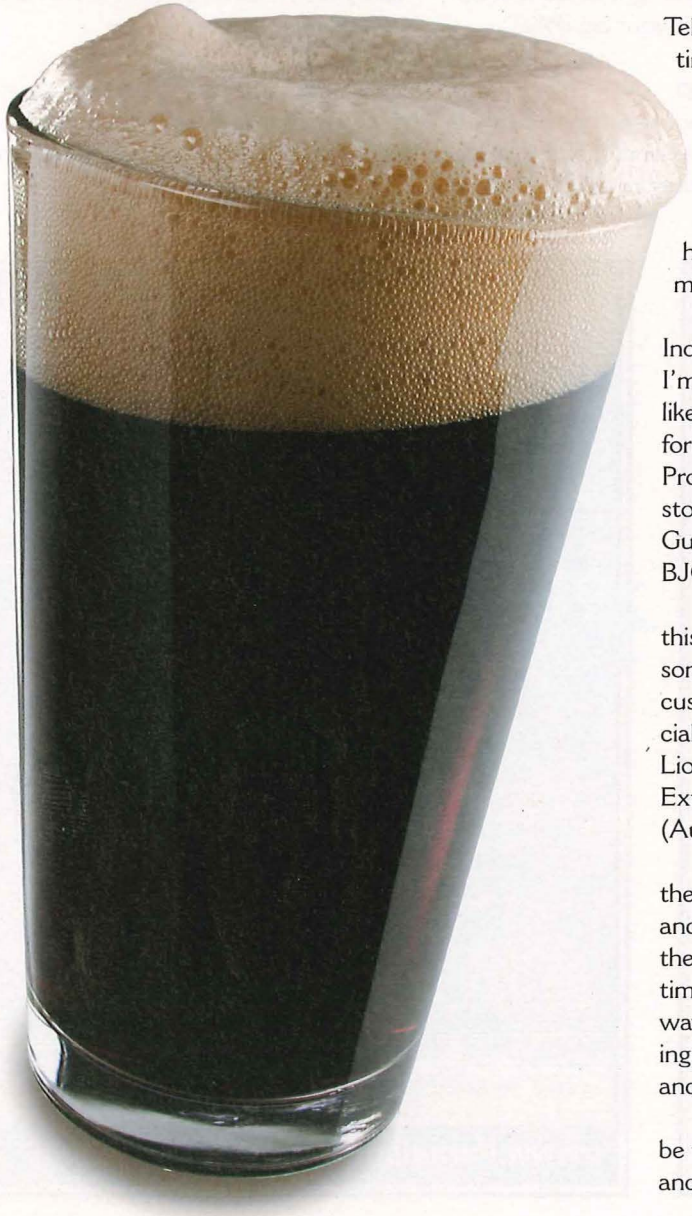


Photo by Charels A. Parker/Images Plus

Tell me if this sounds familiar. There was once a beer destined for lands far and wide across the seven seas. To ensure its safe passage, it was made in the mold of a popular domestic style in what is now the UK, but with a higher amount of hops and a more robust grain bill. The resulting preservational qualities from increased levels of ethanol and iso-alpha acids allowed the beer to travel halfway around the globe unharmed by Mother Nature's microbial pests.

At this point, most people would think I'm describing an India Pale Ale (IPA). The truth of the matter is that the beer I'm referring to looks nothing like an IPA, nor does it taste like one. The style I present to you today is alternately called foreign extra stout (by the Beer Judge Certification Program's (BJCP's) 2008 Style Guidelines) or foreign export stout by the 2010 Brewers Association (BA) Style Guidelines. For the sake of consistency, I will stick with the BJCP version.

I'll be the first to admit that I didn't know much about this style until a couple years ago when I stumbled across some chatter in an online beer forum where people were discussing their favorite stouts. Some of the favorite commercial examples mentioned by many of the participants were Lion Stout (Sri Lanka), Dragon Stout (Jamaica) and De Dolle Extra Export Stout (Belgium), Coopers Best Extra Stout (Australia) and Guinness Foreign Extra Stout (Ireland).

A few of those particular beers can be hard to find as they are mostly exported to areas like the Caribbean, Africa and Australia. In the case of Guinness, there are records of the Foreign Extra Stout (known as West India Porter at the time) being brewed as far back as 1801. This beer found its way to the U.S. in 1817, but was pulled from the shelves during prohibition in 1920. There are also US craft breweries and brewpubs that have made successful versions of it.

Generally speaking, the characteristics of the style can be thought of as the intermediary between dry/sweet stouts and the granddaddy of them all, Imperial Russian Stout. The

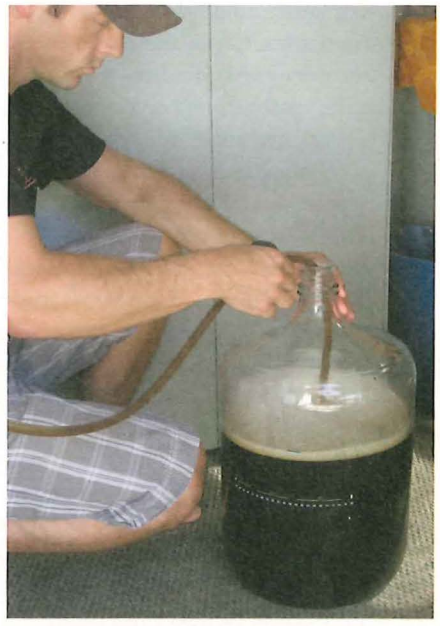
official BJCP guidelines suggest an unofficial division within the style itself between tropical and export versions — the tropical being a more robust version of a sweet stout and the export being a scaled up dry stout. This gives you a lot of latitude when it comes to which way you want to go when formulating your recipe.

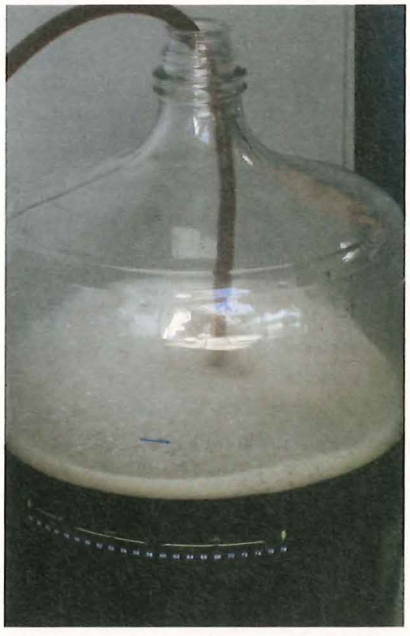
Malts

The base malts that can be used in a foreign extra stout aren't anything out of the ordinary. A 2-row pale malt from either the US or the UK is pretty much the standard. Maris Otter would also work if you wanted to give the beer a bit of traditional British flair. The base malts in this style are primarily there to provide sugars and enzymes to the mash. A bit different from the likes of a Bohemian Pilsner or a Belgian triple where the base malts provide you with a large part of the beer's signature flavor. You don't need to fret too much over them. As always is the case in extract brewing, you need to find the freshest malt extracts available. Light liquid malt extract will work just fine as a substitute for the 2-row pale malt. At the end of the day, you're shooting for a beer that comes in at 5.5–8% ABV.

Roasted Grains

The rich, roasted flavors and aromas provided by the specialty grains/malts used are the actual essence of this style. With the bevy of online retailers at your disposal these days, the variety you have to choose from is pretty extensive. What you decide to put into the grist will determine the level of coffee, chocolate, slightly burnt grain and sweet flavors that are per-





Photos courtesy of Justin Burnsed

Foreign extra stout is a broadly-defined beer style — it can range from dry to sweet and covers the intervening alcoholic strengths between dry/sweet stouts and Russian imperial stout. It typically gets its color and dark roast character from roasted barley or black malt, but other darkly-roasted grains (such as chocolate malt). Tropical versions may be brewed with substantial additions of crystal malts to add sweetness. Export versions may be brewed with sugar as a kettle addition to enhance their dry character. Hopping is usually restrained, with highly-hopped versions being better categorized as American stouts. Foreign extra stout is usually brewed as an ale, but tropical versions are sometimes brewed as a lager. Homebrewers have a lot of options when it comes to brewing a foreign extra stout and should get to know the ingredients when formulating their recipe.

ceived in the final product. Most of the well-known commercial examples use either black malt or roasted barley as the only darkly-roasted grain. Crystal malt and some sugar as a kettle adjunct frequently round out the list of fermentables. Given the broad characteristics of the style, homebrewers could try adding more kinds of dark and specialty malt to build complexity, as long as you don't overdo it with any single one of them.

The roasted aspect of a foreign extra stout is commonly provided by some of the most highly-kilned grains around, roasted barley or black patent malt. Roasted barley provides plenty of color, a coffee-like aroma and also gives the added bonus of better head retention due to the higher levels of proteins in the unmalted grain. Black patent malt can also be used. Black malt provides color, just as roasted barley does, but without the coffee-like aroma. A combination of the two could give you good results. Although not common in the well-known commercial examples, another one you may consider to provide a portion of the roasted flavor is chocolate malt, which can provide a bit of nuttiness as well. It should be noted that the export version of the style should contain more of the roasty character and the tropical typically has less.

Crystal Malts?

The level of sweetness in the flavor and aroma of the style also depends on which version you want to focus on.

Tropical versions should have a sugary, almost rum-like quality. This can be obtained in a variety of ways. The use of crystal malts can provide some of this character. Personally, I like to use crystal malts in the 60–120 °L range as I think that the burnt sugar flavors they provide complement the style nicely. In addition, variations in mash temperature and the yeast strain used will also affect the amount of residual carbohydrates left in the beer.

The export version should have very little in the way of sweetness. In this case, the use of crystal malts should be scaled back. Many commercial brewers use simple sugars in the kettle to enhance the dry character of the beer.

Mash

Using a single infusion mash with a conversion rest in the range of 152–156 °F (67–69 °C) should strike a nice balance between fermentable and non-fermentable sugars to give you the body you are looking for (in the beer, of course). Which end of the range is dependent on the version you choose to emulate. I'd use the higher end for the tropical version and lower end for the export. Carbonation should be moderate to moderately-high. A good amount of bubbles is going to help keep that nice, creamy head propped up for you in the glass, which is consistent with the style's expectation of good head retention.

A couple of other grains that can provide desirable characteristics for the style are wheat malt and flaked barley. Used in small quantities (1.0 lb./0.45 kg or less for a 5.0 gallon/19 L batch) they both help increase that all important head retention.

Getting the color right when brewing a Foreign Extra Stout should be fairly easy

One option that some brewers perform is to intially mash in the pale malt and other "light" grains, then stir the darkly-roasted grains into the top layer of the grain bed. This is done to prevent any problems with lautering, but is not neccesary unless you frequently experience issue during lautering.

Boil

All-grain brewers will probably need a good, rolling 90-minute boil to reduce the volume of wort collected and concentrate the wort to reach your target original gravity. Extract brewers can boil their wort for 60 minutes.

Hops play a very singular note when it comes to this style. They are added to provide bitterness and not much else. It is important not to overdo it with the early addition hops as the highly kilned grains will add some of their own bitterness to the party. The target bitterness range for the style is 30–70 IBUs. Most of the well-known commercial examples use only one hop addition at the beginning of the boil. The actual variety used for bittering isn't all that important as it doesn't contribute much, if anything, in the way of flavor. I would suggest using whatever high alpha hop you've got laying around or that you can easily get your hands on.

Hop flavor and aroma should range from non-existent to barely perceivable at most. If you want the beer to have just a hint of hop flavor, I would recommend only adding them up until 15 minutes remaining in the boil. You should be fine using a very small amount (0.50 oz./14 g) or less of any typical English aroma hop or American equivalent such as Goldings, Fuggles or Willamette. On the other hand, if you do "overhop" this beer, you won't ruin it. It will simply be better classified as an American stout.

Fermentation

As previously mentioned, the aroma should be predominantly roasty with little or no hop presence. Dried fruit, molasses and licorice notes have also been deemed as appropriate. Some of the dark crystal malts will help provide these, but the fermentation temperature is also a key component when it comes to the aromatics. Esters produced by the yeast during fermentation can give you the medium to high levels of fruitiness expected in a foreign extra stout. By maintaining a fermentation temperature range of 70–72 °F (21–22 °C), you can help the yeast pro-

duce these desirable compounds while also keeping the fermentation in check. If the temperature goes much higher than that, you run the risk of unpleasant flavors from excessive amounts of esters and fusel alcohols.

The strain of yeast you decide upon will also have an affect on the ester production. There are many to choose from that would fit the bill and which one you go with should also enhance the characteristics of which version you are trying to emulate. The export version needs a yeast that attenuates a bit on the high side (73–77%) and will help attain the necessary dry character. I would suggest using White Labs WLP007 (Dry English Ale Yeast) or Wyeast 1275 (Thames Valley) for that. If you want to lean more toward the sweeter, tropical version, a yeast that has a bit lower attenuation (69–73%) will work best. White Labs WLP 004 (Irish Ale Yeast) or Wyeast 1728 (Scottish Ale) should be able to accomplish that for you. Some commercial versions of the tropical sub-style are fermented with lager yeast.

To prevent an abundance of diacetyl in your beer, be sure to give it a nice rest after it has reached its final gravity for at least a couple days at around the same temperature you kept it at during fermentation. If you transfer the beer to a secondary vessel immediately after final gravity is reached, the same rules apply. Even though the majority of the yeast will be left behind, there are still plenty of cells in suspension to finish the job. Just remember not to crash cool it until you have given enough time for the yeast to turn that buttery character into cleaner, flavorless compounds.

Getting the color right when brewing a foreign extra stout should be fairly easy in comparison to some of the lighter styles. This style is much more forgiving and allows you a range of 30–40 SRM. Anything from deep brown to completely opaque is completely acceptable. The grain bill alone should provide plenty of color to the beer. If you made a tropical version with a small amount of the highly kilned malts and want it to be as dark

FOREIGN EXTRA STOUT RECIPE

Capt. Leo's Foreign Extra Stout

(5 gallons/19 L, all-grain)

OG = 1.074 FG = 1.020
IBU = 43 SRM = 40 ABV = 7.1%

Ingredients

9.5 lbs. (4.3 kg) domestic 2-row pale malt
2.0 lbs. (907 g) Munich malt (10 °L)
1.0 lbs. (454 g) wheat malt
1.0 lbs. (454 g) flaked barley
8.0 oz. (227 g) American crystal malt (80 °L)
8.0 oz. (227 g) American crystal malt (120 °L)
8.0 oz. (227 g) roasted barley (300 °L)
6.0 oz. (170 g) American chocolate malt (350 °L)
6.0 oz. (170 g) black patent malt (500 °L)
1 tsp. Irish moss (or 1 whirfloc tablet) (15 min)
7.5 AAU Amarillo hops (60 min) (1.0 oz./28 g of 7.5% alpha acids)
3.75 AAU Amarillo hops (30 min) (0.5 oz./14 g of 7.5% alpha acids)
2.5 AAU Willamette hops (15 min) (0.5 oz./14 g of 5.0% alpha acids)
White Labs WLP007 (Dry English Ale) or Wyeast 1275 (Thames Valley) yeast
0.75 cup (150 g) priming sugar

Step by Step

Mill the grains with the exception of the flaked barley. Dough in (including the unmilled flaked barley) using 5.0 gallons (19 L) of water and a target mash holding temperature of 154 °F (68 °C). Hold the mash temperature for approximately 60 minutes or until the conversion is complete. Raise the temperature of the mash to 168 °F (76 °C) and begin sparging with 170 °F (77 °C) water until you collect 6.5 gallons (25 L) of wort in the kettle.

Boil for 90 minutes. After 30 minutes of a full rolling boil have passed, begin your scheduled hop additions. When there are 15 minutes remaining in the boil, be sure to add your Irish Moss or whirfloc tablets to help with precipitation of the hot break.

Cool the wort to 70 °F (21 °C), transfer to your fermentation vessel and aerate the wort adequately. Add the contents of your yeast starter to the chilled wort. Ferment around 70 °F (21 °C) until the final gravity is reached, which should be in 5 to 7 days. Rack to a secondary vessel and allow the beer to mature another 5 to 7 days around the same temperature. Your beer is now ready to rack into a keg or bottles along with the priming sugar.

