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Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

OCTOBER 2013, VOL.19, NO.6

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6 Vermont Cult Clones (From Heady to Hill Farmstead!)

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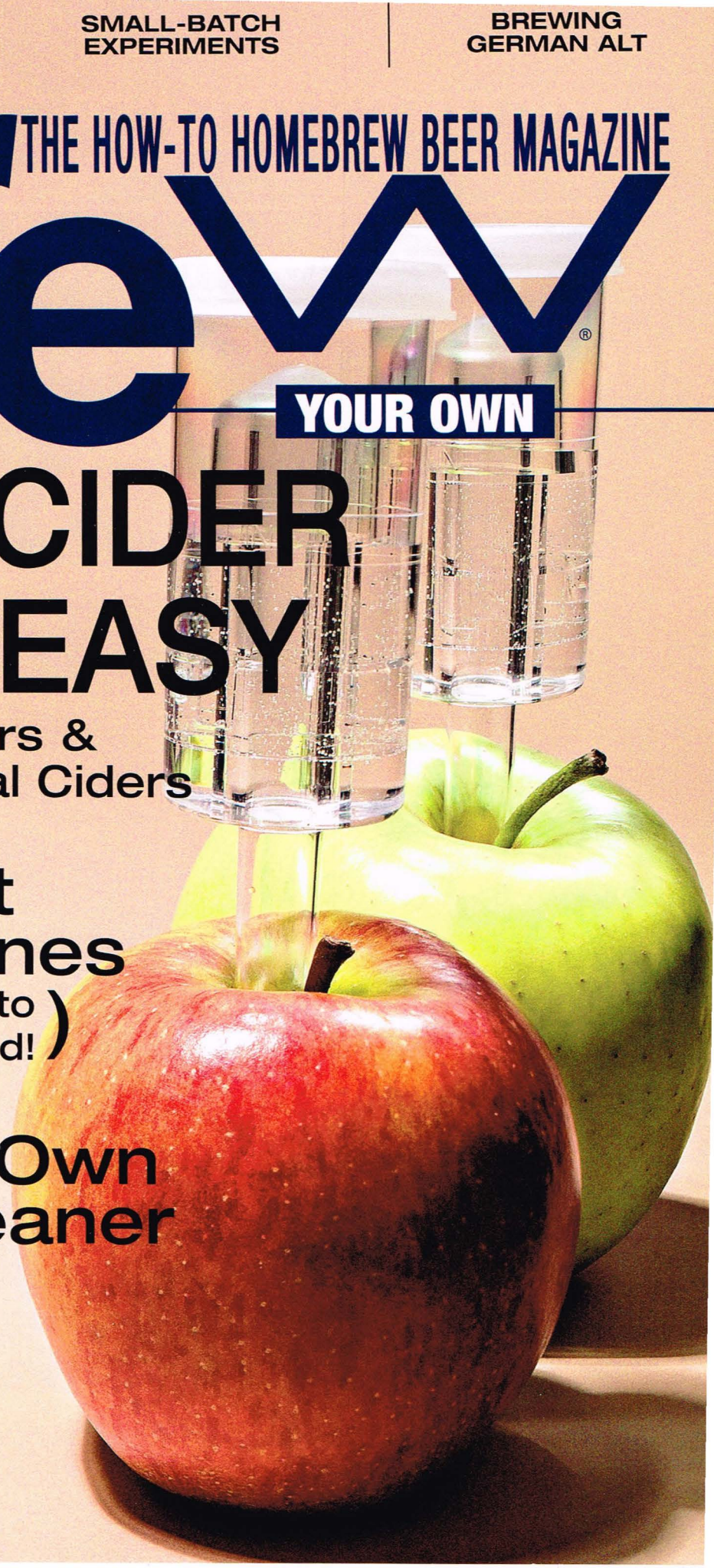

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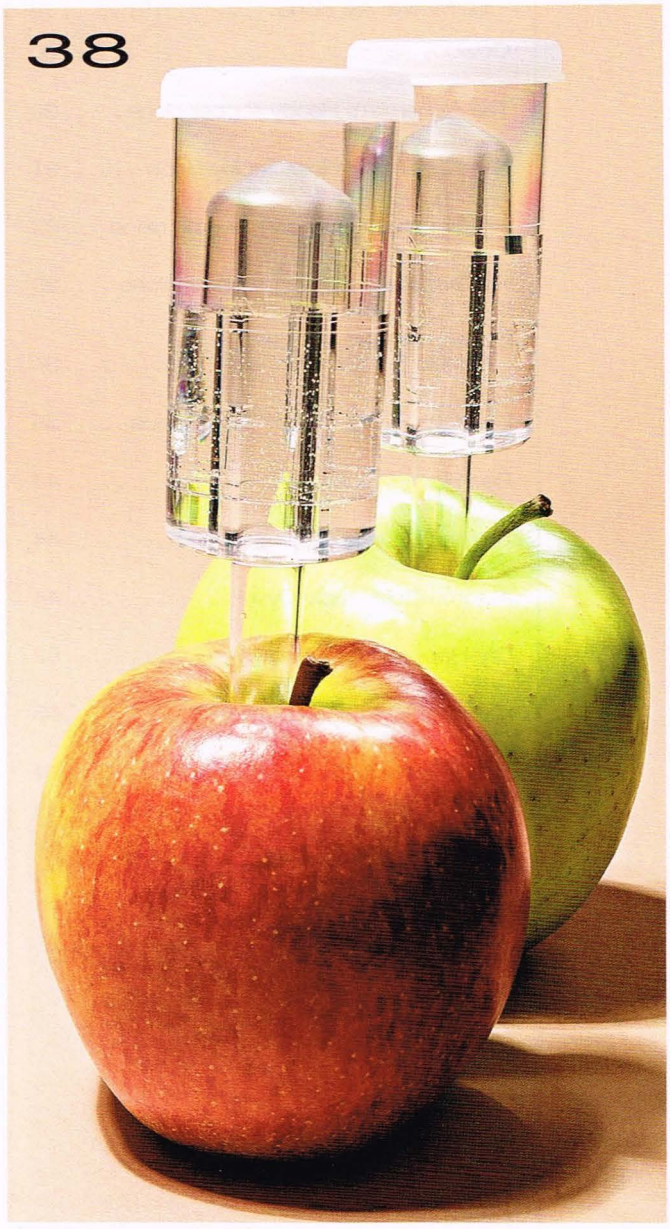
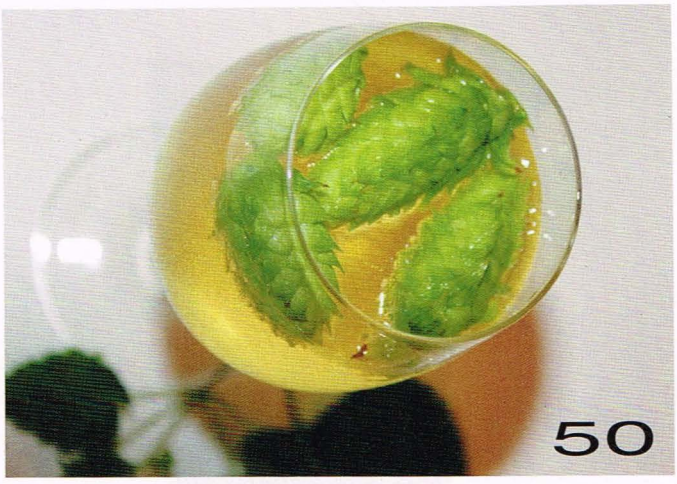
CONTENTS

October 2013 Volume 19 Number 6





features

26 Vermont Cult Clones

Hill Farmstead Brewery, The Alchemist and Lawson's Finest Liquids have made the rural hills of Vermont a destination for craft beer enthusiasts from around the world. Plus: 6 clone recipes for these hard-to-find beers.
by Dave Green

38 Making Hard Cider

Explore how to make sweet cider into hard cider that you'll be proud to share with your friends and family.
by Anne Whyte

50 Hopped Cider

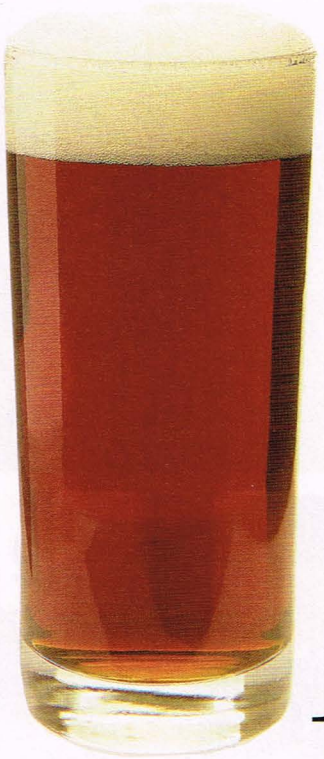
Hop heads can take a break from drinking IPAs as more and more cidermakers are adding hops to their beverages.
by Glenn BurnSilver

56 Brew with a Crew

Hear what members of homebrew clubs from across the country have to say about running successful homebrew clubs.
by Betsy Parks

66 Historical Homebrew

Christopher Bowen is a modern day brewing Renaissance man who recreates recipes from the Victorian and Edwardian eras of the 19th and early 20th centuries.
by Michael Madaus



19

departments

5 Mail
A reader writes in looking for some parts to build a wort chiller from the September issue, and another looking for Bavarian Pilsner malt extract.

8 Homebrew Nation
The basics of formulating a clone recipe, and The Replicator prepares for Day of the Dead with a clone for Freetail Brewing Company's La Muerta Ale.

13 Tips from the Pros
Three cidermakers discuss single-varietal hard ciders.

15 Mr. Wizard
The Wiz warms up talking about lager yeast starters and clarifies a question about chill haze.

19 Style Profile
Rich and bready with caramel notes, Düsseldorf altbier is about malt character and balance.

71 Techniques
Contemplating between two different yeast strains? Sounds like a perfect time for a small batch experiment!

75 Advanced Brewing
Chris Bible explores the biochemistry of barley in brewing.

79 Projects
Build your own drill-powered carboy cleaner to save your time and energy soaking and scrubbing.

96 Last Call
Shawn Marchese felt lost immediately after the birth of his first child this spring until he remembered lessons he learned as a new homebrewer years ago.

where to find it

83 Reader Service
84 Classifieds & Brewer's Marketplace
86 Homebrew Supplier Directory

RECIPE INDEX

Untouchable Amber 8
Freetail Brewing Company's La Muerta Ale clone 12
Cowboy Alt 20
The Alchemist's Heady Topper clone 30
The Alchemist's Holey Moley clone 31
Hill Farmstead Brewery's Everett clone . . . 32
Hill Farmstead Brewery's Abner clone 33
Lawson's Finest Liquids' Double Sunshine clone 34
Lawson's Finest Liquids' Toast clone 35
Red Flannel Cider 44
Autumn Sparkle Cider. 44
Autumn Gold Apple Cyser 44
Dry-Hopped Hard Cider 52
HammerSmith Ales English IPA 68
Split Infinitive Bitter 74

BYO RECIPE STANDARDIZATION

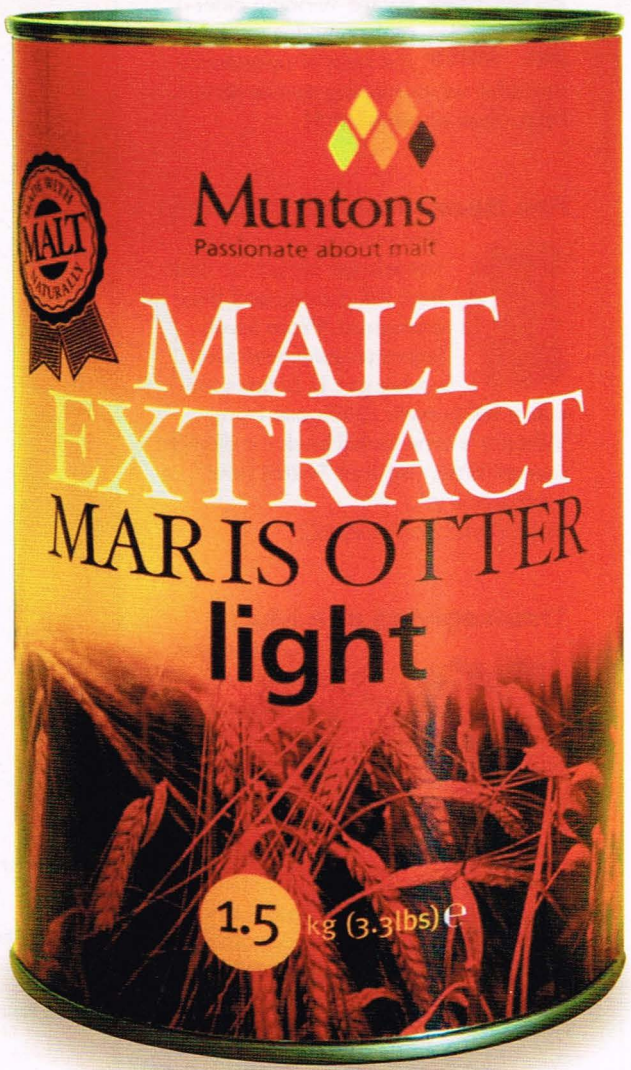
Extract efficiency: *65%*
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one gallon of water, would yield a wort of 1.024.)

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

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

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

CAN DO!



Developed by Dr G.D.H Bell and his team at Cambridge, England in the 1960s, *Maris Otter* is a two-row barley with unrivalled heritage in the UK brewing industry.

Dr Bell bred *Maris Otter* barley from a cross of *Proctor* and *Pioneer* - two top quality traditional malting barley varieties. To this day, *Maris Otter* seed is only sold to a select group of farmers who are specially chosen to grow the variety.

Soon after its introduction, *Maris Otter* barley malt became a favourite with brewers due to its excellent malting characteristics, low nitrogen content and forgiving brew-house performance.

Maris Otter is still highly prized in today's craft brewing industry providing independent brewers with a rare opportunity to create beers of unparalleled individuality and quality.

And now you can benefit from the unique characteristics of *Maris Otter* in your home brewed beers. Muntons *Maris Otter* liquid Malt Extract is a new addition to the Muntons Malt Extract range available in both 3.3lb cans and bulk malt.

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what's happening at BYO.COM

Apple Cider: The Flavor of Autumn

With your brewing knowledge and current equipment you can also make great cider. An award-winning cider-maker guides us through the field of options to consider when making this beverage.
http://byo.com/story141

Fall Beers Recipe Roundup

We put the call out to homebrew shops for their best fall recipes and they answered. From lovely lagers to awesome ales, we've got 11 recipes for every fall brewer to choose from. When it's time to fall back for daylight savings time, use that "extra hour" to a get a boil in!
http://byo.com/story622

Thanksgiving in a Mug

Thanksgiving is just around the corner and many brewers may want to brew a special holiday beer.
Coincidentally, several ingredients found in typical Thanksgiving dishes can be used for making beer. Let our recipes for pumpkin old ale, cranberry zinger ale and sweet potato ESB grace your table this year.
http://byo.com/story1458

Vermont Pride: Last Call

Long before Heady Topper and before Lawson's or Hill Farmstead, the late Greg Noonan, of the Vermont Pub and Brewery, helped put Vermont craft beer on the map, and homebrewers in the Green Mountains won't forget it.
http://byo.com/story2533

Cover Photo: **Charles A. Parker**

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Volume 19, Number 6: October 2013

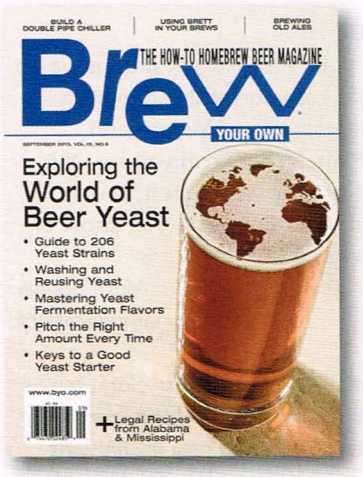
contributors

Anne Whyte is the Co-Owner of Vermont Homebrew Supply in Winooski, Vermont and a long-time member of *Brew Your Own*'s Editorial Review Board. She has been a homebrewer for more than 20 years and makes beer, cider and wine. She is a nationally ranked BJCP beer judge and frequently judges meads and wines at *WineMaker* magazine's annual International Amateur Wine Competition. Anne has operated Vermont Homebrew Supply with her husband and partner, Matt, for almost 20 years. In this issue, Anne calls on her knowledge of Vermont apples and cidermaking for a story about making hard cider at home. If you can make a basic batch of beer, you can definitely make a batch of cider. Read her story on page 38.

Betsy Parks is the Editor of *Brew Your Own* magazine. She is a 1996 graduate of the New England Culinary Institute and was a chef before going back to college for a journalism degree. Betsy came on board at *Brew Your Own* in February 2007 as Assistant Editor and then Associate Editor before taking over the helm as Editor this spring. She is a frequent contributor to *Brew Your Own* feature stories and columns, including "Tips from the Pros" and "Beginner's Block." In this issue, Betsy shares some tips for starting and running a homebrew club, complete with photos from her trip to the 2013 National Homebrewers Conference in Philadelphia, Pennsylvania, which starts on page 56.

Dave Green is *Brew Your Own*'s Advertising Sales Coordinator and resident ranking homebrewer. When he's not at work, *BYO* often convinces Dave to do some writing, including his past feature stories about hop stands, whirlpool hopping and "hop bursting" (in the March-April 2013 issue. http://byo.com/story2808). In this issue, Dave's hop stand story will come in handy as he discusses how to brew some of the hop-heavy beers from Vermont's highly-rated Hill Farmstead Brewery, Lawson's Finest Liquids and The Alchemist. We twisted Dave's arm to visit these three breweries and get some clone recipes, brewing tips and techniques for his story that starts on page 26.

mail



Double pipe wort chiller

I like the idea of Walter's chiller (featured in "Projects" in the September 2013 issue of *BYO*) and look forward to building one, but some of the information seems to have been either omitted or edited out.

First, the description of "10 plastic compression fittings (¾" NPT x ½)" seems to be a little vague. I've been to Ferguson and Noland. Neither recognizes the part in the magazine nor knows of a part to do what we are looking to do. Does Walter have a part number, manufacturer or resource for these fittings?

Second, the article and parts list doesn't mention anything for the water intake and exhaust. Are these barb fittings for silicone tubes? I would think that's what I would do, but I don't know if standard parts exist to transition from PVC to brass barbs.

Lastly, neither of my suppliers know of a pipe brush that is 5 feet long. Does he have a supplier for that?

Tim Seelbach
Stephens City, Virginia

Story author Walter Diaz responds: "Thanks for the questions, Tim. I got a few other readers asking about those compression fittings. The compression fittings I used are made by Parker and the line of product is called Fast & Tite, part number P10MC12. These fittings come with a stopper that just needs to be drilled out so that the copper pipe goes through it. The copper pipe is ½-inch inside diameter (⅝-inch outside diameter). As for the connectors for the cooling water inlet/outlet, I glued a 1-inch slip by ¾-inch female pipe thread into each end of the PVC manifold. Then a regular hose adapter can be threaded into it for the cooling water inlet/outlet. For cleaning the inside of the copper pipe I use a 36-inch (0.9-m) pipe brush that I bought at my local homebrew shop in Tucson, Arizona, but brushes this size can also be found online. You can clean the inside of a 5-foot (1.5-m) pipe with a brush that length if you clean it from both ends of the pipe. One source for a similar brush I have found is Zoro Tools (www.zorotools.com), part number G0944212."

Pilsen malt supplier

I read with great interest your July-August 2013 issue on brewing Helles and Kölsch. I am currently an extract brewer and the article suggests using Weyermann Barvarian Pilsner Liquid Malt. Where can you buy this malt? I can't seem to find anyone who sells it, unless I were to order it from another country. Do you know of anyone in the States who has it?

Mark Sponer
via Facebook

Brew Your Own *Editor Betsy Parks responds: Mark, try e-mailing orders@bsghandcraft.com to see if they can point you to a supplier in your area. You could also try brewing with a substitute, such as Briess' Pilsen Unhopped liquid malt extract. Good luck with your German-style brews!*

Build a Burton Union at home?

I was reading my copy of *300 Beers To Try Before You Die* and read the page on Samuel (Sam) Smith's Old Brewery IPA quickly followed by the page on Marston's Pedigree. This got me thinking — Sam Smiths uses Yorkshire Squares to brew and Marston's uses the Burton Union system. Is it possible for a homebrewer to replicate the Burton Union system on a smaller scale, and has anyone had a go at doing it?

Nigel Greensitt
Manchester, England

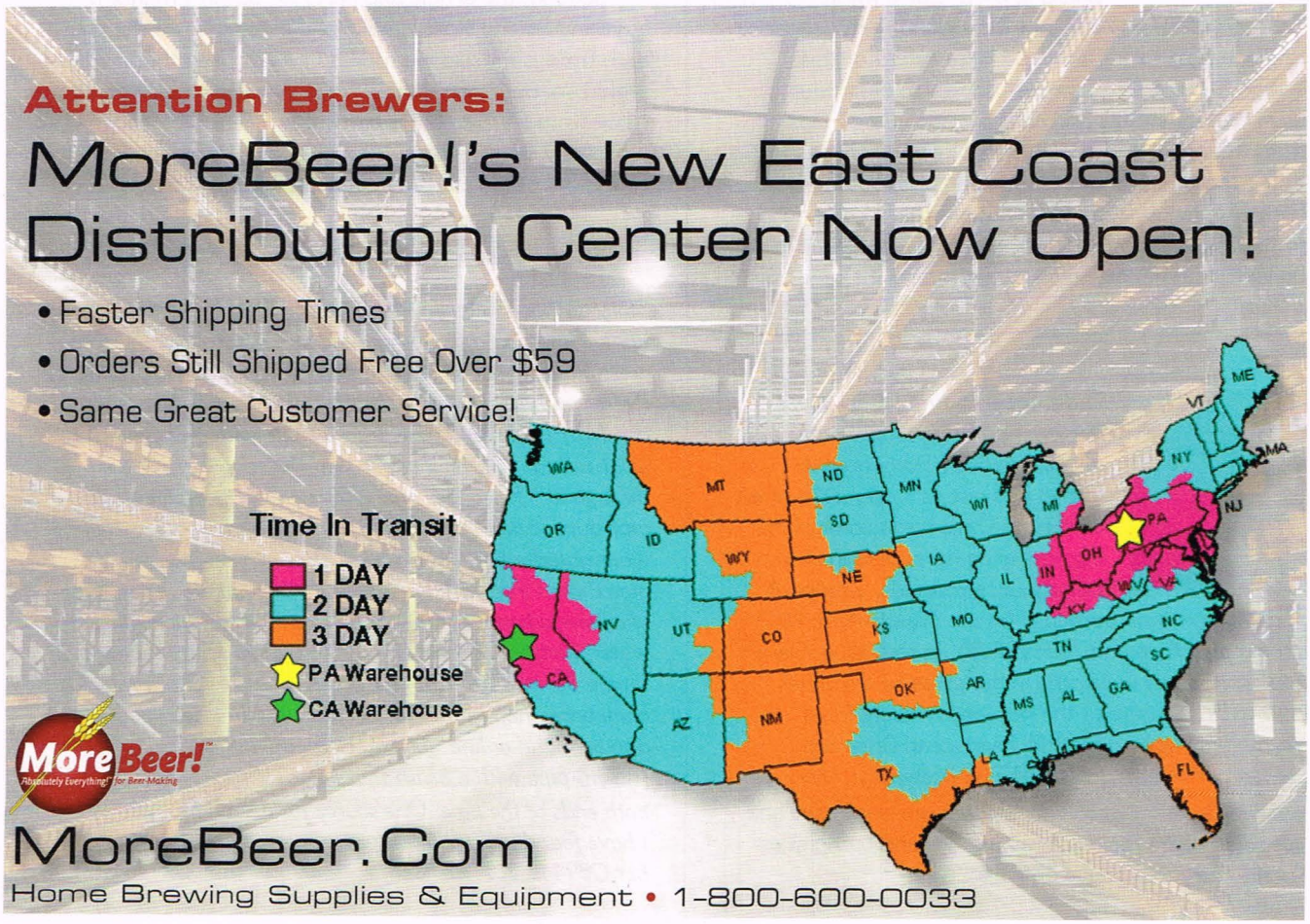
Brew Your Own *Editor Betsy Parks responds: As a matter of fact, Nigel, we do have an article that should be helpful: http://byo.com/story351. Hope that helps!*

Cover kudos

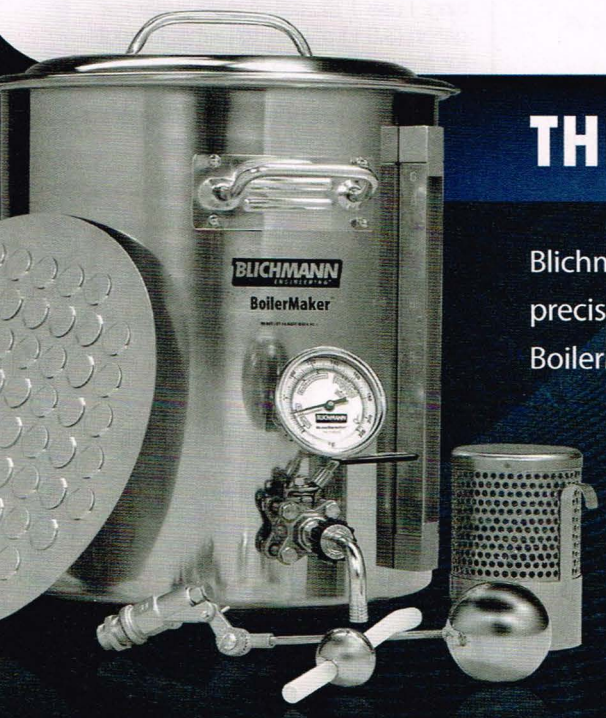
Just had to tell you your cover (of the September 2013 issue) shocked me. The beer replicating our planet caught me off guard. I looked at the cover three times before I realized the beer in the photo was North America, Africa, Europe and several other continents. Keep up the good work!

Dirk Smithson
via email

Brew Your Own *Editor Betsy Parks responds: Thanks for the feedback, Dirk. The cover image was created by* Brew Your Own*'s longtime cover-art photographer, Charles A. Parker, who works out of his studio, Images Plus, in Quechee, Vermont. Charlie has been making a lot of photo magic happen for* BYO *since his first cover shoot for the Summer 2000 issue. Glad you enjoyed his work!* BYO



FALSE BOTTOM.
TRUE INNOVATION.



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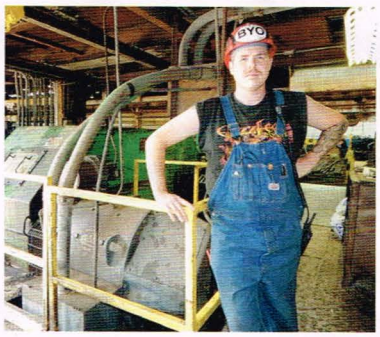
homebrew nation

READER PROFILE:



Brewer: Chad Vanderpool

Hometown: Shelby, Ohio

Years Brewing: 4

Type of brewer: All-grain

Homebrew Setup (volume, style, efficiency):
15-gallon (57-L) Blichmann boil kettle with Coleman coolers for mashing and hot liquor tank. I mostly brew 5-gallon (19-L) batches.

Currently fermenting:
Stout, peanut butter stout, mead, Flanders, and a mystery sour.

What's on tap/in the fridge:
On tap are Falconer's Flight® the 7 Cs Pale Ale, Flanders red, and a wit. In bottles I have a hefe, Citra® pale ale, Mosaic™ pale ale, Galaxy pale ale, stout, vanilla stout, hazelnut brown, gueuze, Berliner, RyePA, barleywine, and 3 variations of saison. I'm probably forgetting a few.

How I started brewing:
Two things started my brewing journey; one was a local pub challenge at the Parrott Head Pub in Shelby, Ohio. My small, rural, hometown pub has 200-plus beers in bottle not including seasonals, and they used to do a century club challenging you to try 100 different beers in a year. The other thing that got me started was my cousin's wedding in which he gave all of us groomsmen a homebrew starter kit. My cousin and his wife made all the beer and wine at their wedding. I enjoy the adventure in a glass that you can share.