Extract with grains version:

Replace pale malt, Munich malt and wheat malt with 1.0 lb. (0.45 kg) of 2-row pale malt, 6.5 lbs. (2.9 kg) light liquid malt extract, 1.0 lbs. (0.45 kg) Munich liquid malt extract and 10 oz. (0.63 kg) wheat liquid malt extract.

Mill the specialty grains with the exception of the flaked barley. Place the flaked barley and the milled grains in a grain bag. Steep them in 5.8 qts. (5.5 L) of 154 °F (68 °C) water for 30 minutes. Rinse the grain bag with about 2.0 qts. (1.9 L) of water and allow it to drip into the kettle for about 15 minutes, but be sure not to squeeze the bag.

Add enough water for a pre-boil volume of 6.5 gallons (25 L). Stir in all three malt extracts and begin the boil. The total wort boiling time for this recipe is 90 minutes. After 30 minutes of a full rolling boil have passed, begin your scheduled hop additions. When there are 15 minutes remaining in the boil, be sure to add your Irish moss or whirfloc tablets to help with precipitation of the hot break. (If you can't manage a 90-minute, 6.5-gallon (25-L) boil, try to boil at least 3.5 gallons (13 L) for 60 minutes. Add bittering hops immediately after the boil starts and withhold half of the malt extract until late in the boil.)

Cool the wort to 70 °F (21 °C), transfer to your fermentation vessel and aerate the wort adequately. Add the contents of your yeast starter to the chilled wort. Ferment around 70 °F (21 °C) until the final gravity is reached, which should be in 5 to 7 days. Rack to a secondary vessel and allow the beer to mature another 5 to 7 days around the same temperature. Your beer is now ready to rack into a keg or bottles along with the priming sugar.

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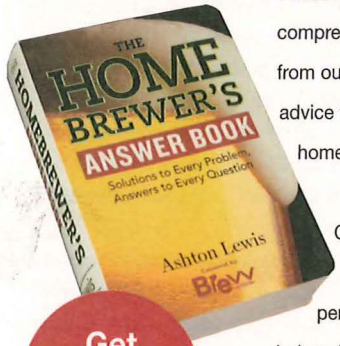

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Photo by Jeremy Keith

as possible — because you love the idea of staring into that dark Guinness-like black foamy oblivion — then just boil it longer. You'll get the benefits of the Maillard reaction which will help you pick up some of that color you're looking for. Just be sure to adjust your pre-boil wort volume to compensate for the increased amount of evaporation. You could also add some debittered black malt, if you so desire, for extra color depth.

If you really want to get wild, you can take a page from the people at Guinness and add small amount of *Brettanomyces* to your wort during fermentation. For instructions on how to go about that, I will defer to the latest *BYO 250 Classic Clone Recipes* special issue. If you dare to go that route, the resulting beer would be considered by most style purists to fit into the specialty category when entering it into a homebrew competition.

The great thing about this style is that you have a lot of options. You can make a sweet, fruity, liqueur-like stout or go the opposite direction and make a dry, bitter version that tastes like it just walked out of Starbucks. And who says you have to choose? Take a few components from both and see what you come up with! BYO

Justin Burnsed recently graduated from the University of California at Davis Master Brewers Program. He chronicled his education on his blog at byo.com. This is his first article for

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DELICIOUS dry stout

by **Chris Colby**

> "BREWING A GREAT DRY STOUT REQUIRES FOCUSING ALL OF YOUR ATTENTION – FROM INGREDIENT SELECTION TO PROCESS – ON ACHIEVING A DRY BEER WITH AN APPEALING ROASTED GRAIN CHARACTER."

A SUPER SESSION BEER

Some beer styles are fairly easy to brew. Others are difficult. I've always thought that it is easy to brew a good dry stout, but difficult to brew a great one. (My opinion here may be influenced by the fact that I brewed a long line of really mediocre dry stouts before I finally turned the corner and got it right.) In most ways, a dry stout is a simple ale. So, if you understand and focus on the main idea of the brew — it's a pleasantly roasty session ale — you can brew a great example at home.

Defining Dry Stout

Dry stout is a dark beer. Sitting on a table or bar it looks black, but if you hold it up to a light, it will look dark brown with ruby highlights. The best dry stouts have a nice cap of white or tan foam on top. Dry stouts have an enticing roasty aroma reminiscent of coffee. The flavor is likewise roasty, with a solid hop bitterness. The roast character and bitterness are prominent, but not so aggressive to keep the beer from being a highly drinkable session beer. In fact, given the low alcohol content of dry stouts, they are one of the very best session beers as they are wonderfully flavorful, but not imposingly alcoholic.

The mouthfeel of a stout can vary widely and is strongly influenced by whether or not it is pushed with nitrogen. Nitrogen taps and the "widget" cans deliver very fine bubbles and a creamy mouthfeel that mixes well with the overall roasty character. (See the sidebar on the facing page for more info.) However, dry stouts that undergo and are served with "ordinary" carbonation may lack this character and still be excellent beers.

Finally, a dry stout is . . . well, dry. The roast flavors take center stage in this brew because there is little sweetness or body to compete with them. Just as a great American IPA relies on the specialty malt character and body taking a back seat to the hop assault, a great dry stout revolves around not letting other elements of the beer interfere with the expression of the roasted grain characters. In fact, I would draw an explicit parallel between the approaches to these two styles. In an American IPA, it's all about the hops. Everything you do — from ingredient selection to recipe formulation to process — is focused on getting the best expression of the hops. In a dry stout, it's all about the roast. And likewise, everything you do as brewer should be aimed at getting the best expression from your darkly roasted grains.

Roasted Grains

The heart of a dry stout is the dark roasty character and this style can be made with a variety of roasted grains. However, the primary roasted grain used in the classic examples of the style — Guinness, Murphy's and Beamish — is roasted (unmalted) barley (around 500 °L). You can let roasted barley (500 °L) be the only dark grain in your grist, or you can blend it with other dark grains. Roasted barley is available from many different maltsters, and — although all are similar in their coffee-like roastiness — each has slightly different characteristics. If brewing a great dry stout is a goal of yours, experimenting with different sources of roasted barley is worthwhile. Keep in mind you may want to blend roasted barley from different maltsters if you find two or more with characteristics you like.

Two other dark roasted grains that can be used in dry stout are chocolate malt and black malt. A little chocolate malt thrown in the mix adds a chocolate-like aroma and flavor that works well with the coffee-like notes of roasted barley. Black malt (500 °L) — a malt closely associated with robust porter — can add an "sharp" edge to the flavor of a dry stout, although it does little for the aromatics. (See the sidebar on page 44 for how these grains are made.)

Less darkly-roasted grains, such as roasted barley (300 °L), coffee malt or pale chocolate malts can be used in small amounts, for complexity. However, these should comprise only a small percentage of the dark grains in your grist — you need most of your roast character coming from a very dark grain.

Roasted barley, and other darkly-roasted grains and malts, supply more than just roast to your beer. By their nature, darkly roasted grains are also bitter. In addition, they are more acidic than pale grains. And finally, darkly roasted grains are more likely than pale grains to add astringency to a beer. (In a dry stout, a hint of astringency can be a good thing, but if the beer is puckeringly astringent, it is not going to be a pleasant session beer.)

The amount of combined darkly roasted grains in a dry stout recipe is typically around 10% of the grain bill. There is a relatively small window of acceptable roast character in a dry stout. Too much and it becomes too harsh and bitter. Too little and you get a thin, coffee-flavored beer with little to recommend it. Just the right amount, however, and you have a wonderfully aromatic and roasty beer that you can drink all night.

Getting the right amount of roast character, and having it be appealing, involves more than just having the correct percentage of dark grains in your grist. As you will see, it also depends on not oversparging these grains (and extracting overly bitter or astringent elements from them) and manipulating the chemistry of your brewing liquor to balance their acidity.

Other Sources of Roast

If you're willing to think outside of the box, there are other sources of roast character that you can incorporate into your dry stout, specifically actual coffee or chocolate. A small dose of espresso added at bottling or kegging can add some complexity to the aroma and flavor of a dry stout. The same goes for adding small amounts of (unsweetened) cocoa powder to the boil or "dry beaning" the brew with cacao nibs. Depending on the amount you add, these "non-beer" beer ingredients can add a small amount of complexity in an otherwise straightforward dry stout, or they can turn the brew into a specialty beer.

Base Malt

Some brewers will tell you that, in dark beers, your base malt does not

Dispensing a Stout with Nitrogen

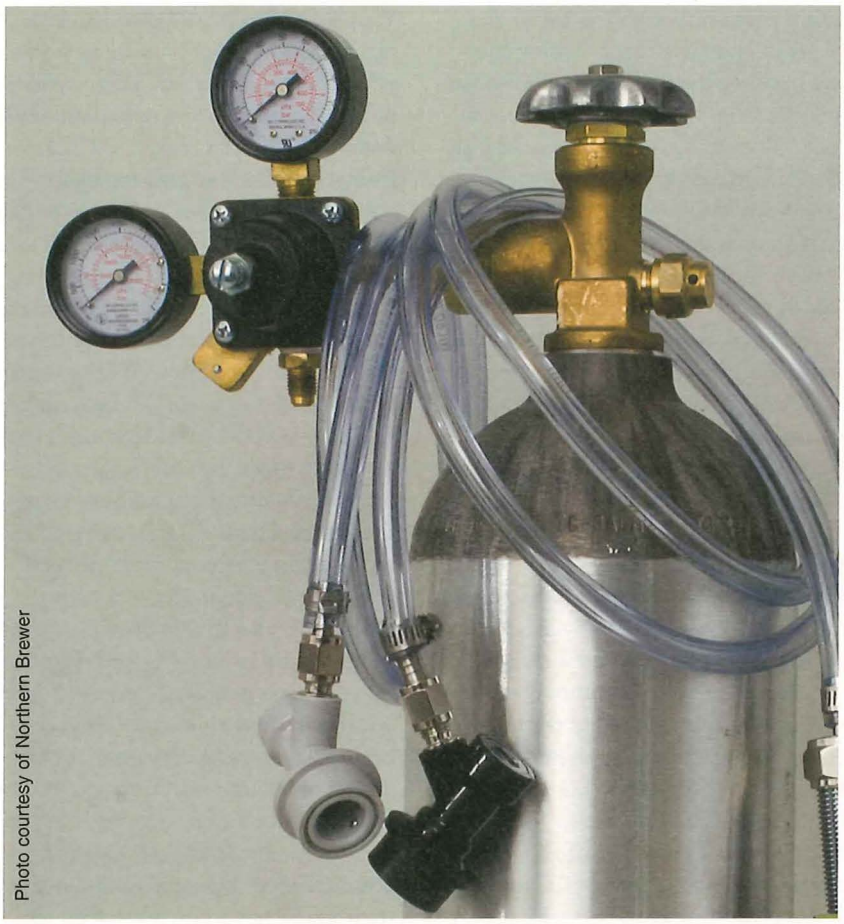


Photo courtesy of Northern Brewer

If you'd like to push your dry stouts with nitrogen, to acheive the same effect as when Guinness or other stouts are, you'll need some additional equipment beyond a standard keg set up. The techniques for preparing the beer to be served are also slightly different, but if you are able to keep a CO_2 keg system running, you should have no problems with a nitrogen system.

Mixed gas cylinders are different from those that contain carbon dioxide. The threads on mixed gas cylinders are left-handed so that a mixed gas regulator cannot accidentally be attached to a CO_2 cylinder. Additionally, the gauges have higher maximum readings because both the tank and dispensing pressure of the gas blend is higher.

Another difference between a CO_2 setup and one with mixed gas is the faucet for dispensing nitrogen beers. Typically, these are taller and thinner. They are designed for mixed gas only.

Beers served with nitrogen are typically equilibrated and pushed with a 75%:25% blend of nitrogen:carbon dioxide. Nitrogen gas (N_2) is much less soluble in beer than carbon dioxide — around 80 times less at beer serving temperatures. And, as with carbon dioxide (CO_2), it does not react with beer.

American Pilsners have around 5,000 mg/L of CO_2 dissolved in them. In contrast, beers served with nitrogen typically contain around 2,400 mg/L of CO_2 and only about 20 mg/L of N_2. Even though the gas mix is mostly nitrogen, the difference in solubility ensures that only a small amount of nitrogen enters the beer, compared to CO_2.

The dispensing pressure for beers on mixed gas is considerably higher than for other beers. Guinness recommends, and most bars push nitro beers with, about 30 PSI of gas pressure.

To prepare your stout for a nitrogen tap, ferment as usual, but carbonate it very lightly. For example, if a dry stout is fermented at 68 °F (20 °C), it will already have nearly 0.8 volumes of dissolved CO_2. Increasing this to the recommended 1.2 volumes (the target CO_2 level for Guinness) would require only a little force carbonation if the beer is chilled to the recommended serving temperature of 43 °F (6.1 °C).

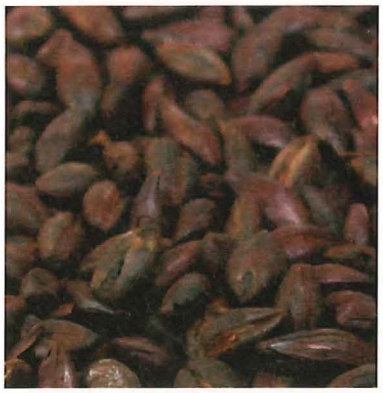
Force carbonation should be done with pure CO_2. Trying to accomplish this with mixed gas requires much more time. (Even though the overall gas pressure on the beer is higher, the amount of CO_2 in the mix is lower and thus the partial pressure of CO_2 is correspondingly lower.)

To get a real "nitro pour," you need to equilibrate the beer with the mixed gas. As with CO_2, this can be accomplished by letting cold beer sit under pressure. However, given the low solubility of nitrogen, this can take a week or more. A faster way is to inject mixed gas into the beer through a carbonation stone. To do this, turn the regulator to 30 PSI and bubble the gas from the stone through the beer. You will need to release the keg's headspace pressure whenever the flow of gas slows.

Ashton Lewis, Master Brewer at Springfield Brewing says, "We gas for 30 minutes, rest for 30 minutes and gas for 30 minutes." Once the beer is ready to go, connect the gas fitting of the keg to the mixed gas regulator and cylinder, and the beer fitting to the dispensing line. Open the mixed gas cylinder fully, adjust the pressure at the regulator, if needed, to serving pressure.

With 30 PSI of pressure behind it, won't your dry stout shoot out of the tap as if from a fire hose? The answer is no, because a key element of a nitro tap is a small disc called a restrictor plate. This plate forces the beer to flow through through tiny holes (usually five). This agitates the beer and causes nitrogen bubbles to be released so it has a cascading head when first poured. The plate also counteracts the high serving pressure and slows the beer to a reasonable flow rate. If you're a big fan of dry stouts, the extra expense and effort required to get a nitro pour is worth it.

Dark Roasted Grains



A variety of dark grains are available for the homebrewer here are brief profiles of three of the most popular:

Roasted Barley

Roasted barley is made by roasting unmalted barley at 221–233 °F (420–450 °C) for about 3.5 hours. After this time, it reaches approximately 500 °L. Roasted (unmalted) barley is highly aromatic, with coffee-like notes being the most prominent aroma.

Chocolate Malt

Chocolate malt is a malt which, as the name implies, has a flavor and aroma reminiscent of chocolate. The roasting profile for chocolate malt is 221–233 °F (420–450 °C) for around 2.5 hours. This produces a dark malt with a color of 350–500 °L. US versions are generally on the lower end of the color scale while British versions are darker. There are also dehusked chocolate malts that are less bitter than their regular counterparts. In addition, there are chocolate versions of rye malt and wheat malt.