I have won awards for stouts, bitters, saisons, sours, brown ales, cream ales, and fruit beer, and I couldn't have done it without the help I've found in *BYO*, my brew clubs (MALTZ & MBC), and the help I've had at the expense of my local homebrew shop, The Hops Shack. And of course God for providing all the materials.

reader recipe

Untouchable Amber
(6 gallons/23 L, all-grain)

OG = 1.052 FG = 1.012
IBU = 27 SRM = 15 ABV = 5.1%

Ingredients

6 lbs. (2.7 kg) domestic 2-row malt (1.8 °L)
5 lbs. (2.3 kg) Weyermann dark Munich malt (9 °L)
0.75 lbs. (0.34 kg) Briess Victory® malt (28 °L)
0.75 lbs. (0.34 kg) Briess special roast malt (40 °L)
1 lb. (0.45 kg) crystal malt (60 °L)
5 AAU Vanguard hops (60 mins.) (1 oz./28 g at 5% alpha acids)
3.8 AAU Vanguard hops (30 mins.) (0.75 oz./21 g at 5% alpha acids)
2.5 AAU Vanguard hops (7 mins.) (0.5 oz./14 g at 5% alpha acids)
Irish moss and yeast nutrients (15 mins.)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis Safale US-05 or Lallemand BRY-97 (American West Coast Ale) yeast.

Step by Step

Mash with 4 gallons (15 L) reverse osmosis (RO) water at 152 °F (67 °C). Sparge with 4 gallons (15 L) RO water at 185 °F (85 °C). Boil for 60 minutes, adding hops at times indicated. Cool wort to around 70 °F (21 °C). Pitch yeast and then ferment around 65 °F (18 °C) for two weeks. I skip the secondary. If bottling, I use 1 oz. (28 g) corn sugar per gallon (3.8 L) of beer to prime. I shoot for around 6 gallons (23 L) in my fermenter, that way when racking into keg or bottling bucket I get a true 5 gallons (19 L) finished product.

byo.com brew polls

Have you ever made hard cider?

No, but I would like to
35%

Yes, I love it
32%

No, I'm not interested
17%

Yes, but I was not happy with it
16%

social homebrews

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

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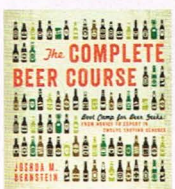
what's new?

Free Online Brewing Software

Mybrewco.com is a free service that enables homebrewers to give their brewing an online presence and bring their brewery to life. The site allows users to create an online homebrewery, create and upload recipes, record brew day statistics for analysis, tell friends what you are serving, track efficiencies of equipment and much more. www.mybrewco.com can be accessed anywhere from any device with an Internet connection.

Beer Boot Camp



In his new book, *The Complete Beer Course*, Joshua M. Bernstein brings readers on a fun, flavorful tour through the world of craft brews. In 12 beer tasting classes, Bernstein demystifies beer by "elementally breaking down the grains, yeast, hops, and techniques that cause beer's flavor to spin into thousands of distinctively different directions." The book is structured around a series of suggested, targeted tastings that cover a spectrum of ingredients and beer styles. Available at major booksellers.

Grain Crusher

Millar's Mills has released a new barley mill, the "B3 model," which improves on its previous models. Amongst the upgrades are the quality of the stainless steel rollers, which are made using a unique heating treatment system that is designed to prevent rust and stand up to high volume use. There are also upgrades to the bearing system, the knurl pattern on the rollers, and the inclusion of two aluminum alloy rails to mount the mill for grinding barley into a receptacle or container. For more information, visit www.millarsmills.com

calendar

October 12
2013 Delafield Brewhaus Schnapp Hans Cup
Delafield, Wisconsin

One entry from the Best of Show round will be chosen for a production run at the Delafield Brewhaus by Brewmaster John Harrison. The entry limit for the competition is 300 and the entry deadline is September 28. Entry fee is $8.
Web: www.schnapphanscup.com

October 19
Hoptoberfest Homebrew Contest
Madison, Wisconsin

Wine and Hop Shop's annual Hoptoberfest Homebrew Contest will be held from 7-11 p.m., at the Italian Workmen's Club, on Regent Street. The contest accepts 36 homebrew entries to be reviewed by a dozen judges who award 1st, 2nd, and 3rd in 6 categories (American Pale Ale, American IPA, DIPA, Black IPA, British Pales and IPAs, and Beyond the Pale (Other)). A Best in Show will also be awarded. Tickets are $20 or $15 with if you ener a beer. Proceeds go to the Goodman Community Center Food Pantry.
Web: http://www.wineandhop.com

October 19
8th Annual New England Regional Homebrew Competition
Nashua, New Hampshire

This is a BJCP Registered/Sanctioned event. The entry deadline is October 4 and the fee is $7. Proceeds from the competition go to charities throughout New England. For more information, email rob.north@gmail.com

October 20
Delaware Wine & Beer Festival
Dover, Delaware

New this year, the 4th annual Wine & Beer Festival features two Delaware distilleries in addition to more than 100 varieties of the state's beers and wines. The festival also includes a homebrew competition sanctioned by the American Homebrewers Association. Entries cost $10 each. Web: www.delawarewineandbeerfestival.com

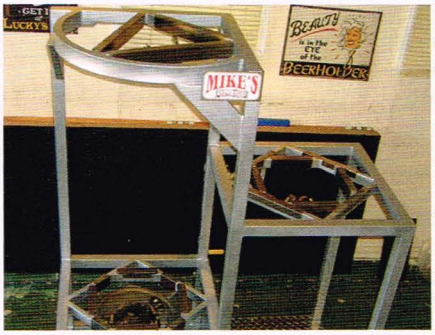
homebrew drool systems

Mike's Homebrew

Mike Cook • Fullerton, California

I began homebrewing in 1997 on the stovetop but moved outdoors pretty quickly. Sixteen years later, I have three sheds full of homebrewing equipment. I mostly brew all-grain, but if I am short on time, or teaching my class for the local Addison Homebrew Provisions homebrew shop, I'll do an extract. I brew all styles of beer and try to keep a good mix of styles on tap, but the fourth handle is reserved for the hard cider I make for my girlfriend. She bought me the 4-tap Beverage Air Kegerator, along with both my 10- and 20-gallon (38-L and 76 -L) Blichmann kettles. Yes, she buys me the brew gear I could never justify getting for myself, so she gets jewelry. I also make mead to satisfy her sweet tooth.

After 16 years of brewing, I finally built my own 10-gallon (38-L) natural gas, all-grain system. I did all the design, construction and welding on the brew stand. I designed it to fit through a doorway since I brew in my garage, but the brew stand lives in a shed. The contact surfaces on all three tiers are stainless steel, as are the valves and pipes.



I wanted to make my brew stand a little different, so I made the top tier a 3-leg design, which gives me better access to the brew kettle on the bottom burner. I also used a radius piece of rectangular tubing I had bent on a 100-ton press. I think it gives my stand a smooth look, and I won't hit my head on any sharp edges.

The third leg of the top tier is thick wall tubing, which acts as a natural gas manifold to all three burners and cuts down on visible plumbing. This stand will work as a gravity system, but I use the bottom aluminum diamond plate deck for my pump.

beginner's block

CLONING BEERS

by dawson raspuzzi

There are hundreds of resources available to homebrewers looking to clone the world's most popular beers. But, inevitably, we've all stumbled upon that obscure brew that flies below the radar — be it a brew at the local pub or a limited release seasonal beer that came and left all too soon. Don't fret, just because a recipe does not exist yet does not mean you can't create your own! Sure, it takes some work, and trial and error, but there is no such thing as a beer homebrewers can't clone. You just need to know how to go about it.

For starters, gather as much information as you can. A great place to start is at the website of the brewery, or even on the bottle itself. At the very least, you should be able to find the alcohol by volume (ABV), and often times breweries state many of the ingredients used in a beer, the bittering (in IBUs) and, if you're lucky, they may even state any special techniques employed. Often you can find reliable information from fellow beer geeks on the Internet, and, of course, the most reliable sources are the brewers themselves (many of whom are happy to help a homebrewer out). If all else fails, you can find information on a beer that is similar in style and taste and then base some of your assumptions for the clone you hope to make on its description.

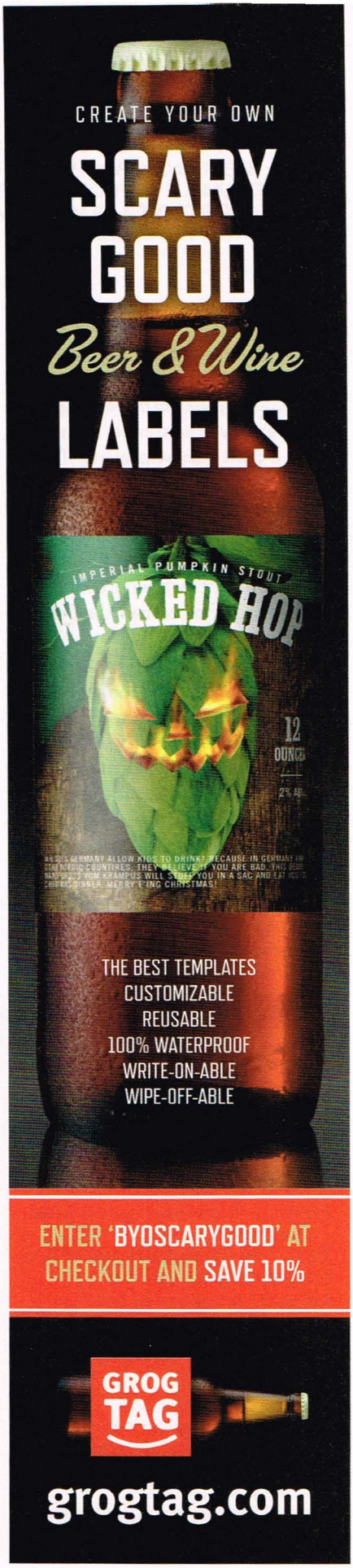
With information in hand, plug the details you have into a brewing calculator, of which there are many available online including ours at www.byo.com/resources/brewing. This is where the first phase of trial and error often comes into play, depending on how much information you are missing. Using a brewing calculator, begin by entering the amount and types of base malts (or malt extract) you believe are needed, using the original gravity (OG) as a guide. If you do not know the beer's OG, but have its ABV, you can estimate the OG by using the average attenuation rate of the yeast strain you select. After base malts, add the other malts, keeping an eye on OG and color (measured by SRM) and adjusting the base malt amounts if necessary.

Once your OG and color look good, compare the final gravity (FG), if known, or the ABV. If they are not in line, then the amount of attenuation may need to be adjusted. Next, look at hop additions. If the brewer does not list the type of hops it uses, taste tests are key. By picking up the effect hops have on taste and aroma, select the hops you will use and consider the additions needed to hit your target IBU.

Then it's on to selecting any other additions that may be called for and the yeast. The best bet is to reculture yeast out of a bottle-conditioned beer, but if that isn't an option consider available commercial yeast that is true to the style.

If you lack confidence in your clone, pinpoint areas you made assumptions and try substitutions to see if any would make you more comfortable. I would also recommend giving the brewer a copy of your clone at this point and asking for feedback. Very often they will give you some direction, which could make all the difference.

Finally, it is time to try brewing your clone (possibly in small batches) and then evaluating your beer's color, aroma, and taste next to the commercial example. This is when the next trial and error phase comes into play, as you may realize the hop aroma falls a little short, or the grain bill you selected is too dark. With those notes, try again. Even if your first attempt didn't come out tasting identical to the commercial example you were shooting for, it should be close enough to enjoy.



by marc martin

DEAR REPLICATOR, WHENEVER I'M IN SAN ANTONIO, TEXAS, I STOP AT FREETAIL BREWING COMPANY, WHICH HAS A GREAT SELECTION OF BEERS INCLUDING SOME WITH UNIQUE INGREDIENTS LIKE PRICKLY PEAR. RECENTLY I ENJOYED THEIR "DAY OF THE DEAD" BEER, LA MUERTA. AS I ONLY GET DOWN TO TEXAS ONCE A YEAR, I WAS HOPING THAT I COULD BREW MY OWN WITH YOUR HELP.

DMITRI MAYER
WAUWATOSA, WISCONSIN

In the late 1990s my former corporate job relocated me to Austin, Texas, for three years. While much of the country was experiencing a microbrewery renaissance, Texas was almost a craft beer wasteland. That has changed over the past few years largely because of efforts to change state laws by Freetail Brewing Co. owner Scott Metzger and Brock Wagner of Saint Arnold Brewing Co. in Houston, who co-chair the Texas Craft Brewers Guild.

Scott is known within the Texas brewing community as somewhat of a renegade. He chooses not to brew beers to established style guidelines, but instead crafts recipes that will appeal to both the beer novice and the more adventurous consumer. It's rare to find an owner with a background as diverse as Scott's. When he is not busy with the brewpub, Scott is an economics professor at the University of Texas – San Antonio. He began homebrewing in 2004 and became active with the local homebrew club, The Bexar Brewers, and is still a big supporter. For the club's annual competition, Alamo City Cerveza Fest, Freetail Brewing picks the winner for their "funkiest of show" category.

Scott believed in the future expansion of craft beer in Texas and opened Freetail in November 2008. Production was 600 barrels in its first full year of business. He projects 2013 production to be twice that. Head Brewer Jason Davis meets the demand using a 15 barrel system. About 95% of their production is in keg sales, with the other 5% being hand-filled into 22 ounce bottles.

Jason also got his start as a homebrewer in 1992 and has worked at Waterloo Brewing and Celis Brewery, both in Austin. When Scott met Jason he was brewing at the Blue Star Brewery in San Antonio, where they discovered they both had the same philosophy regarding adherence to styles. Jason has been with Freetail since the opening day.

La Muerta is brewed once a year and released on its namesake, Day of the Dead, Nov. 1. True to Freetail's business model, it does not emulate any particular style but would best be classified as a smoked imperial stout. Black, rich and flavorful, the 9.5 barrels they bottle sell out within a week. The grain bill is balanced more toward chocolate and less roast to accent the smoked malt background. A firm, tan head tops this medium-bodied beer. A slightly sweet finish hides the relatively high alcohol content. This is truly a beer that begs to be sipped and is destined to cellar well.

Dmitri, you won't need to make a trip to Texas to get La Muerta because now you can "Brew Your Own." For more information about Freetail Brewing Co., visit www.freetailbrewing.com BYO

Freetail Brewing Company La Muerta Ale Clone

(5 gallons/19L, extract with grains)

OG = 1.092 FG = 1.020 IBU = 50 SRM =52 ABV = 9.5%

Ingredients

6.6 lbs. (3 kg) Briess, special dark, unhopped, liquid malt extract (90 °L)
2.5 lbs. (1.1 kg) traditional dark, dried malt extract (30 °L)
3.0 lbs. (1.36 kg) Weyermann smoked barley malt
1.5 lbs. (.68 kg) chocolate malt (350 °L)
4.0 oz. (.11 kg) Munich malt
2.0 oz. (57 g) crystal malt (120 °L)
2.0 oz. (57 g) roasted barley (450 °L)
15.75 AAU Summit™ hop pellets (60 min.) (0.9 oz./26 g at 17.5% alpha acids)
½ tsp. Irish moss (30 min.)
½ tsp. yeast nutrient (15 min.)
White Labs WLP 007 (Dry English Ale) or Wyeast 1335 (British Ale II) or Safale S-04 (English Ale) yeast
¾ cup (150g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 2.5 gallons (9.5 L) of water at 152 °F (67 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.9 L) of hot water. Add the liquid and dried malt extracts and boil for 60 minutes. While boiling, add ingredients as per schedule. After, 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). Once cooled, 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 and allow the beer to condition for 1 week and then bottle or keg. Allow the beer to carbonate and age for 2 weeks and enjoy your La Muerta Ale.

All-grain option:

This is a single-step infusion mash using 11.5 lbs. (5.2 kg) 2-row pale malt to replace the liquid and dried malt extracts. Increase the smoked barley malt by 1.5 lbs. (0.68 kg), the Munich malt by 18 oz. (0.51 kg), the crystal malt by 14 oz. (0.40 kg), the roast barley malt by 12 oz. (0.34 kg) and reduce the chocolate malt by 10 oz. (0.28 kg). Mix all of the crushed grains with 6 gallons (23 L) of 173 °F (78 °C) water to stabilize at 152 °F (67 °C) for 60 minutes. Slowly sparge with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the Summit™ hop addition to 0.75 oz. (21 g) (13.1 AAU) to allow for the higher utilization factor of a full wort boil. The remainder of this recipe and procedures are the same as the extract with grains recipe.

Single-Varietal Cider

tips from the pros

by Dawson Raspuzzi

Accentuating the characteristics of an apple

MOST COMMONLY, HARD CIDERS USE A BLEND OF APPLE VARIETIES — WITH EACH VARIETY EXPECTED TO BRING ITS UNIQUE TASTE TO THE CIDER — BUT MANY CIDERMAKERS ARE ALSO PRODUCING SINGLE-VARIETAL CIDERS TO EXEMPLIFY THE CHARACTERISTICS OF A SPECIFIC VARIETAL. WE'VE CONTACTED THREE PROS THAT APPRECIATE SINGLE-VARIETAL CIDERS FOR ADVICE ON WHAT HOME CIDERMAKERS SHOULD LOOK FOR WHEN CHOOSING AN APPLE THAT CAN STAND ALONE.

Our primary focus when searching for new varieties to make hard cider is on unique flavor and aromatic qualities. The secondary factor is chemical composition — pH, tartaric acid, and specific gravities. At Blue Mountain Cider, we love apples that have ample acidity, relatively high specific gravity around 1.065 and mild tannin content (bitterness).

We make single-varietal ciders with Gravenstein, Newtown Pippen and Winesaps. Each apple variety is unique in flavor and chemical composition and not to be cliché, but terroir — the growing region and soil composition — can also have a big effect on flavor profiles. So, a benefit of making single-varietal cider is that it increases awareness among cider consumers of single-varietal characteristics, producer/grower practices, regional terroir, and micro-climates.

Single-varietal ciders are usually not as complex as blended ciders. Some of the most common problems with single-varietals are composition shortfalls — apples often lack or have excess acid, sugar, or tannin. It is also easier to detect vintage variation from growing season to growing season. At Blue Mountain, we tend to shy away from additives and manipulation. Playing with what nature gives you takes away from the expression of fruit and terroir of the single-varietal.

For any homebrewers who want give single-varietal cidermaking a try, experiment with different yeast. Yeast selection can have a huge impact on aromatic profile.

Andrew Brown is the Cidermaker for Blue Mountain Cider in Milton-Freewater, Oregon. He studied winemaking as the Cellar Master for Saviah Cellars for two years before becoming the Winemaker for Watermill Winery and Cidermaker at Blue Mountain Cider, both run by his third-generation fruit farming family.

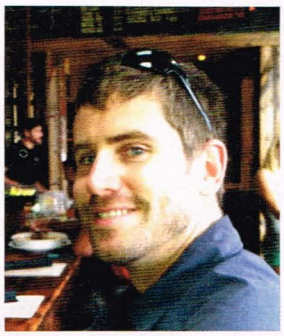
When West County Cider started making hard cider (as a farm-winery) in 1984, nearby farmers and country diehards were the only ones who had kept fermenting this once well-known drink in the U.S.A. Hard cider has always been part of the, "If you have it, use it, enjoy it, don't waste it" tradition of frugal survivors and interested others.

We started a small orchard getting scions and having them grafted from the Geneva Agricultural Experiment Station in Geneva, New York. They had a living library of cider/heritage varieties and we wanted to know what they tasted like, looked like, and grew like. In autumn, we brought home a truckload of this and that and tasted and fermented small batches. We planted three rows of mixed apples and lines of Golden Russet, Ashmead's Kernel, Redfield, Tremlett's Bitter, Reine de Pomme, and others.

Those who make their own cider here have favorite trees in small or abandoned orchards, along dirt sideroads, or secret crabs, as well as certain late apple varieties they can get from the local commercial orchards. We too wanted to pay attention to the varieties we were interested in: that was the wealth of this apple zone and also of what we had planted.

That is why we have made single-varietal ciders: the differences between bitter-sharps, bitter-sweets, and desserts need to be tasted to be understood. We of this age are just now learning the different tastes and textures that might have been understood when more cider was made in small batches in local zones, with wild and cultivated apples . . . this has been our interest and will continue to be so.

Judith Maloney and her husband, Terry, started West County Cider in Colrain, Massachusetts, in 1984, at which time the family harvested 100 cases of apples. Nearly 30 years later, they now make cider from 1,800 cases of apples. West County Cider has many single-varietal ciders including Kingston Black, Pippen, Baldwin, Redfield and McIntosh.



Nick Gunn is part Owner and Cidermaker for Wandering Aengus Ciderworks in Salem, Oregon, which he and his wife, Mimi, started in 2004. Nick has been making cider for more than 15 years. Nick and business partner James Kohn have been instrumental in developing the cider industry as a whole through efforts to organize CiderCon every year and help start the US Association of Cidermakers (USACM).

A good single-varietal apple should have a nice balance between tannins, acidity, and sweetness. All three of these qualities are hard to find in the same apple, but a really good example is Kingston Black. Here at Wandering Aengus Ciderworks we make single-varietal ciders out of Wickson Crab Apples and Golden Russets. We have played around with Newtown Pippin as well.

Single-varietal ciders are less complex, but often times more interesting than blended ciders. The benefits of single-varietals lie in consumer education. A lot of folks lump cider into one category of sweet and apply, but cider can be much more than that. Our single-varietal ciders are bone-dry and showcase the dramatic differences in apple varieties. We are very traditional in our cidermaking techniques — this means no adding acid, tannins, sugars, etc. What Mother Nature gives us is what we get. If we added anything to the cider it wouldn't showcase the apple's natural abilities. Ultimately, I hope the cider-drinking populace will appreciate not only the single-varietal apples for their natural fermentation abilities but the terroir that makes a Golden Russet cider from Oregon taste different from a Golden Russet cider from New Hampshire.

If any home cidermakers are interested in trying their hand at a single-varietal cider for the first time, my advice is to use your mouth as a guide. If the apple has sharp acidity, intense sweetness and maybe some interesting tannins or other characteristics, it will probably ferment out nice. If it is crisp and watery, it probably won't be very interesting. Other than that, the usual saying of, "Clean, clean, and clean some more" is very important to keep in mind when making cider. BYO

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Lager Yeast Starters

Clarifying chill haze

help me
mr. wizard
by Ashton Lewis

Q I ALWAYS MAKE A YEAST STARTER IN ORDER TO PITCH THE PROPER AMOUNT OF YEAST. TYPICALLY, I USE A STIR PLATE IN THE BASEMENT, WHICH IS A CONSISTENT 68 °F (20 °C) AMBIENT TEMPERATURE. THE LAST TIME I MADE A STARTER I HAPPENED TO TAKE A TEMPERATURE READING WITH AN INFRARED THERMOMETER AND IT READ 80 °F (27 °C). WOULD THIS BE A PROBLEM WHEN MAKING A LAGER THAT I PLAN TO FERMENT AT 58 °F (14 °C). WILL THE YEAST MUTATE AT A HIGHER TEMPERATURE? SHOULD I BE CONCERNED ABOUT THE TEMPERATURE OF THE STARTER DURING PROPAGATION? SHOULD I ATTEMPT TO MAKE THE STARTER AT THE PLANNED FERMENTATION TEMPERATURE?

RANDY DAUGHERTY
LOVELAND, OHIO

A There is a widely held belief among brewers that yeast should be propagated at, or very close to, the same temperature as the subsequent fermentation. I have always thought that this general rule comes partially from empirical observations and partially from what seems to make sense. If you are getting ready to ride a bicycle race in Colorado, it makes sense to train in the mountains and not at sea level. So if you are preparing lager yeast to ferment at 58 °F (14°C), then it seems logical to propagate the yeast at 58 °F (14 °C) instead of 80 °F (27 °C). The problem I have with this logic is that comparing how an animal responds to environmental conditions is far more complex to how a single-celled organism like yeast responds to environmental conditions. We humans love anthropomorphisms, yet the connections are usually not so obvious.

One of the common misconceptions about lager yeast strains is that these yeasts like the cold and are not as happy when grown at warmer temperatures where ale strains seem so content. That's three anthropomorphisms in one sentence and the temptation to think of yeast cells as little people is not particularly useful to brewers. The fact is that lager strains grow really well at warmer temperatures and it is also true that the resulting beer is fruitier and ale-like than when the same strain is fermented at cooler temperatures. Anchor Steam is an example of a lager beer fermented at warmer temperatures. The same is true for ale strains; reduce the fermentation temperature and fruitiness usually follows. The main difference is that lager yeasts can ferment at much cooler temperatures than ale strains, and when fermented at the lower end of their functional range, lager strains result in very clean beer.

> "One of the common misconceptions about lager yeast strains is that these yeasts like the cold . . ."

In my experience, lager yeast can be propagated at warmer temperatures (68-77 °F/20-25°C) and then pitched into cooler wort and be successfully used for lager fermentations in the 50-55 °F (10-13 °C) range. During yeast propagation, brewers are more concerned about growing healthy yeast cells than controlling the environment in such a way to optimize beer flavor. In order to optimize growth the propagating culture is aerated using a variety of methods.

On a small scale, flasks stoppered with cotton plugs and mixed using stir plates or shaker tables have enough

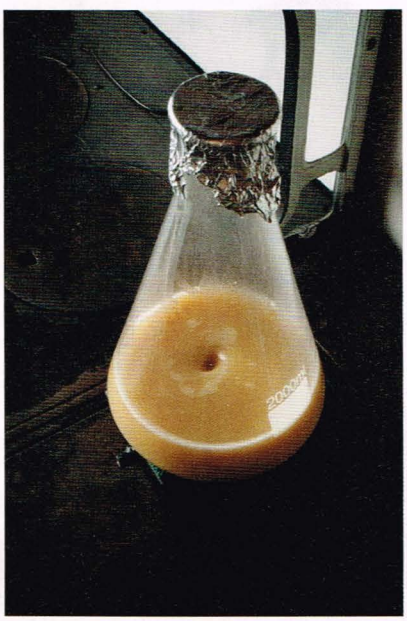


Photo by Les Jörgensen

gas transfer at the gas-liquid interface to provide oxygen to the growing culture. In larger propagators, air or oxygen is bubbled into the culture and the transfer of oxygen into the liquid is often aided by the use of mixers. In all cases, oxygen is added during fermentation to benefit the growth of yeast. This practice is far different from normal beer fermentations where oxygen is usually detrimental to beer flavor (there are notable exceptions to this rule, such as Yorkshire Square fermenters). My point is that yeast propagation and fermentation methods have some key differences.

You ask about the potential for mutations if lager yeast is grown in a warmer environment. Again, human perception comes into play. Many of us think of a three-eyed fish as a mutation, but mutations are rarely so obvious with yeast cultures. Subtle changes are more common with yeast strains. Cultures may slowly become less flocculent over time, or diacetyl reduction may become problematic, or attenuation may begin to suffer as a culture is used over and over.

Brewers know that changing the environment, for example the fermentation temperature or wort original gravity, is one way to change how a yeast strain behaves. As brewers conduct a fermentation, harvest the yeast from the top or bottom of the fermenter (depending on yeast type and harvest method) after fermentation, re-use the yeast crop and repeat the process, we are selecting cells from the total yeast population for re-use based primarily on flocculation properties. Over time the culture may lose the properties that are desirable to brewers and when this occurs, the yeast is re-propagated from laboratory cultures. This is perhaps the primary reason commercial brewers want to grow the yeast in a similar environment that fermentation takes place. In my view of this subject, I do not believe the nuances of propagation temperature, within the norm of what most of us consider "room temperature," are likely to have much effect in the typical homebrewery.

Q I'M NEW TO ALL-GRAIN BREWING. I HAVE A 10-GALLON COOLER AS A MASH/LAUTER TUN AND GET A FAIR AMOUNT OF CHILL HAZE IN MY BEERS. MY TYPICAL PROCESS IS TWO WEEKS IN PRIMARY, TWO IN SECONDARY, AND TWO BOTTLE CONDITIONING. I THEN CHILL AND SERVE. IS THERE SOMETHING I CAN DO TO REDUCE OR ELIMINATE THE CHILL HAZE WITHOUT A LARGE INVESTMENT IN MORE BREWING EQUIPMENT?