Black Malt

Black malt, or black patent malt, is kilned at 221–233 °F (420–450 °C) for up to 4 hours. It has essentially the same roasting profile as roasted barley. However, because it is malted, almost all of the volatile compounds are driven off in the kiln. Since much of what we perceive as flavor is really aroma, black malt is fairly neutral, with a bitter, deeply roasted (but not burnt) character — it is more subtle than you may have been led to believe.

matter — the intense flavors of the dark grains will just overpower it. I disagree. Even though the focus in a dry stout is on the roast, I think the base malt makes a difference. Choose a good quality base malt for your dry stout. The obvious choice would be a nice English pale ale malt, perhaps made from Maris Otter barley, or a Scottish pale malt made from Golden Promise. But don't overlook the possibility of using a quality malt from the US, Belgium or Germany, or throwing a little Vienna malt in the mix.

Wheat malt can be used in small amounts (under 10% of the grist) to add a hint of wheaty "zing" and give a boost to the beer's foam.

Adjuncts

Guinness is brewed with flaked barley as an adjunct and other dry stout makers use sugar as a kettle adjunct.

Flaked barley is just unmalted barley that has been extruded through rollers. There is a widely-held belief among North American homebrewers that this adds creaminess to the beer. However, this idea does not seem to exist anywhere outside of the homebrewing community. Professional brewers (who didn't get their start in homebrewing) simply look at flaked barley as an adjunct.

Using cane or corn sugar as a kettle adjunct allows the brewer to make a drier stout compared to an all-grain beer. Both of these sugars are completely fermentable by brewers yeast. Adding them will boost your original gravity (OG) a bit, but your final gravity (FG) will remain the same. Adding up to 12% cane or corn sugar will yield an appropriately dry stout. Over that amount and the beer will simply seem thin and watery.

Sugar is not required when brewing a dry stout. There are many elements in the beer that contribute to its dry character and you do not need to maximize each one. As long as the beer has an overall dry feel to it, it can be a fine dry stout.

Malt Extract

If you are an extract brewer, you have two main considerations when brewing a dry stout. The first is whether you are going to use flaked barley. Your best bet would be to leave this out of your extract brew. However, if you do want to include some, you will need to "steep" some pale malt along with it at 150–158 °F (66–70 °C). Enzymes from the pale malt will degrade the starches in the flaked barley, which could otherwise serve as a food source for many contaminating microbes. For every unit of flaked barley in your recipe, add a minimum of two units of pale malt. (Three would be better if you use a UK pale malt.)

Your second consideration is making a wort that can be fermented to dryness. Malt extracts differ in their fermentability and you may need to replace some of your malt extract with refined sugar (corn or cane). Hopefully, you'll have brewing notes to guide you on the FG and flavor of beers you've previously brewed with your favorite malt extract. If you've brewed reasonably dry beers before with a particular malt extract, you may only need to swap about 5% of extract for sugar. If your extract brews frequently seem a bit cloying in their sweetness, you may need to replace as much as 30% of the extract with sugar.

Strength

Dry stouts are session beers and, as such, are not very strong. The BJCP gives the range of acceptable starting original gravities (OGs) as 1.036–1.050, with 1.007–1.011 as target final gravities (FGs). The range of alcohol levels is given as 4–5% alcohol by volume (ABV). When formulating a dry stout recipe, keep in mind that a low original gravity (OG) translates to a low final gravity (FG), contributing to the overall dry feel of the beer. However, as mentioned, the dry aspect of the beer does not need to be maximized. You can brew a good dry stout near the high end of the specified OG range if you compensate for this in other areas.

Hops

In dry stouts, hop bitterness combines with the bitterness associated with

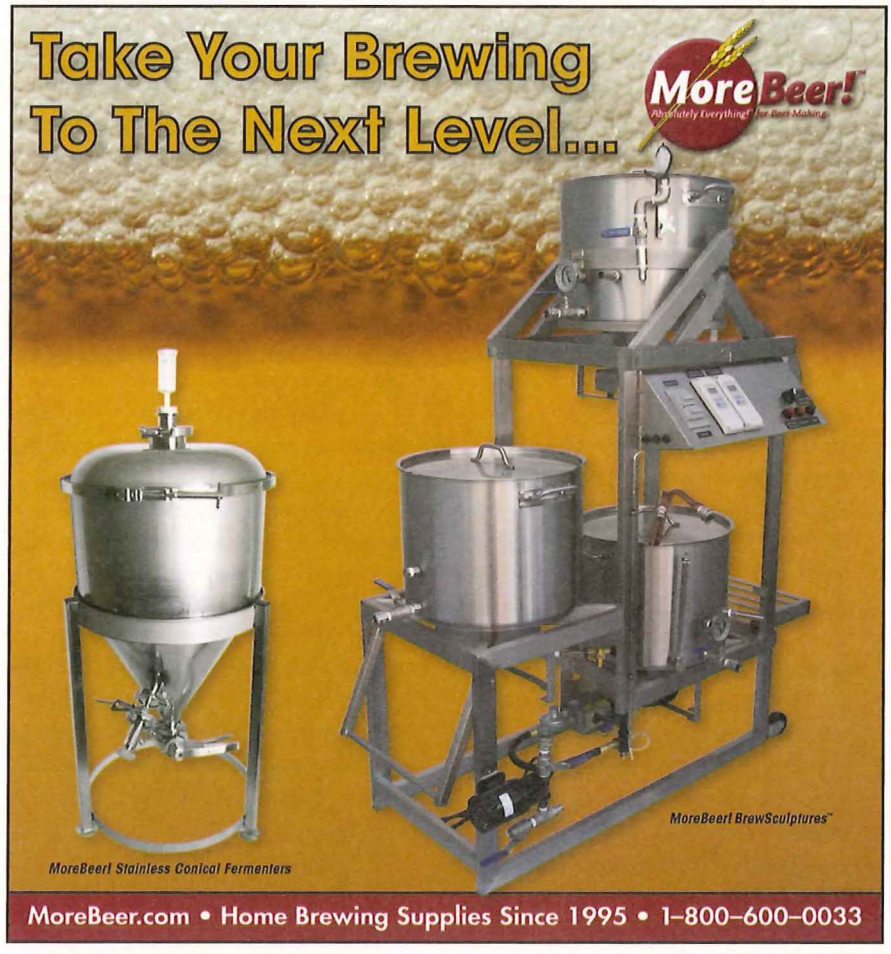
the dark grains to enhance the roasty character in the beer. Bitterness levels are what we might today — in this age of double IPAs — call moderate. The BJCP give 30–45 IBUs as the appropriate target. Because dry stout is a session beer, the level of bitterness, although firm, should not keep it from being a highly quaffable pint. (On the other hand, given the shift in our perceptions, homebrewed dry stouts may be more hoppy and still qualify as a session beer for serious lupulophiles.) Dry stouts don't typically show a lot of hop flavor and aroma, but modest late additions are acceptable as long as they don't take the focus off the roast. For 5.0 gallons (19 L) of beer, I would recommend keeping the total amount of late hops under 0.50 oz. (14 g).

English hops are an obvious choice, given the style's ties to Ireland. For bittering, Challenger, Target or other high alpha hops are appropriate. You could also use Kent Goldings or Fuggles, and these two hops would also work well for late additions. You could also use any "neutral" hop for bittering. The distinctive, citrusy American hops used in many IPAs are not expected in a dry stout.

Ale Yeast

Wyeast and White Labs both offer an Irish ale yeast — 1084 and WLP004, repectively — and these are popular choices for dry stouts. However, many English ale strains will do a good job in a dry stout, especially if they are relatively highly attenuative. Likewise, a "neutral" American strain — including the very popular strain available as Wyeast 1056, White Labs WLP001 or Safale US-05 — is also a good choice. If the yeast has enough character on its own to distract from the roast character, then it's not appropriate.

Keep in mind that, although dry stouts are meant to be dry, they don't have to be bone dry. You do not need to shy away from your favorite English ale yeast if it is only moderately attenuative. Dry stouts start at fairly low original gravities (OGs), so you can reach an appropriately low final gravity, even if your yeast strain is not among the highest attenuators.



Sweet Stout

Photo by Charles A. Parker

In alcoholic beverages, the opposite of "dry" is "sweet." And, there are both dry and sweet stouts. A sweet stout, however, is not simply a dry stout that has been sweetened. The two styles differ in many ways and understanding their differences will help brewers who would like to formulate their own recipes for these beers (or the extra/export versions of these beers).

In most dry stouts, unmalted roasted barley (500 °L) is the roasted grain of choice, comprising all or most of the grain bill. At around 10% of the total grist, this provides an assertive roast character to the brew. In sweet stouts, the roast character is less prominent and may come from a variety of sources. Chocolate malt — which, at around 350 °L, is not as dark and roasty as roasted barley (500 °L) — may be the most abundant, or only, dark grain in the grist. Black patent malt, or debittered black malt may also be used to yield a dark color and roast flavor without much aroma.

In addition, although crystal malts are either omitted or used very sparingly in dry stouts, most sweet stouts generally show a substantial amount of caramel character from crystal malt.

Adding chocolate and crystal malts has a couple other consequences as well. Although the overall amount of color from the darkest malts is typically lower in a sweet stout, the addition of crystal malts brings their color in line with dry stouts. Also, the foam on a stout made with (unmalted) roasted barley as the only dark grain and no crystal malt will be nearly white. Foam on a stout made with mostly chocolate malt and containing crystal malt will be a cream to nearly amber color.

For homebrewers, the sweetness in a sweet stout comes from adding lactose to the beer. Lactose is a mildly sweet sugar (compared to glucose or fructose), but it cannot be fermented by brewers yeast. Adding it adds sweetness to the beer and boosts the beer's final gravity. In some commercial beers, sugar is added and then the beer is pasteurized.

So, sweet stouts are less roasty, typically have some flavor and body from crystal malts and show some sweetness from sugar. They typically start at a higher original gravity (OG), but they also finish at a higher final gravity (FG), so they are not strong beers. (The BJCP lists dry stouts as spanning the 4–5% ABV range while sweet stouts are pegged at 4–6%.)

Sweet stouts are hopped just enough to balance their sweetness and body, often at around 30 IBU. Unlike dry stouts, which may have small amounts of late hopping, sweet stouts are almost always brewed with a single kettle addition early in the boil.

A sweet stout brew day is very similar to a dry stout brew day, but there are a couple differences. In a sweet stout, your mash temperature will likely be a bit higher, because you are not looking to make a highly fermentable wort. Given that lactose will be added in the kettle, your overall grain bill may be smaller than you are used to and — just as in a dry stout — you may need to stop collecting wort before you reach your full pre-boil wort volume. (Monitor your final runnings and stop collecting wort around SG 1.010.)

Sweet stouts are generally not served from nitrogen taps.

Sweet Stout

(5 gallons/19 L, all-grain)

OG = 1.054 FG = 1.023
IBU = 26 SRM = 44 ABV = 4.0%

Ingredients

8.0 lbs. (3.6 kg) UK pale ale malt
0.75 lbs. (0.34 kg) crystal malt (90 °L)
8.0 oz. (0.23 kg) chocolate malt
4.0 oz. (0.11 kg) roasted barley (500 °L)
1.0 lb. (0.45 kg) lactose (15 mins)
9.3 AAU Kent Goldings hops (60 mins) (1.9 oz./53 g of 5% alpha acids)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast (1.5 qt./1.5 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step

Heat 12 qts. (11 L) of water to 165 °F (74 °C), stir in grains and rest at 154 °F (68 °C) for 60 minutes. Mash out to 170 °F (77 °C), then recirculate briefly. Sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Take gravity readings of the runnings and quit collecting wort when they drop below SG 1.010. Boil wort 90 minutes, adding hops with 60 minutes remaining in the boil and lactose with 15 minutes remaining. Cool wort and transfer to fermenter. Aerate and pitch yeast. Ferment at 68 °F (20 °C).

Extract with grains option:

Replace 7.0 lbs. (3.2 kg) pale malt with 0.50 lbs. (0.23 kg) UK pale ale malt, 1 lb. 10 oz. (0.74 kg) Muntons Light dried malt extract and 3.3 lbs. (1.5 lbs.) Muntons Light liquid extract. Place crushed grains in a large steeping bag. Heat 2.8 qts. (2.6 L) of water to 165 °F (74 °C), lower bag into liquid and steep at 154 °F (68 °C) for 60 minutes. Rinse grains with 1.5 qts. (~1.5 L) of water at 170 °F (77 °C). Add water and dried malt extract to wort to make pre-boil volume of 3.0 gallons (11 L). Boil wort 60 minutes, adding hops at beginning of boil and liquid extract and lactose with 15 minutes left in boil. Cool wort and transfer to fermenter. Top up to 5.0 gallons (19 L), aerate and pitch yeast. Ferment at 68 °F (20 °C).

Water

Just as the sulfate level can be adjusted in an American IPA to better accentuate the hop flavor and aroma, getting the right water chemistry for a dry stout will best showcase the aromatic roast character.

Darkly-roasted grains are more acidic than pale malts and — in a beer with a substantial portion of dark grains in the grist — the mash pH can be lowered to a degree that is detrimental. Likewise, the beer itself can end up too acidic and have a nearly sour character to it. When this happens, the roast character in the beer is rarely pleasant. With the proper water chemistry, however, the mash pH will fall into the correct range and the roast character in the beer will be presented in its best light.

To counteract the acidity of the dark grains, you may need to adjust your water chemistry.

If you are familiar with brewing water chemistry, then all you need to know is that you should adjust the residual alkalinity (RA) to match the color of the beer. (See "It's the Water: Understanding residual alkalinity and pH" in the May-June 2005 issue for more on this.)

You can also try two other approaches to manipulating your water chemistry. The best of these two methods is to monitor the pH of your mash and adjust it accordingly. To do this, mash in as you normally would and let the mash sit for 2–3 minutes. Then, take a small sample and check its pH with a pH meter. If the pH is below 5.2, stir in a small amount of either calcium carbonate or sodium bicarbonate. For a 5.0-gallon (19-L) batch, add approximately a teaspoon at a time. Sodium bicarbonate has a larger effect on mash pH than calcium carbonate, so use it if you know that your water is soft or if your initial mash pH is 4.9 of less.

Continue checking the pH and adding carbonate until you reach a pH of 5.2. Stir the mash thoroughly with each addition and let it sit for 2–3 minutes before checking the pH again. Record how much carbonate you added to the mash and dissolve this same amount into your first wort. (Because of pH, it's easier to dissolve carbonates into the mash or wort than to dissolve them into water.)

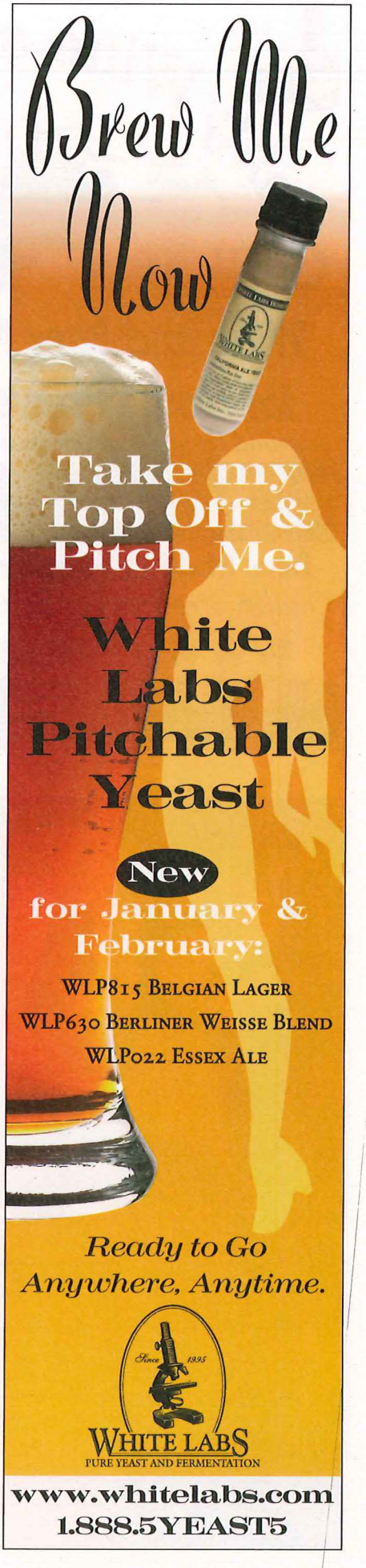
Finally, you can simply take a stab at hitting the right water chemistry, based on your previous brewing experience. If your brewing water contained sufficient calcium, but no carbonates at all, you might need to add as many as 2 tsp. (about 9 g) of sodium bicarbonate to every 5.0 gallons (19 L) of your brewing liquor. Based on this, a "shot in the dark" approach would go something like this:

If you typically brew a lot of dark stouts and porters and they taste fine, then your water chemistry likely does not need to be adjusted. If your best beers are almost always those that are the lightest in color, add sodium bicarbonate at the rate of 2 tsp. (8.8 g) per 5.0 gallons (19 L) of brewing liquor. (Stir roughly half of this into the mash at mash in; add the rest to the first wort.) If your best beers are usually amber, add sodium bicarbonate at the rate of 1 tsp. (4.4 g) per 5.0 gallons (19 L). You can adjust these numbers in subsequent brews.

Obviously, this last method is fairly crude, but you don't need to have exactly the right level of carbonates to brew a successful dry stout.

However you choose to approach the preparation of your brewing liquor, always take good tasting notes and be prepared to make adjustments if needed. Even if you hit the proper mash pH, the final beer can still end up being too acidic. Conversely, if you overshoot on your carbonate additions, your beer can become overly astringent or even take on an unpleasant soapy character.

If you are an extract brewer, you should follow these same guidelines regarding how much to add. Stir roughly half of your total planned carbonate addition into your steeping water. Add the remaining amount when you dissolve your malt extract. If you are boiling less than your total volume of wort, add half of your total carbonate addition to the steep, a quarter to the boil and the final quarter to the beer in the fermenter.



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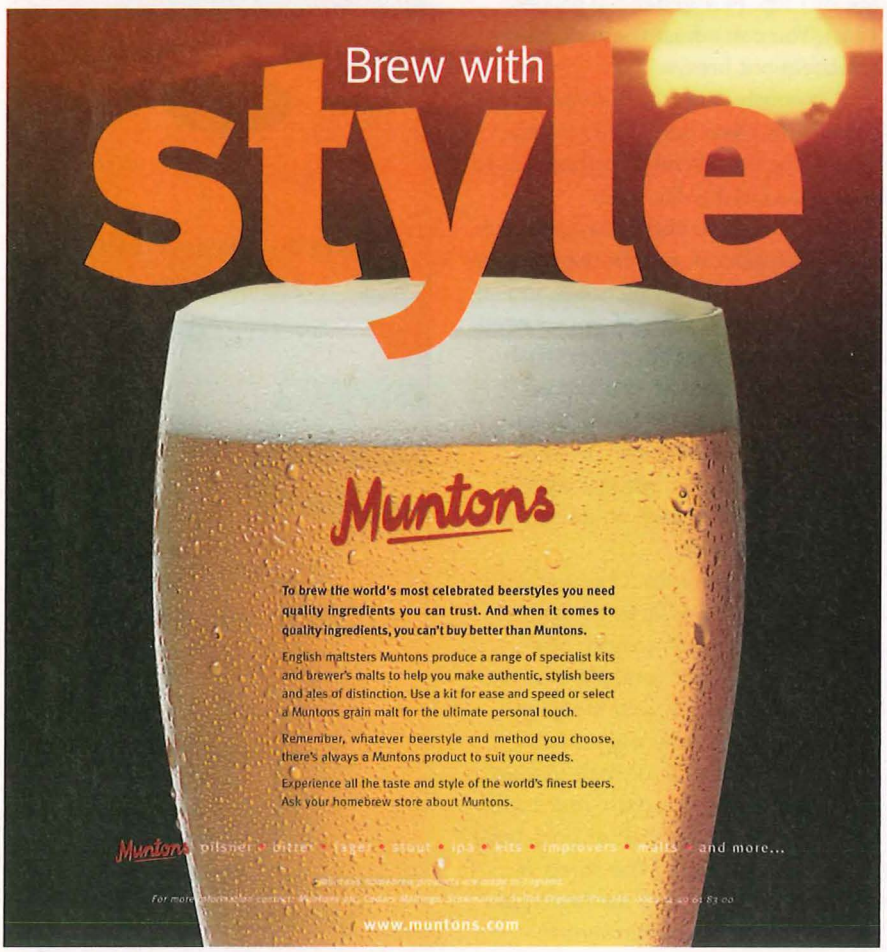

Process

The process of brewing a dry stout is similar to brewing most other ales. However, as with other aspects of brewing this style, you need to focus on how your choices affect the roast character in the beer.

With their low original gravities (OG), dry stouts require less grain than normal-strength or strong beers. If some of the extract for the brew comes from sugar, this is doubly true.

When brewing an average strength ale, a common homebrew practice is to collect wort until the full pre-boil volume is reached. In a dry stout, this will lead to an overly astringent beer.

There is an optimal amount of wort that can be collected from any grain bill. Below this amount, the brewer has left fermentable sugars in the lauter tun. Over this amount and the brewer has likely extracted too many tannins from the grains. Dark grains are especially likely to give up their tannins if oversparged, so dry stout brewers should pay careful attention to the amount and quality of wort they collect.

After you have collected your first wort and started sparging, you will see your wort start to lighten. At this point, begin checking the specific gravity of your runnings. (A refractometer is a good tool for this, because you only need a drop and you do not need to cool the sample, as you would with a hydrometer.) When the specific gravity falls below 1.010, stop collecting wort. You should also taste your final runnings to gauge if they are becoming too astringent. After you stop collecting wort, add water to reach your pre-boil wort volume. From that point forward, follow your normal ale brewing procedures.

Brewing a great dry stout requires focusing all of your attention — from ingredient selection to process — on achieving a dry beer with an appealing roasted grain character. If you do this, you will be rewarded with a delicious dry stout — a wonderful session beer.

Chris Colby is Editor of BYO *and a big fan of dry stout.*

Dry Stout Recipes

My Goodness
(5 gallons/19 L, all-grain)

OG = 1.038 FG = 1.008
IBU = 35 SRM = 46 ABV= 3.9%

A Guinness-inspired dry stout (although not a clone). A little chocolate malt adds a hint of complexity to the roast.

Ingredients
6.5 lbs. (3.0 kg) UK pale ale malt
0.50 lbs. (0.23 kg) flaked barley
13 oz. (0.37 kg) roasted barley (500 °L)
4.0 oz. (0.11 kg) chocolate malt
9.3 AAU Kent Goldings hops (60 mins)
(1.9 oz./53 g of 5% alpha acids)
Wyeast 1084 (Irish Ale) or White Labs WLP004 (Irish Ale) yeast
(1 qt./1 L yeast starter)
0.66 cups corn sugar (for priming)

Step by Step
Heat 10 qts. (9.5 L) of water to 161 °F (72 °C), stir in grains and flaked barley and rest at 150 °F (66 °C) for 60 minutes. Mash out to 170 °F (77 °C), then recirculate briefly. Run off wort slowly, aiming to collect about 4.5 gallons (17 L) over 60–90 minutes. Keep grain bed around 170 °F (77 °C) during sparging. Quit collecting wort when final runnings drop below SG 1.010. Add water to wort to make pre-boil volume of 6.5 gallons (25 L). Boil wort 90 minutes, adding hops with 60 minutes remaining in the boil. Cool wort and transfer to fermenter. Aerate and pitch yeast. Ferment at 70 °F (21 °C).

My Goodness
(5 gallons/19 L, extract with grains)

OG = 1.038 FG = 1.008
IBU = 35 SRM = 46 ABV= 3.9%

Ingredients
1.0 lb. (0.45 kg) US 2-row pale malt
0.5 lbs. (0.23 kg) flaked barley
13 oz. (0.37 kg) roasted barley (500 °L)
4.0 oz. (0.11 kg) chocolate malt
3.0 lb. (1.4 kg) Muntons Light dried malt extract (late addition)
9.3 AAU Kent Goldings hops (60 mins)
(1.9 oz./53 g of 5% alpha acids)
Wyeast 1084 (Irish Ale) or White Labs WLP004 (Irish Ale) yeast
(1 qt./1 L yeast starter)
0.66 cups corn sugar (for priming)

Step by Step
Place crushed grains and flaked barley in a large steeping bag. Heat 3.2 qts. (3.0 L) of water to 161 °F (72 °C), lower bag into liquid and steep at 150 °F (66 °C) for 60 minutes. Rinse grains with 1.5 qts. (~1.5 L) of water at 170 °F (77 °C). Add water and roughly half of the dried malt extract to wort to make pre-boil volume of 3.0 gallons (11 L). Boil wort 60 minutes, adding hops at beginning of boil and remaining extract with 15 minutes left in boil. Cool wort and transfer to fermenter. Top up to 5.0 gallons (19 L), aerate and pitch yeast. Ferment at 70 °F (21 °C).

I Fought Murphy's Law (And the Law Won) Dry Stout
(5 gallons/19 L, all-grain)

OG = 1.043 FG = 1.007
IBU = 31 SRM = 38 ABV = 4.6%

Ingredients
5.5 lbs. (2.5 kg) domestic 2-row pale malt
2.0 oz. (57 g) dark crystal malt (120 °L)
11 oz. (0.31 kg) roasted barley (500 °L)
3.0 oz. (85 g) chocolate malt
1 lb. 7 oz. (0.65 kg) cane sugar (15 mins)
7.0 AAU Target hops (60 min)
(0.68 oz./19 g of 11% alpha acids)
2.5 AAU Willamette hops (15 min)
(0.23 oz./6.4 g of 11% alpha acids)
¼ tsp. yeast nutrients (15 mins)
White Labs WLP007 (Dry English Ale) yeast
(1 qt./~1 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step
Mash grains for 60 minutes at 150 °F (66 °C) in 8.1 qts (7.7 L) of water. Raise mash temperature to 170 °F (77 °C) and recirculate briefly. Run off wort slowly. You will probably only collect around 3.5–3.75 gallons (13–14 L) of wort. Do this over 60–90 minutes. Sparge with water hot enough to keep grain bed around 170 °F (77 °C). Take gravity readings of the runnings and quit collecting wort when they drop below SG 1.010. Add water to wort to make pre-boil volume of 6.5 gallons (25 L). Boil wort 90 minutes, adding hops at times indicated. Cool wort and transfer to fermenter. Aerate and pitch yeast. Ferment at 68 °F (20 °C).

I Fought Murphy's Law (And the Law Won) Dry Stout
(5 gallons/19 L, extract with grains)

OG = 1.043 FG = 1.007
IBU = 31 SRM = 38 ABV = 4.6%

Ingredients
1.0 lbs. (0.45 kg) domestic 2-row pale malt
2.0 oz. (57 g) crystal malt (120–150 °L)
11 oz. (0.31 kg) roasted barley (500 °L)
3.0 oz. (85 g) chocolate malt
1 lb. 7 oz. (0.65 kg) cane sugar
2 lb. 6 oz. (1.1 kg) Briess Light dried malt extract (late addition)
7.0 AAU Target hops (60 min)
(0.68 oz./19 g of 11% alpha acids)
2.5 AAU Willamette hops (15 min)
(0.23 oz./6.4 g of 11% alpha acids)
¼ tsp. yeast nutrients (15 mins)
White Labs WLP007 (Dry English Ale) yeast
(1 qt./~1 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step
Place crushed grains in a large steeping bag. Heat 2.5 qts. (2.4 L) of water to 161 °F (72 °C), lower bag into liquid and steep at 150 °F (66 °C) for 60 minutes. Rinse grains with 1.5 qts. (~1.5 L) of water at 170 °F (77 °C). Add water and roughly half of the dried malt extract to wort to make pre-boil volume of 3.0 gallons (11 L). Boil wort 60 minutes, adding hops at beginning of boil and remaining extract with 15 minutes left in boil. Cool wort and transfer to fermenter. Top up to 5 gallons (19 L), aerate and pitch yeast. Ferment at 68 °F (20 °C). BYO

Pulque is made from the juice of the *maguey* agave cactus (pictured above). It once enjoyed a widespread popularity, but was marginalized with the arrival of beer. Homebrewers can make their own *pulque* from commercially available cactus nectar.

In the popular consciousness, Mexico is commonly associated with the tequilas and lagers that are exported in mass quantities. Homebrewers would be interested to know, however, that the nation is also home to several traditional, homemade libations: *colonche* is made from the fermented prickly pear; *tepache* from pineapple or cane sugar, *tesgüino* from corn, and *tuba* from the nectar of palm trees.

None of these folk brews are more intricately interwoven with Mexico's history and national identity, however, than *pulque* (pronounced POOL-kay), the fermented nectar of the *maguey* cactus. The beverage has served as sacramental wine for the Aztecs, *materia prima* for the distillation of tequila and mescal, and a national institution at the turn of the 20th Century. As the drama of Mexico's history has unfolded, the *maguey* and its fermented juice have always occupied center stage.

"In ancient Mexico, the lunar goddess Mayahuel watched over the miracle of fermentation. The *maguey* plant itself was considered sacred."

THE GODDESS MAYAHUEL

In ancient Mexico, the lunar goddess Mayahuel watched over the miracle of fermentation. The *maguey* plant itself was considered sacred in the Aztec cosmology, associated with Mayahuel as a connecting point between the divine and the earthly realms — some legends even described the nectar of the maguey as the blood of Mayahuel herself. Given the holy nature of the plant, *maguey* was used ceremonially by the ancient Aztecs; the spines of the cactus were used by the faithful to pierce their flesh in a physical act of contrition evocative of medieval Catholic penitentes.

Mayahuel's husband was the god Pantecatl, the deity who is said to have discovered the process of fermentation. Pantecatl was also the first to brew *pulque* using the *ocpactli* root: this infusion was added to *pulque* in order to aid in fermentation, add a bitter flavor and preserve the drink from spoilage. For his discovery, Pantecatl was honored with his own month in the Aztec calendar, *Panquetzaliztli*, a time of massive celebration.

In this sense, *pulque* was viewed by the ancients as the result of the union between the female and male archetypes — agave nectar and *ocpactli*. Curiously enough, in many European languages, the word for barley malt is feminine while the word for hops is masculine.

400 FURRY FERMENTERS

Abusing *pulque* in a secular context was harshly punished among the Aztecs — the offender's house might be torn down, his hair burned off or he may even be beaten to death.

In the religious, ceremonial context, on the other hand, drunkenness was tolerated, as it was viewed as "possession by the gods." In fact, intoxication is still associated with the intervention of supernatural forces in many modern-day communities of Mexico which speak *Nahuatl*, the Aztec language.

Mayahuel reigned over a pantheon of 400 divine rabbits, the patron gods

PULQUE: mexican INDIGENOUS BREW

by **David J. Schmidt**

of fermentation, which represent the variety of forms which intoxication might take. The number is largely symbolic, signifying a large, nearly uncountable number. Some of the sacred rabbits had specific names, associated with specific forms of intoxication — anger, sleepiness, joviality, etc.

Pulque was used for a variety of religious purposes. Before being consumed, a bit of *pulque* would be poured onto the ground as a symbolic offering to the gods. *Pulque* was used to christen newborn infants, and given to prisoners about to be sacrificed. The Aztecs even held gladiator-type spectacles in which *pulque*-fortified prisoners would be stripped naked and left to fight five warriors, armed only with a wooden stick.