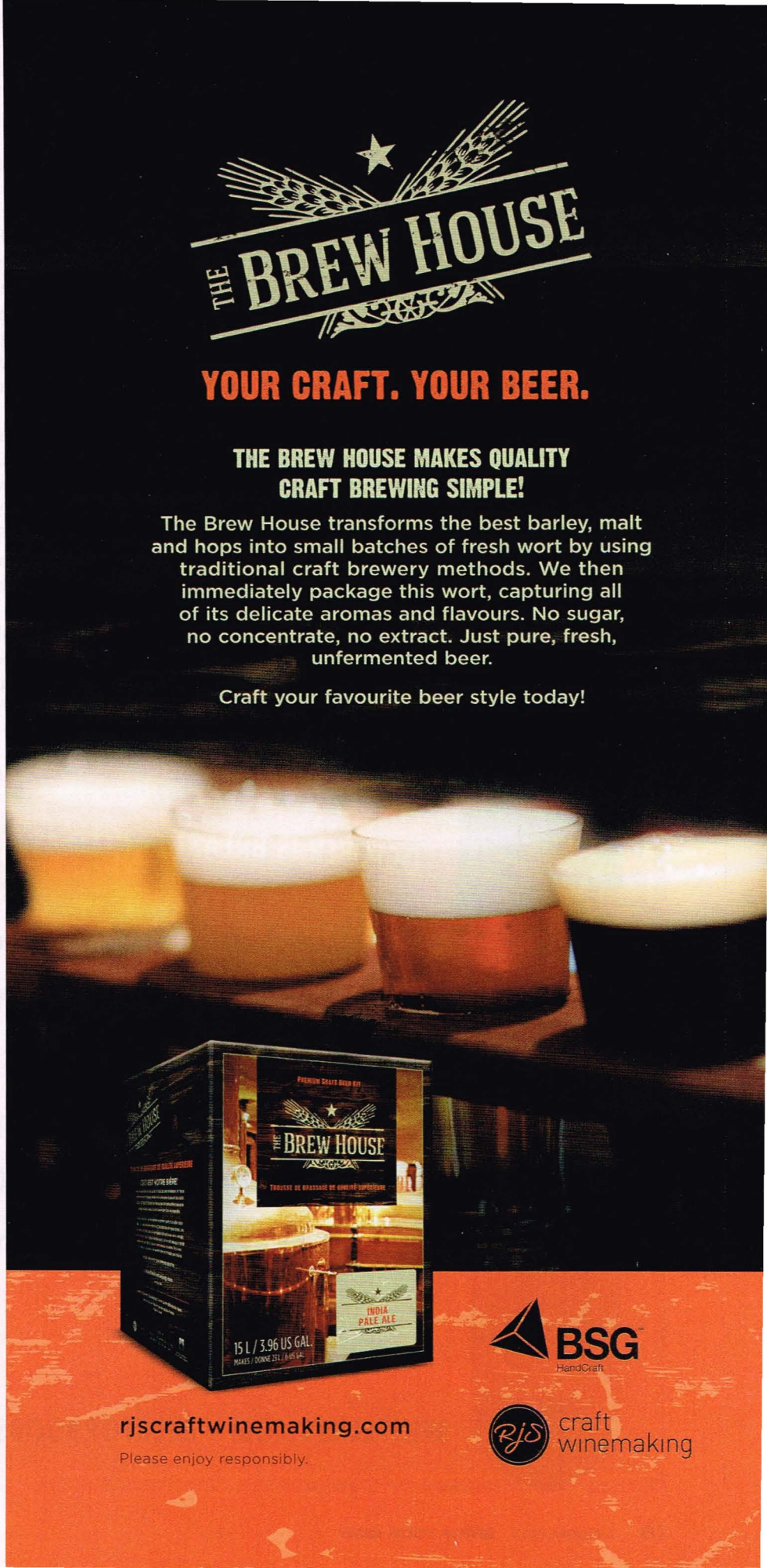
ROB METZGER
VIA FACEBOOK

A I am one of those brewers who believe in sticking to the fundamentals of brewing and then bringing in special tools and brewing aids only after knowing that the fundamentals are being addressed. It is really tempting to begin an answer about chill haze with a long discussion about fining agents and how proteins and polyphenols (tannins) can be selectively removed by the proper selection and use of these compounds. You may discover you need to travel down that road and if you do need to use finings to address your chill haze issues you can research this topic at that time.

It is possible to brew bright, stable beer without using finings, but this does not happen by accident. You are new to all-grain brewing, so there are several things that you need to make sure you are doing correctly before you begin looking for a silver bullet to solve the problem. Here is a short list of items that I would begin reviewing to address your quest for clarity:

1. Malt milling can influence beer clarity if the crush is very fine and you carry an excessive load of particulates into the kettle. Since malt husk contains tannins that react with proteins to form haze, an increase in these compounds from over-milling and poor wort clarity flowing from the lauter tun can cause haze problems in the finished beer. This is one of several reasons that brewers are careful about malt milling and mill gap adjustment.

2. When wort first flows from the lauter tun it is normal for the wort to be cloudy and a bit weak since the lauter tun bottom is normally covered with water prior to filling. For these reasons the wort is recirculated by gently pumping or pouring the "first wort" flowing from the lauter tun to the top of the mash. This flushes the weak wort to the top of the mash and allows the mash bed to establish its filtration properties. The recirculation process in a commercial brewery is typically continued until the wort is clear and the specific gravity has risen



to the expected first wort strength. An inconsistent wort flow rate during wort collection can lead to spikes in turbidity so keep the wort flow steady during collection.

3. A vigorous kettle boil for at least 60 minutes is very important for beer flavor and beer clarity since certain undesirable aromas and protein and tannin fractions are removed during the boil. Many brewers add Irish moss, a good source of kappa-carrageenan, to wort towards the end of the boil in an effort to increase the size of protein flocs. Since the large flocs settle faster than the smaller and more fragile chunks of protein "break," or denatured proteins and protein fragments, Irish moss aids in removing these haze-active proteins from wort and beer. With or without Irish moss, a vigorous boil is a must. Almost all commercial brewers use whirlpool vessels to separate protein break and pelletized hop residues (when pellet hops are used) from wort following the boil. Many homebrewers have begun using whirlpool-type vessels for the same purposes.

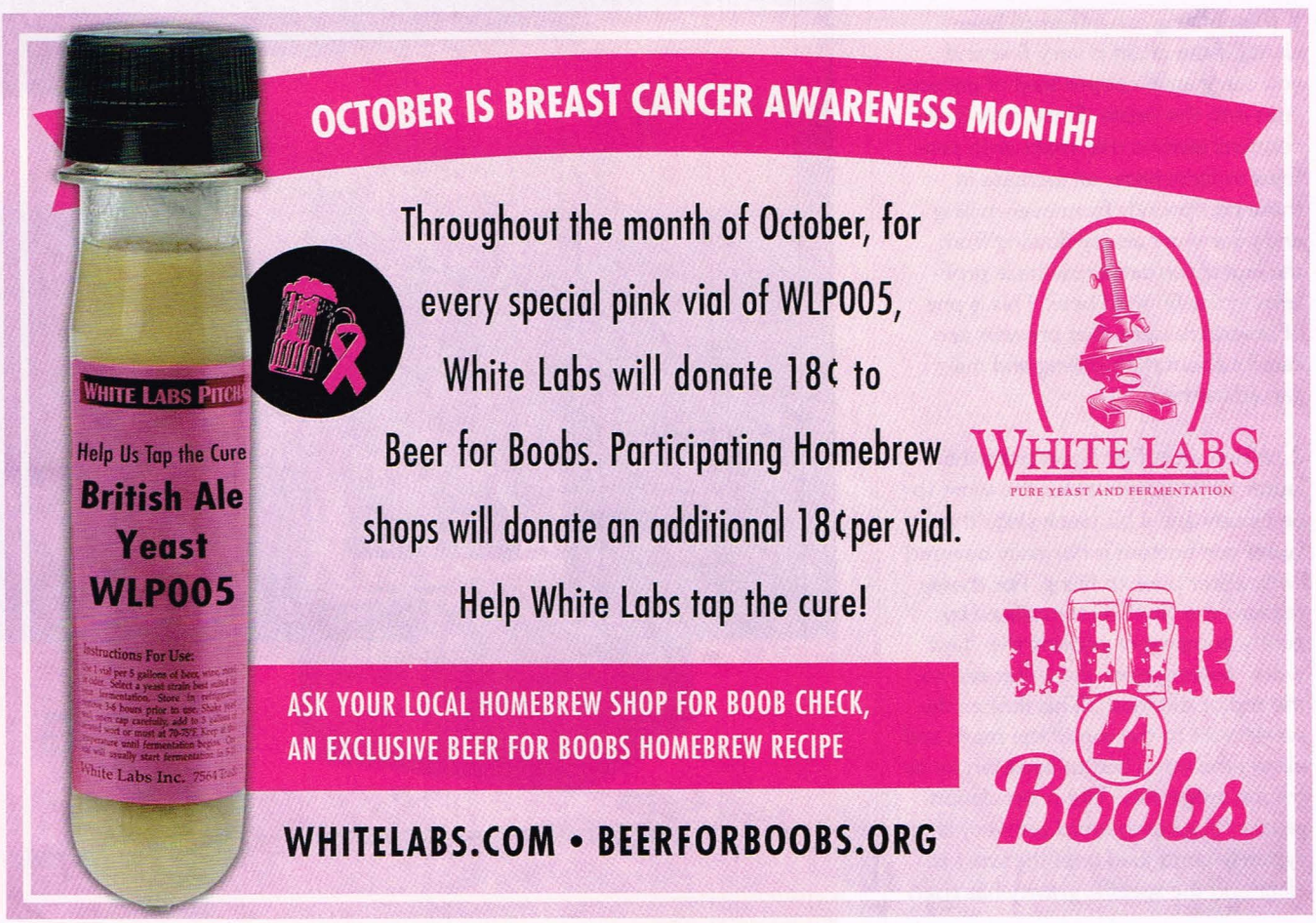
4. Rapid wort cooling after the boil is also very important if you want to brew bright beer. When wort is rapidly chilled "cold break" forms and this settles out in the fermenter. Cold break, like hot break, is comprised of proteins and tannins. Cold break formation is hindered by slow wort cooling; this is one reason why wort chillers are so valuable.

5. Cold storage prior to packaging is the closest thing to a silver bullet when it comes to producing clear, stable beer. The reason this method is so effective is that it causes chill haze formation and, given enough time, allows for the haze to settle from the beer. Most chill proofing aids accelerate this process, which is one reason why they are so critical in commercial operations, and do work very well, but at the end of the day are not required if you have time. The important thing about this process is temperature; you want the beer close to freezing, 30 °F (-1 °C) is perfect to cause as much chill haze formation and subsequent settling as possible. You will want to carefully rack your beer off of the sediment before bottling. Since yeast will also settle during this time, it is often a great benefit to add a small amount of yeast prior to bottling.

After you focus on the five fundamentals above, you should see the fruits of your labor. If you still want clearer beer, send us another question and I will discuss finings and enzymes that can be used to combat haze! BYO

Related Links

To read even more on this topic, check out this story from the *BYO* archives: "Conquer Chill Haze" at www.byo.com/story486



Düsseldorf Altbier

A lagered German ale

style profile
by Jamil Zainasheff

While driving through Germany on family vacation, the traffic started to slow to a stop on the outskirts of Düsseldorf. I mentioned to my wife, "That is the only place in the world you can find true altbier." She and the kids immediately insisted that we stop so I could spend the afternoon sampling the beers of Düsseldorf. Ah, it is no wonder I love my family so much!

It turned out to be one of the greatest beer experiences I have ever had. We wandered the *Altstadt*, stopping in to sample beers from pubs that have been brewing the same beer for 800 years. The sense of history and the quality of the beer makes this an amazing destination for any beer geek. The friendliness of the locals makes it a wonderful stop for any tourist. All of these pubs brew and serve just one kind of beer served in one size glass. They bring the beer up in wooden casks from the cellar and roll them across the pub floor using their feet. They serve the beer by gravity, tapping the keg with a simple faucet. You simply sit down and ask for *"ein Bier bitte"* (A beer please).

Some travelers like to take pictures of buildings and statues. I like to take photos of the beers I drink. At Brauerei Zum Schlüssel I took a picture of my beer and a very large fellow at the end of the bar, speaking German, said in a very gruff voice, "Hey Cowboy, are you taking a picture of me?" I fumbled for the German words to explain that I was only taking a picture of the beer, when the locals chimed in that I just liked the beer. Of course, the big guy was just kidding around and we all had a good laugh. That is one of my fondest beer memories ever, because of my family and the wonderful people of Düsseldorf.

Düsseldorf altbier is a well-balanced, lagered, German ale — it is often referred to by Germans as *"obergäriges Lagerbier"* (top-fermented lager beer) — with a rich and complex malt character. The flavor and aroma often have rich bready and caramel notes. A firm hop bitterness balances the malt and good examples range from balanced to a little bitter. Hop character is never stronger than moderate. This is a beer more about malt character and balance, and it is never a hop-forward beer. In all cases, malt character is the main focus of this style. Fermentation is very clean for an ale, almost lager-like, with slight fruity notes in some examples, and while it should have a medium body, the finish should still be drier than sweeter.

Unfortunately, many people have a flawed understanding of what Düsseldorf altbier should taste like. I recall an American brewery that would always receive gold medals for its altbier, yet it was insanely bitter. The malt character was there, but the bittering was through the roof. Yes, altbier should have a certain level of bittering, but the result is almost always more of a balanced character than it is a bitter-forward one. In fact, the more bitter-forward examples are more of an exception, not the rule. Of course, most judges have never tasted a fresh, classic example, so if winning at competition is your goal, then leaning toward the bitter side is probably to your advantage.

An altbier recipe can be simple or complex. The key to brewing altbier is using the proper yeast and fermenting cool, but still getting enough attenuation to avoid too much residual sweetness. If you want to make something like what you find at Zum Uerige, some Pilsner, Munich, and a little crystal malt is all it takes. If you want something darker, richer, and more complex such as you would find at Zum Schlüssel, you can add in a bit more specialty malt. Keep in mind that all German beers are easy-drinking and even though you might want rich

Continued on page 21

DÜSSELDORF ALTBIER
by the numbers

OG:	1.046–1.054 (11.4–13.3 °P)
FG:	1.010–1.015 (2.6–3.8 °P)
SRM:	11–17
IBU:	35–50
ABV:	4.5–5.2%

Photo by Charles A. Parker/Images Plus

Cowboy Alt
(5 gallons/19 L, all-grain)

OG = 1.050 FG = 1.013
IBU = 45 SRM= 15 ABV= 4.9%

7.3 lbs. (3.3 kg) continental Pilsner malt (2 °L)
1.8 lbs. (0.8 kg) Munich malt (8 °L)
14.1 oz. (0.4 kg) Briess Aromatic® (Munich) malt (20 °L)
7.1 oz. (0.2 kg) Weyermann CaraMunich® III (57 °L)
2.6 oz. (75 g) Weyermann Carafa® Special II (430 °L)
8.75 AAU Magnum hops (60 min.) (0.67 oz./19 g at 13% alpha acids
1.7 AAU Tettnanger hops (15 min.) (0.42 oz./12 g at 4% alpha acids
1 tsp Irish moss
White Labs WLP036 (Düsseldorf Alt) or Wyeast 1007 (German Ale)

Notes

I currently use Best Malz Pilsen and Munich. The aromatic malt is a product of Briess Malt. The CaraMunich® and Carafa® Special are products of Weyermann. Feel free to substitute any high-quality malt of the same type and color from a different supplier. My hops are in pellet form and come from Hop Union, Willamette Valley, or Hopsteiner.

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water (1.4 L) to 1 pound (0.45 kg) of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 149 °F (65 °C). Hold the mash at 149 °F (65 °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 1.039.

The total wort boil time is 90 minutes, which helps reduce the S-methyl methionine (SMM) present in the lightly kilned Pilsner malt and results in less dimethyl sulfide (DMS) in the finished beer. Add the first hop addition with 60 minutes remaining in the boil. Add Irish moss or other kettle finings and the second hop addition with 15 minutes left in the boil. Chill the wort to 60 °F (16 °C) and aerate thoroughly and pitch the yeast. I pitch 50% more yeast for altbier fermentation than I do for most ales. The proper pitch rate is around 230 billion cells, which is approximately two packages of liquid yeast or one package of liquid yeast in a 2.7 liter starter.

Let the beer slowly warm over the first 36 hours to 63-65 °F (17-18 °C) and then hold at this temperature for the remainder of fermentation. If fermentation seems sluggish at all after the first 24 hours, I am not afraid to raise the temperature a couple degrees more. With healthy yeast, fermentation should be complete around 7 to 10 days, but do not rush it. Cold fermented beers take longer to finish than ales or lagers fermented at warmer temperatures. If desired, perform a diacetyl rest during the last few days of active fermentation. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2 to 2.5 volumes. A month or more of cold conditioning at near-freezing temperatures will improve the beer.

Cowboy Alt
(5 gallons/19 L, extract with grains)

OG = 1.050 FG = 1.013
IBU = 45 SRM= 16 ABV= 4.9%

6.8 lbs. (3.1 kg) Munich blend liquid malt extract (LME) (6 °L)
7.1 oz. (0.2 kg) Weyermann CaraMunich® III (57 °L)
2.6 oz. (75 g) Weyermann Carafa® Special II (430 °L)
8.75 AAU Magnum hops (60 min.) (0.67 oz./19 g at 13% alpha acids
1.68 AAU Tettnanger hops (15 min.) (0.42 oz./12 g at 4% alpha acids
1 tsp. Irish moss
White Labs WLP036 (Düsseldorf Alt) or Wyeast 1007 (German Ale)

Notes

I have used a number of Munich blend extracts. Most should do an admirable job of brewing an altbier. Always choose the freshest extract that fits the beer style. If you cannot get fresh liquid malt extract, use an appropriate amount of dry extract instead. CaraMunich® and Carafa® Special are products of Weyermann. Feel free to substitute any high-quality malt of the same type and color from a different supplier.

Step by Step

Add enough water to the malt extract to make a pre-boil volume of 5.9 gallons (22.3 liters) and a gravity of 1.043. Stir thoroughly to help dissolve the extract and bring to a boil.

Once the wort is boiling, add the bittering hops. The total wort boil time is one hour after adding the first hops. Add Irish moss or other kettle finings and the second hop addition with 15 minutes left in the boil. Chill the wort to 60 °F (16 °C) and aerate thoroughly. Then pitch the yeast. I pitch 50% more yeast for altbier fermentation than I do for most ales. The proper pitch rate is around 230 billion cells, which is approximately two packages of liquid yeast or one package of liquid yeast in a 2.7 liter starter.

Let the beer slowly warm over the first 36 hours to 63-65 °F (17-18 °C) and then hold at this temperature for the remainder of fermentation. If fermentation seems sluggish at all after the first 24 hours, I am not afraid to raise the temperature a couple degrees more. With healthy yeast, fermentation should be complete around 7 to 10 days, but do not rush it. If desired, perform a diacetyl rest during the last few days of active fermentation. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2 to 2.5 volumes. A month or more of cold conditioning at near-freezing temperatures will improve the beer.

malt character, you want to keep the beer from being too full and rich. The best way to achieve that great German malt character is with high quality, full-flavored base malts and excellent fermentation practices. Continental Pilsner and Munich malts, plus some crystal malt is a good base. The bulk of the grist should be Pilsner malt, anywhere from 65 to 90%. A portion of the grist should always be Munich malt. Anywhere from 10 to 30% works well, depending on the color and character of the Munich malt. One of my favorite tricks in developing a diverse malt character is splitting the Munich malt additions between a lighter Munich (8 °L) and a darker version (20 °L). I generally keep it around ⅔ lighter and ⅓ darker. Caramel malt adds a little malty sweetness, which helps balance the firm bittering. You can experiment with different Lovibond caramel malt and percentages, but approximately 5% of a mid-color (40 to 80 °L) caramel is plenty. If you need a little more color, a small portion of a husk-less dark malt such as Weyermann Carafa® Special or Briess Blackprinz® malt adds color without adding roasty notes. You do not want roast character in your altbier.

Extract brewers will need to use a Munich malt extract or do a partial mash with Munich malt. Most Munich malt extract is a blend of Munich and Pilsner (or other pale malts) in different percentages. I would try to get an extract made with as much Munich malt as possible for this style, but always let flavor and freshness be your guide. That said, most Munich extract blends are close enough for a decent altbier.

I like to avoid any work that I do not feel really improves a beer, so I prefer a single-infusion mash. Perhaps, historically, a brewer would use a decoction mash when brewing most German-style beers, but I find that high quality continental malts, a single-infusion mash, and excellent fermentation practices will produce beer every bit as good as the best commercial examples. It is far more important to invest time and effort in fermentation, sanitation, and post-fermentation handling than on decoction. If you have ensured that all of those other aspects of your process are flawless, then decoction might be something of interest. For a single-infusion mash, target a mash temperature range of 148-154 °F (64-68 °C). Use higher mash temperatures for lower gravity beers and beers with fewer specialty grains, and lower mash temperatures for higher gravity beers and beers with larger amounts of specialty grains.

Hop character should be minimal to moderate in altbier, and most examples have some subtle background noble hop character that comes across as peppery, floral or perfume-like. Less frequently, you will find an example with some hop aromatics as well. In general, a moderate

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flavor hop addition during the last 15 minutes of the boil of ½ to 1 oz. (14-28 g) of noble hops for a 5-gallon (19-L) batch should get you in the ballpark. Keep it subtle and use only floral or spicy hops. Spalt hops are traditional in altbier, but I prefer German-grown Tettnang hops. Other German-grown hops, such as Hallertau, Perle or Tradition work well also. These hops, when grown outside of Germany, can still work well but you should check with your supplier first if you are not sure how closely they match the German-grown varieties. If you cannot get any of those hops, try to select hops with that same flowery or spicy noble hop character. You do not want to use anything fruity or citrusy. Some decent substitutions are Liberty and Mt. Hood. You can also try Crystal, Ultra, and Vanguard. The big picture is that you want restrained hop character and a balancing bitterness that both complement and integrate with the malt. The balance of bittering versus malt sweetness should be even or slightly on the bitter side. The bitterness to starting gravity ratio (IBU divided by the decimal portion of the specific gravity) ranges from 0.6 to 1.0. I like to target around 0.9 for the brew day, because during the ong lagering period after fermentation some of the bittering will settle out, leaving the beer less bitter than initially brewed.

I have tried fermenting Düsseldorf altbier with lager yeast and clean American ale yeasts and the results have been very good. However, if what you want is *great* altbier (and I am sure that is what you want), then your best choice is most likely White Labs WLP036 Düsseldorf Alt or Wyeast 1007 German Ale. I pitch 50% more yeast for altbier fermentation than I do for most ales. I like to start fermentation cool, in the low 60s Fahrenheit (~16-17 °C) and then let the temperature ramp up toward the end of fermentation. This only works well if you pitch enough active, healthy yeast. In fact, if you read the WLP036 description on the White Labs website, it will warn you away from fermenting too cold with this yeast. Yeast that is stressed produces more sulfur, and slow, sluggish fermentations do leave more sulfur in solution as well. The solution to this is pitching enough healthy yeast and to ramp up the temperature as soon as there is any sign that the fermentation might be slowing down. Vigorous fermentation drives off more of the volatile compounds, attenuates better, and results in a cleaner tasting final product.

For altbier, I like to chill the wort down to 60 °F (16 °C), oxygenate, and then pitch my yeast. I let the beer slowly warm over the first 36 hours to 63-65 °F (17-18 °C) and then I hold this temperature for the remainder of fermentation. If fermentation seems sluggish at all after the first 24 hours, I am not afraid to raise the temperature

a couple degrees more. Once the growth phase of fermentation is complete, it is important to have enough activity to blow off aromatic sulfurs and other unpleasant compounds. Vigorous yeast activity at the end of fermentation also improves reduction of compounds such as diacetyl. Keep in mind that starting fermentation colder only works well if you are pitching enough clean, healthy yeast at the start. If not, you will need to start warmer (perhaps 65 °F/18 °C) to encourage more yeast growth. Even if you start fermentation warmer, you can still raise the temperature toward the latter part of fermentation.

Since diacetyl reduction is slower at colder temperatures, a cold fermented altbier may require a diacetyl rest. To perform a diacetyl rest, simply raise the temperature into the 65-68 °F (18-20 °C) range for a two-day period near the end of the fermentation. While you can do a diacetyl rest after the fermentation reaches terminal gravity, a good time for a diacetyl rest is when fermentation is 2-5 specific gravity points (0.5-1 °P) prior to reaching terminal gravity. Brewers ask how they should know when fermentation has reached that stage. My advice is to raise your fermentation temperature for a diacetyl rest as soon as you see fermentation activity significantly slowing. It will not hurt the beer and it should help the yeast reach complete attenuation as well.

It seems that every beer improves with some period of cold conditioning and in this style it should be considered mandatory. Traditional lager conditioning utilizes a slow temperature reduction before fermentation reaches terminal gravity. The purpose of the slow cooling rate is to avoid sending the yeast into dormancy. After a few days, the beer reaches a temperature close to 40 °F (4 °C) and the brewer transfers the beer into lagering tanks. If you want to use this technique, you will need precise temperature control so that fermentation slowly continues and the yeast remains active. Rapidly chilling the beer near the end of fermentation can cause yeast to excrete a greater amount of ester compounds instead of retaining them.

I prefer to wait until fermentation is complete, including any steps such as a diacetyl rest, before lowering the beer temperature. The yeast is far more active and able to reduce fermentation byproducts at higher temperatures. Once I am certain the yeast have completed every job needed, I use a period of cold storage near freezing. This time in storage allows very fine particulates to settle out and the beer flavors to mature. BYO

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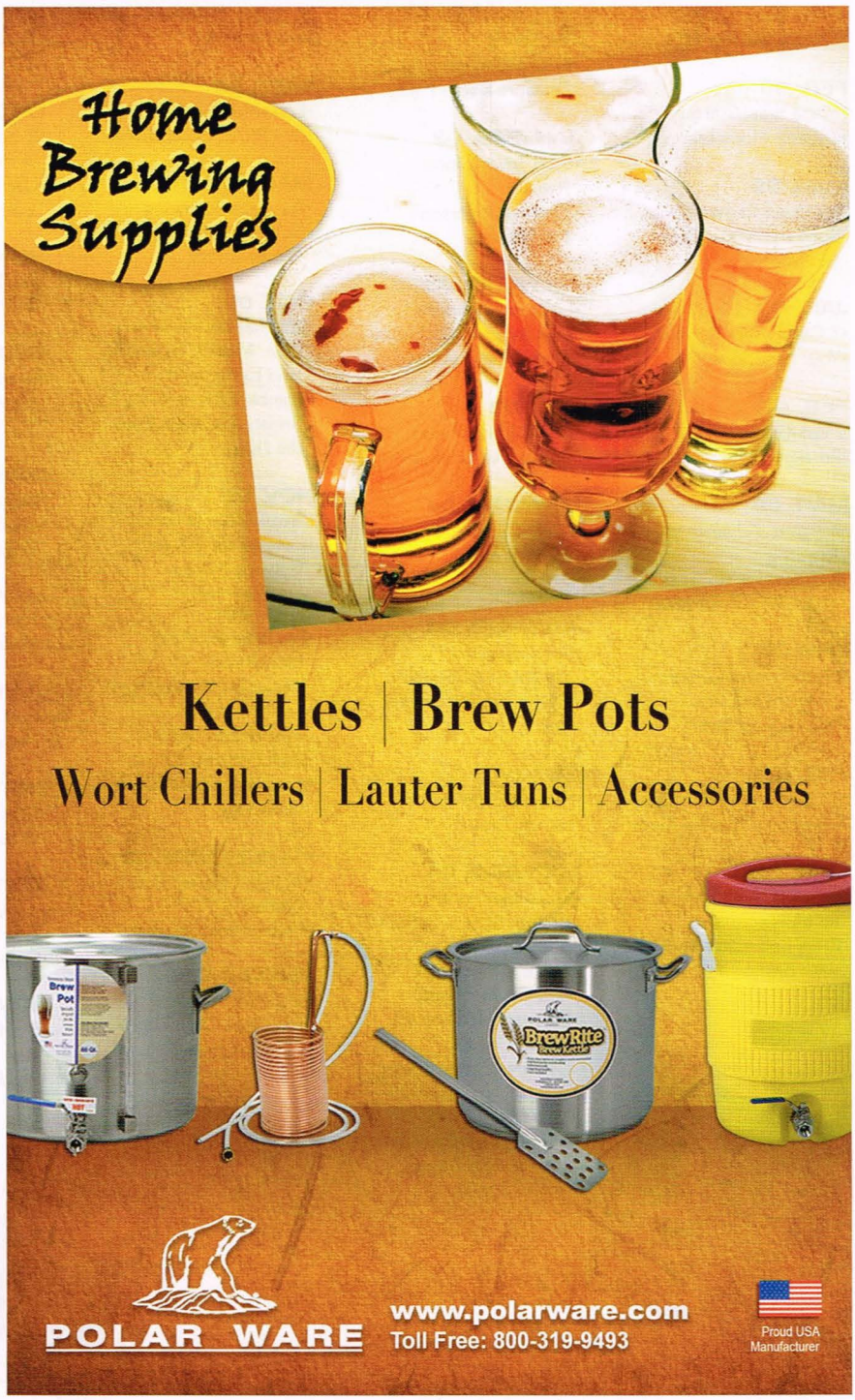
For another *BYO* writer's take on Düsseldorf altbier, check out this story from our archives published in 2004 at: www.byo.com/story582



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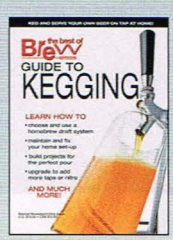

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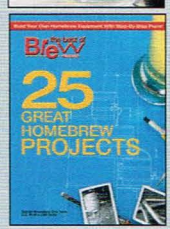

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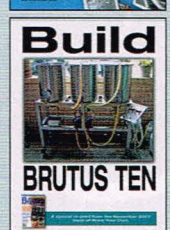

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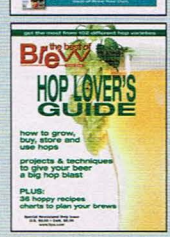

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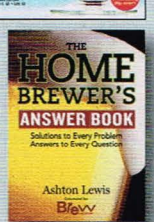

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Story by **Dave Green**
Photos by **Erica Michelsen**

Top left: The parking area in front of the tiny Hill Farmstead Brewery in Greensboro Bend, Vermont, home of RateBeer.com's "2013 Best Brewery in the World."

Top right: The sign in front of The Alchemist cannery in Waterbury, Vermont invites would-be Heady Topper drinkers to drink their highly-acclaimed DIPA, "from the can!"

Lower right: Barely bigger than a homebrewer's barn, Lawson's Finest Liquids is the home of award-winning beers such as Double Sunshine IPA, Maple Tripple and Toast.

TRACKING DOWN BIG POPULAR BEERS FROM A SMALL STATE

It's 2:30 on a Monday afternoon and I find myself sitting at a pub called the Blackback Pub in downtown Waterbury, Vermont (pop. ~5,000). It is standing room only and the pub across the street looks just as crowded. Conversation is lively among the patrons and they are all drinking from stemware more familiar to an upscale wine bar than your typical pub. There is no wedding or festival on this particular day; it is just a typical afternoon in this little New England town. The patrons, myself included, are there for only one reason: the beer.

There is a group of three gentlemen sitting catty-cornered from me at the bar. Striking up a conversation with them I discover that two of them work at a highly-acclaimed beer bar in New York City and the third is a sales representative for one of America's major craft breweries. I ask them what brought them up to these parts. The question is really rhetorical in nature since I already know the answer and their answer suggests they're on to me as well. They are here on their beer pilgrimage.

Northern Vermont has recently gotten a lot of attention on the national craft beer scene. Online beer forums have become loaded with questions from prospective beer-drinking pilgrims asking travel advice from locals and those who have made the pilgrimage exactly how to devise their game plan. What hours do I show up to avoid lines? When do deliveries occur at X, Y & Z stores? What is the current case limit being imposed? When should I expect the supply to run out? This is all done so that they too can become one of the few who have tried beers from what has become known as the Vermont Big Three; Hill Farmstead Brewery, Lawson's Finest Liquids and The Alchemist.

John Kimmich, owner of The Alchemist, coined the phrase "IPA highway" to describe the route between the three breweries. Those that have ridden that highway boast of their hauls for the day or sing dirges in their failure to obtain the beers of their desires. From the war stories I heard

at the Blackback Pub that afternoon, I felt the passion, felt the excitement and experienced the disappointment of the quest for the big three as most everyone in the pub that Monday afternoon had just recently ridden that IPA highway. (Don't be mislead by the term "IPA highway," by the way. The actual route between the three breweries is anything but a highway. In fact, a GPS unit would be recommended for anybody without a detailed map since back roads are the best way to describe the route.)

So what is so special about the Vermont "Big Three"? Strictly from a beer ratings standpoint, each can boast something only a few breweries in the world can: A beer found in the top 25 on BeerAdvocate.com's list of top 250 beers of the world, which is based upon user's reviews. Six of the top 50 beers on that list are produced between these three breweries. The only two states in the US that can boast more beer labels in the top 50 are California and Michigan. And Florida is the only other state on the US East Coast that can claim to even have one beer ranked in the top 50. And the number one ranked beer in the world on that list, Heady Topper, is made by The Alchemist. If you move over to RateBeer.com, you will find that Hill Farmstead Brewery won the "Best Brewery in the World" in 2013 with eight of the ten best new beers for 2012.

If you step away from beer ratings and the hype surrounding these three breweries, however, you will find three brewers with a true passion and an obvious mastery of their craft. As a homebrewer and a constant disciple of the craft, I am always intrigued by what makes a successful brewer. What separates their beers from mine? To find out, I took my own pilgrimage.

Hill Farmstead

Before ending up at Blackback Pub that Monday afternoon, I headed out that morning to Greensboro Bend, Vermont (pop. 232), home of Hill Farmstead Brewery. Lucky for me the brewery's retail store is closed on Mondays, so I was able to park right up front, which would be like winning big in scratch lotto on a day when the retail store was open.

Shaun Hill's path to open the brewery started when he was 15 years old, attempting his first batch of homebrew. When he went off to college he founded a homebrew club while getting his degree in philosophy. By the time he was 24 he was the brewmaster for The Shed, a brewpub in Stowe, Vermont (which has since relocated). While brewing at The Shed, Shaun's beers gained notoriety from acclaimed brewers such as Stone Brewing Co.'s Mitch Steele, who modeled Stone's Sublimely Self Righteous on Shaun's dark IPA, Dark Side.

After his time at The Shed, Shaun traveled, spent a year brewing at the Trout River Brewing Co. in Lyndonville, Vermont and made a first attempt at starting up his own brewery before landing an overseas brewing position at Nørrebro Bryghus in Denmark in 2008. The craft beer scene in Denmark at the time was beginning to explode thanks in part to Scandinavians who got a taste of the beer being brewed in United States. After almost two years brewing in Denmark and helping Nørrebro Bryghus win three World Beer Cup medals, including two golds, Shaun found what he was looking for; not only enlightenment regarding brewing techniques, but also the pieces were falling together for him to begin his own brewery back in his own hometown of Greensboro Bend. He lined up the necessary investors to get his venture off the ground and soon opened a brewery on the farm that his family had cultivated for eight generations.

As I walked up to the brewery, I heard the pneumatic press and found Shaun Hill with one arm on the lever of his hand bottling line, bottling his latest saison fermented with *Brettanomyces*. The smell of *Brett* permeated the air; the sounds of Jerry Garcia, too. His team of four, Shaun and his Dad included, were working hard to get ready for the next wave of beer drinkers. Shaun is quick to point out to me when we start talking, this isn't his success; it is the team's success.

Lawson's Finest Liquids

By noon that Monday, I made my way to Warren, Vermont (pop. ~1,700). More dirt roads led me to my second brewery of the day, Lawson's Finest Liquids. When I walked into Sean Lawson's brewery I was nearly floored. It was like I had stuck my whole body inside a bottle of his Double Sunshine IPA.

Sean started homebrewing in college back in 1990. After college he was living out in the western part of the US, skiing and working at several breweries including Breckenridge Pub & Brewery. He ended up moving back east to Vermont after a few years where he helped design an environmental stewardship program, which he runs, at Mad River Glen Ski Resort in Fayston, Vermont.

I first met Sean Lawson, proprietor and namesake of the label, back in 2006 at a mutual friend's birthday party. I remember my friend commenting when I RSVP'd, "Wait until you try his beers!!" So when Sean handed me a glass of a beer he called Maple Nipple at the party, I felt disbelief. I had never had a maple beer like this before. It bared no resemblance to the cloyingly sweet flavors that most commercial maple beers I had tried at that point, nor was it akin to the flat maple beers myself and homebrewing friends had attempted to brew.

Lawson's Finest Liquids has won two World Beer Cup awards, a bronze and silver, for his Maple Tripple. But Sean's story doesn't end with his award-winning maple beers. Currently another beer, Double Sunshine, an Imperial IPA, is ranked #12 in the world according to BeerAdvocate.com's user rankings. With its explosion of citrus, mango and cantaloupe flavors, it's really no wonder there is such acclaim for this beer. His Triple Play IPA also won the title of National IPA champion by *The Brewing News* in 2011.

Sean guided me around his brewery and his oak aging program during my visit. As we entered his cold room with bright tanks, he said he was currently carbing up the 2012 Maple Tripple and wanted to check to see if it was ready. By his meter it still needed

a little more carbonation and poured off the first sampling of the vintage for me to taste; even better than I remembered it.

The Alchemist

Situated not much more than a stone's throw from Ben & Jerry's ice cream factory in Waterbury, Vermont you will find the cannery of one of the great stories of Vermont beer legacy, The Alchemist. John Kimmich and his wife Jen were the founders of the Alchemist Pub & Brewery back in 2003, located in the middle of downtown Waterbury at that time. It is hard to pinpoint their influence on the regional beer scene, but when you have a beer bar like the Alchemist, it is hard not to deny their influence. When I went to the Vermont Brewer's Festival back in 2007, the line to The Alchemist even back then was probably at least a 20-minute wait to get a tasting-sized pour while most other lines were no more than about a five minute wait.

John Kimmich got his start brewing under the auspices of Greg Noonan of Burlington's Vermont Pub & Brewery. For those of us who are well versed in the US craft beer world, Greg Noonan was a giant whose untimely passing in 2009 shook the beer world. Lucky for us, John was able to take Greg's wealth of knowledge and use it to make some inspired and innovative beers of his own. For those of us that were lucky enough to visit The Alchemist Pub & Brewery before Hurricane Irene struck in 2011, we were the lucky ones. That brewery was a place for beer nerds to truly get geeky about beer. I don't want to imply that The Alchemist Pub & Brewery spawned the explosion of world-class breweries in the area, but to say that it wasn't a big influence in my opinion would be naïve. Both Shaun Hill and Sean Lawson recount the days of drinking beer at John and Jen's pub, and in my opinion, The Alchemist is a key player in the development of Northern Vermont's craft beer destination status.

When Hurricane Irene came through Vermont in 2011, the town of Waterbury was hit especially hard, including The Alchemist. Lucky for us in the beer world, John and Jen didn't completely throw in the towel when their pub was severely damaged by flood waters. After much deliberation, they decided it best to close down the brewpub and focus on their cannery, which had just opened up earlier in 2011 on the north side of town. The Alchemist currently brews one beer, Heady Topper, and they do it well considering there is a line out the door on a Monday at 2 pm when I stopped by the brewery. The Alchemist has recently doubled their production capacity, but demand has grown faster. The "sold out" sign still frequently hangs on the brewery door most every weekend.

The Alchemist's Heady Topper double IPA, brewed in Waterbury, Vermont, is in such high demand that the brewery frequently sells out of their supply in less than a week.

John said that they also have plans to release a specialty beer each month. Everyone I talked to about this idea is excited. (See page 31 of this story for a recipe for Holey Moley, one of those upcoming specialty beers.)

Brew Like a Vermonter

As a homebrewer, how can you benefit from the skills these three brewers possess? Think of these brewers as craftsman, and remember that you can't learn everything from a craftsman in a day — you have to apprentice. Also, a true craftsman must have nearly complete understanding and control of what they are working with. As brewers we mainly are working with malt, hops, yeast and water. While we can't all apprentice in Northern Vermont, here is some advice about brewing ingredients that these three brewers offered to share with homebrewers.

Malt

It all starts with a good malt base. As with all great beers, a basic pale malt is a good place to start and can be improved upon with some Munich or Vienna malt or some caramel malt to add body and undertones. An alternative is to start with a floor-malted British pale ale malt, which can achieve similar results with some very subtle differences. Also, there is a stigma among homebrewers that IPAs can't be dry enough. Don't be afraid to mash on the higher end of the spectrum to see what you come up with. A mash in the upper 150s to 160 °F (69 to 71 °C) may produce a beer that can be sur-

Continued on page 36

Vermont Cult Clones Recipes

Heady Topper clone (The Alchemist) (5.5 gallons/21 L, all-grain)

OG = 1.076 FG = 1.014
IBU = 100+ SRM = 6 ABV = 8%

Ingredients

15 lbs. (6.8 kg) British Pale Ale Malt
6 oz. (170 g) Caravienne® malt
1 lb. (0.45 kg) turbinado sugar (10 min.)
7 AAU Magnum hops (60 min.) (0.5 oz./14 g at 14% alpha acids)
13 AAU Simcoe® hops (30 min.) (1 oz./28 g at 13% alpha acids)
5.75 AAU Cascade hops (knockout) (1 oz./28 g at 5.75% alpha acids)
8.6 AAU Apollo hops (knockout) (0.5 oz./14 g at 17.2% alpha acids)
13 AAU Simcoe® hops (knockout) (1 oz./28 g at 13% alpha acids)
10.5 AAU Centennial hops (knockout) (1 oz./28 g at 10.5% alpha acids)
7 AAU Columbus hops (knockout) (0.5 oz./14 g at 14% alpha acids)
1 oz. (28 g) Chinook hops (primary dry hop)
1 oz. (28 g) Apollo hops (primary dry hop)
1 oz. (28 g) Simcoe® hops (primary dry hop)
1.25 oz. (35 g) Centennial hops (secondary dry hop)
1.25 oz. (35 g) Simcoe® hops (secondary dry hop)
1 Tb. Polyclar
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

Achieve a target mash temperature of 153 °F (67 °C). Boil for 60 minutes, adding the hops as instructed. After boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling. Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (20 °C) for one week. After final gravity has been achieved, add a clarifying agent such as Polyclar. Allow three days for clarifying agent to work, then add first set of dry hops to primary fermenter. After seven days, rack the beer off the dry hops and yeast cake either into a keg or secondary fermenter. Purge with carbon dioxide if available. Add the second set of dry hops to the keg or secondary fermenter. After five days prime and bottle, or keg. If bottling, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Heady Topper clone (The Alchemist) (5.5 gallons/21 L, extract with grains)

OG = 1.076 FG = 1.014
IBU = 100+ SRM = 6 ABV = 8%

Ingredients

9.9 lbs. (4.5 kg) light liquid malt extract
1 lb. (0.45 kg) extra light dried malt extract
6 oz. (170 g) Caravienne® malt
1 lb. (0.45 kg) turbinado sugar (10 min.)
7 AAU Magnum hops (60 min.) (0.5 oz./14 g at 14% alpha acids)
13 AAU Simcoe® hops (30 min.) (1 oz./28 g at 13% alpha acids)
5.75 AAU Cascade hops (knockout) (1 oz./28 g at 5.75% alpha acids)
8.6 AAU Apollo hops (knockout) (0.5 oz./14 g at 17.2% alpha acids)
13 AAU Simcoe® hops (knockout) (1 oz./28 g at 13% alpha acids)
10.5 AAU Centennial hops (knockout) (1 oz./28 g at 10.5% alpha acids)
7 AAU Columbus hops (knockout) (0.5 oz./14 g at 14% alpha acids)
1 oz. (28 g) Chinook hops (primary dry hop)
1 oz. (28 g) Apollo hops (primary dry hop)
1 oz. (28 g) Simcoe® hops (primary dry hop)
1.25 oz. (35 g) Centennial hops (secondary dry hop)
1.25 oz. (35 g) Simcoe® hops (secondary dry hop)
1 Tb. Polyclar
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

Steep the crushed grains in 2 qts. (1.9 L) for 20 minutes at 155 °F (68 °C). Rinse the grain with hot water and add water to achieve 6.5 gallons (25 L) in your kettle. Turn off the heat, add the malt extract to your kettle and stir until fully dissolved. Boil for 60 minutes, adding the hops as instructed. After the boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling. Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (20 °C) for one week. After final gravity has been achieved, add a clarifying agent such as Polyclar. Allow three days for clarifying agent to work, then add the first set of dry hops to the primary fermenter. After seven days, rack beer off the dry hops and yeast cake either into a keg or secondary fermenter. Try to purge with carbon dioxide if it is available. Add the second set of dry hops to the keg or secondary fermenter. After five days prime and bottle, or keg. If bottling, use the priming chart at http://byo.com/resources/carbonation.

Tips for Success:

The goal is to get at least 5.5 gallons (21 L) into your fermenter to compensate for the loss of wort which will occur during dry hopping. Make sure your primary fermenter has enough headspace to accommodate that much wort plus a large kräusen. John Kimmich's biggest piece of advice for trying to clone this beer: "Technique and water treatment." For more information about brewing water treatments, visit http://byo.com/story1547. To tweak your brewing water, download *BYO*'s brewing water spreadsheet, written by Vermont Pub & Brewery's Greg Noonan: http://byo.com/resources/brewwater

If you have access to a can of Heady Topper, try culturing the yeast from the can to get as close to the original as possible. Read about the culturing process here: http://byo.com/story1661

For extract brewers who use concentrated boils (usually around 3 gallons/11 L), try adding most of the extract near the end of the boil. This will keep the gravity low, which may help alpha acids convert into iso-alpha acids.

Vermont Cult Clones Recipes

Holey Moley clone (The Alchemist) (5 gallons/19 L, all-grain)

OG = 1.078 FG = 1.016
IBU = 75 SRM = 9 ABV = 8%

Ingredients

14 lbs. (6.4 kg) 2-row pale malt
1.7 lbs. (0.77 kg) Munich malt
13 oz. (0.36 kg) caramalt (37 °L)
7 AAU Magnum hops (60 min.) (0.5 oz./14 g at 14% alpha acids)
5.5 AAU Cascade hops (30 mins.) (1 oz./28 g at 5.5% alpha acids)
7.8 AAU Cascade hops (5 mins.) (1.5 oz./42 g at 5.5% alpha acids)
18 AAU Amarillo® hops (knockout) (2 oz./56 g at 9% alpha acids)
2 oz. (56 g) Cascade hops (dry hop)
3 oz. (85 g) Amarillo® hops (dry hop)
1 Tb. Polyclar
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

Achieve a target mash temperature of 155 °F (68 °C). Boil for 60 minutes, adding the hops as instructed. After the boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling.

Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (20 °C) for one week. After the final gravity has been achieved, add a clarifying agent such as Polyclar. Allow three days for clarifying agent to work, then add the dry hops to primary fermenter. After seven days, rack beer off dry hops and yeast cake either into a keg or bottles. Purge with carbon dioxide if it is available to you. If bottling, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Holey Moley clone (The Alchemist) (5 gallons/19 L, extract with grain)

OG = 1.078 FG = 1.016
IBU = 75 SRM = 9 ABV = 8%

Ingredients

9.9 lbs. (4.5 kg) light liquid malt extract
1.1 lbs. (0.5 kg) Munich liquid malt extract
13 oz. (0.36 kg) caramalt (37 °L)
7 AAU Magnum hops (60 min.) (0.5 oz./14 g at 14% alpha acids)
5.5 AAU Cascade hops (30 mins.) (1 oz./28 g at 5.5% alpha acids)
7.8 AAU Cascade hops (5 mins.) (1.5 oz./42 g at 5.5% alpha acids)
18 AAU Amarillo® hops (knockout) (2 oz./56 g at 9% alpha acids)
2 oz. (56 g) Cascade hops (dry hop)
3 oz. (85 g) Amarillo® hops (dry hop)
1 Tb. Polyclar
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

Steep the crushed grains in 2 qts. (1.9 L) water for 20 minutes at 155 °F (68 °C). Rinse the grain with hot water and add water to achieve 6.5 gallons (25 L) in your kettle. Turn off the heat, add the malt extract to your kettle and stir until fully dissolved. Boil for 60 minutes, adding the hops as instructed. After the boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling.

Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (20 °C) for one week. After the final gravity has been achieved, add a clarifying agent such as Polyclar. Allow three days for the clarifying agent to work, then add dry hops to the primary fermenter. After seven days, rack the beer off of the dry hops and yeast cake either into a keg or bottles. Purge with carbon dioxide if it is available. If bottling, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Tips for Success:

John Kimmich says that this beer was, "dry hopped extensively with Cascade and Amarillo" hops, which makes me believe he either used a lot of dry hops in one stage or dry hopped this beer in two stages. I decided to go with the former in my clone attempt. Kimmich is a very technique-oriented brewer, so don't be afraid to experiment with your dry hopping to try and find the best flavor profile. Bagging your hops in a muslin brewing bag commonly used for steeping grains can make them easier to retrieve when you are ready to remove them from the beer. If you bag your dry hops, however, keep in mind that it can reduce the hops exposure to the beer. Remedy this by making sure you don't pack the bag of hops too tightly.

Be careful not to disturb the CO_2 blanket on top of the beer during dry hopping. After you add the dry hops to the fermenter, re-establish the CO_2 blanket by gently injecting CO_2 across the top of the beer (if you have CO_2 available to you in your homebrewery). If you have to open the fermenter for some reason during this period, repeat the process. For more information about dry hopping, visit http://byo.com/569.

This beer's relatively high terminal gravity led me to believe all-grain brewers should not go too low with their mash temperature. Remember when brewing any beer with a high gravity to pitch a healthy amount of active yeast cells. Beers made from underpitched worts start slower, and increase the stress on the yeast, producing more esters and fusel alcohols. Consider making a yeast starter a day ahead of your brew day to generate a healthy population of yeast before pitching. A general rule of thumb for pitching ale yeast is that you need 0.75 million cells per milliliter of wort per degree Plato. This translates to about a 1-L starter if using a stir plate and about a 2-L starter if you only swirl the starter every few hours. Visit http://byo.com/yeaststarter for more information about making a yeast starter, as well as a table for recommended starter sizes for a variety of worts. Visit www.mrmalty.com for a useful pitching rate calculator.

Vermont Cult Clones Recipes

Everett clone
(Hill Farmstead Brewery)
(5 gallons/19 L, all-grain)

OG = 1.088 FG = 1.030
IBU = 38 SRM = 55 ABV = 7.5%

Ingredients

13.5 lbs. (6.1 kg) 2-row pale malt
1 lb. (0.45 kg) dextrine malt
1.25 lbs. (0.57 kg) caramalt (37 °L)
0.5 lb. (0.23 kg) crystal malt (90 °L)
1 lb. (0.45 kg) chocolate malt (300 °L)
1.25 lbs. (0.57 kg) roasted barley (500 °L)
11 AAU Columbus hops (60 mins.) (0.8 oz./23 g at 14% alpha acids)
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

When crushing the grains keep the dark roasted grains (crystal-90, the chocolate malt and the roasted barley) separate from the other grains. Mix the pale malt, dextrine malt and caramalt with 20 qts. (19 L) to achieve a target mash temperature of 159 °F (71 °C). Hold for 20 minutes, then mix in the darker grains. Hold for 5 minutes and begin the mash out procedure or lauter phase. Boil for 60 minutes. Add the Columbus hops at the beginning of the boil.

Chill the wort rapidly to 68 °F (20 °C). Target pitching rate at 1.0 million cells/milliliter/degrees Plato (~2.5-L starter). Add the yeast to the chilled wort and ferment at 68 °F (20 °C) until the final gravity is reached — about one week. Allow the beer to condition for an additional week at 52 °F (11 °C). Your beer is now ready to rack into a keg, or into bottles with priming sugar.

Everett clone
(Hill Farmstead Brewery)
(5 gallons/19 L, extract with grains)

OG = 1.088 FG = 1.030
IBU = 38 SRM = 55 ABV = 7.5%

Ingredients

9.9 lbs. (4.5 kg) light liquid malt extract
1 lb. (0.45 kg) dextrine malt
1.25 lbs. (0.57 kg) caramalt (37 °L)
0.5lb. (0.23 kg) crystal malt (90 °L)
1 lb. (0.45 kg) chocolate malt (300 °L)
1.25 lbs. (0.57 kg) roasted barley (500 °L)
11 AAU Columbus hops (60 mins.) (0.8 oz./23 g at 14% alpha acids)
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

Crush the caramalt, crystal malt, chocolate malt and roasted barley and place them in a muslin brewing bag. Steep the crushed specialty grains in 2 gallons (7.8 L) at 155 °F (68 °C) for 20 minutes. Rinse the grains with 3 qts. (2.8 L) hot water and allow it to drip into the kettle for about 15 minutes, but be sure not to squeeze the bag to prevent extracting harsh tannins from the grain husks.

Add the malt extract to the brewpot with the heat turned off and stir well to avoid scorching or boilovers. Top off the kettle to 6 gallons (23 L). Boil for 60 minutes. Add the Columbus hops at the beginning of the boil.

Chill the wort rapidly to 68 °F (20 °C). Target pitching rate at 1.0 million cells/milliliter/degrees Plato (~2.5-L starter). Add the yeast to the chilled wort and ferment at 68 °F (20 °C) until the final gravity is reached — about one week. Allow the beer to condition for an additional week at 52 °F (11 °C). Your beer is now ready to rack into a keg, or into bottles with priming sugar.

Tips for Success:

Shaun Hill is able to start all of his Hill Farmstead beers with a fairly clean slate with his water, and builds the water profile for a beer like Everett. He recommends if you are attempting to brew this beer to make sure your water calculator can calculate for residual alkalinity (RA) since this is an important part of brewing with a large portion of dark grains in order to keep the wort's pH in range. Using a water calculator such as BeerSmith or Bru'n Water will help. You will want to experiment but I would recommend keeping the residual bicarbonate level low after the dark grains have been added. This should allow the dark grains to pop on the tongue. Shaun mentioned that he does not add any calcium chloride to Everett. If you haven't done so already, request a water report from your town or city (if you are using a municipal water source) or have your home water supply tested to find out what is in your water. (Read more about the basics of water reports in "Beginner's Block" in the July-August 2012 issue of *BYO*.) If you use well water, Ward Laboratories offers a base water chemistry analysis for around $30. If you have hard water, cutting it with reverse osmosis (RO) water or distilled water to a level that your RA is low is a good option.

Chocolate malt is mostly used for color and flavor in darker beers like Everett. As the color (°L) of the malt increases, so does its intensity, low to high respectively. For more about homebrewing with chocolate malt, visit http://byo.com/story456 and also http://byo.com/story314.

Roasted barley, also included in this clone recipe, has many of the same characteristics of black malt. The darkest of the dark malts, roasted barley has some starch that can be converted during the mash, which will impact the specific gravity. Roasted barley will also lend to the sweetness of a beer. Jay Wince, Head Brewer at Weasel Boy Brewing Company in Zanesville, Ohio advised in the January-February 2011 issue of *Brew Your Own*, "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." Everett has a silky smooth body with a very high terminal gravity. Shaun said, "The hops will help balance the beer from turning into a sweet mess," so you may want to try increasing your hopping rate. For more information about homebrewing with roasted barley, visit http://byo.com/story2267 and http://byo.com/story533.

Vermont Cult Clones Recipes

Abner clone (Hill Farmstead Brewery) (5.5 gallons/21 L, all-grain)

OG = 1.077 FG = 1.014
IBU = 100+ SRM = 7 ABV = 8%

Ingredients

15 lbs. (6.8 kg) 2-row pale malt
0.75 lbs. (0.34 kg) caramalt (37 °L)
1 lb. (0.45 kg) corn sugar (10 mins.)
15.5 AAU Warrior® hops (60 mins.)
(1 oz./28 g at 15.5% alpha acids)
10.5 AAU Columbus hops (30 mins.)
(0.75 oz./21 g at 14% alpha acids)
13 AAU Simcoe® hops (knockout)
(1 oz./28 g at 13% alpha acids)
10 AAU Centennial hops (knockout)
(1 oz./28 g at 10% alpha acids)
6.5 AAU Chinook hops (knockout)
(0.5 oz./14 g at 13% alpha acids)
3 oz. (84 g) Simcoe® hops (dry hop)
2 oz. (56 g) Chinook hops (dry hop)
1 Tb. Polyclar
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

This is a single infusion mash. Achieve a target mash temperature of 149 °F (65 °C). Hold for 45 minutes, then proceed to mash out or begin lauter phase. Collect about 7 gallons (27 L) in your kettle. Boil for 75 minutes, adding the hops as instructed. After boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling. Target pitching rate at 1.0 million cells/ milliliter/degrees Plato (~2 L starter). Ferment at 68 °F (20 °C) for one week. Add a fining agent to clear yeast from beer. Add the dry hops and let the beer sit on the dry hops for an additional seven to ten days. You are now ready to bottle or keg. If priming, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Abner clone (Hill Farmstead Brewery) (5.5 gallons/21 L, extract w/grains)

OG = 1.077 FG = 1.014
IBU = 100+ SRM = 7 ABV = 8%

Ingredients

9.9 lbs. (4.5 kg) light liquid extract
0.5 lbs. (0.23 kg) extra light dried malt extract
0.75 lbs. (0.34 kg) caramalt (37 °L)
1 lb. (0.45 kg) corn sugar (10 mins)
15.5 AAU Warrior® hops (60 mins.)
(1 oz./28 g at 15.5% alpha acids)
10.5 AAU Columbus hops (30 mins.)
(0.75 oz./21 g at 14% alpha acids)
13 AAU Simcoe® hops (knockout)
(1 oz./28 g at 13% alpha acids)
10 AAU Centennial hops (knockout)
(1 oz./28 g at 10% alpha acids)
6.5 AAU Chinook hops (knockout)
(0.5 oz./14 g at 13% alpha acids)
1 Tb. Polyclar
3 oz. (84 g) Simcoe® hops (dry hop)
2 oz. (56 g) Chinook hops (dry hop)
Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) or Lallemand Nottingham yeast
Priming sugar (if bottling)

Step by Step

Steep the crushed caramalt in 2 qts. (1.9 L) water at 155 °F (68 °C) for 20 minutes. Top off kettle to 7 gallons (27 L). Off heat, add the liquid and dried malt extract and bring to a boil. Boil for 75 minutes, adding the hops and corn sugar as instructed in the ingredients list. After boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling. Chill the wort rapidly to 68 °F (20 °C). Target pitching rate at 1.0 million cells/milliliter/degrees Plato (~2 L starter). Ferment at 68 °F (20 °C) for one week. Add a fining agent to clear any yeast from beer. Add the dry hops and let the beer sit on the dry hops for an additional seven to ten days. You are now ready to bottle or keg.