Like beer in medieval Europe, *pulque* was infused with different herbs, plants, roots and minerals, creating several varieties. Some records survived the Spanish conquest, allud-

Photos by Teodoro S. Gruhl

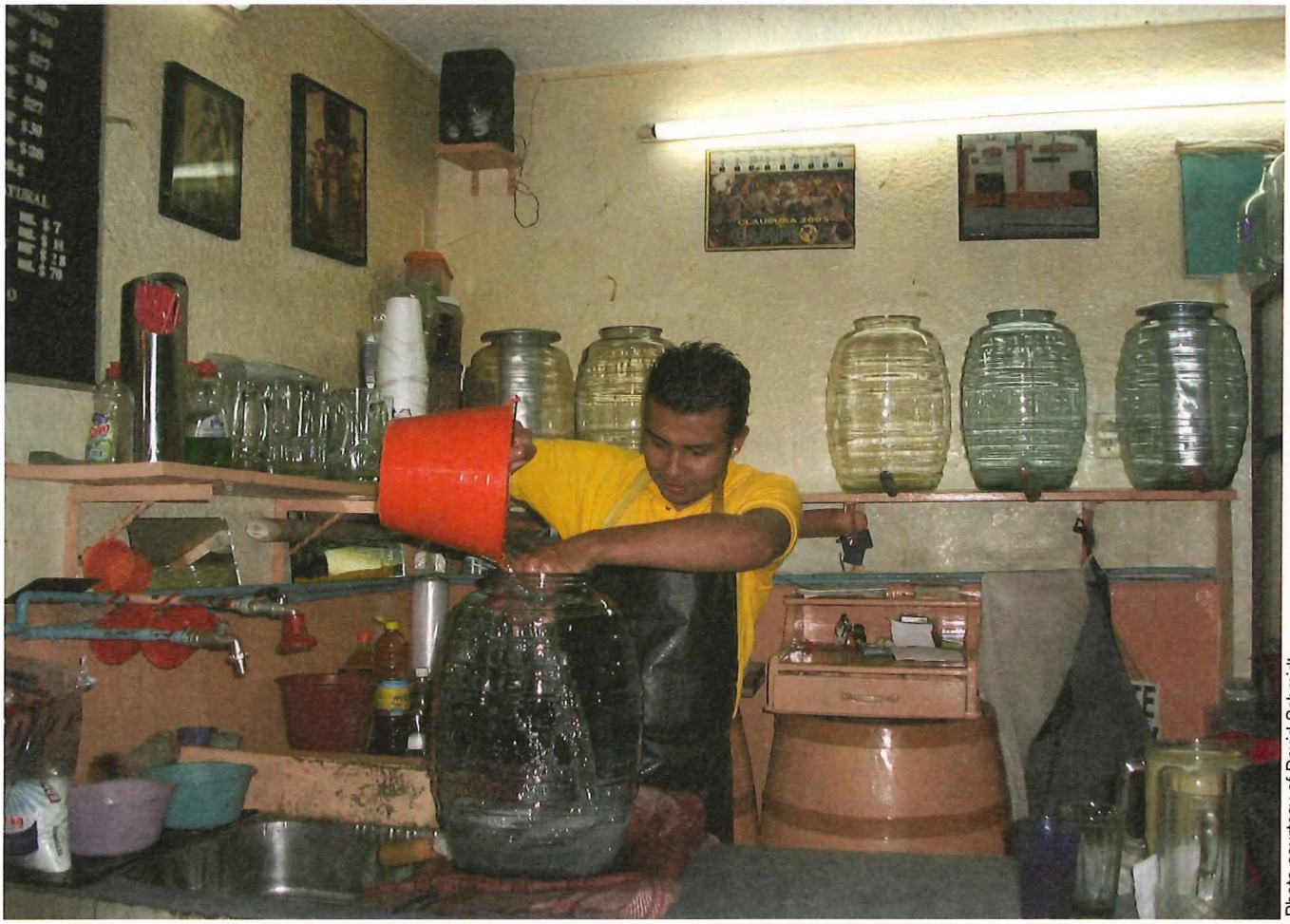

Photo courtesy of David Schmidt

"From the very beginning of the Spanish conquest of Mexico, the *maguey* plant was associated with resistance to the invasion."

ing to the numerous varietals and their uses in Aztec ceremonial life. *Teoctli*, or "divine *pulque*," was given to court musicians for inspiration. During the festivities of the month of *Panquetzaliztli*, a bluish-colored *pulque* known as *matlaloctli* was served; a different variety was named *tlilioctli*, or "black *pulque*."

THE LIBATION OF NEW SPAIN

From the very beginning of the Spanish conquest of Mexico, the *maguey* plant was associated with resistance to the invasion. Legend has it that in a last act of desperation, the Aztecs planted the sacred maguey cacti along the road to Tenochtitlan, hoping to invoke Mayahuel's protection in the face of the advancing conquistadores.

After the emperor had been dethroned and the nation of Mexica renamed "La Nueva España," *pulque* was ever-present in the Spaniards' struggle to consolidate their authority. In fact, the word "*pulque*" itself may derive from a manifestation of passive resistance to Spanish rule. In *Nahuatl*, the proper name for the drink is *octli*; it is believed that the Spanish word "*pulque*" derives from the *Nahuatl* phrase *octli poliuhqui*, meaning "rotten *pulque*." Apparently, the Aztecs gave their conquerors the skunky, oxidized leftovers and kept the higher quality *pulque* for their own clandestine consumption.

In what appears to have been an arbitrary assertion of their authority, the governors of "New Spain" attempted to regulate the production of *pulque* on various occasions. The

Catholic hierarchy pressured the colonial authorities to prohibit the use of the *ocpactli* root, claiming that it increased drunken, disorderly conduct.

Throughout the three centuries of foreign rule, *pulque* became associated with the assertion of native identity in the face of colonial domination. In 1692, a limited uprising of indigenous and *mestizo* peasants against the Viceroy of New Spain took place; as they marched through the streets, the crowds shouted, "*Viva el pulque*!" Of course, this was only a precursor to the actual Mexican War for Independence . . . in which the maguey plant was ever-present.

THE VIRGIN AND THE REBELLION

Perhaps no icon symbolizes the identity of Mexico as much as the Virgin of Guadalupe. According to tradition, the Mother of Christ appeared to the peasant Juan Diego in 1531; she was dressed in the traditional garb of the indigenous poor and spoke to Juan Diego in the *Nahuatl* language. The startled peasant was told to collect roses from a bush that appeared at the Virgin's feet and bring them to the local Catholic bishop as proof of the divine apparition. He collected the flowers in his cloak; upon arrival at the parish, he found that the Virgin's image had been miraculously imprinted on the cloth.

This cloth was an *ayate*, a traditional Aztec cloak sewn from the fibers of the *maguey* plant. The visual depiction of the Virgin of Guadalupe, as well, is heavily embedded with imagery reminiscent of Mayahuel and the *maguey* plant. Some scholars have suggested that the halo surrounding her represents *maguey* leaves, and the moon beneath her feet suggests a connection with the ancient moon goddess. Indeed, among many *Nahuatl*-speaking people, the Virgin has been referred to as *la Virgen del Maguey* and *pulque* has been described as "the milk of the Virgin."

The Virgin of Guadalupe represents the process of *mestizaje*: the blending of the indigenous and the European, the Old and New Worlds,

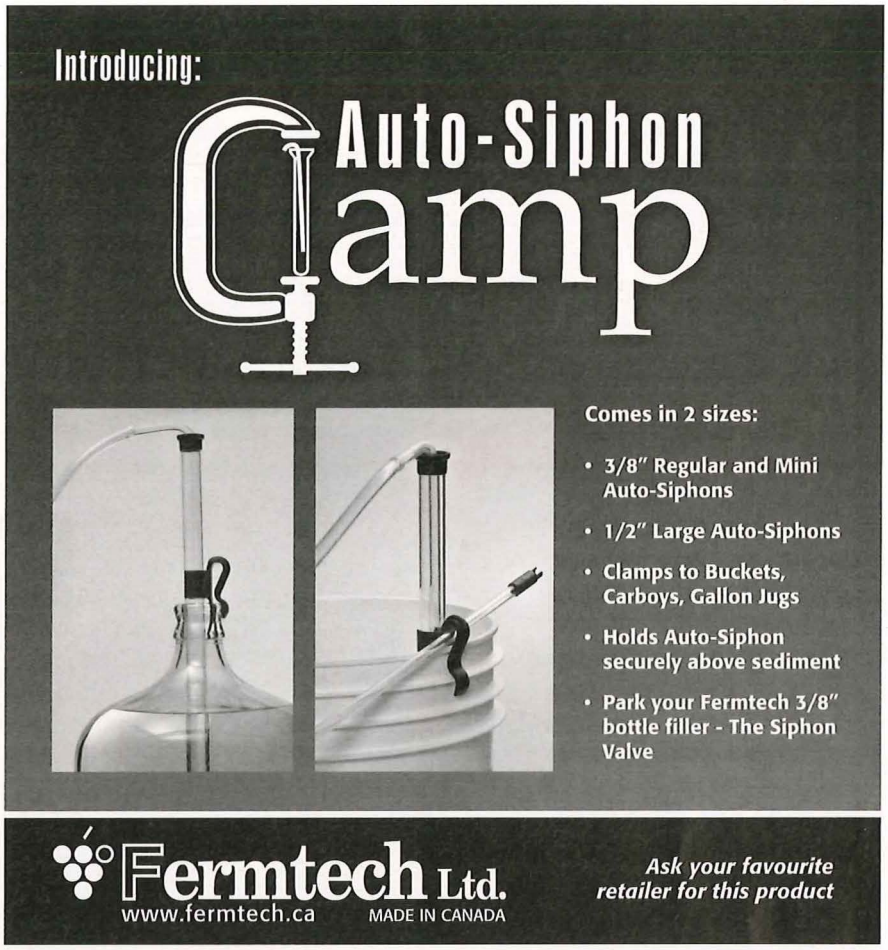

Photo courtesy of David Schmidt

"The bartender would serve the *pulque* out of barrels using a hollow gourd, earning him the title of *jicarero* — the bearer of the gourd."

the fusion that would result in the modern nation of Mexico. The Virgin of Guadalupe became further associated with the identity of the Mexican nation during the War of Independence. In 1810, the patriot-priest Miguel Hidalgo y Costilla carried a banner which bore the image of the Virgin of Guadalupe as he declared Mexico a free and sovereign nation. This flag, the first national banner of independent Mexico, bore a sacred image intricately connected to *pulque* and the *maguey* plant.

THE RISE AND FALL OF *PULQUE*

By the early 20th Century, the production of *pulque* had become a vast commercial enterprise, filling the coffers of landowners who oversaw expansive haciendas across central Mexico. The drink was carted into the nation's capital by the barrelful and served in elegant drinking halls, known as *pulquerías*, which numbered well over a thousand in Mexico City alone. The bartender would serve the pulque out of barrels using a hollow gourd, earning him the title of *jicarero* — the bearer of the gourd. *Pulque* was drunk from green-tinted mugs made of blown glass. In continuity with Aztec tradition, many different varieties were produced using various additives to enhance flavor.

This national institution suffered a nearly fatal blow in the late 20th Century, however, at the hands of the beer breweries founded by European immigrants. Urban

Mexicans gradually began to drink beer more than *pulque* as the century wore on, and the number of *pulquerías* severely atrophied. This transition was artificially accelerated by an aggressive marketing campaign.

A common urban legend regarding *pulque* is the claim that a piece of excrement is dropped into the fresh agave nectar to aid fermentation (referred to euphemistically as *la muñeca* — "the little doll"). While this may or may not have been the case in some remote past, I have not been able to find any modern *pulqueros* who actually use this technique; indeed, a starter of pre-fermented *pulque* is much more effective. Still, the truth never gets in the way of a good story . . . especially when scatology is involved.

Rather, the belief appears to be the result of a "smear campaign" launched by beer breweries in the early 20th Century as they muscled their way into the Mexican alcoholic beverage market. Breweries sponsored widespread advertisements which associated *pulque* with dangerous, unsanitary practices. In contrast, they touted European beer as sanitary and hygienic.

The tendency to reject national traditions in favor of all things foreign is known pejoratively in Mexico as *malinchismo*, referring to the indigenous woman La Malinche who aided the Spanish in their invasion. *Malinchismo* became firmly entrenched in many sectors of society during the dictatorship of Porfirio Diaz. With it, beer pushed *pulque* to the marginal edges of society. The *pulque* market would never recover; in the 21st Century, urban *pulquerías* are ever more difficult to come by.

I recently visited one of the last remaining establishments in Mexico City, shortly after the Day of the Dead celebrations. Amidst ancient colonial churches, vendors selling *cempaxúchitl* marigold flowers and public altars dedicated to the deceased, I found the Pulquería El Casino tucked away on an inconspicuous side street. I stepped through the saloon-style swinging doors to find a small, one-room establishment. The walls were adorned with photographs of bull fighters and 1950's pinup girls; a handful of local men sat at the metal tables, sipping *pulque* and watching a Spanish language translation of *The Simpsons* on a diminutive television set.

The bartender served me up a liter of plain white *pulque*, explaining that it is trucked in from the nearby countryside in enormous barrels. True to tradition, this establishment offers a variety of *pulques curados*, involving the infusion of various flavors. In addition to the unadulterated beverage, patrons can order the creamy, sweet peanut *pulque*, spicy tomato *pulque*, and even a varietal with whole shrimp in it.

The atmosphere was intimate and familiar. Given its location in the colonial city center, this *pulquería* is a place where social class carries little bearing: it is not uncommon to witness mechanics and day laborers sharing a table with businessmen and college students. I was encouraged by the numerous newspaper and magazine articles on display that mention the establishment, which I took to represent a possible resurgence of interest in the traditional beverage. Regardless of the potential expansion of the urban *pulque* market in the near future, however, the heart of Pulque Country remains firmly rooted in Mexico's central countryside.

A RURAL HOMEBREW

The small town of Jilotepec sits nestled amidst pine forests and *maguey* fields. It is emblematic of many rural towns in central Mexico: Ancient Mexican delicacies, including *escamoles* (ant larvae collected from the forest) and *huitlacoche* (fungi that grow on the ears of corn), are still prepared by the townsfolk. An enormous cathedral overlooks the town from the highest mountaintop; when I visited Jilotepec years ago during Holy Week, I joined the faithful in climbing the many steps up to the church.

As is the case in hundreds of towns throughout the Valley of Mexico, *pulque* is brewed there. After descending the mountainside, I was

PULQUE RECIPE

Homebrewed Pulque
(5 gallons / 19 L)

OG = 1.055 FG = 1.010
IBU = 0 SRM = varies
(depending on color of nectar)
ABV = 4.25% (average)

Readers should keep in mind that it is difficult to replicate true pulque *using only the ingredients in a home brewer's pharmacopeia. It is common for* pulque *brewers in Mexico to reproduce their own strains of yeast, using a starter of fermented* pulque *(known as the "semilla", or seed) to ferment a fresh batch of agave nectar. These yeast strains, like many tricks of the trade, are closely guarded secrets amongst* pulqueros *— indeed, some of these strains of yeast may be as old as the Aztec Empire itself.*

Ingredients

8.0 lbs. (3.6 kg) agave (*maguey*) nectar (Madhava brand agave nectar is available at Henry's and other organic markets in light and dark versions. Either works.)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Safale US-05 yeast (Traditionally, a yeast strain known as *Saccharomyces carbajali* is commonly used.)

Step by Step

Dissolve the agave nectar into the water, much as when making a mead. Heat for as long as it takes to dissolve nectar, but do not boil. After cooling wort, add the yeast (and bacteria, if using. See below). Ferment at 65 °F (18 °C). Fermentation time may vary. Best if served shortly after fermenting. If bottling, let cure in bottles for a few days, then keep refrigerated.

You can ferment the agave using only yeast; however, to replicate the sour flavor common in true *pulque*, I recommend adding a bacterial culture. You can use a commercially available lambic blend — such as Wyeast 3278 (Lambic Blend) or White Labs WLP655 (Belgian Sour Mix 1) — or a culture of *Brettanomyces lambicus* or *Lactobacillus delbrueckii* will also work.

parched, and ready to break my Lenten fast from alcoholic beverages. The friends I was visiting told me that a few of their neighbors brewed *pulque*, and I anxiously followed them to the nearest residence. The *pulquero* pulled the top off a large plastic barrel and drew about four liters of the frothy substance into a plastic canister for us, explaining to me the work that goes into creating a batch of pulque. The production involves three basic steps: 1.) cultivating *maguey* plants, 2.) harvesting the nectar from the *maguey* plants and 3.) fermenting it.

To harvest the nectar, a few of the fronds are cut away from the side of a mature *maguey* plant, and an opening is cut into the heart of the plant. One legend claims that the opossum discovered *pulque*, becoming the first creature on earth to get drunk. This story derives from the fact that opossums do indeed scratch at the maguey to drink the rich nectar from it. Since wild yeasts grow on the *maguey* plant, some of these animals may indeed enjoy the mild "buzz" of naturally fermented *pulque*.

Traditionally, the nectar was harvested from the *maguey* plant by sucking it out through a long, hollow gourd; many modern *pulqueros*, however, use a metal ladle to remove the syrup. After removing up to 6.3 qts (6.0 L) of nectar, the inside of the plant is scraped to induce the production of more nectar. Many plants will continue to produce for 4–6 months until they eventually die.