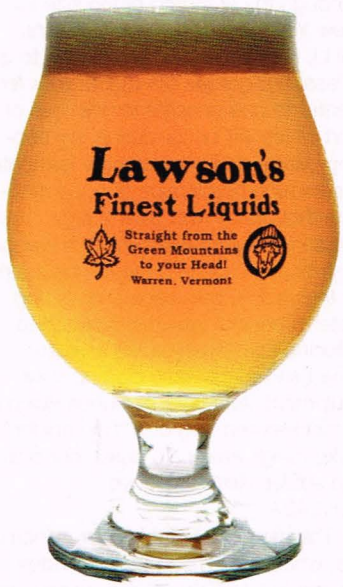
Tips for Success:

Although the standard batch size for *Brew Your Own* recipes is 5 gallons (19 L), the goal with this recipe is to get at least 5.5 gallons (21 L) into your fermenter to compensate for the loss of wort which will occur during dry hopping. Make sure your primary fermenter has enough headspace to accommodate that much wort plus a large kräusen. Brewing with whole-flower or fresh hops (if you choose to use them for this recipe) can leave a lot of hop material behind, which in addition to reducing your final volume as mentioned earlier, can also clog up your equipment. Add your boil hops using a muslin brewing bag or a "hop spider" to make things easier. To build your own hop spider, visit: http://byo.com/story2427.

The mouthfeel of this beer is incredible, which may mean that chlorides are one key to Shaun Hill's success at Hill Farmstead Brewery (one key of many). To try and duplicate this in your homebrewery, start off with soft water and make sure the chloride level in your brewing water is at least 50 ppm to help boost the mouthfeel. Try experimenting with different chloride levels in test batches until you get the one you like. Also, don't forget sulfate levels. A good starting point is 50 ppm with the addition of gypsum salt. To tweak your brewing water, download *Brew Your Own*'s brewing water spreadsheet, written by Vermont Pub & Brewery's Greg Noonan: http://byo.com/resources/brewwater. No matter what type of brewer you are, carbon filtering your water or treating it overnight with Campden tablets is recommended, especially if your water comes from a town or city source that is chlorinated (as opposed to well or spring water). Adding one Campden tablet in 20 gallons (76 L) of water (left overnight) will rid your water of chlorine compounds that can lead to off flavors in your beer.

Another huge factor in Abner, as with all pale, hoppy beers, is minimizing oxygen uptake after fermentation. When transferring your finished beer, make sure you are either flushing the receiving vessel with CO_2 or using a closed transfer system. This is because hop compounds are especially sensitive to oxidation and their flavors diminish quickly when exposed to oxygen. If priming, use the priming chart at http://byo.com/resources/carbonation to determine how much priming sugar you will need.

Vermont Cult Clones Recipes



Double Sunshine clone (Lawson's Finest Liquids) (5 gallons/19 L, all-grain)

OG = 1.074 FG = 1.013
IBU = 100+ SRM = 6 ABV = 8%

Ingredients

9.5 lbs. (4.3 kg) 2-row pale ale malt
2.5 lbs. (1.1 kg) Vienna-style malt
1 lb. (0.45 kg) flaked oats
12 oz. (0.34 kg) carapilsen malt (7–9 °L)
6 oz. (0.17 kg) caramunich-type malt (20–30 °L)
1 lb. (0.45 kg) corn sugar (10 mins.)
10.5 AAU Columbus hops (60 min.) (0.75 oz./21 g at 14% alpha acids)
12.5 AAU Citra® hops (20 mins.) (1.0 oz./21 g at 12.5% alpha acids)
37.5 AAU Citra® hops (5 mins.) (3.0 oz./84 g at 12.5% alpha acids)
37.5 AAU Citra® hops (knockout) (3.0 oz./84 g at 12.5% alpha acids)
3.0 oz. (84 g) Citra® hops (dry hop)
Fermentis Safale US-05 yeast or Lallemand BRY-097 or Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale).
Priming sugar (if bottling)

Step by Step

This is a single infusion mash. Achieve a target mash temperature of 152 °F (67 °C). Hold for 45 minutes, then raise mash to mash out temperature and begin lauter phase. Collect enough wort to boil 6.5 gallons (25 L). Boil for 60 minutes, adding the hops as instructed in the ingredients list and the corn sugar with 10 minutes left in the boil. After boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling.

Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (18 °C) for one week. Cool to 55 °F (13 °C) to settle yeast. Dump the yeast from the bottom of fermenter, or rack to a clean, sanitized vessel. Add the dry hops and let the beer sit on for an additional four to seven days at 55–57 °F (13–14 °C). Rack into a keg, or into bottles with priming sugar.

Double Sunshine clone (Lawson's Finest Liquids) (5 gallons/19 L, extract with grains)

OG = 1.074 FG = 1.013
IBU = 100+ SRM = 6 ABV = 8.0%

Ingredients

6.6 lbs. (3 kg) light liquid malt extract
2.5 lbs. (1.1 kg) Vienna-style malt
1 lb. (0.45 kg) flaked oats
6 oz. (0.17 kg) caramunich type malt (20-30 °L)
1.5 lb. (0.68 kg) corn sugar (10 mins)
10.5 AAU Columbus hops (60 min.) (0.75 oz./21 g at 14% alpha acids)
12.5 AAU Citra® hops (20 mins.) (1.0 oz./21 g at 12.5% alpha acids)
37.5 AAU Citra® hops (5 mins.) (3.0 oz./84 g at 12.5% alpha acids)
37.5 AAU Citra® hops (knockout) (3.0 oz./84 g at 12.5% alpha acids)
3.0 oz. (84 g) Citra® hops (dry hop)
Fermentis Safale US-05 yeast or Lallemand BRY-097 or Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale)
Priming sugar (if bottling)

Step by Step

Mix the crushed Vienna, flaked oats and caramunich type malts into 2 gallons (7.6 L) water to achieve a mash temperature of 152 °F (67 °C) then hold at this temperature for 45 minutes. Rinse the grains with 2.5 qts (2.4 L) hot water, add liquid extract and bring to a boil. Top off kettle to 6.5 gallons (25 L). Boil for 60 minutes, adding the hops as instructed and the corn sugar with 10 minutes left in the boil. After boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling.

Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (20 °C) for one week. Cool to 55 °F (13 °C) to settle yeast. Dump the yeast from the bottom of fermenter, or rack to a clean, sanitized vessel. Add the dry hops and let the beer sit on for an additional four to seven days at 55–57 °F (13–14 °C). Rack into a keg, or into bottles with priming sugar.

Tips for Success:

Having a strong and healthy fermentation as well as following good practices during downstream beer handling are key to trying to replicate a beer like Double Sunshine IPA. Be sure to run a clean fermentation and you also need to make sure oxygen has no chance for uptake post fermentation.

Make a yeast starter a day ahead of your brew day to generate a healthy population of yeast before pitching. Visit http://byo.com/yeaststarter for more information about making a yeast starter, as well as a table for recommended starter sizes for a variety of worts. Visit www.mrmalty.com for a useful pitching rate calculator.

Hop compounds are also especially sensitive to oxidation and their flavors diminish quickly when exposed to oxygen, so make sure you are either flushing the receiving vessel with CO_2 or using a closed transfer system when you transfer your beer from vessel to vessel.

Sean Lawson advises homebrewers to, "determine if you have hard or soft water. I recommend John Palmer's *How to Brew* for reference. If you have hard water, then cut by at least half with distilled or reverse osmosis (RO). With soft water, a basic guideline for IPAs would be to add equal parts gypsum and calcium chloride to bring total calcium content over 50 ppm." If you homebrew with a water source that is chlorinated, one Campden tablet in 20 gallons (76 L) of water (left overnight) will rid your water of chlorine compounds that can lead to off flavors in your beer. For more information about brewing water treatments, visit http://byo.com/story1547. To make adjustments to your brewing water, download *Brew Your Own*'s brewing water spreadsheet: http://byo.com/resources/brewwater.

For all-grain brewers, a handful of rice hulls in the mash may help you if your brew setup is prone to a stuck mash. Rice hulls are a great tool when using moderate to high percentages of gummy grains such as flaked oats.

Vermont Cult Clones Recipes

Toast clone (Lawson's Finest Liquids) (5 gallons/19 L, all-grain)

OG = 1.059 FG = 1.013
IBU = 70 SRM = 33 ABV = 5.9%

Ingredients

11 lbs. (4.9 kg) 2-row pale malt
8 oz. (0.23 kg) toasted barley flakes
8 oz. (0.23 kg) toasted rye flakes
6 oz. (0.17 kg) Weyermann Carafa® Special III
6 oz. (0.17 kg) Briess Midnight Wheat
7 AAU Magnum hops (60 min.) (0.5 oz./21 g at 14% alpha acids)
11.6 AAU Columbus hops (20 mins.) (0.75 oz./14 g at 15.5% alpha acids)
15.5 AAU Columbus hops (knockout) (1 oz./28 g at 15.5% alpha acids)
13 AAU Chinook hops (knockout) (1 oz./28 g at 13% alpha acids)
13 AAU Simcoe® hops (knockout) (1 oz./28g at 13% alpha acids)
1.5 oz. (42 g) Columbus hops (dry hop)
1.5 oz. (42 g) Chinook hops (dry hop)
1.5 oz. (42 g) Simcoe® hops (dry hop)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast or Lallemand BRY-97
Priming sugar (if bottling)

Step by Step

If your brew shop does not stock toasted barley and rye flakes then you can toast them yourself. Before brew day begins, pre-heat your oven up to 350 °F (177 °C). Place the flaked barley and rye spread out on baking sheets. Toast the flakes for about 20 minutes shaking the sheet every couple of minutes. Use your nose as a guide to know when they are finished.

Achieve a target mash temperature of 150 °F (66 °C). Boil for 60 minutes, adding the hops as instructed. After boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling.

Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (20 °C) for one week. Cool to 55 °F (13 °C) to settle yeast from beer. Dump the yeast or rack the beer to a clean, sanitized vessel. Add the dry hops and let the beer sit on the dry hops for an additional four to seven days at 55–57 °F (13–14 °C). Your beer is now ready to rack into a keg, or into bottles with priming sugar.

Toast clone (Lawson's Finest Liquids) (5 gallons/19 L, extract with grains)

OG = 1.059 FG = 1.013
IBU = 70 SRM = 33 ABV = 5.9%

Ingredients

6.6 lbs. (3 kg) light liquid malt extract
2 lbs. (0.91 kg) 2-row pale malt
8 oz. (0.23 kg) toasted barley flakes
8 oz. (0.23 kg) toasted rye flakes
6 oz. (0.17 kg) Weyermann Carafa® Special III
6 oz. (0.17 kg) Briess Midnight Wheat
7 AAU Magnum hops (60 min.) (0.5 oz./21 g at 14% alpha acids)
11.6 AAU Columbus hops (20 mins.) (0.75 oz./14 g at 15.5% alpha acids)
15.5 AAU Columbus hops (knockout) (1 oz./28 g at 15.5% alpha acids)
13 AAU Chinook hops (knockout) (1 oz./28 g at 13% alpha acids)
13 AAU Simcoe® hops (knockout) (1 oz./28g at 13% alpha acids)
1.5 oz. (42 g) Columbus hops (dry hop)
1.5 oz. (42 g) Chinook hops (dry hop)
1.5 oz. (42 g) Simcoe® hops (dry hop)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast or Lallemand BRY-97
Priming sugar (if bottling)

Step by Step

If your brew shop does not stock toasted barley and rye flakes then you can toast them yourself. Before brew day begins, pre-heat your oven up to 350 °F (177 °C). Place the flaked barley and rye spread out on baking sheets. Toast the flakes for about 20 minutes shaking the sheet every couple of minutes. Use your nose as a guide to know when they are finished.

Place crushed and flaked grains in a grain bag and add to 1 gal (3.8 L) water to achieve a mash temperature of 150 °F (66 °C) for 45 minutes. Rinse the grains with 2 qts (1.9L) hot water, and top off kettle to 6 gal. (23 L). Add extract off heat then bring to a boil. After boil is complete, begin a whirlpool in the kettle and let the knockout hops rest in the hot wort for at least 30 minutes before chilling.

Chill the wort rapidly to 68 °F (20 °C). Ferment at 68 °F (20 °C) for one week. Cool to 55 °F (13 °C) to settle yeast from beer. Dump the yeast or rack the beer to a clean, sanitized vessel. Add the dry hops and let the beer sit on the dry hops for an additional four to seven days at 55–57 °F (13–14 °C). Your beer is now ready to rack into a keg, or into bottles with priming sugar.

Tips for Success:

When toasting flaked grains at home (if you can't get them from your homebrew shop) the key is getting the flaked grains to a point where your entire kitchen is smelling of wonderfully toasted bread. It will add a layer of complexity to the final beer, which is a fundamental part of this impeccably-brewed black IPA. Experimenting with toasting the flaked grains is probably a good idea to get this process down pat before brew day. Do this by trying out different toasting levels and tasting them in small test batches to find the color and corresponding flavor that tastes best. If you find that your flaked grains make your mash a little gummy, try adding a handful of rice hulls to break things up a bit.

Also make sure that you purchase Carafa® Special, or similarly de-husked malted barley, as this is the de-husked version of Weyermann's Carafa® malt. The de-husked version of these types of malts reduces astringency in the beer, which is common when brewing with highly-roasted grains. This is a key to producing the dark color of the beer without also getting the bite found in other darker beers.

Don't skimp on the hops when brewing a black IPA. A common mantra is hop a black IPA like it were a DIPA. This will allow the hop characteristics to shine above the roasted aspects of this style of beer.

Kegs of recently-brewed Hill Farmstead beers lined up and awaiting delivery.

prisingly dry on your palate if attenuated with a yeast that is a strong finisher. Another stigma is that caramel malts have no place in very hop-forward beers. If used judiciously, however, caramel malts do indeed have a place in hop-forward beers such as American IPAs and imperial IPAs. If using larger proportions of caramel malts or darker caramel malts, you may want to up your piney, resiny hops, like Chinook or Columbus, to balance the flavors.

Hops

If you want to brew beers similar to the IPAs the Vermont guys are brewing, you need to focus strongly on the hops. Making sure you have fresh, resiny, aromatic hops is a prerequisite. New breeds of hops come out all the time and it is hard to keep up with them all, but just look at Shaun Hill's website (www.hillfarmstead.com) and at the hop varieties he is using in many of his renowned DIPAs and you will probably recognize all the names. Some hop varieties that will play nicely in these types of beers are Centennial, Simcoe®, Citra®, Columbus, Amarillo®, Apollo, Chinook, Galaxy® and Cascade. Don't focus too much on the specific hops you are using for the beer, but more so on how you use them. Focus a small portion on an early addition to the boil, then focus the majority on the late boil additions. Hop extracts are also something you may want to explore to achieve iso-alpha conversion. This will cut down on polyphenol extraction, but lack the glycosides that may leave the beer lacking some level of depth. Also, I don't recommend adding any hops between 30 minutes left in the boil to 5 minutes left in the boil. Add a big addition between 5 minutes and 0 minutes (knockout hops) and then let those hops steep for at least 30 minutes. You really want those hops to soak into the wort, and the post-boil phase is the time to do just that. Dry hops can then be added later on to supplement your late boil hops.

Yeast

Conan is the strain that most homebrewers will hone in on when trying to clone many of these beers. But in my conversations with the brewers it was indicated that Conan is no longer the strain that is being used. From tastings, the yeast they are using throws some peach and other stone fruit flavors. In my experience, taking Chico yeast (Wyeast 1056 American Ale™, White Labs WLP001 California Ale, Bry-97 or Safale US-05) down to about 62 °F (17 °C) or below can throw some of those characteristics, but be careful of diacetyl at those temperatures. A diacetyl rest may be necessary if butterscotch flavors show up in any of your test batches.

If you are looking to brew saisons or sours like those from the early days of The Alchemist Pub & Brewery or like those that are currently found at Hill Farmstead, you will need to do a lot of experimenting with yeast strains. East Coast Yeast, Wyeast and White Labs all offer a diverse and growing number of strains for homebrewers to work with. Split batches and small-scale brewing experiments are going to be the best way for you to go about learning what each strain offers. Direct cultures are maybe another idea for homebrewers with access to these particular beers.

Water

Water may be one of the great advantages these breweries have. Each of them start with very soft water and they are able to build on that soft profile. Take the advice of Shaun Hill when he says, "Make sure that you're using a brewing calculator with residual alkalinity . . ." when building your water profile. I can't provide you with an exact water profile for you to produce The Alchemist's Heady Topper, Lawson's Double Sunshine or Hill Farmstead's Abner, but homebrewers need to start with a profile of the water they will be working with, whether it is reverse osmosis (RO), tap or distilled or a mixture. And homebrewers can't be afraid to experiment. Just because it's a hop-forward beer doesn't mean that chlorides need to be kept low and sulfate levels high. Keeping both sulfates and chlorides elevated may in fact be ideal; water is still a bit of deep-seas exploration for most homebrewers and I recommend trying that if you experiment. The levels of Na^{+}, Ca^{+2}, Mg^{+2}, Cl-, So_4^{-2}, Co_3^{-2} are a few ions of interest to brewers, which indeed have an effect on the overall mouthfeel of the final beer. Only brewers with a deft hand and discerning palate will be able to play with these factors.

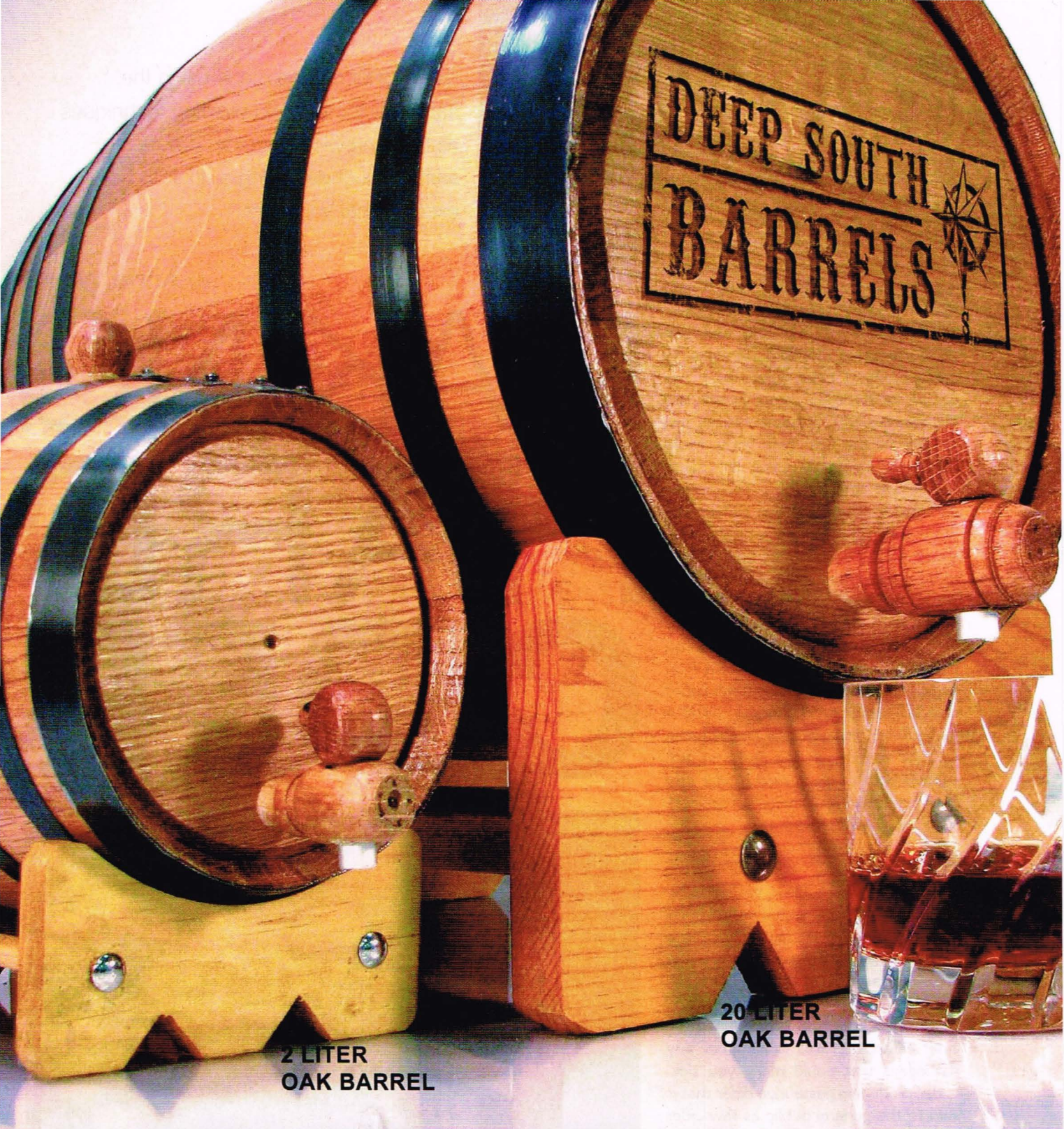
To achieve a level of proficiency in brewing, experience and knowledge is key. Learning not only about homebrewing, but also about nuances of beer and tasting beer is a fundamental part of this craft. Once recipe development becomes familiar to you, you can follow Shaun Hill's advice: "First I imagine how I want the beer to taste. Second, I reflect upon which beers we have created that were similar in taste . . . and conceptualize a point of departure: which ingredients would need to be different? Finally I reflect upon all process variables that I have encountered over my brewing career and contemplate whether or not a variable can be adjusted in order to achieve a more desirable result." BYO

More Information:

The Alchemist:
www.alchemistbeer.com

Lawson's Finest Liquids:
www.lawsonsfinest.com

Hill Farmstead Brewery:
www.hillfarmstead.com



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"Hard cider can be made using the same equipment and brewing techniques as homebrewing, and can deliver the same thrill of designing a drink to be exactly what you want."

By **Anne Whyte**

MAKING HARD CIDER

You might remember a time when a jug of cider that sat around in the fridge too long started to get fizzy. When you removed the cap there was a little spurt of pressure released and, sadly, the cider was deemed too old and sent down the drain. If you only knew then what you know now; that fizzy cider was starting to ferment. With an airlock and a little patience, you might have had your first taste of hard cider.

Fast forward, it's 2013 and one of the hottest "new" beverages to create is hard cider. Craft beer has gotten most of the press in the last decade, but lots of homebrewers are looking for the next new thing. Hard cider can be made using the same equipment and brewing techniques as homebrewing and can deliver the same thrill of designing a drink to be exactly what you want. Hard cider is also probably the easiest alcoholic beverage to ferment for people who are gluten intolerant.

If you are a homebrewer then you already own all the equipment you need. Basic homebrewing techniques such as sanitizing, siphoning, using a hydrometer, etc. are exactly the same for beer or cider. In this story we will explore how to make sweet cider into hard cider that you'll be proud to share with your friends and family.

The Cider

In Vermont, where I live, we are lucky to have many small orchards that press cider from early September into November. The best ciders are the ones that have been treated the least. Most orchards will wash the apples and some orchards will also pasteurize the cider before it is sold to eliminate any pathogens that could make you sick. Cider producers pasteurize cider that is sold to the general public as raw cider has been linked with *E. coli* deaths.

If you don't want wild yeast to be a part of the fermentation you have two choices: You can use pasteurized cider, or you can heat the cider and kill the yeast yourself, however this might also have the side effect of changing the flavor and aroma of the cider. Most pasteurization techniques used for commercial cider are "high temperature,

Photo by Brenda Bailey Collins/Farnum Hill Ciders

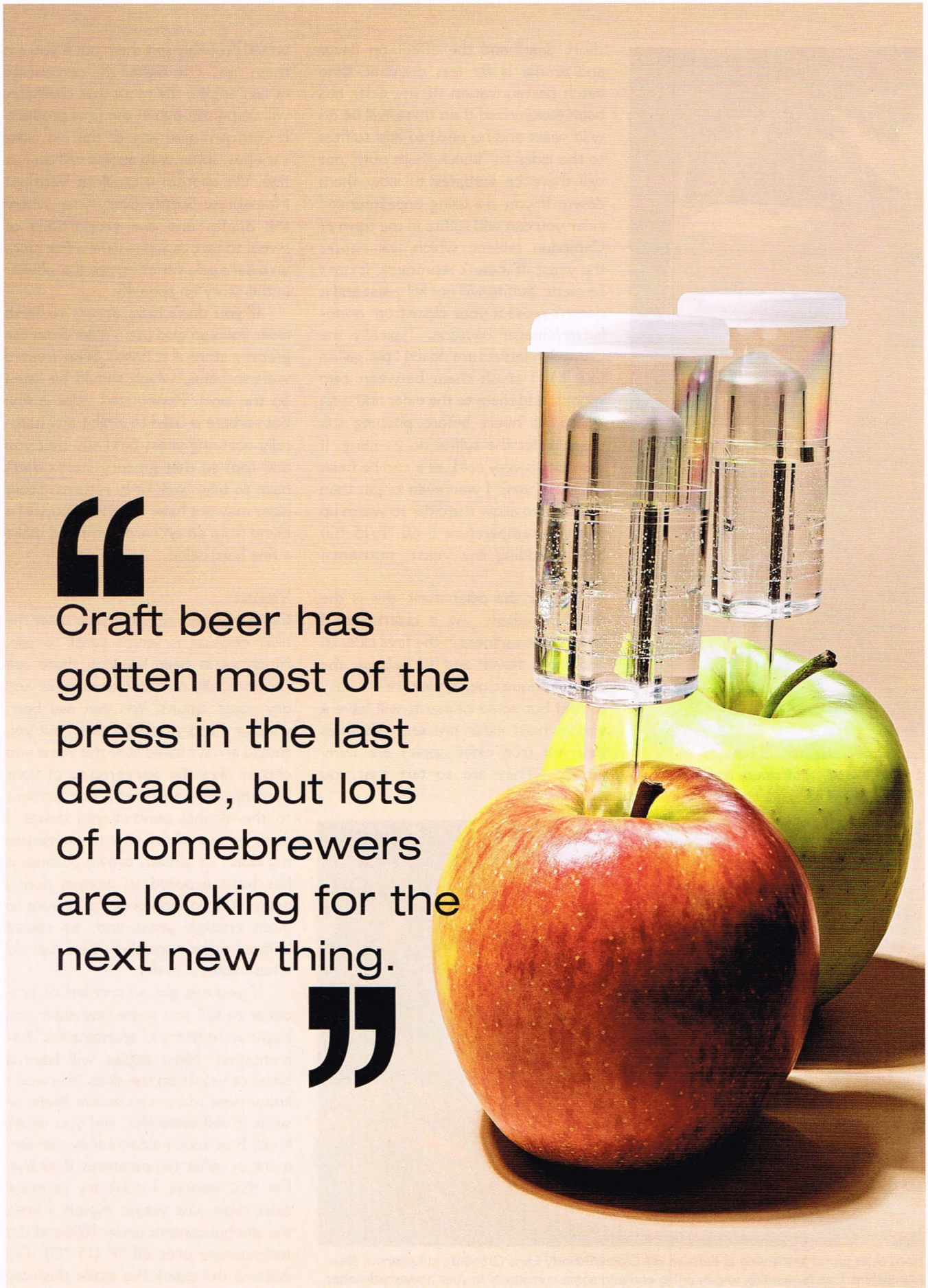

Photo by Charles A Parker/Images Plus

Photo by Brenda Bailey Collins/Farnum Hill Ciders

Sweet cider starts off cloudy and brown but can ferment to a clear, pale yellow color.

short time" and the effect on flavor and aroma is far less dramatic than batch pasteurization. If the cider has been pasteurized then there will be no wild yeast and no need to add sulfites to the cider to "knock them out," nor will there be sorbates to slow them down. If you are using unpasteurized cider you can add sulfite in the form of Campden tablets, which will neuter the yeast. If it can't reproduce, it can't ferment. Sulfite will not kill yeast and it doesn't protect your cider from *acetobacter*/vinegar bacteria. Typically the Campden tablets are dosed 1 per gallon (3.8 L). I crush them between two spoons, add them to the cider and wait 24 to 36 hours before pitching the yeast to let the sulfite do its thing. If the cider is very cold, as it can be fresh from the press, I wait even longer than 36 hours to allow the cider to warm up to room temperature (~60 °F/15 °C) before adding my yeast, nutrients, sugar, etc.