We returned to my friends' home, where a family gathering was well underway. Jilotepec townsfolk danced and drank with relatives who had driven in from Mexico City for the holiday. I drank my first glass of *pulque* while *cumbias* blared from the nearby speakers and children danced with their aunts and uncles. The beverage appeared milky and viscous, had a sweetish sour flavor to it, and went down smooth, not unlike some Belgian sour ales. Many of the urban youth who were visiting for the weekend eyed the pitcher of *pulque* suspiciously, and turned back to their familiar Victoria and Sol beers.

I chatted with some elderly Jilotepec natives as the sun slowly went down, learning that *pulque* was still a ubiquitous part of daily life for this rural community. Two women, ages 80 and 97, told me that they drank *pulque* on a daily basis as children, given its high vitamin content. In a household of seven people, they would drink at least ~5 qts. (5 L) of the beverage every day. Waxing nostalgic, the women told me how they used to wash clothes in a nearby river as they leisurely drank *pulque* and gossiped with each other. A middle-aged man told me that, for most of his life, he drank *pulque* instead of water, as it was more nutritious and sanitary.

Many of the native peoples of the Americas have recognized the medicinal values of the *maguey* plant. Among indigenous groups, it has been used as a diuretic, an antirrheumatic, a laxative and a digestion agent. The root of the plant is even used as a soap and shampoo by some of the native peoples of North America.

By its very nature, *pulque* does not lend itself to long-term storage, making it difficult to commercialize. A few companies have attempted to bottle and can the beverage; the brand "Néctar del Razo" is exported to many parts of the United States. Still, the canned *pulque* doesn't hold a candle to the real thing. (Think of comparing a packet of "fancy ketchup" with a fresh, homegrown tomato.) As a result, *pulque* remains tied closely to the communities that produce it, a fact that should bring satisfaction to aficionados of the "slow food" movement and fans of local small-scale microbrews.

In spite of the drastic changes which have taken place over the past 500 years of Mexican history, *pulque* remains indelibly printed on the national consciousness, and remains a mainstay in hundreds of towns across the diverse, picturesque countryside. BYO

David J. Schmidt is a writer and translator in San Diego, California. He speaks seven languages, has been to 25 countries, and has spent the last ten years exploring rural Mexico.

Small Is Beautiful

The mechanics of brewing session beers

by Terry Foster

Is that all you've got, a 3% bitter? Don't you have something with a kick, like a double imperial dark mild Pilsner? That may sound like an exaggeration, but a drinker at a beer festival once asked me a question very like that. The point is that our opinions about craft beer are often skewed towards extremes — the buzz is that "big is best," and "bigger is even better." I must admit that I do like big beers and the whole American craft brewing approach of pushing the envelope. But when I'm settling down in the evening at home, or pulling up a stool beside friends in a good beer bar, I don't want to drink pints of beers at 8% ABV or more. Instead I want something a little gentler, something that I can drink in reasonable quantity and not fall over. In short I'm looking for a session beer.

That's a pretty vague designation, and one about which drinkers may have quite different views. My comments above define "session beer" as moderate in alcohol content, which I would further define as 3–5% ABV. Many people narrow down the definition still further on the assumption that "session beers" refers to English-style bitters and mild ales. But although it is true that the term is an English coinage, virtually all of the major beer-brewing countries produce substantial amounts of relatively low alcohol beers. In fact, my definition embraces just about every "ordinary" lager produced in the world, including everything under the "Pilsner" designation, which means virtually all the high-volume lagers produced by the US major brewers.

However, my personal idea of a session beer would indeed include British bitter and mild ales, although not all such offerings by British brewers, since more than a few are quite bland to my taste. So I would include something like Fuller's London Pride in my definition, but not Boddington's pub ale. And American beers brewed in an "English" style, would fit this bill. One example is a current favorite of mine, Stone's Levitation Ale, at 4.4% ABV, and packed with hop flavor. I'm also tempted to slip in Sierra Nevada Pale Ale, even though it is a little higher in alcohol at 5.6% ABV. And I have to, of course, mention the offerings from my hometown Bru Rm@BAR in New Haven Connecticut — a 5% ABV Pale Ale, Raven-Haired Beauty a 3.8% ABV dark mild, and our "cross-over" beer, Toasted Blonde Ale at 4% ABV.

Also in that list I should include a number of lager beers, notably Czech Republic Pilsners such as Czechvar and Pilsner Urquell. To my taste, many of the North German Pilsners, such as Jever Pilsner fit this designation very well, with their pronounced levels of bitterness and hop character. Widening the range still further, we could include wheat beers, such as those from Southern Germany. American versions of wheat beer are not particularly to my taste, so I'm exercising author's license and excluding them from my personal list, but you could certainly include them on your own.

Yet other beers could be included, notably German ales, such as Altbier and Kölsch. The latter is a little on the light side for me, but I have had some very enjoyable sessions in Hamburg on Altbier. And you shouldn't need an Irishman to tell you that Guinness and Murphy's stouts are session beers!

I'll stop there because I don't want to bore you with a list that is little more than a seed catalog. The point is that a good session beer is one that you like which has flavor and fits the appropriate alcohol range. Take your pick! For the record, if I had to pick one style for my favorite session beer it would be English bitter, but that's more a question of heritage since that was the kind of beer I cut my drinking teeth on. (For a short list of commercial session beer suggestions, see the sidebar on page 59.)

Brewing session beers

Of course, we tend to think of session beers as those we drink in a pub or bar, but there are plenty of reasons to brew them at home too. Perhaps the best is that from a comment from a brewer friend of mine. He maintains that if you can brew a 3.7 ABV beer with taste then you can really

> "I want something a little gentler, something that I can drink in reasonable quantity and not fall over."

Photo by Charles A. Parker

> "Of course, we tend to think of session beers as those we drink in a pub or bar, but there are plenty of reasons to brew them at home too."

call yourself a brewer!

How you brew such a beer depends upon the style, but there's an important fact to consider first. And that fact is it is not original gravity, which determines the alcohol content, but the difference between OG and the final gravity of the beer. In other words, if you can get some unfermentables in there you will give the beer more body without adding alcohol. That starts with infusion mashing and upward step infusion mashing at saccharification temperatures higher than the "norm" of 150 °F (65.6 °C) and/or using specialty malts, the latter being particularly important for extract beers. These topics I dealt with in the "Techniques" column in the October 2010 issue of *BYO*. An extreme example of this approach (which I didn't refer to in the article) is adding a non-fermentable sugar to the wort. This of course is pretty much limited to the addition of lactose to the wort in the brewing of sweet stouts — of which several examples fit my definition of a session beer. Neither did I talk of decoction mashing, which was traditional for Pilsner lagers, and is held by some to give more body than can be obtained by infusion mashing. It is, however, a complicated procedure and beyond the scope of this article (but you can read more about it in Horst Dornbusch's article on the subject in the December 2010 issue of *BYO*).

Another topic I did not deal with in that previous column, and one which is particularly appropriate for session beers, especially extract-based beers, is the use of hops to add flavor and complexity to the beer. That may seem obvious, but it is not so simple as that. Such beers are always going to be relatively light in body, which means bitterness levels cannot be too high or they will throw the drink's palate out of balance. More is definitely not better in this instance. Something like a Kölsch, for example, should be of a delicate flavor, and not high in bitterness (16–25 IBU) or hop character. In contrast, a Pilsner lager could go up to 40–45 IBU, while English bitter ale might even go up to 50 IBU, particularly if you have beefed up its body with specialty malts, such as Vienna, Victory, Crystal and even chocolate or black malts; use these two latter carefully in bitters — no more than about 1–2% of the total grist.

But of course there's more to hops than just bitterness, and hop aroma and character show to advantage in many session

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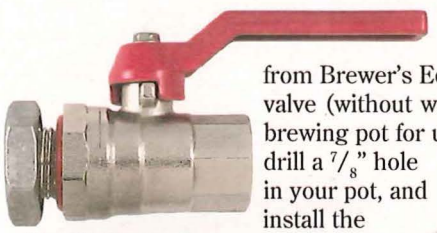

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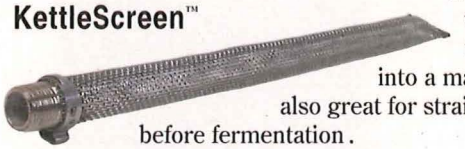

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beers. For example, Woodforde's of Norfolk in Eastern England brew an excellent and very popular 3.8% ABV bitter ale called Wherry, which just bursts with hop character, achieved by late addition of hops in the wort boil. This late addition is the major part of the total hop addition, so the bulk of the hop bitterness comes from this, rather than from addition at the start of the boil. You have to bear this in mind if you want to use big late hop additions and don't want to unbalance the beer. For the homebrewer, I think a better approach is to add bittering hops at the start, at the level to achieve your IBU target, and then late hop with low alpha aroma hops, such as Saaz, Hallertauer or Liberty, and the usual suspects for English ales, such as Goldings, Fuggles and Styrian Goldings.

Another favored approach, especially for English ales, is dry hopping with varieties such as those just mentioned in the secondary fermenter. For American ales that fit my definition of session beers, you can also use stronger-flavored hops, such as Cascades, Amarillo and Simcoe. And

Commercial Session Beer Suggestions

Canada
Central City Brewing Co Red Racer Wheat Ale
Gulf Islands Brewing Saltspring Island Ales Golden Ale
Okanagan Spring Brewery Bavarian Helles
Scotch Irish Brewing Co. Stuart's Natural Session Ale

Czech Republic
Czechvar
Novopacké pivo Broucek
Pilsner Urquell

Germany
Augustiner-Bräu Lagerbier Hell
Jever Pilsner
Mühlen Kölsch
Schwelmer Alt

Ireland
Galway Hooker Brewery Irish Pale Ale
Guinness Irish stout
The Porterhouse Brewing Co. TSB
Murphy's Irish stout

United Kingdom
Brains Dark
Coniston Old Man Ale
Fuller's London Pride
Hobson's Mild
Woodforde's Wherry

United States
Anchor Small Beer
Brooklyn Brewery Pennant Ale
Harpoon Brown Session Ale
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RECIPES

Unorthodox Pilsner

(5 gallons, 19 L, all-grain)

OG = 1.048 (11.9 °P)
FG = 1.014 (3.6 °P)
ABV = 4.4% IBU = 40 SRM 3

Ingredients:

8 lb. (3.6 kg) Briess Pilsner malt (1 °L)
1 lb. (0.45 kg) Briess Carapils® malt (1.3 °L)
1 lb. (0.45 kg) German Vienna malt (3.8 °L)
10.4 AAU Northern Brewer pellet hops, (1.3 oz./37 g at 8% alpha acid) (90 mins.)
1 oz. (28 g) German Hallertau hop pellets (0 minutes)
1 oz. (28 g) Saaz pellet hops (dry hop)
Wyeast 2124 Bohemian Lager yeast, or White Labs 800 Pilsner yeast

Step by Step

Infusion* mash at 154–156 °F (68–69 °C) for 90 mins. Run off and sparge with hot water to collect 6 gallons (23 L) of wort. Boil wort for 90 minutes, adding Northern Brewer hops at start, and Hallertau hops at end. Pitch yeast (preferably as a 1-quart/1-L starter) when cool and ferment at 50 °F (10 °F) for seven to ten days. Remove the beer from cooler, and let temperature rise to about 65 °F (18 °C) to reduce diacetyl level.

Rack to secondary, add Saaz hops in weighted sanitized bag, and lager at 33–35 °F (0.6–1.7 °C) for 2–4 weeks. Rack again, and bottle with priming sugar (2.0 oz. corn sugar maximum), or force carbonate in keg.

*If you prefer, use an upward infusion approach — 15 minutes at 120–122 °F (49–50 °C), 5 minutes at about 150 °F (66 °C), 1 hour at 154–156 °F (68–69 °C).

Meaningful Mild

(5 gallons/19 L, extract plus grains)

OG = 1.042 (10.5 °P)
FG = 1.012 (3.1 °P)
ABV = 3.9% IBU = 23 SRM = 60+

Ingredients

4 lb. (1.8 kg) amber* liquid malt extract
12 oz. (0.34 kg) amber* dried malt extract
0.5 lb. (0.23 kg) crystal malt (55 °L)
4 oz. (0.11 kg) pale chocolate malt (218 °L)
4 oz. (0.11 kg) Dehusked Carafa II® malt (425 °L)
4 oz. (0.11 kg) Black Malt (550 °L)
6 AAU Fuggles pellet hops, 1.5 oz (43 g) at 4% alpha-acid (60 mins)
0.5 oz. (14 g) Fuggles pellet hops (0 mins.)
White Labs 002 English Ale yeast, or Wyeast 1318 London Ale yeast.

*Preferably those made with a portion of Munich and caramel malts

Step by Step

Steep crushed grains in 2 qts. (2 L) water at 140–160 °F (60–71 °C) for 20 mins. Strain liquid into boil pot, and rinse grains with further 2 qts. (2 L) hot water. Add 3 gallons (11.5 L) to collected liquors, and dissolve the liquid malt extract, then dried malt extract. Top up to 5 gallons (19 L) with water and bring to boil. Add bittering hops and boil 60 mins; add rest of hops when heat is turned off. Cool to 65–70 °F (18–21 °C), and pitch yeast (preferably as a 1 qt. (1 L) active starter). Ferment five to seven days, then rack into secondary for up to one week. Bottle or keg with priming sugar, using as little sugar as possible (depending upon the residual carbonation level of the beer); 1–1½ oz. (28–42 g) corn sugar would be my recommendation, as you are shooting for a beer at a little under 2 volumes CO_2. Higher carbonation levels can "drown out" the nuances of this mild ale.

> "Since session beers are not meant to keep for any length of time, dry hopping can be done in the keg if you are serving them as draft beers."

actually, since session beers are not meant to keep for any length of time, dry hopping can be done in the keg if you are serving them as draft beers. There's also no reason why you cannot dry hop lager beers in the secondary lagering stage. This is especially good for Pilsners in my view, as late hopping on the small scale of homebrewing doesn't always work as well as on a commercial scale. In this case you would probably want to go with European varieties such as Hallertau, Hersbrucker, Spalt and Tettnang, although Liberty and Mt. Hood also work well.

Summary

Session beers should be easy drinking but still flavorful. This can be achieved in a number of ways, notably high-temperature mashing, using specialty malts and late and dry-hopping. These approaches are exemplified in the two recipes I have given. Try them and set both your digestive and creative juices flowing! BYO

Terry Foster writes "Techniques" in every issue of Brew Your Own *magazine. He is the author of the books "Pale Ale" and "Porter" in the Classic Beer Style series.*

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Lightstrike

The photochemical effect of light on beer

by Chris Bible

Beer is a beautiful and complex drink. Several hundred different chemical compounds have been identified within a typical beer. Of these myriad compounds, those derived from hop additions during the brewing process are much loved by homebrewers, and are vital to the organoleptic qualities of beer. Compounds derived from hops play several roles in beer, but in particular they are crucial as a source of aroma (from the essential oils) and bitterness (from the hop resins).

Although the flavor and aroma chemistry associated with hop oils and hop polyphenols is rather complex, the chemistry associated with providing bitterness to beer is well understood. The most important compounds associated with hop-derived bitterness are the α-acids. In a pure state, the hop α-acids are weak acids that occur as pale-yellowish solids. The naturally occurring α-acids exhibit very poor solubility in water. α-acids typically comprise between 2 and 15% of the dry weight of the hop, depending upon the specific hop variety and the hop storage environment. Hops with higher α-acid content have greater bittering potential.

When energy is applied to these α-acid molecules during the boiling of the wort, the atoms within the α-acid molecules rearrange themselves in a process called isomerization. The α-acid molecules are isomerized to form iso-α-acids. There are three different α-acids in hops. These α-acids are molecularly similar, but differ from one another in their side-chain structure. Each iso-α-acid exists in two forms, cis and trans, which differ in the orientation of the side chains relative to the rest of the components within the molecule. The six iso-α-acids differ in the quality and intensity of their bitterness. So hops provide both flavor and aroma from their essential oils and bitterness from their iso-alpha acids. Under certain storage conditions, they can also supply another, unwanted, character to beer.