As for the cider itself, this is the main ingredient. As a cidermaker I want some tartness in the final cider to add more flavor and to balance the cider. Antique cider apples are not easy to find but some orchards will have a special hard cider pressing. Varieties that are true cider apples are fairly inedible. They are so tart that you would probably spit them out if you ate them raw. The higher the percentage of tart apples, the more that character will come through in the final product. If you can't find any of the old cider varieties, some crab apples will do just fine. We sponsor a crush at Vermont Homebrew Supply every year where the apples and the proportions of sweet to tart varieties varies. For more on cider apple varieties, see the sidebar in this story on page 48.

If you don't have access to fresh cider you can also use a cider from the grocery store if it hasn't been treated with sorbates, which should be listed on the label. Pasteurized cider is fine but sorbate is used to inhibit any naturally occuring yeast (and any that you add too) so that grocery stores don't have to take back fizzy returns. Store cider may not have the complexity of a blend from an orchard but it will make a fine hard cider.

Yeast

Once you have selected your cider the next decision is which yeast to use. Much as in beer brewing there are commercially manufactured liquid and dry yeast strains. You can use beer, wine or mead yeasts for cider, but you should always make sure the yeast you choose likes the temperature of your homebrewery and that it can ferment to the alcohol content you desire. I don't go out of my way to oxygenate my cider; it's already brown because it has been exposed to oxygen during pressing. I do, however, make sure to pitch enough yeast and, as stated before, make sure the yeast can do what I want it to do.

If you can get an orchard or producer to sell you some raw cider you might want to try a "spontaneous" fermentation. Most apples will have a blend of yeasts on the skins. You won't know how many strains are there or what it will taste like, and you won't know how much alcohol they can ferment or what temperatures they like. For that reason, I don't try to make cider with wild yeasts myself. I keep the alcohol content under 10% and the temperature over 60 °F (15 °C). I've enjoyed the ciders I've made this way

Photo by Brenda Bailey Collins/Farnum Hill Ciders

Hard cider barrel fermenting at Farnum Hill Ciders/Poverty Lane Orchards in Lebanon, New Hampshire. Oak fermenting and/or aging can add some complexity to your homemade cider.

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Photo by Brenda Bailey Collins/Farnum Hill Ciders

If you are planning to use oak for your cidermaking, be careful of over-exposure. Take samples of your cider frequently and transfer it to a carboy as soon as you taste what you want.

and lots of other cidermakers agree. It can be a little stressful (that's my inner homebrewer talking) but if you've dabbled in *Brettanomyces* and sour beers, and if you have the right cider, go for it. One time I waited a week for the fermentation to start and I couldn't take anymore — I pitched a wine yeast and got the fermentation going. Other cidermakers with the same blend encountered the same thing, so be prepared to pitch a commercial strain if you try a wild fermentation and feel that it is taking too long. You can always try a wild fermentation again next year.

If your cider is going to be under 10% ABV you can also pitch any ale or lager brewer's yeast. Just make sure your pitching rate is sufficient. I have had some lovely ciders brewed with Belgian yeasts. Without the malt and hops getting in the way, the flavor and aroma of the yeast can really shine.

For ciders over 10% ABV I prefer to use a wine or mead yeast as they can tolerate higher gravities. I've also used liquid cider yeasts to enhance the fruitiness of the cider. German white wine yeasts will give a very aromatic nose, while Champagne yeast is the most commonly used wine yeast for cidermaking. Champagne yeast has the ability to ferment a higher alcohol cider, and tolerance to cooler temperatures make it work in a variety of recipes and temperature conditions. Champagne yeast is also used for its ability to attenuate. The final gravity of cider can be as low as .995. If my cider is already going to be tart due to the apple blend, then Champagne yeast might be too tart and dry for you. In a cider with no cider-specific apples, then champagne yeast will give you the crispest, driest cider.

Adjuncts

Once you have your cider you will want to know its sugar density. When you take a hydrometer reading you can use the potential alcohol scale to see what you're going to get for an alcohol content. Unlike beer, cider will fully ferment out so the potential alcohol scale is very useful. Most of the time my ciders test out between 5 to 6.5% alcohol, but it can vary widely and I wouldn't want to assume anything just from how sweet it tastes. Once I know the starting gravity I can then decide if I want to fortify the cider to get more alcohol. Not only will adding more sugar increase the alcohol content, it can influence the color, flavor and aroma of your cider. Darker, more caramelized sugars are great to try. I have used Belgian amber candi sugar, dark and light brown sugars like raw, Turbinado and Demerara. A bit of molasses will darken the color and add another layer of complexity to a New England-style cider. And honey has been my go-to sugar for cidermaking for many years. It will completely ferment out so it will not add honey sweetness, and I like the smooth mouthfeel. I have used a lavender honey that added a delicate floral nose. — expensive but worth it! You can dissolve the sugar in a small amount of cider then pour it back into the fermenter. If you aren't sure how dense the sugar is then you can check the gravity then add more if you need it.

Other adjuncts could include spices, fruits and berries, oak chips/cubes, flowers, ginger . . . there really is no limit. Just remember that the cider is going to be clean, crisp and dry. Whatever you add, do so judi-

ciously. You can't take it out but you can always add more.

When I want to oak a cider I have had the best results from using a small amount in the secondary. I have boiled and steamed the chips and just added them to the carboy. If you don't want to risk too much oak exposure then plan on thieving out a sample and be prepared to rack into another carboy. A scale is very helpful when you are recording adjunct additions. Lately I have been soaking the oak chips in a spiced rum during the fermentation, then adding them to the secondary.

If you are interested in experimenting with hops in your cider, read more about that on page 50 of this issue.

Other Additions

I always add 2–3 tsp. of a yeast nutrient to a 5-gallon (19-L) batch of cider if the alcohol content is going to be over 10%. It wouldn't hurt to do it for a lighter cider either. With a tart cider you won't need to increase the acidity,

Photo by Brenda Bailey Collins/Farnum Hill Ciders

If you have a large enough batch of cider, separate a small portion and experiment with different adjuncts. If you find flavors you like you can scale it up to the rest of the batch.

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Hard Cider Recipes

Red Flannel Cider
(5 gallons/19 L)

OG = 1.095 FG = 0.998
ABV = ~12%

A classic New England barrel-style hard cider.

Ingredients

5.5 gallons (20 L) of fresh apple cider, pasteurized or not*
5 lbs. (2.3 kg) sugar: a combination of white sugar, brown sugar, a bit of molasses, honey, raw sugar
2.5 tsp. yeast nutrient
2.5 tsp. pectic enzyme
2 packages of dry wine yeast or Wyeast 4767 (Port Wine™) yeast
1 oz. toasted or untoasted oak chips (optional: soak in rum, bourbon, calvados, etc.)
1 lb. (0.45 kg) raisins

*If your cider is not pasteurized you might want to add one Campden tablet per gallon (3.8 L) to the cider, wait 24–36 hours, then add the sugars, other additives and yeast. Do not try to ferment cider that has been treated with sorbates.

Step by Step

Dissolve the sugars in a small part of the cider and then mix that back into the main volume of cider. Stir well. Add the yeast nutrient and pectic enzyme and stir again. Record the starting gravity. Add the yeast and keep the fermenter sealed with an airlock at 60–75 °F (15–24 °C) until fermentation is complete. Siphon the cider into a 5-gallon (19-L) carboy. Keep the cider under an airlock until it clears. Add the raisins. When the raisins have settled out, cover the oak chips with boiling water, strain off the water and add the chips to the carboy. A typical fermentation can last three to six weeks depending on the temperature in your homebrewery and another two to six months to clarify. Once the cider is clear you can bottle it with or without carbonation. If you want to carbonate the cider you can add a scant teaspoon of corn sugar (dextrose) per 22-ounce bottle or add two or three organic raisins per bottle. For 5 gallons (19 L) of hard cider you can also boil ½ cup of dextrose in some water and add it to the cider before bottling.

1 gallon (3.8-L) option: Scale down to 1.25 gallons of fresh apple cider, 1 lb. (0.45 kg) sugar (combination listed in ingredients above), 0.5 tsp. each of yeast nutrient and pectic enzyme, 1 package of dry wine yeast or Wyeast 4767 (Port Wine™) yeast, 0.25 oz. (7 g) toasted or untoasted oak chips (optional: soak in rum, bourbon, calvados, etc.), 4 oz. (113 g) organic raisins (brown or red flame).

Autumn Sparkle
(5 gallons/19 L)

OG = 1.060 FG = 0.998
ABV = ~8%

A crisp, dry cider.

Ingredients

5.5 gallons (20 L) of fresh apple cider, pasteurized or not*
1.5–2 lbs. (0.7–0.9 kg) sugar or raw unfiltered honey
2.5 tsp. yeast nutrient
2.5 tsp. pectic enzyme
2 packages of dry wine yeast

*If not pasteurized you might want to add one Campden tablet per gallon (3.8 L) to the cider, wait 24–36 hours, then add the sugars, other additives and yeast. Do not try to ferment cider that has been treated with sorbates.

Step by Step

Take a hydrometer reading of the cider. You will need to add enough sugar to get 8% potential alcohol. Dissolve the honey/sugar in a small part of the cider and then mix it back into the main volume of cider. Stir well. Record the starting gravity. Add the yeast nutrient and pectic enzyme and stir again. Add the yeast and keep the fermenter sealed, with an airlock at 60–75 °F (15–24 °C) until fermentation is complete. Siphon the cider into a 5-gallon (19-L) carboy and keep the it under an airlock until it clears. Once it is clear you can bottle with or without carbonation. If you want to carbonate the cider you can add a scant teaspoon of corn sugar (dextrose) per 22-oz. bottle or boil ½ cup of dextrose in some water for 5 gallons (19 L) of carbonated cider. A typical fermentation can last three to six weeks depending on the temperature and another two to four months to clarify.

1 gallon (3.8-L) option: Scale down to 1.25 gallons (4.7 L) of fresh apple cider, 4–5 oz. (113–141 oz.) sugar or raw unfiltered honey, 0.5 tsp. each of yeast nutrient and pectic enzyme and 1 package of dry wine yeast.

Autumn Gold Apple Cyser
(5 gallons/19 L)

OG = 1.080 FG = 0.998
ABV = ~10.5%

A cider-mead hybrid.

Ingredients

5.5 gallons (20 L) of fresh apple cider
5 lbs. (2.3 kg) raw, unfiltered honey
2.5 tsp. yeast nutrient
2.5 tsp. pectic enzyme
2 packages of dried wine yeast

Step by Step

Dissolve the honey into a small part of the cider and mix it back into the main volume of cider. Stir well. Add the yeast nutrient and pectic enzyme and stir again. Record the starting gravity. Add the yeast and keep the fermenter sealed with an airlock at 60–75 °F (15–24 °C) until fermentation is complete. Siphon the cyser into a 5-gallon (19-L) carboy and keep it sealed with an airlock until it clears. Once clear, you can bottle the cyser with or without carbonation. If you carbonate, you can add a scant teaspoon of corn sugar (dextrose) per 22-ounce bottle or boil ½ cup of dextrose in some water for 5 gallons (19 L) of carbonated cyser. A typical fermentation can last three to six weeks depending on the temperature in your homebrewery and another two to six months to clarify.

1 gallon (3.8-L) option: Scale down to 1.25 gallons (4.7 L) of fresh apple cider, 1 lb. (0.45 kg) raw unfiltered honey, 0.5 tsp. each of yeast nutrient and pectic enzyme and 1 package of dried wine yeast.

but you might have to bump it up with a store-bought cider. I have added dried tart cherries and cranberries to cider that needs acidity to good effect. After fermentation is over you can add a little acid blend (much like a mead-maker), but try to let the cider clear and condition a bit before you start making adjustments.

Pectic enzyme can help you get your cider to be clear. Apples naturally contain high levels of pectins that can haze your cider. If it doesn't matter to you if it clears or not, then it's totally optional. Using sweet cider to top off can add a haze so do this only if you don't mind a cloudy cider.

Timeline

The time it takes to ferment and secondary your cider has a lot to do with the alcohol content and the tartness of your cider. A 6% ABV cider could take two to three weeks to fully ferment out and another two to four months to clarify. Carbonation time is about the same as it is for beer, and your cider should be crisp and tasty for a year or two. Once you start adding sugar the process is much more like winemaking. I might give a 12% cider a year in secondary and enjoy it for the next 3–4 years. But like all homebrews, trust your palate and if you aren't sure it is ready wait a bit longer.

Since cider will tie up a secondary for a fair bit of time, you might want to invest in a cider-only carboy that isn't needed for your beer brewing. Ciders that don't get enough time to fully sediment out can have a deep layer of sediment in the bottle. That sediment can be fluffy and come up off the bottom when you open a carbonated cider.

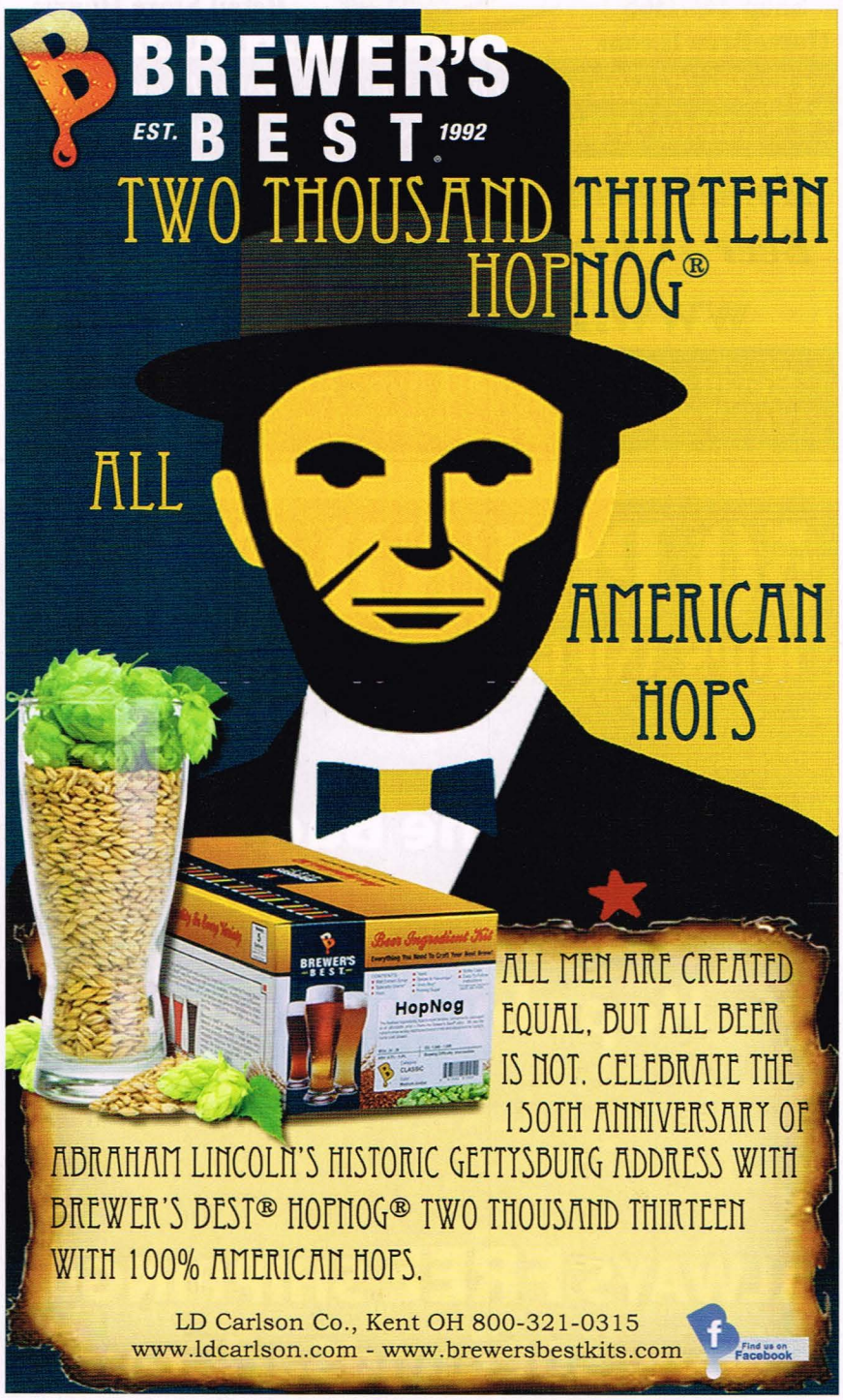
Post Fermentation Fun

In addition to the adjuncts that you can add in secondary, you can still tweak your cider. One of the more common adjustments is to sweeten your cider. If the cider is too tart, back-sweetening can help to balance things out. If you are trying to duplicate a commercially-made cider you can de-gas and take a hydrometer reading of a sample to see how sweet it is, then adjust your cider to match. Of course, once you have added sorbate you won't be able to carbonate the cider unless you can force carbonate in a keg.

Blending ciders is also an option. If you have done more than one cider recipe, then perhaps a third version is possible from a blend.

Other Considerations

Just like beer, you need to be sure your equipment is in good shape and well sanitized. The fermenter should have enough headspace to accommodate a little foam, but many ciders will not head up like a beer so you can get away with using a slightly smaller fermenter. Since cider will likely be in secondary longer than most beers, it is critical that there is only an inch or two of headspace to prevent oxidation. I always try to make an extra quart or two of cider in the fermenter so when I rack into



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my carboy I can always fill it right up. When you have extra headspace and no cider to top up, a white wine works very well in a pinch. We used sweet cider to top up a fermenter one year and that batch of cider never cleared as well as the other ciders we made that year. Oxygen in the sweet cider is what makes it brown, but in the secondary the cider will settle out and lighten to a pale yellow that can be totally transparent. If there is too much headspace/oxygen, however, then it may go back to an amber tint and develop nutty/oxidized aromas.

Bottling

It's your choice whether to bottle your cider still or sparkling. A still cider can be bottled in any kind of beer or wine bottle. If you choose to carbonate your cider, however, only use thicker-walled Champagne-style bottles, and be sure that if your cider has been back sweetened that you don't overcarbonate and create bottle bombs by adding too much sugar. And of course you can keg your cider too. I prefer a fairly light level of carbonation. Since I also use liter and half-liter bottles I prime 5 gallons (19 L) with ⅓–½ cup of dextrose/corn sugar. You can also use honey or a darker sugar to prime. I have also had success using raisins to prime ciders. One or two per bottle did a great job of lightly carbonating a spontaneously-fermented cider. I have thought about trying this with dried cranberries or cherries; I might use two or three small ones per pint bottle or just one or two if they seemed like very large raisins.

But wait, there's more! Here in the North Country winters can be dark and very cold. If you find yourself with a clear, 12% cider on a -20 °F (-29 °C) February night, try making applejack. Siphon some hard cider into a plastic bucket, cover and set it out to freeze for a day or so until it forms a layer of ice on the top, bottom and sides. Using the black knob of a racking cane, poke it through the ice, siphon and bottle. I have taken 12% ciders and after freezing they test out at just over 20%. Not hot like a distilled brandy, but nice to have on a cold night. BYO

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Cider Apple Varieties

Photo by Brenda Bailey Collins/Farnum Hill Ciders

If apple cider is something you always just bought at the grocery store when summer turns to fall, you may have never thought much about the varieties of apples that are used to make it. Variety makes a big difference when it comes to making cider, however — especially hard cider. Just as a brewer decides which grains are needed to make a specific beer style, a cidermaker must also choose his or her apples wisely. And with more than 7,500 different varieties of apples grown around the world, 2,500 varieties in the US alone (which are grown in all 50 states), there are many apple choices, indeed.

Most of the sweet (non-fermented) ciders you can get at the grocery store or local farm stand are made from a blend of all-purpose culinary apples, which will make a totally acceptable sweet or hard cider, but it won't be very complex. Unlike the Macintosh, Granny Smith and Empire varieties you might find in the grocery store produce section, true "cider" apples are not generally good eating apples. While supermarket varieties tend to be in the 12–14 °Brix (1.048–1.057 SG) range, cider varieties will often reach 15 °Brix (1.061 SG) and others can get as high as 20 °Brix (1.083 SG). Cider varieties also have different acid and tannin levels than all-purpose eating apples. What apples you choose to use for making cider are your call, however, consider this advice from Oscar Mendelsohn in his book *The Earnest Drinker: A Short and Simple Account of Alcoholic Beverages for Curious Drinkers*:

"Cider of a sort can be made from any variety of apple juice, but for a fine beverage it is essential to use 'vintage' apples, which are distinguished by a chemical composition which make them inferior or even unusable for general purposes. Cider varieties of apples are broadly distinguished by comparatively high acidity and tannin. They are therefore somewhat sour and bitterish."

There are four generally-accepted categories of cider apples: sweets, sharps, bittersweets and bittersharps. Here are some suggestions of cider apple varieties to look for in your area:

Sweet *(high sugar levels, which encourages fermentation and raises alcohol levels. Low tannins and acidity.)*
Ashmead's Kernel
Esopus Spitzenberg
Golden Russet
Gravenstein
Sweet Alford
Sweet Coppin
Northern Spy
Taylor's Sweet

Sharp *(high in acidity, tend to be low in sugar and tannins.)*
Bellflower
Bramley's Seedling
Brown's Apple

Bittersweet *(high in both tannins and sugar)*
Amére de Berthecourt
Ashton Bitter
Beden
Binet Rouge
Brairtot Fuji
Brown Snout
Bulmer's Norman
Chisel Jersey
Dabinett
Ellis Bitter
Frequin Rouge
Medaille d'Or
Michelin
Somerset Redstreak
Stembridge Jersey
Yarlington Mill

Bittersharp *(high tannins and acid)*
Fox Whelp
Herefordshire Redstreak
Kingston Black
Porter's Perfection
Stoke Red
Tremlett's Bitter
Yarlington Mill

Cidermakers also often use other apple varieties that are sometimes as good for eating or cooking as they are for fermenting. Here are a few to try:
Baldwin
Black Gilliflower
Elstar
Gala
Golden Delicious
Granny Smith
Hidden Rose
Jonagold
Macintosh
Newtown Pippen
Pomme Gris
Wickson (a crab apple)

~ Betsy Parks

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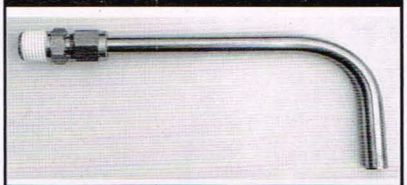

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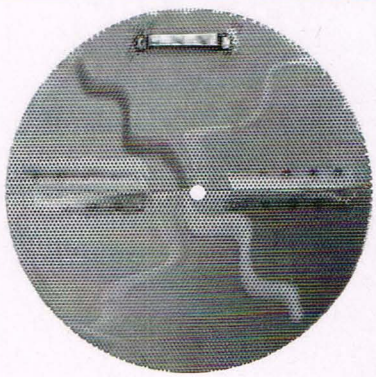

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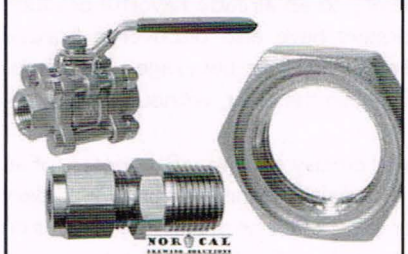

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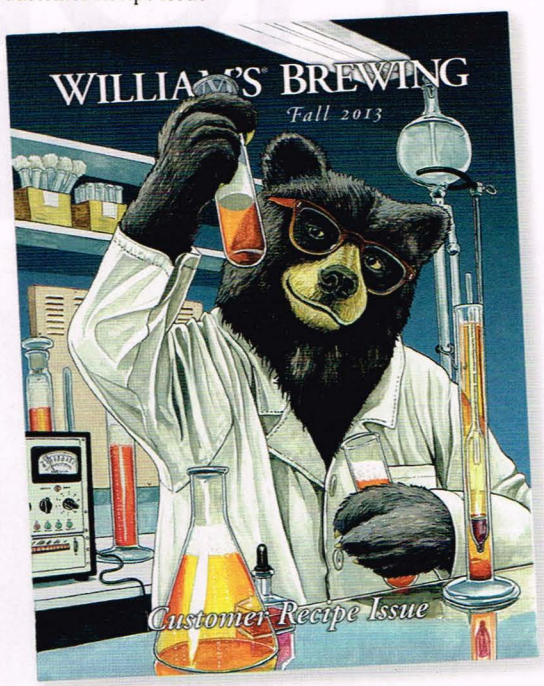

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HOPPED CIDER

By **Glenn BurnSilver**

To paraphrase William Shakespeare, who probably quaffed his fair share of hard cider: "To hop, or not to hop, that is the question?" At least, that's the going question for modern cidermakers looking for new methods of enhancing their ciders, while simultaneously attempting to attract craft beer drinkers to the cider fold.

"It's something a little bit different for your craft beer drinker looking for familiar flavors," says Devin Britton, Cidermaker of the Highland, New York-based Bad Seed Cider Company. "There is a huge demographic of craft beer drinkers. We needed to make something for them. It was an effort to bridge that gap."

Britton's ciders are but two of a double handful of hopped ciders now found in the United States. Some brands attempt to emulate traditional beer IPAs with big, floral-forward notes and citrus-packed aromas, while others simply highlight or add complexity to an already flavorful product. Many former beer drinkers have also discovered hopped cider as a gluten-free alternative beverage. The hops provide the essence of beer in the cider, without the prohibitive gluten.

"You've got the floral, citrusy and grapefruit notes (of an IPA), but it's missing the malt," Finnriver Farm & Cidery Cidermaker Keith Kisler says, a fact he proudly advertises on his cider. "It's the next best thing for people who can't drink beer anymore, but still want that (hoppy) flavor."

The idea of dry hopping cider originated with Salem, Oregon's Wandering Aengus Ciderworks — planted by a Washington brewery that blended its cider with an IPA. This introduced beer drinkers to the idea that hops "worked really well with the sweet apple character of the cider," explains

Wandering Aengus founder Nick Gunn. When a brewer suggested adding hops to cider, Gunn initially thought it was "a little crazy," but after a few attempts, the results "really blew us away."

"When you drink a good cider, you're looking for those subtle lemon, citrus, grapefruit notes in the background," Britton explains. "Hops work naturally with cider because you're infusing those flavors into it. It enhances the key flavors you're looking for in a cider."

"We were after something unique and interesting in our cider," Kisler concurs. "It was like, well, let's put some hops in there. And we all were surprised at how much we liked it."

Hop Selection

The concept of dry hopping cider works on the same principle as dry hopping beer. Once the cider has aged and is ready to be bottled, that's the time to add the hops. Hop selection is crucial to development of balance and flavor components that highlight a cider. Use the wrong hops and the apple flavors can get masked or off-flavors can compete with the central cider taste.

"We're looking for hops that would come through but also allow the apple aromas to come through, and we found that a challenge," says Citizen Cider Works Head of Product Development Bryan Holmes, who is based in Essex, Vermont. "Sometimes you get a lot of hop aroma, but that apple aroma gets masked. Finding that balance is a delicate thing for sure."

Looking at the hops and what they're traditionally used for in brewing beer is not really that helpful. Hops used in dry hopping do not impart bitterness since they are not heated and no isomerzation of alpha acids takes place. Instead, only hop aromas and flavors are imparted to the cider. So before tossing just any hops into the carboy, it's important to determine the desired hop characteristics of the finished product.

The key is lining up the right hops with the apple flavors present, which varies with apple varieties used. As many ciders tend to be floral, citrusy, lemony and crisp, popular hop choices typically fall along the lines of the fruity hops IPA beer makers gravitate towards. These include Cascade (most commonly used), Citra®, Palisade®, Amarillo®, Simcoe®, Galaxy, Sorachi Ace, Nelson Sauvin and Centennial.

"We've been playing around with some Galaxy, Simcoe®, Citra® and other designer hops," Gunn says. "They do some real knockout things to cider."

Interestingly, traditional bittering hops like Galena or Fuggle are also be utilized by cidermakers. Since isomerization does not take place, the normal bitterness attained in beer production isn't added. Instead, these ciders benefit from the earthy or nutty tones they impart.

"That's kind of the trick. It all depends on what you want

Photo by Courtney Mailey/Blue Bee Cider

> "Most cidermakers recommend breaking down a finished cider into smaller sample sizes and adding different hops to each . . ."

Dry-Hopped Hard Cider Recipe

by Bryan Holmes • Citizen Cider, Essex, Vermont

Dry-Hopped Hard Cider
(5 gallons/19 L)

OG = 1.060 FG = 0.998
ABV = ~8%

Ingredients

5.5 gallons (20 L) sweet apple cider
1.5–2 lbs. (0.7–0.9 kg) sugar
1 package dry Champagne yeast
Fermentation nutrients (e.g. Fermaid K, DAP)
Yeast rehydration nutrient (e.g. Fermaid Protect)
Potassium metabisulfate (KMS) or Campden tablets
Pectinase
Cascade Hops (whole or pellets)
Potassium sorbate (optional)

Step by Step

Sanitize your equipment using a product such as Star San. Do not use halogen-based sanitizers such as Iodophor. As soon as the cider is pressed and in the sanitized carboy, stir in 0.6 grams (0.12 grams per gallon) of potassium metabisulfite (KMS) for a target of 30 ppm free sulfites. Alternatively, you can use crushed Campden tablets to achieve 30 ppm free sulfites in 5 gallons (19 L).

To remove pectin and clarify the juice, add pectinase enzyme. Leave overnight and rack the juice into a sanitized carboy, leaving the sediment at the bottom of the first carboy.

Using your thermometer, rehydrate the dry yeast in 104 °F (40 °C) water with the yeast rehydration nutrient, following your yeast rehydration nutrient manufacturer's instructions. You do not want to add the yeast to your cool cider if the difference in temperatures of the yeast and the cider exceed 15 °F (8 °C). To avoid temperature shock, you should acclimate your yeast by taking about 10 mL of the cider and adding it to the yeast suspension. Wait 15 minutes and measure the temperature again. Do this until you are within the specified temperature range. Do not let the yeast sit in the original water suspension for longer than 20 minutes. Now pitch the yeast/nutrient/cider combination into the main volume of cider.

At the beginning of the fermentation, add a nitrogen source, such as Diammonium Phosphate (DAP) or Fermaid K. Follow the directions on the package. Often cidermakers will add half of the total needed nitrogen at the beginning of the fermentation and the second half after ⅓ of the sugars have been depleted. Use your hydrometer before the yeast is added to determine the initial sugar concentration and make measurements daily to know when to make the second nitrogen addition. A 10% sugar. Give the carboy a stir daily to rouse the sediment off of the bottom. Once the airlock has stopped bubbling and your hydrometer readings have stabilized just below 0.000 units, the fermentation has finished. Using a siphon, rack the dry cider into a clean, sanitized carboy. Add KMS or Campden tablets to bring the free sulfites up to 0.5–0.8 ppm molecular SO_2. 0.8 ppm will give you about 99% protection against spoilage where 0.5 ppm is the minimum for protection. The trade off is that sulfur aromas (matchstick) may be detectable at the higher molecular SO_2 levels. The amount of KMS or Campden tablets you need to add is based on the pH of the dry cider, so you have to measure the pH using a pH meter or with test strips. Alternatively, you could ask a local cidermaker, winemaker or brewer to make the measurement for you. Use an online sulfite calculator to calculate how many grams of KMS or Campden tablets you will need to reach your target SO_2 level (http://www.winemakermag.com/guide/sulfite). Initially, multiple additions may need to be made to get the target level. Do not make more than one KMS or Campden addition per day.

Allow the cider to age, settle and clarify. After it clarifies, rack the dry cider into a clean, sanitized carboy. Aging time can be two or more months. Maintain free/molecular SO_2 levels by using SO_2 test kits (e.g. Accuvin) every few weeks and adding KMS or Campden tablets as necessary.

Dry Hopping

After the cider has sufficiently aged, add around 1.4 oz. (40 grams) of Cascade hop cones or pellets to the carboy. Sparge the carboy with an inert gas to displace the oxygen in the fermenter. Carbon dioxide is a good choice if you already have it in your homebrewery for kegging.

After four to seven days, rack the cider off of the settled hops and bottle or keg. Continually taste the cider until you've reached the desired aroma/flavors/ Since hop compounds are especially sensitive to oxidation, keeping oxygen at a minimum by sparging for a few minutes with CO_2 will increase the shelf life and preserve aroma. To carbonate, shake the keg under about 30–40 PSI of head pressure for about 5 to 10 minutes while the keg is at refrigerator temperature.

For an off-dry or sweet cider, add about 50 to 400 grams (1.5 to 14 oz.) of sugar to the cider in a Corny keg. This should be done to taste. For off-dry, it is recommended here to start around 15 grams (~5 oz.) To prevent refermentation, add 3.5 grams (0.05 oz.) of potassium sorbate to the cider and refrigerate it at around 35 °F (2 °C) or below overnight. This cooling step must be done since the yeast must be dormant to prevent refermentation. To carbonate, shake the keg under about 30–40 PSI of head pressure for about five to ten minutes while the keg is at refrigerator temperature (between 35-38 °F/1.7-3.3 °C).

that end aroma to be," adds Marcus Robert of Tieton Cider Works in Yakima, Washington, who uses three hops — Fuggle, Cascade and Palisade® to add complex notes to his hopped cider. "If you want it be more earthy and round, you might use an older variety like Fuggle or a noble hop."

Of course, the idea is to have fun experimenting with these hops. Most cidermakers recommend breaking down a finished cider into smaller sample sizes and adding different hops to each, taking notes and then using the varieties that best suit the maker's palate. What this entails is simply pouring small samples of cider in wine glasses, adding a pellet or two of hops and covering them with a plate to allow the hops to dissolve and then smelling the headspace to evaluate the hop aroma.

"We're constantly playing around and trying new (hop varieties). Some of them we put on the paper: 'Never again,'" Britton says with a laugh.

Both pellets and whole cone hops can be used. An advantage to pellets, Gunn explains, is the increased surface area, which imparts more hop aroma. Other cidermakers swear by whole cones for the freshness and crispness they impart. Either should do the job, though one consequence of using pellets is the mess they leave behind when they dissolved.

"As long as you rack carefully," Gunn says, laughing about the mess he encounters with pellets, "you can get some amazing extraction."

Dump Them In

The next question to address is the best method for putting the hops on the cider. As with homebrewing, it's a personal choice. To avoid the mess mentioned above, Britton puts his pellet hops in a large, weighted grain bag that he floats in the middle of his tank. A lot of other cidermakers simply throw hops into the cider.

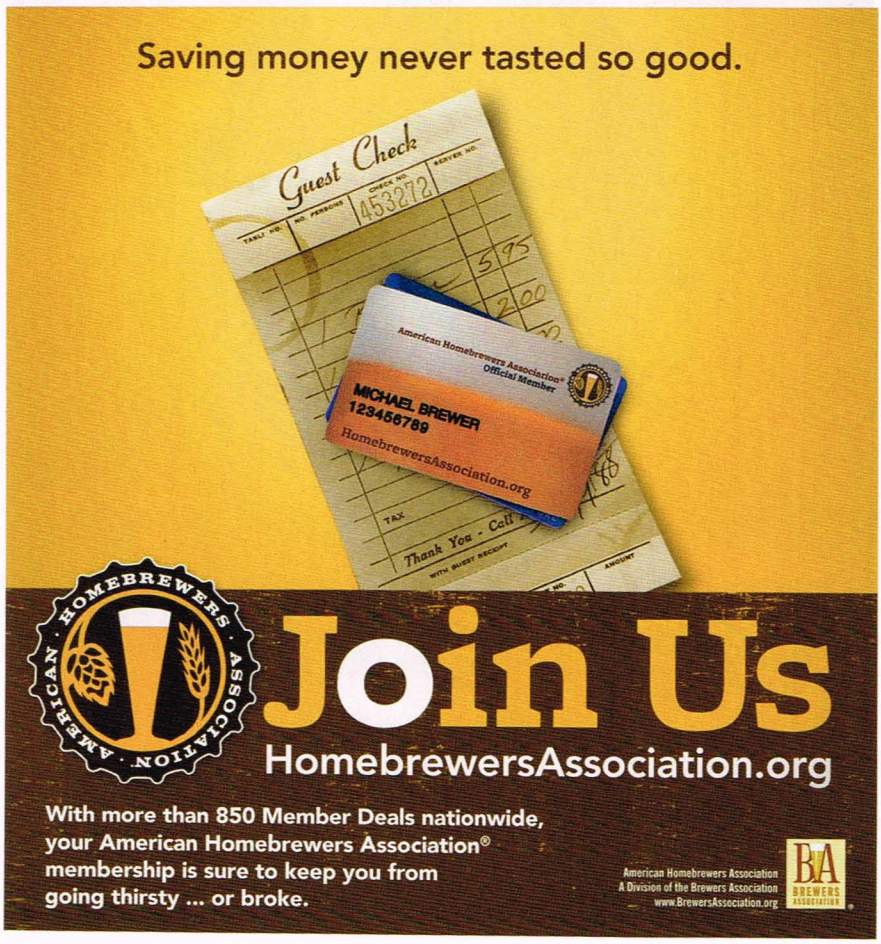
A third option is using a hop back. Tieton uses a "Torpedo-like" device, similar to what Sierra Nevada Brewing uses in its Torpedo beers, which speeds up and enhances hop oil extraction.

Gunn, however, doesn't think any fancy equipment is necessary to achieve solid results, at least not on a homebrew scale: "You can try filtering through Torpedos and all kinds of things," he says. "As far as homebrewers go, you don't need any high tech materials, just toss them in."

How Much for How Long?

As with hopping methods and varieties in brewing, the volume of hops used for hopped cidermaking is also subjective. Most cidermakers recommend approximately 2 ounces (57 g) per 5-gallon (19-L) batch. Hops varieties like Citra® or Simcoe® are more pungent than say, Cascade, so a little goes a long way. Again, it all comes down to final flavor.

"Cider is a little more delicate than most beers. It's like working with a Pilsner or a lager, very light, crisp



and clean," Robert explains. "(Hops) can overwhelm the cider."

Once the hops are in the cider, most cidermakers agree the best thing to do it just let them sit.

"We're careful about opening the tanks," Britton says. "We're careful about oxidation because we don't want to use sulfites (like SO_2 used in winemaking) to combat it."

Another hopping idea is the two-step hop, which Gunn employs for some ciders. Add a portion of the hops — half or more — at the start, then add the rest for the final three days for a floral blast right out of the bottle.

The duration the hops sit on the cider also plays a key role in final flavor. Too long and the hop essence can take over, not long enough and the subtleties are lost. Yet, there is no "set time" to leave the hops on the cider. Cidermakers soak between three days and three weeks. The key is regular sampling to get the flavor you want.

Adding Bitterness

Cider doesn't carry the malt base to balance much bitterness, but it doesn't mean a little bitterness can't work in some ciders. To do this either heat a portion of the cider, or all of it, to between 170–190 °F (77–88 °C) and add some hops. There's no set time to leave the hops in — 30 minutes should be sufficient — but be careful not to boil the juice.

"Stay away from cooking because you can denature some acids and caramelize sugars during the cooking process," Robert says, which leads to burnt sugar flavors.

Get Hopping

In the end, hopping cider all comes down to your own preferences. If you understand how to dry hop a beer, you also understand how to dry hop a cider. From there it's a matter of experimenting with different hop varieties at different quantities until you get the desired flavor profile, then bottling the cider.

Holmes sums it up simply: "Let soak, taste, soak, taste. Just keep tasting until you hit that point to where you're like, 'this is good!'" BYO

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BREW WITH A CREW

By **Betsy Parks**

TIPS FOR A SUCCESSFUL HOMEBREW CLUB

Above: The NJ HOPZ homebrew club shows off their tee shirts at the 2013 National Homebrewers Conference in Philadelphia, Pennsylvania during the event's Club Night.
Left: Members of the Scranton Brewer's Guild pour samples of their homebrew at Club Night.

Brewing beer is fun whether you like to brew alone or with friends. Getting involved with a dedicated group of homebrewers, however, can have some real advantages beyond better beer. For starters, it's a good excuse to have a set time each month for getting together with like-minded people and geeking out about beer. Meetings are also a great opportunity to taste and evaluate beers — your own, those of fellow club members as well as commercial beers. Clubs can also be a great way to share in the cost of ingredients or equipment if you want to order in bulk. They are also an opportunity to try out some roles and responsibilities that you might not have in your everyday life; perhaps you've never organized an event, or you've never served on a board of directors — a homebrew club gives you the chance to try on a different hat . . . all under the guise of brewing beer.

To get some expert advice, I turned to the folks who would know about club life the best — homebrewers who are active in a homebrew club. I asked homebrewers that I met at the National Homebrewers Conference (NHC) in Philadelphia this year to share their knowledge with me, as well as club members who follow *Brew Your Own* on Facebook and Twitter. I picked my favorite tips and explored each one with more detail. If you're ready to start or join a club, or you want to see your club grow or try new things, don't skip these tips!

Starting A Club

Getting a homebrew club together isn't as easy as it sounds. It's not hard to get together once or twice with a few like-minded friends, but to be successful in the long run you need to decide on a direction and mission, communicate your message and meeting time as much as possible and be welcoming and be consistent about when and where you meet.

• Michael Berrios
Skippack, Pennsylvania:
"I just started the Plymouth Pride Brew

Andrew Moore from Litchfield, Maine representing his homebrew club MALT — the Maine Ale & Libation Tasters — during the 2013 NHC Club Night in Philadelphia.

Club in January. My biggest advice is consistency! Have your meetings in the same place at the same time each month. There were times where I would sit there by myself just waiting to see if anyone would come — we now have 16 members!"

Think about that new restaurant that came to town a few years ago and never took off — what ever happened to that place? You went in once and it was great, but the next two times you stopped by it was closed — so you never went back. The same is true for your homebrew club. It takes time for people to get into a routine or schedule, so at first you may — like Michael — be the only person at some of the the meetings. Make the best of it and bring some good homebrew and a copy of a good beer magazine to keep you occupied, or choose a meeting place you don't mind hanging out at . . . like a local brewpub. If you wait it out for a few weeks or months, eventually people will catch on to your established meeting time and make it a part of their homebrew routine.

• Steve Travis
Half Moon Bay, California:
"We started a brew club five months ago and now have just over 20 active members. We have several modes of communication, from group forums on Google, to the Facebook page and Facebook group. We work to keep people engaged between meetings. This is the key to keeping people interested."

Make it easy for people to get basic information and find out what's going on with your homebrew club. If they have to search for you, they won't come to meetings. It's inexpensive to create a basic website these days thanks to platforms like WordPress and Blogger, and a website is an easy way to get your message out there to both members and anyone interested in joining the club. Second, establish pages for your club on social media like Facebook, Twitter, Google+, etc. (wherever your members prefer to hang out) and keep them active — be sure to login at least a few times a week to see if anyone has tried to contact you for more information about joining. Finally, establish an email contact list and keep it active and fresh. Be sure to get contact information from any new members as they join. You can make a monthly email newsletter as simple as a group-wide email from your personal account, or you can try using a web-based html newsletter platform, such as Constant Contact, iContact, Bravemailer, etc. (some are paid, some are free, depending on your budget). (PS, check out Steve's homebrew blog http://halfmoonbrewer.com/ for some details about his newly-formed club.)

• Chris Bourdages
Ajax, Ontario:
"As founder and President of the Durham Homebrewers Club here in Ontario, Canada, with 29 consecutive monthly meetings under our belt and 150+ members, I can tell you that the best thing you can do to start a club is to set a solid foundation to base the club — meaning you need to inform the members about the club's specific opera-

tional mandate."

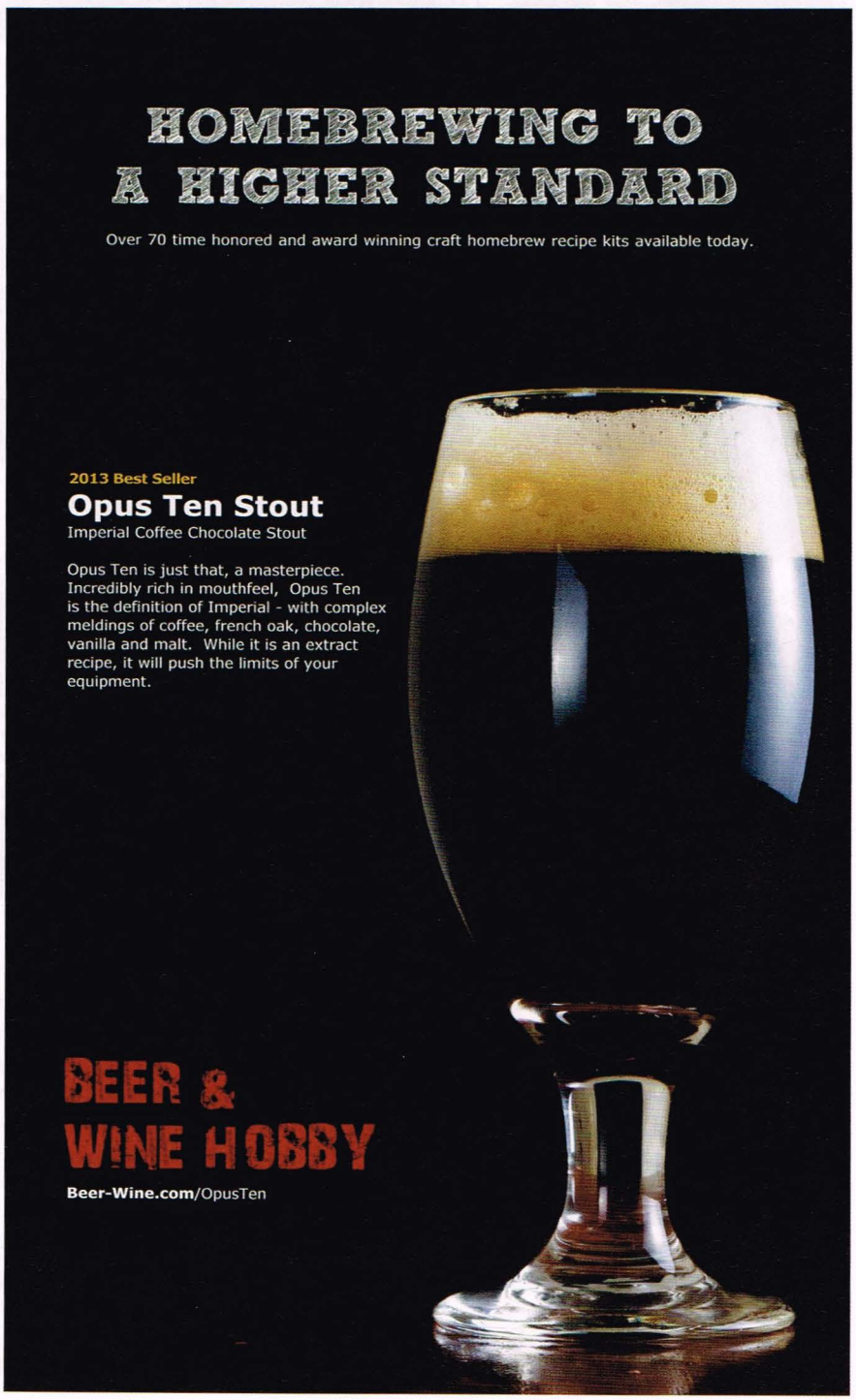
Make sure you have a clear message in mind when you establish a homebrew club. Are you getting together just to brew? Will there be a learning component? Narrow down your mission and make it known to everyone who is interested in joining. Make it specific, but keep it approachable. This will ensure that everyone in the club understands what the goals are from the get go. For example, The Knights of the Brown Bottle in Arlington, Texas posted their mission on their website: "The mission of The Club is to promote public awareness and appreciation of the quality and variety of homebrewed beer through education, research, and the collection and dissemination of information; to serve as a forum for the technological and cross-cultural aspects of the art of brewing; and to encourage personal responsibility when using beer or other alcohol-containing beverage." (Read more about the Knight's constitution, rules and bylaws for more ideas at http://hbd.org/kobb/bylaws.htm).

• Greg Bell
Bristow, Virginia:
"The first thing we did was find a place we could meet consistently. Ask questions and be aware of the laws and regulations surrounding the place you decide to meet."

It's not a bad idea when you're starting up a club to have meetings in your garage or at your house once a month, but a lot can change over the course of a year; your work hours might change, your wife or husband might get sick of having a bunch of homebrewers invade their space after a few meetings, or you might move away and leave the group without a gathering spot. Keep the bigger picture in mind when choosing a meeting space and try to find a home base that is neutral for all current and potential members. A natural choice (as I mentioned earlier) is a local brewpub. Other good spots are local restaurants (with good beer lists and space for a group, of course), or local community centers with meeting space. Be sure to always approach your potential host for permission before descending on your meeting space — many places might not allow guests to bring homebrew or beer onto their premises for insurance purposes. They might also have other groups committed to the space and time. You could also rotate meetings amongst club members once you have a core group of committed attendees. Just be sure that if you have a rotating schedule that you post the schedule ahead of time and make sure everyone knows when and where you will be meeting. It only takes showing up at the wrong place once or twice to turn off a new member.

Maintaining A Club

In the beginning, a homebrew club may just be as simple as getting together with a few friends each month and talking about



Each year, the club that brings the most beer to NHC is given the "Golden Urinal" Award. The Barley Legal Homebrewers from Maple Shade, New Jersey won the award for 2013.

homebrewing informally. As your group grows, however, it's important to develop a structure of planned events and meeting themes to keep people interested. Make sure everyone feels welcome and a part of the club and you will see your group continue to grow year after year.

• Jason Stuffle
Burlington, Vermont:
"Have fun educational events that help build up knowledge and skills in the club. We (the Green Mountain Mashers) have a BJCP study group to help people become judges or improve their rank. We have a club style challenge and a club clone challenge once a year where members all brew a certain style/clone recipe for a mini competition between members. Also, club brews are great for learning new techniques, helping newer brewers become familiar with the brewing process and engaging with other club members."

Once you get over the novelty of hanging out with homebrewers to talk about beer, the enthusiasm for meeting up every month can die down unless you provide a schedule of brewing projects, trips, competitions and learning opportunities. If you keep things interesting, you'll have members for life. For regular (non-event) meetings, invite guest speakers to come talk to the group, such as local commercial brewers, maltsters, yeast professionals or award-winning homebrewers. Also, try some group activities such as a "big" brew, or have everyone brew the same recipe then bring in the results to taste. Take field trips to breweries and beer-related events together. And consider creating your own homebrew competition if there isn't one in your area already; if there is, get your club involved with helping out.

• Bruce Buerger
Waukesha, Wisconsin:
"One thing I've seen when talking with people is – a lot of people try to take on the whole thing by themselves or one to two people. Shape it as an opportunity to do something differently than they would in their professional lives. For example, I wasn't setting up any LLC, non-profit organizations, I've never been a treasurer, I never taught classes – these are all new leadership opportunities people can embrace. If you shape the opportunities as positive (rather than a burden), you're going to get more people wanting to try getting involved. Look at it as an opportunity to make things happen."

Don't look at homebrew club responsibilities as a burden — focus on the positive. Bruce Buerger, who shared this tip and who led a seminar at the 2013 National Homebrewers Conference on improving club events and attracting new leaders, explained that negative momentum is very tough to overcome. "One thing I've seen when talking with people is a lot of them try to take on the whole thing by themselves, or with just one to two people," he said of club organizers. This can lead to burnout and make it feel as though everything they do is work. It's important to spread out the responsibilities and remember you're a part of the club to have fun —

and that there's always going to be homebrew! (To listen to Bruce's presentation, visit the American Homebrewers Association's website at http://www.ahaconference.org/conference/2013-seminars/. You must be an AHA member to login.)

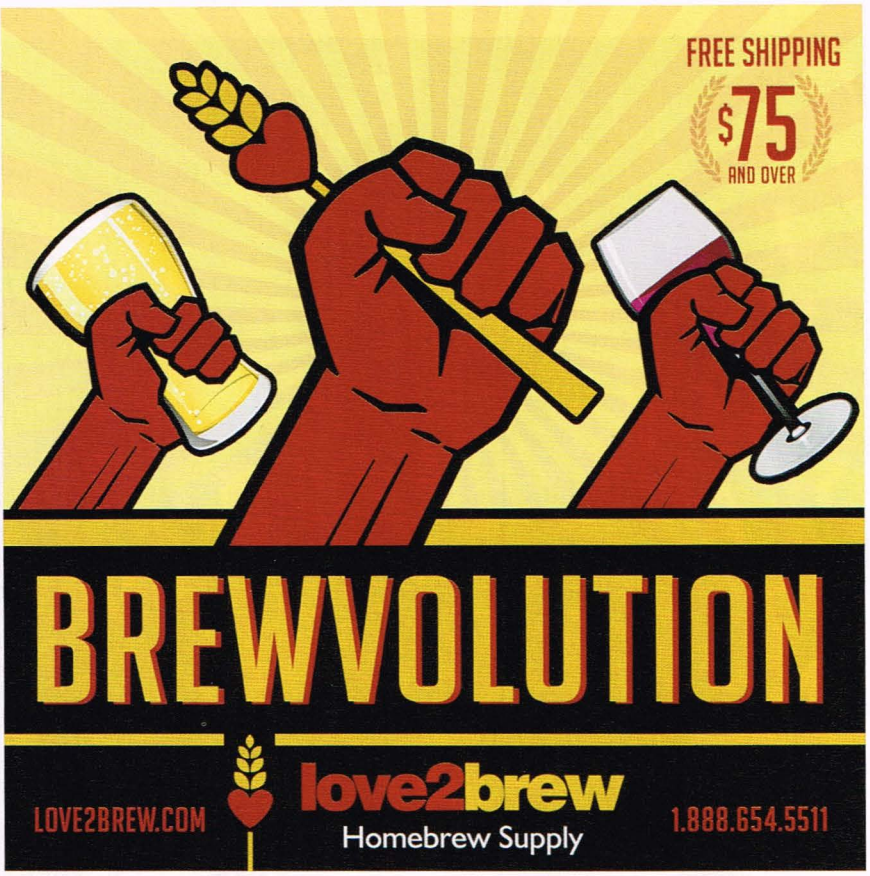
• Dave Allen
Broad Ripple, Indiana:
"Fiduciary transparency. What expenses will dues cover? What additional expenses can be expected? What are the costs and benefits of special projects? No one likes unexpected or unpleasant surprises."

Be very up front about the costs and use of dues, if you choose to collect them. For many people, the money spent on homebrewing is carved out of a tight budget and the choices you make for spending dues can alienate a member if they feel like they don't have a say in how their money is spent. Always have any financial information related to dues available to all your members. And also try to have a system in place for membership scholarships for potential members who might not be able to afford dues or participation in more expensive events so that people don't feel like they can't join in the fun if they can't afford it.

Expanding A Club

Homebrewers often cycle in and out of the hobby, or they move away, take different jobs with conflicting hours or encounter family commitments — all of which can cause your homebrew club ranks to dwindle if you're not actively recruiting and welcoming new members. Homebrew clubs can also get stale without ideas and input from new members. Stay committed to welcoming anyone new and to getting your club's name out there, even after you've established a core group of homebrewers — you never know who will be the next club president.

• Bruce Buerger
Waukesha, Wisconsin:
"We get involved with the community quite a bit. It raises our profile. We do competitions in the area and try to get in good with the local breweries in town.



Bill Straub pours homebrew in the Bruclear Homebrew Club booth. The Limerick, Pennsylvania club won the 2013 Keystone Homebrew Supply Barrel Brew Championship.

We will partner with them and run a competition in parallel with an event of theirs; we get their word out, they get ours out. We also work with local homebrew shops and refer people to them. Do Big Brewday at your local homebrew shop; that way the staff doesn't have to pay for someone to brew. Also, help out with changing legislation in your state. We did that with Wisconsin law a year ago. All those things kind of add up to say 'hey, here we are.'"

Visit any thriving beer scene in any part of the US (and around the world), and odds are you'll find a homebrew club or two (or more) behind the scenes. Homebrew clubs very often organize homebrew competitions in conjunction with local beer festivals. They also pour beer at your city's beer week or volunteer to help set up and break down events. Identify those types of roles in your community and get your club members excited to be a part of the scene — and ask everyone to wear a tee shirt with a club logo whenever they participate in an event. Every positive experience with a member of your homebrew club is an endorsement for joining the club ranks.

• Matthew Berthiaume
Rockford, Illinois:

"As the President of the Forest City Brewers, I believe the point of a homebrew club should ultimately be about education of the craft. We support nearby festivals and local events with bus trips and group presence. Run sensory analysis classes. And it never hurts to have someone to call and come help you run a couple batches through the system or do an all-out group brew."