The photochemical effect of light on beer

The flavor of beer is directly related to the ingredients used to make the beer. Beer flavor is also affected by the details associated with the brewing process. Beer flavor continues to change after packaging and storage, and can be dramatically altered by exposure to heat and light. Exposure to heat will increase the oxidation rate of the compounds in beer and produce a flavor and aroma that is often described as "wet paper," "cardboard" or "sherry-like." Exposure to light will produce offensive flavors and aromas that are described as "catty," "skunk-like" or "lightstruck."

There are many opportunities for beer to be exposed to light during storage. Commercial beer could be exposed to light when sitting on a display shelf or inside the refrigerator at a grocery store. Beer could also be exposed to light inside your refrigerator at home. Beer may also be exposed to sunlight if allowed to sit outside — for example, at a picnic or sporting event.

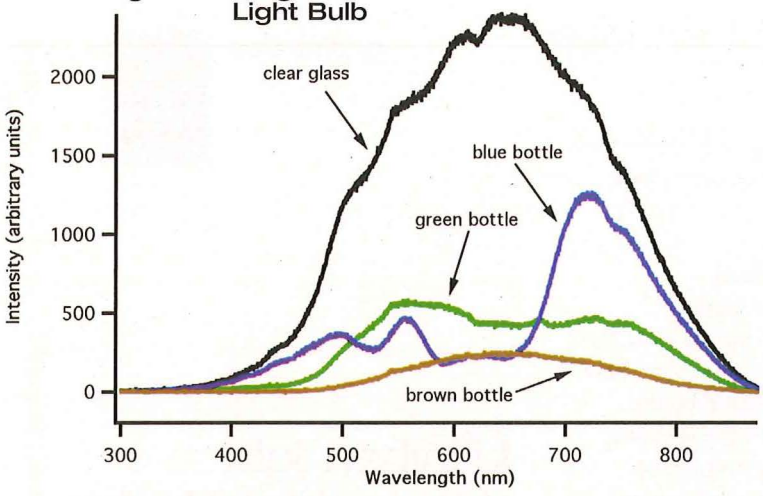
When light (especially UV light) hits beer, it provides the energy necessary to drive a chemical reaction that cleaves an iso-α-acid into two pieces. The smaller of the two pieces gets modified — losing a CO residue and gaining an SH^+ — to turn it into 3-methylbut-2-ene-1-thiol. The "thiol" part of the name indicates that there is sulfur present. Sulfur compounds often have strong, offensive aromas — think rotten eggs or, in this case, skunk spray. The flavor threshold of 3-methylbut-2-ene-1-thiol is so low that a concentration of even a few parts-per-billion is enough to irreversibly spoil the beer and impart the characteristic "lightstruck" flavors and odors. And for the record, 3-methylbut-2-

"When light (especially UV light) hits beer, it provides the energy necessary to drive a chemical reaction that cleaves an iso-α-acid into two pieces."

Photo by Charles A. Parker/Images Plus

Green bottles lead to skunky beer. Green glass does little to filter out the wavelengths of light that cause beer to become lightstruck.

figure 1: Tungsten-Filament Light Bulb



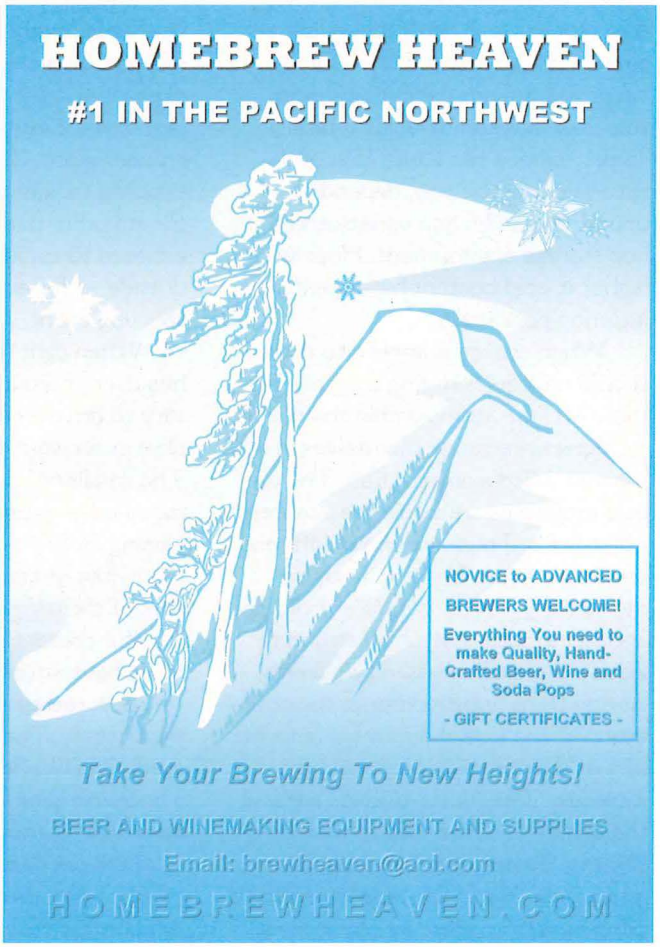
ene-1-thiol is very similar to one of the main chemical components of skunk spray.

Visible light is a form of electromagnetic radiation that has a wavelength of between 380 nm and 780 nm. Visible light with wavelengths from 380–450 nm appears purple or violet. Light with a wavelength shorter than 380 nm is called ultraviolet (UV) light. At wavelengths from 620 nm to 780 nm, visible light appears red. Light with a wavelength longer than 780 nm is called infra-red light. The detrimental impact of light on beer is greater for higher energy light. Waves of light with a shorter wavelengths — or, equivalently, a higher frequencies — carry more energy. Light with a wavelength of 380 nm is higher in energy than light with a wavelength of 500 nm, and light with a wavelength of 500 nm is higher in energy than light with a wavelength of 600 nm.

How packaging protects beer from lightstrike

Beer can be entirely protected from being "lightstruck" by storing it in opaque containers such as cans or kegs. Beer that is packaged and stored in bottles, however is susceptible to developing "lightstruck" flavors. The level of protection provided by bottles depends upon the color of the glass. Glass that allows fewer high-energy wavelengths of light to pass through is better for protecting the flavor of beer. Figure 1 (this page) shows how light that is emitted from a standard, tungsten-filament light bulb is filtered by clear, green, blue and brown glass. Figure 2 (facing page) shows the same thing for sunlight, and Figure 3 (page 64) shows the same spectra for fluorescent light bulbs.

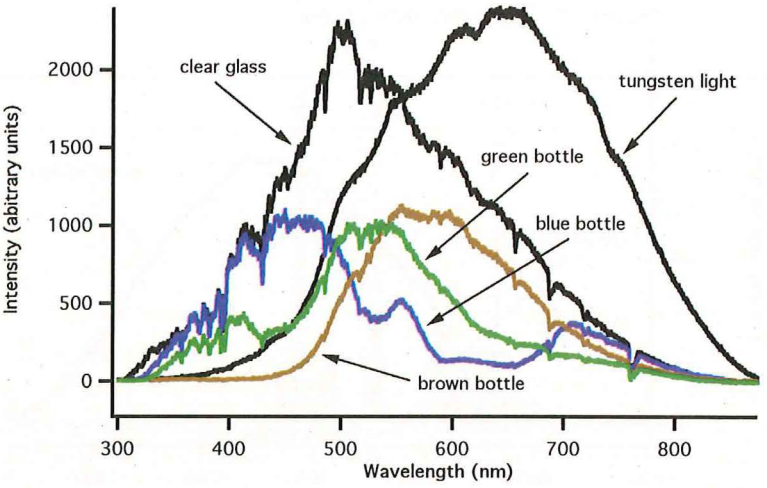
Note that the emission spectra from the three sources are very different. The sun's spectrum is shifted to higher-energy, shorter wavelengths compared to the tungsten bulb. The sun puts out a broad spectrum of wavelengths,



but the spectrum of light that reaches the Earth (and the spectrum shown in Figure 2) is the result of most UV light, and many bands in the infra-red, being filtered out by our atmosphere. The frequency spectrum of an incandescent bulb is based on how a tungsten filament glows when a current passes through it. The fluorescent bulb has well defined emission line "spikes" due to the fact that fluorescent bulbs work based on the excitation of mercury vapor.

The data presented in Figures 1, 2 and 3 show that brown glass filters the largest amount of high energy light, while blue, green and clear glass filters much less. Note that green and blue glass is much less effective than brown glass for light in the frequencies associated with skunking (the shorter wavelengths near the left hand side of the graph). The photochemical reaction occurs very quickly; a well-hopped beer in clear glass can become noticeably offensive with just 30 seconds of exposure to sunshine.

figure 2: Sunlight



Another approach at protecting beer from lightstrike

Apart from storing beer in light-proof containers, the photosensitivity of beer can be reduced by chemically altering the iso-α-acids so that the chemical precursor to the photochemical reaction responsible for producing the "lightstruck" flavor is not present within the beer.

Iso-α-acids can be converted to reduced iso-α-acids by hydrogenation or by reaction with sodium borohydride. Three major types of reduced iso-α-acids can be produced: dihydro, tetrahydro, and hexahydro.

Although the chemically reduced iso-α-acids are as photoreactive as the ordinary iso-α-acids, 3-methylbut-2-ene-1-thiol cannot be formed from these compounds subsequent to photocleavage. As a result, the lightstruck flavor developed from reduced iso-α-acids has distinctly different,

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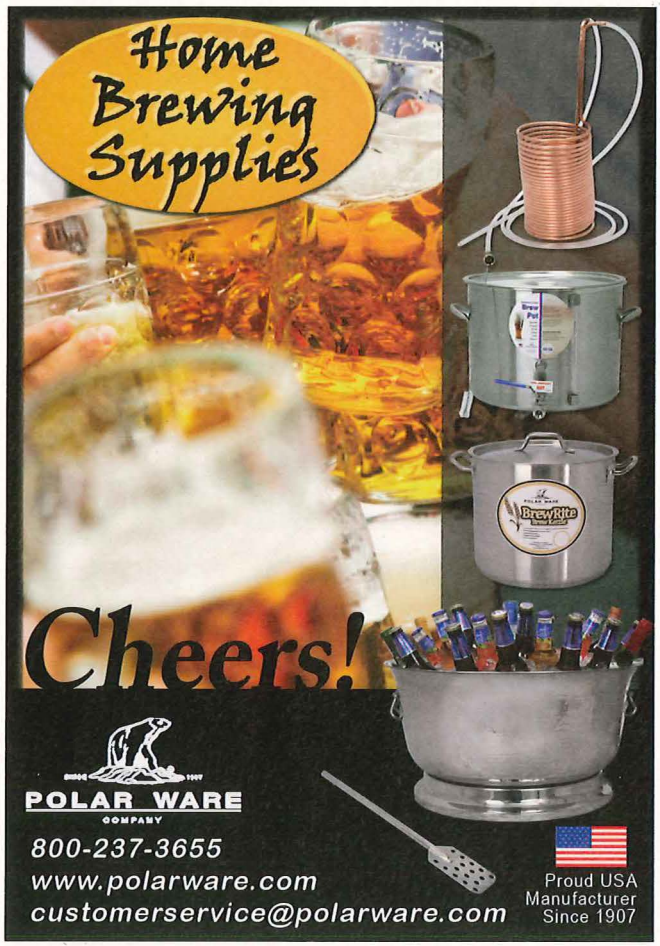


figure 3: Fluorescent Light

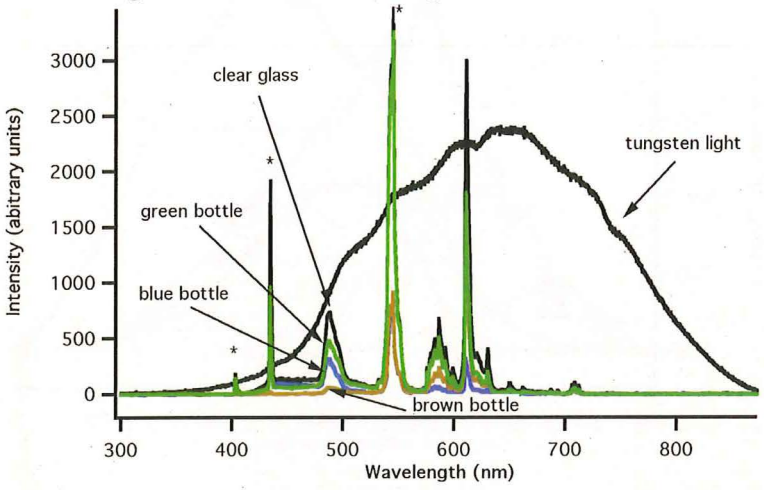


Table 1: Comparison of Bittering Properties	
Compounds	Relative Bitterness
Isohumulones	1.0
Dihydro-isohumulones	0.6-0.7
Tetrahydro-isohumulones	1.5-1.9
Hexahydro-isohumulones	1.0-1.2

and much less obnoxious, organoleptic features than the lightstruck flavor resulting from photocleavage of the ordinary iso-α-acids. Substitution of iso-α-acids by dihydro-, tetrahydro- and hexahydro-iso-α-acids allows brewing of light-stable beers, which can be bottled in clear or green glass. Additionally, the bittering properties of dihydro-, tetrahydro- and hexahydro-iso-α-acids are comparable to that of ordinary iso-α-acids as shown in Table 1 (page 64). These modified hop extracts are used in some commercial beers, but are not available to homebrewers.

Conclusions

The best way to keep beer from developing lightstruck flavors and odors is to prevent it from coming into contact with light. Packaging beer in opaque containers such as cans or kegs will guarantee that no photochemical reactions occur. If beer is to be packaged in bottles, then brown bottles are definitely the best choice. If beer must be packaged in bottles that are green or clear. keep it away from light as best as possible. Hops themselves can be exposed to light, as they are throughout growing season, because only iso-α-acids get cleaved by light. BYO

Chris Bible is a frequent feature story contributor to Brew Your Own *and writes the "Advanced Brewing" column in every issue.*

Simple Tap Cleaner

Keep your keg lines fresh

by Forrest Whitesides

In addition to balancing carbonation and keeping the temperature appropriate to style, a big part of maintaining a homebrew kegging system and serving homebrew is keeping the beverage lines and dispensing hardware clean and sanitized.

Tap lines are pressurized to keep out the air, which prevents the keg from losing carbonation or spoiling the beer in the keg. However, each time you disconnect an empty keg and replace it with a fresh one, a small amount of beer or beer residue can get trapped in the line from the old keg. This residue can sit in the lines and cause a buildup of bacteria, yeast and mold, which can negatively impact the flavor of the beer in the next keg and even cause excessive foaming. Therefore it is a good idea to clean your tap lines and dispensing hardware each time you change the keg. Think of it as cleaning your beer glass after drinking from it.

One of the biggest reasons why brewers don't clean their lines, however, is because it's perceived as a chore. Cleaning tap lines should be quick and easy in order to ensure that it gets done frequently, otherwise cleaning gets put off over and over again. This design is not only inexpensive to build, it is also incredibly simple to use — and cleans your lines and fixtures in no time.

And while a DIY project based around cleanup isn't particularly sexy, this one will provide tremendous utility in the form of saving time, minimizing losses to infection, and helping to avoid sour- or funky-tasting beverage lines. There's nothing worse, perhaps, than great beer served through dirty lines — especially a great beer that you brewed yourself, and the simple tap cleaner project presented here will keep your lines and faucets clean and funk-free.

Additionally, this project avoids the use of a keg and CO_2 to push cleaning solution through the lines and taps. You may find this handy if all of your kegs are full of beer or if you have just run out of gas.

(Note: this cleaner only works on kegerators that have faucets attached to shanks. Those with draft tower setups won't be able to make use of this particular design).

For more information about kegging, check out Andy Sparks' story about kegging in the November 2010 issue of *Brew Your Own*. For more information about draft pressure and how to balance you draft system, check out the "Advanced Brewing" column in the Jan-Feb 2006 issue.

> "You may find this handy if all of your kegs are full of beer or if you have just run out of gas."

Parts and tools list

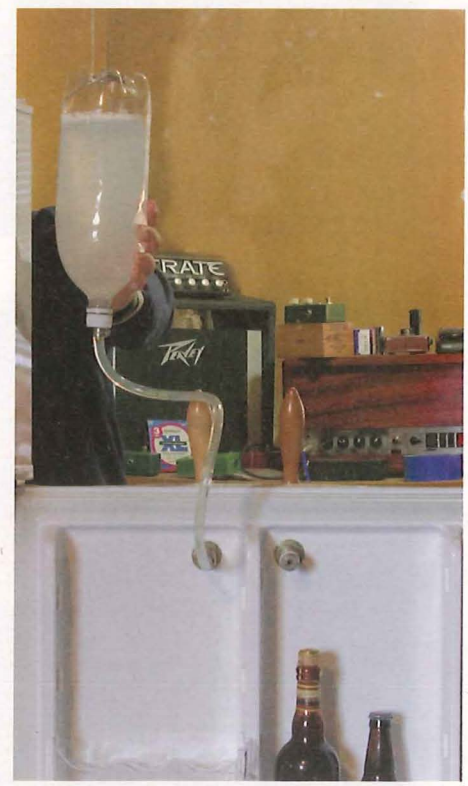
As with any DIY project I embark on, the prime directives are "effective" and "low cost." This one, in particular, meets both directives. Here's what you'll need to put together a simple, effective tap/line cleaner:

Parts and tools

- Brass fitting: ⅜" male pipe thread to ¼" hose barb (Watts A-193)
- Beverage tubing: approximately 3 feet of ¼" ID
- Gasket: a single gasket from a flip-top Grolsch-style bottle; or you can cut your own from a sheet of gasket rubber
- Two small hose clamps
- One 1- or 2-liter plastic soda bottle with cap (I recommend having a few extra caps on hand in case you mis-drill)
- If your shanks require a beer nut to connect tubing, you'll need that as well.

Tools:

- Hand drill with ¼" twist bit
- Round hand file



This easy-to-build draft line cleaner project will clean your beverage lines quickly and cheaply.

1. ASSEMBLE THE PARTS

For quick cleaning during a keg change-out, you may simply want to use the beverage tubing already connected between your liquid-out disconnect and the tap. During a more extensive cleaning job, you may wish to use a dedicated section of tubing just for the tap cleaner bottle and soak your beverage lines in a separate container.

2. PUTTING IT TOGETHER

The process to put the tap cleaner together is very straightforward. The only tricky part is getting the drilling just right. It is important to get the hole as close to the center of the bottle cap as possible; otherwise, the brass fitting may not fit properly and the hole in the cap will not line up with the hole in the gasket.

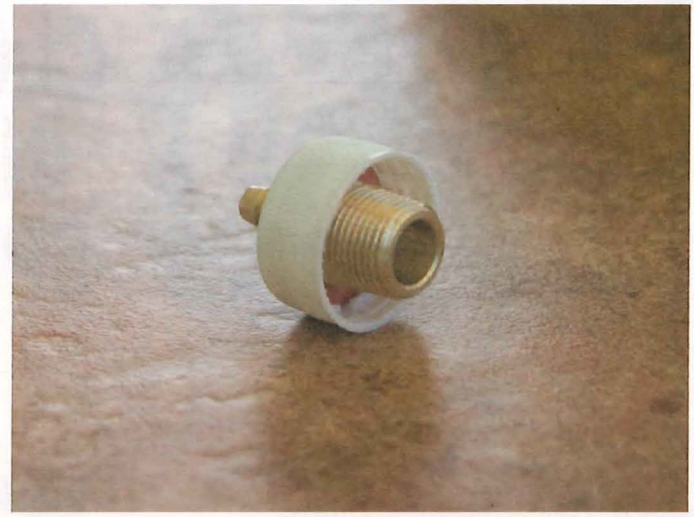
Drill a ¼" hole in the center of the bottle cap. The hose barb end of the fitting will not quite clear the ¼" hole, so you'll need to slightly widen the hole with a round file. Widen the hole in small increments, and check for a snug fit each time you widen. You could also scrape out the hole with a utility knife or another sharp implement, but a round file makes for quick work in this case. If you don't have a round file on hand, I highly recommend picking one up for your toolbox, as they come in handy quite a bit more often than you might think.

3. ADD THE GASKET

Remove any plastic burs that were extruded during the drilling and filing process, and then lay the Grolsch gasket flat in the bottle cap (see photo). If the hole in the gasket doesn't line up with the hole in the cap, you may need to start fresh with an undrilled cap and the get the hole closer to the center.

4. MAKE IT LEAK FREE

Now push the hose barb end of the brass fitting through the holes in the gasket and bottle cap (see photo). It should be a very tight fit, otherwise you may run into trouble keeping a seal when the bottle is full of cleaning solution. I have built three of these tap cleaners for testing before writing this article, and all three kept a tight, leak-free seal without the use of any kind of sealant. However, you can use 100% silicone caulk as a sealant if you wish. Apply it between the bottle cap and the gasket and also where the brass fitting presses against the gasket. If you are unsure which caulk to choose, you can pick up some "aquarium sealant" at your local pet store, as it is 100% silicone.

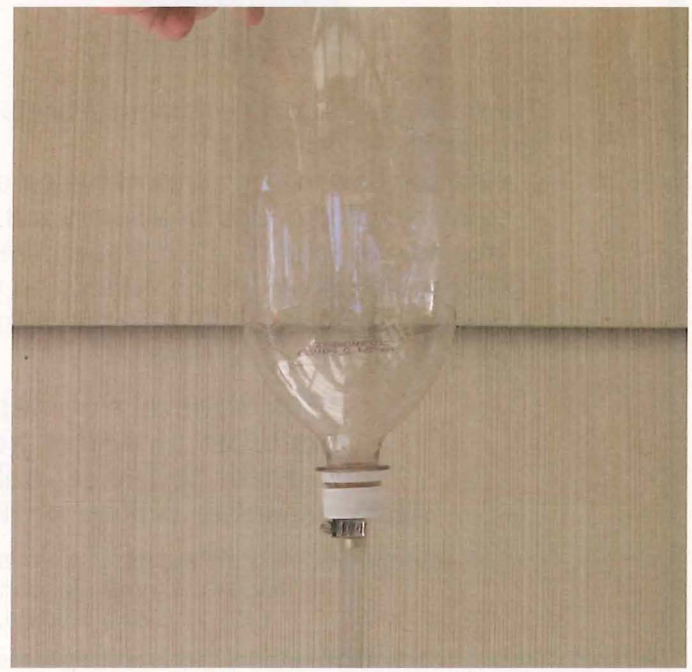


5. ADD THE HOSE CLAMP

Slip the beverage tubing over the exposed hose barb. This will be a tight fit, and you may need to heat the tubing under running hot water in order to soften it up enough to facilitate the barb. Slip on a hose clamp and tighten it. Now screw the completed cap assembly into the bottle to check that the fitting clears the screw threads on the bottle. Give the setup a test run with plain water at the sink to be sure your fittings are all tight. If not, go back and troubleshoot where you see leaks. You may need to start again with a new bottle if the fittings seem loose. If there are no leaks, you are now ready to clean those taps!

6. CLEANING YOUR TAPS

Fill the bottle with your cleaning solution of choice. I use Beer Line Cleaner (BLC) or Powdered Brewery Wash (PBW), followed by a flush with clean, warm water, and finished off with a mild StarSan solution. Attach the tap cleaner's tubing to a faucet shank, and then hold the bottle above the level of the shank. Open the tap to allow the flow to start from the bottle. You will find that because there is no vent on the tap cleaner, you will have to squeeze the bottle periodically to keep the flow moving. If you are using quick disconnects, they will need to be removed or opened to allow the solution to flow. Sanke couplers can be locked into the "open" position. Dispense ¼ of the bottle and then close the tap to let the solution sit in the lines and the faucet for a few minutes, then continue dispensing the cleaning solution. BYO



Forrest Whitesides was recently a guest on the Final Gravity homebrewing podcast, hosted by the NJHopz homebrew club in New Jersey (available for free through iTunes or at the club's Web site at www.njhopz.com).

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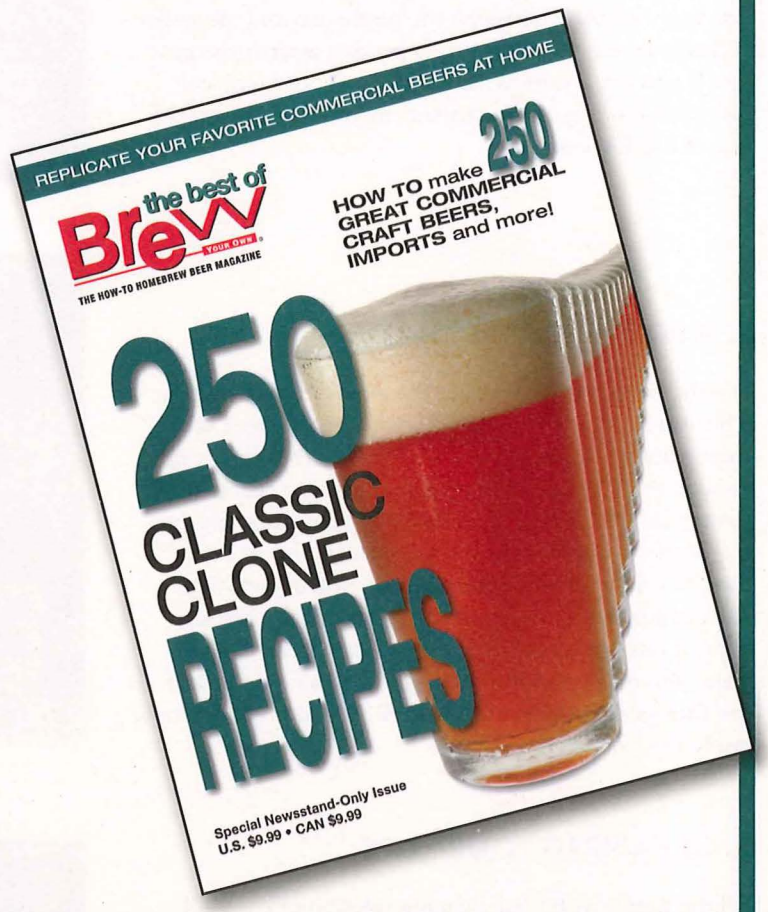

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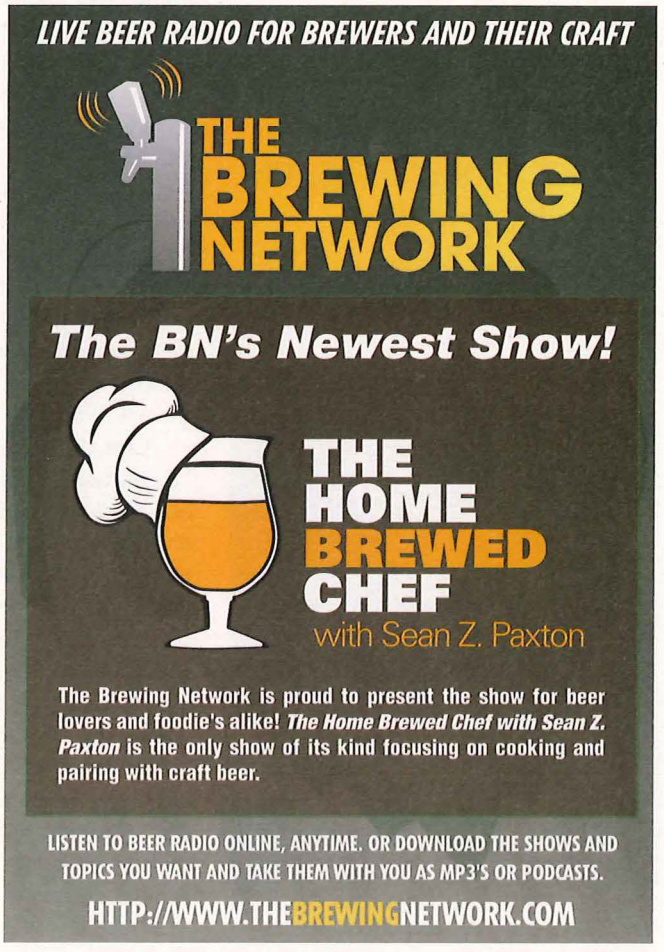


A Collegiate Brew

Homebrewing in the classroom

by Kevin Wandrei • Williamstown, Massachusetts

The scent in the air when walking into our Williams College dorm was easily recognizable: beer. Today, though, the scent was not yesterday night's beer pong game — that's right, the smell was something other than Keystone Light, it was fresh homebrew.

Though our small liberal arts college provides an amicable environment to those with refined tastes, a noticeable gap exists: beer brewing. Williams features a winter study course called "Introduction to the Economics, Geography and Appreciation of Wine" and various clubs for bread making, cheese tasting, organic food harvesting and other gastronomic activities, so the lack of a strong beer brewing culture on our campus is hardly inconspicuous. Some friends and I hoped to fill the gap, beginning in our dorm kitchen.

Our journey in homebrewing (er, college brewing) began, fittingly, in the library — with some basic research. We knew very little about beer brewing, apart from the fact that the necessary ingredients included yeast and some sort of starch (which we later learned was actually some sort of malt). We quickly delved into books, websites and *Brew Your Own*, trying to absorb as much as possible about the art of making a good brew.

One thing quickly intimidated us. "Sanitation" surfaced repeatedly in our readings and the thought of trying to find a sanitary spot among the many dormitory kitchens on campus quickly itched our nerves.

Instead of throwing in the towel, however, we assembled at our local brewery supply store and purchased the necessary items. Conveniently, we were able to purchase a brewing kit, which provided all of the essentials: buckets, siphons, yeast, hops, malt, instructions and, most important of all, sanitation materials.

Back at the dorm, as if it were Christmas morning, we scattered our newly-purchased items across our common room floor, looking at each item, flipping through the instructions and the accompanying brewing guide. Sanitation again resurfaced in these instructions, though the word intimidated us less given how simple the included sanitizer was to make.

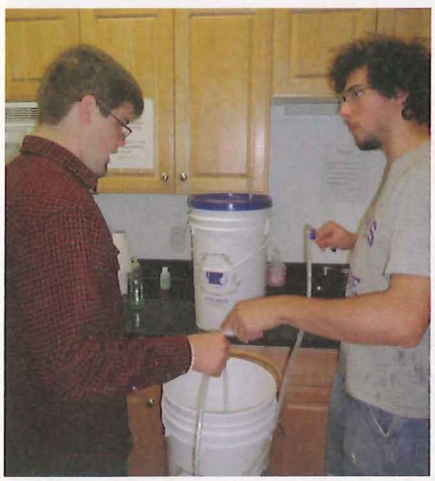
After thoroughly cleaning and sanitizing, all went smoothly, apart from the liquid malt extract that stubbornly decided to remain in its can. After some digging, we managed to get (almost) all of the malt into the boiling pot. For storage, we opted for the dormitory basement — perhaps not the best location as far as sanitation is concerned — but our small dorm rooms were not an option.

And so we waited for three long weeks. Finally we unearthed our bucket from the basement to find something that, reassuringly, smelled like bread fresh from an oven. Though the bucket was covered in a few cobwebs, no mold or mildew had colonized our brew. After a few spills — no use crying over spilt beer — we added some sugar water and moved our beer into (clean and sanitized) bottles, and the waiting was on — again. Only one week to go!

And finally the day arrived when we not only had a quality, homemade, beer, but 50 bottles of it to boot! Nicely carbonated, but not too much like many commercial beers, our final brew had a distinctly wheaty flavor. All the A's in the world could not satisfy these college students the way drinking our very own, homebrewed beer did.

Will this become a hobby? Yes! We've already assembled ingredients for an imperial stout. Any lessons learned? Definitely. A whole world of beer better than the usual varieties that circulate on college campus is readily available to everyone, given a bit of effort and a lot of patience. BYO

> "Will this become a hobby? Yes! We've already assembled ingredients for an imperial stout."



Williams College student Kevin Wandrei and a homebrewing buddy brew in a dorm kitchen.

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