In addition to helping out at festivals and beer weeks, homebrewers can find new club members through teaching and making themselves available to brewers with less experience. Many of the men and women who staff local homebrew shops are in a homebrew club or teach homebrewing classes. If you know enough about homebrewing that you think you can teach someone else, volunteer your services to your local shop owner, or organize a class at your local community college or community center. If you don't want to teach, try just reaching out to the newer brewers in your group and offering an extra set of hands for their next brew day.

• Jake Woldstad
Durand, Wisconsin:

"Beware of becoming too clique-ish within your club. It's great to visit with your friends, but make sure you welcome new people checking out your club for the first time. If they don't feel welcome, they won't come back."

This is a tough one, because people tend to flock to those who joined the club around the same time, or those with similar brewing skill levels. A new member who comes to a few meetings and doesn't feel like he or she is a part of the group, however, will

Finding a local homebrew club

• Talk to your local homebrew supplier. Where there's a homebrew shop there's often a homebrew club somewhere nearby. Ask the staff at your local shop if there are any local meetings. If they aren't members of a club there's a good chance that your homebrew shop staff know where to find someone who is.

• Go to beer events and zero in on the volunteers. Many homebrew clubs are actively involved as volunteers at beer festivals and beer week events. Ask the pourers when you get a beer sample if there are any homebrew clubs in the area, and look for people wearing club tee shirts.

• Find local clubs online or on your mobile device. The American Homebrewers Association (AHA) has an up-to-date directory of homebrew clubs that is searchable by ZIP Code on the Web at http://www.homebrewersassociation.org/pages/directories/find-a-club (if you have a new club be sure to register it on this forum so that potential members can find you). You can also get on any of the online homebrewing forums (Homebrewtalk, Northern Brewer, The Brewing Network, Beer Advocate, Realbeer, etc.) and ask around about local meetings. The forums can be especially helpful if you are trying to start up a group and are looking for potential members in your area. There are also apps such as Meetup for your smartphone or tablet that might be helpful for finding a group.

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stop coming. Don't be the mean girls at the exclusive table in the lunchroom - make a point of noticing any new members when they come to meetings and introduce yourself. When they come back again, encourage them to talk about their brews and enter them into competitions and give them feedback and pointers about the homebrews they bring in to taste. And be fair with your feedback — don't lie if the beer isn't good, but be constructive about what could be improved or avoided next time rather than negative, and even offer to help out with the next batch. Also, encourage new members to take on volunteering roles within the group, such as lining up a guest speaker, organizing a brewery tour or taking on an officer position. The more responsibility a new member accepts, the more they will feel as though they have a stake in the club.

Get Clubbing

In addition to these tips, I have one more bonus tip of my own to share for anyone interested in a homebrew club or for new ideas to try in an existing club: Contact other homebrew clubs for advice even if they aren't located near you. As an editor for *Brew Your Own* for seven years, I've been in contact with lots and lots of homebrew club members and I've never worked with anyone who hasn't been more than willing to help me out with information about their club, when they meet and what they've been up to. If you are thinking about starting up your own local club, get in touch with some of the clubs in your state or region, or contact a club that you know is well established for advice on what works and what doesn't work (see the sidebar on page 63 for finding local or regional clubs). You might save a lot of time and effort by avoiding the same mistakes they made when they formed their club. Or, if you are already in an established club and want to try starting a homebrew competition, there are many clubs who run competitions every year who can share some tips for success. One of the most fun ways (in my opinion) to meet up with homebrew club members is to go to the National Homebrewers Conference Club Night, which is where we shot all the photos for this story. To get an idea of the scale of club participation, check out Basic Brewing's video of 2013's Club Night in Philadelphia at: www.basicbrewing.com/index.php?page=july-8-2013-nhc-club-night

For more about starting up a homebrew club, I also suggest listening to The Brewing Network's podcast about building and managing a club at http://thebrewingnetwork.com/shows/638

And when you get your club off the ground or start organizing some new events or a competition, don't forget about us here at *Brew Your Own*. Be sure to send us updates, competition deadlines and photos to tell us how the club is doing. BYO

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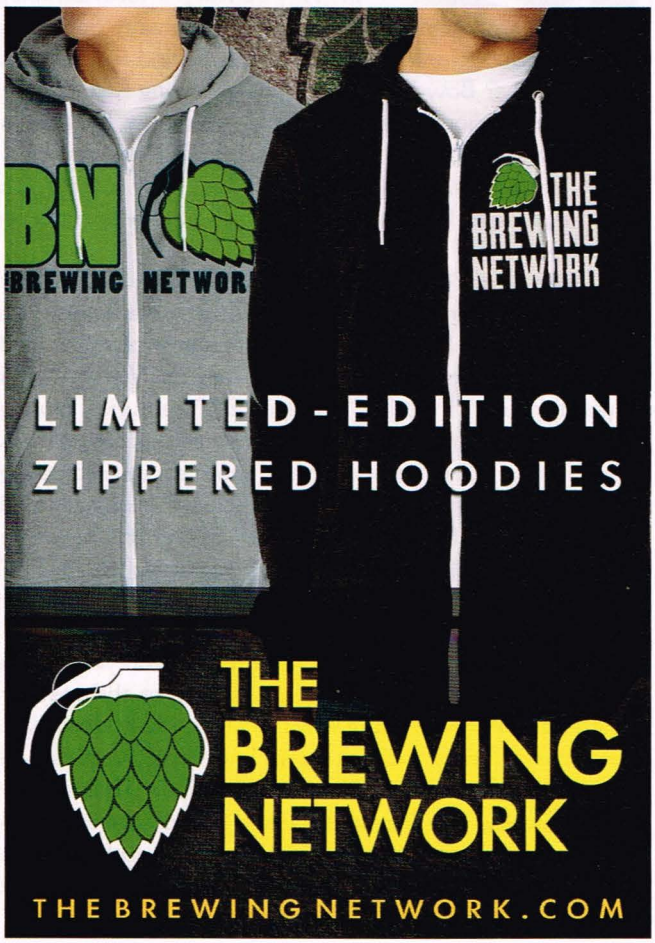


HISTORICAL HOMEBREW

THE STORY OF HAMMERSMITH ALES

By **Michael Madaus**

The history of the city of Bethlehem, Pennsylvania is inextricably linked with brewing. At some city festivals, for instance, you might witness the resurrection of 19th-century Moravian city brewer-turned-mayor Johann Sebastian Goundie. In reality, the man behind the kettle is Christopher Bowen, a modern day brewing Renaissance man. A prodigious homebrewer, Bowen has become a nucleus of activity in the culture of historical brewing. Here is a man who traded his old career in financial planning for a much sweeter job title: beer historian and adventurist.

These days Bowen digs through beer books instead of spreadsheets. From his home shed setup, the HammerSmith Brewery and Alehouse, Bowen's interests evolved around English-style beers, especially those from the Victorian and Edwardian eras of the 19th and early 20th centuries. During his eight years' experience with homebrewing, Bowen has acquired a wealth of knowledge and experience in recreating old beers. In addition to recreating recipes, he has accrued several samples of the originals as well. "I probably have one of the largest collections in the US regarding old beers," Bowen said. "It's not uncommon that I get to drink an 80- or 100-year-old beer to this day."

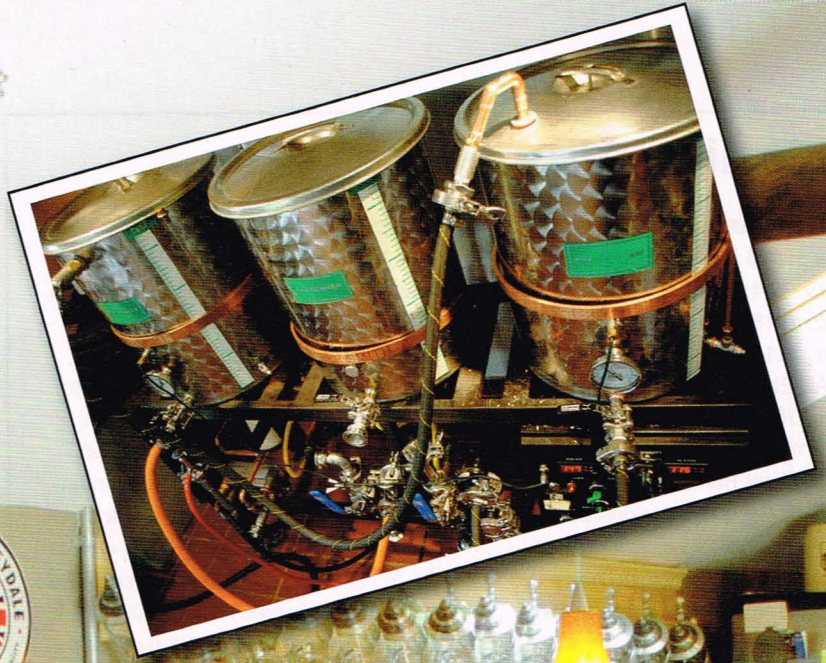
Bowen is just one face in a movement of brewers, both at home and professional, who are looking to the past for inspiration. There are many ways to simply draw ideas from these classic beers such as using known techniques and ingredients such as amber malt, brown malt, or a hop variety with a historical presence in the area. "For most homebrewers there's always a problem with recreating anything from the past," Bowen explained. "We weren't there, so we don't know exactly what was available and what was involved."

The truly dedicated, creative, or just plain adventuresome brewers delve further, trying to recreate as accurately as possible the conditions under which the beer was originally made. This is the quest of Bowen's work. "It's where you say 'I'm going to replicate the water from this town, look at the brewing records, and get malt that is the same as it was 100 years ago,'" he said.

So when Bowen suits up in costume or brews at home, he takes it to the next level. To accommodate his brewing styles and brew volume, he works with several different homebreweries. One, modeled after an 18th-century brewery, utilizes a copper pot and a couple of whiskey barrels. Another, factoring in the technological changes in the 19th century, is a steam-powered system comprised entirely of copper. When not in character, Bowen uses the gleaming mechanized system he built from scratch — enough to make any homebrewer drool — that is housed in his home shed. This setup has been featured in the *New York Times* and was called "America's Coolest Homebrewery" in 2010 by *Forbes* magazine.

Bowen encourages homebrewers to put extra effort into selecting ingredients. When obtaining malt for a 200-year-old recipe, for example, Bowen chooses Thomas Fawcett, a company that has operated on the same site in Castleford, England, since 1809. "In creating a beer from 1810, you want to get malt from a company that was around and making it during that time," Bowen explained. As an official Bethlehem brewing historian, Bowen has access to local recipes and tasting notes from travelers — preserved from centuries ago — that allow him to place his brew in its historical context.

Some ingredients are hard to come by; either they just aren't in demand or they are too expensive to produce. In researching an old porter, for instance, you might need brown malt. Not widely available commercially, brown malt was historically used in some porters and dark ales. Instead of compromising on a substitute ingredient, a brewer can make his or her own. Specialty malts can be achieved by kiln-



Facing page: Christopher Bowen stirs a batch of historically-inspired homebrew wearing a period-appropriate costume.

This page, top: Bowen's HammerSmith Ales homebrew setup, which was honored as "America's Coolest Homebrewery" in 2010 by *Forbes* magazine.

This page, bottom: Bowen entertains friends and beer drinkers in his homebrewing shed, which features a draft bar setup with a true English pub feel.

Photos by Christopher Bowen

HammerSmith Ales Recipe

HammerSmith Ales
English IPA
(5 gallons/19 L, all-grain)

OG = 1.058 FG = 1.010
IBU = 54 SRM = 11 ABV = 6.2%

This is a recipe that won a gold medal and best of show at the 2007 Great American Beer Festival in the ProAM catagory, a silver medal at the AHA regional and a gold medal at the Kona Beer Festival in 2008. It is based off of a 19th century recipe from Samuel Allsopp and Sons LTD, circa 1860s. English brewers used tons of American hops in many beers during the 19th and 20th centuries. This was dry hopped with Chinook, but other than that I used all East Kent Goldings. Chinook is a distantly related cultivar of the Petham Golding.

Ingredients

10.5 lbs. (4.8 kg) British 2-row pale malt
14.4 oz. (0.41 kg) crystal malt (60 °L)
6.4 oz. (0.18 kg) amber malt
5.4 oz. (0.15 kg) torrified wheat
10 AAU East Kent Golding hops (2 oz./56 g at 5% alpha acids) (60 mins.)
2.5 AAU East Kent Golding hops (0.5 oz./14 g at 5% alpha acids) (30 mins.)
7.5 AAU East Kent Golding hops (1.5 oz./42 g at 5% alpha acids) (10 mins.)
1 tablet Whirfloc (15 mins.)
1 tsp. yeast nutrients (15 mins.)
1.25 oz. Chinook hops (dry hops)
Wyeast 1275 (Thames Valley Ale) or White Labs WLP023 (Burton Ale) yeast
Priming sugar (if bottling)

Step by Step

This is a single infusion mash. Target mash temperature is 152 °F (67 °C) mixing grains with 3.6 gallons (14 L) of strike water. Raise mash to 168 °F (76 °C) and begin lautering. Boil for 60 minutes adding the bittering hops at times indicated in the ingredients list. Add the Whirfloc tablet and yeast nutrients when 15 minutes remain in the boil. After the boil is finished, chill the wort to 67 °F (19 °C) and transfer to a sanitized fermentation vessel. Ferment at 67 °F (19 °C). Add the final addition of hops and store the beer an additional week at 58 °F (14 °C). Your beer is now ready to rack into a keg, or bottles along with the priming sugar.

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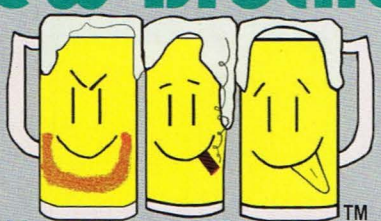

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ing or roasting green or finished malts. Brown malt can be made by roasting pale malt at a high temperature for a short amount of time, then spreading it out and cooling it quickly to prevent over-darkening. A more traditional method would be to roast unkilned malt over a wood fire, which adds smokiness.

Some traditional processes are more involved. For example, historical recipes might call for an 18th century sugar called essentia bina. This is made by diluting muscovado sugar, boiling it, setting the kettle on fire for several minutes, and rehydrating. It's a complex sugar that has some licorice flavor in it alongside peat smokiness. Centuries ago it was very commonly used to add color and flavor to porters in London breweries. "I once had to make 19 pounds of essentia bina for a commercial recipe, which was very difficult," Bowen laughed, "so it's probably best left to the small homebrewer to make the closest replications."

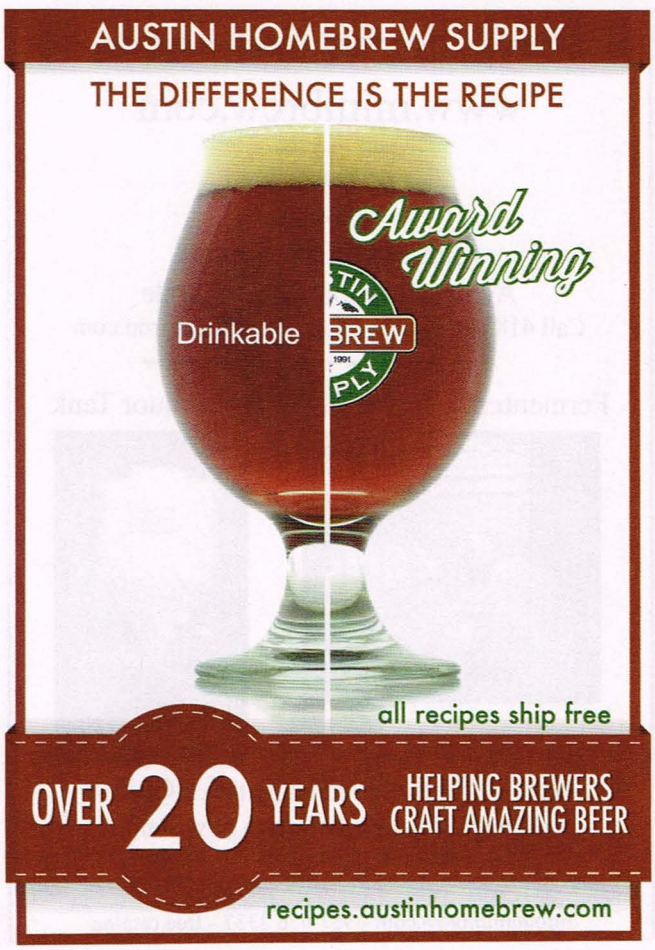
Fortunately, resources are growing for those with the hunger to try making historical beers. One such resource, Mitch Steele of Stone Brewing Co.'s book on IPAs published last year, talks quite a bit about the ale's history and brewing historical versions. Then there are Bowen's direct inspirations like Ron Pattinson — the prominent historian, author and blogger for his site: *Shut Up About Barclay Perkins* — and Martyn Cornell, a beer historian who blogs on *Zythophile* (http://zythophile.wordpress.com/).

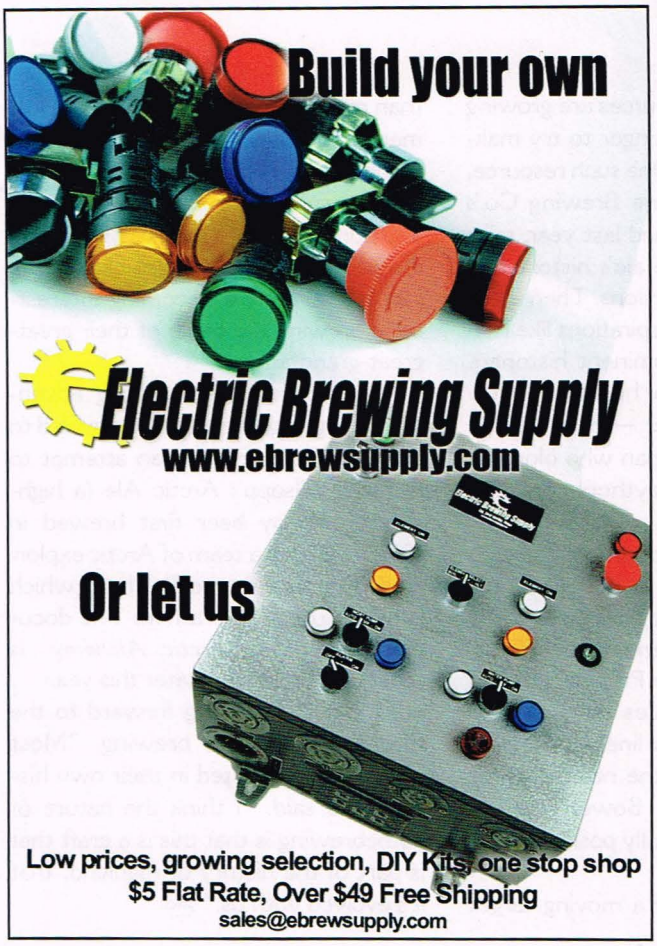
The old beer obsession has also inspired new entries in the craft beer industry. Notable projects include the Once Upon a Time series by the Pretty Things Beer and Ale Project, Dogfish Head's Ancient Ales series, and Fuller's Past Masters line. Looking to the past could lead the next wave of innovation, but as Bowen shows, homebrewers are ideally positioned for the work.

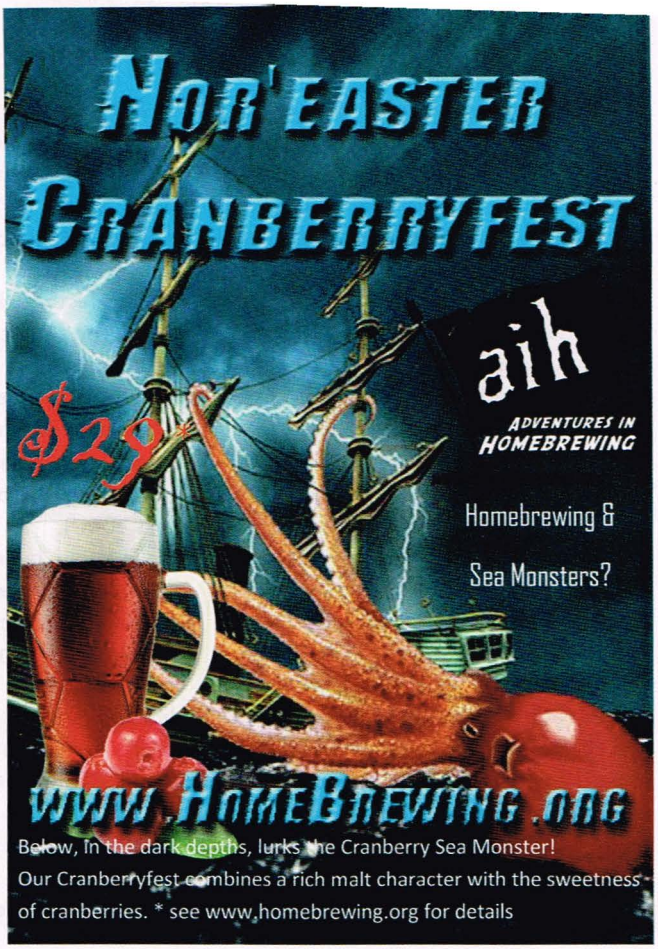
"Beer is more of a moving target than most people think," he said. "Beer made back then was a more laborsome technique — blending, aging — that just doesn't make commercial sense anymore. But in homebrewing there are people taking on these challenges. Homebrewers are becoming interested in brewing the beers of their great-great-grandfathers."

For Bowen, the brewing adventure is ongoing. He recently traveled to the Canadian Arctic in an attempt to recreate Allsopp's Arctic Ale (a high-alcohol, hoppy beer first brewed in 1852 to sustain a team of Arctic explorers led by Sir Edward Belcher), which is being turned into a film. The documentary, called *Arctic Alchemy*, is scheduled for release later this year.

He is also looking forward to the future of historical brewing. "Most people are interested in their own history," he said. "I think the nature of homebrewing is that this is a craft that is part of the history of mankind, that it's evolved with us." BYO







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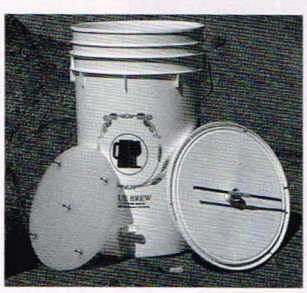

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Splitting the Difference

Small batch experiments

by Terry Foster

How do you learn what effects different strains of yeast or different hop varieties have on the taste of your beer? That's relatively easy for professional brewers, since they frequently brew a beer to a standard recipe. Since they have good control over extract levels and fermentation temperatures, they can simply change one variable at a time and compare the beer with what they brewed previously. For the homebrewer it is more difficult, partly because they often brew only now and again, and partly because they do not brew the same beer every time. And they may not want to make two separate 5-gallon (19-L) brews at the same time because that makes for a long brew day, or they may not want to be left with 10 gallons (38 L) of two beers that are quite similar in style.

If you feel that way you may well have tried to determine the effect of a yeast change by adding different strains to two different worts. You would, of course have done that with brews that have some similarities, say a pale ale and an IPA, or a Pilsner and a bock beer. However, such an approach is of limited value, for you are committing the experimental scientist's "no-no" by changing more than one variable at a time. Also, as I discussed in the September 2013 "Techniques" column, brewing to consistent standards is no simple matter for the amateur. So what's the answer?

It's quite simple; do one brew and split the wort, adding a different hop variety or yeast strain to each portion. Using identical worts immediately eliminates a lot of variables, although it may not reduce brew time much if you are looking at hop varieties, since each portion of wort will have to be boiled separately, and that can introduce differences through losses in the trub and on cooling, for example. This approach can also be used for checking different varieties for dry hopping, but that can just as easily be done by splitting a finished brew at racking for the secondary stage, so I am not going to deal with that here. This method works very well for looking at different yeast strains because wort preparation and boiling are identical, and your brew day will be only a few minutes longer than usual.

How to do it

First you have to decide exactly how to split your wort, and I assume that you are starting with 5 gallons (19 L). I also assume that you will be using 1 gallon (3.8 L) glass jars that can be fitted with fermentation locks for the fermentation, since sizes between 1 and 5 gallons (3.8-19 L) are less easy to come by. You could obviously split this into five 1-gallon (3.8-L) batches and test five different yeast strains, but I feel like that is complicating matters too much and you are better off looking at only two strains at a time. And, in fact, by the time you have cooled the wort you will probably have less than 5 gallons (19 L) due to losses to the trub and so on. That means we are talking about four 1-gallon (3.8-L) test samples; if you do not want to throw it away seal and store cold the remainder for use in topping up later. For me the ideal way would be to ferment two of these with a yeast strain you are familiar with, while using the test strain in the other two batches. In other words, you have duplicate tests for each strain, which will give you a good check on the consistency of your experimental technique as well as two tests to compare the test strain's performance against

> "... do one brew and split the wort, adding a different hop variety or yeast strain to each portion."

Photo by Jason Phelps

your "standard" strain.

There are a number of other factors to consider in these experiments. A prime consideration is what kind of beer to use as your base. It should be obvious that the style of beer should be suited to the yeast strains under examination – lager for lager and ale for ale. But beyond that you need to be able to detect any differences in the final beers, so you do not want one where high alcohol or lots of roasted flavors are present or even ones with very high hop bitterness and flavor, since all these will mask the differences you are looking for. In short, you want something simple such as pale ale for looking at ale yeasts, and a modestly hopped Pilsner for lager yeasts. Of course if you are looking at Belgian yeasts that produce somewhat stronger flavors, you might go for a more flavorful base beer, but I would still recommend something fairly neutral in terms of malt and hop flavors, such as a saison, rather than, say, an Abbey ale.

You want to pitch the worts with the same amount of active yeast, which is relatively easy with liquid strains. Just use a separate pack or vial for each wort which will be about the right amount for 1 gallon of wort. I think it best to use either all packs (Wyeast) or all vials (White Labs), rather than to mix them because there may be a difference in yeast content from vial to pack, since the former requires some yeast growth in the pack (see use instructions on them). In the case of dry yeasts, it is common to use 0.5 g/L of wort, so for each 1 gallon (3.8 L) fraction you'd need 2 g of yeast. Bear in mind that if you want to compare a dry yeast strain against a liquid strain, there may be some differences in the amount of active cells pitched, which might reduce the reliability of the test.

The worts must be cooled to the appropriate fermentation temperature and be well-aerated. You can do this by the "splashing" technique or by oxygenation from an oxygen bottle using a carbonation stone. The latter is more reliable in terms of reproducibility, so I would opt for that. Simply set a suitable gas flow rate for the first portion of wort for two minutes, then repeat the process for the other worts. Measure original gravity (OG) at this stage.

Then comes the tricky bit, for you need to keep the fermentation temperatures as close as possible. You won't be able to control four different vessels precisely, so the best you can do is to try to keep them all together in a relatively cool place. Try to use a similar environment that you would normally use for your standard strain. You particularly do not want the standard to be warmer than your normal practice since this could result in the development of flavors that would mask differences between the two strains. It doesn't matter if the test strain races away and ferments at a higher temperature because that is one of the differences you are looking for!

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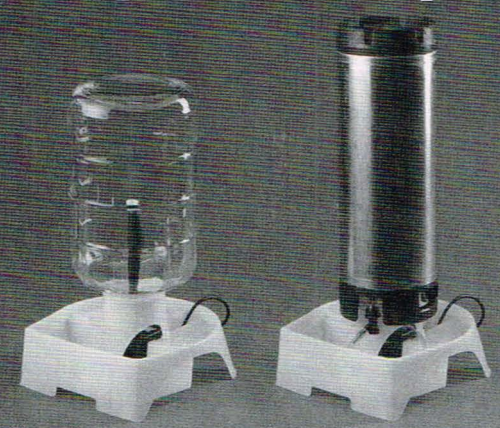
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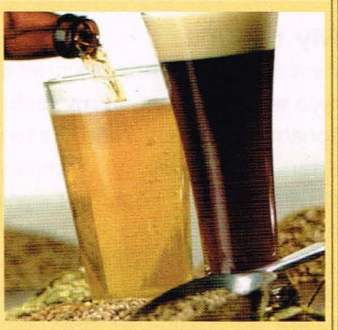

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Finally, you have to be consistent in allowing similar fermentation times (including a diacetyl rest if you are comparing lager strains), and residence time in the secondary fermenter. You should observe the tests as frequently as possible and note any differences, such as when the first rush of activity slows dramatically, and whether there are significant differences in flocculation as the fermentation nears its end. You must, of course, measure finishing gravity and compare the attenuation of the beers (that is the difference between the OG and FG) so that you know whether the test strain is likely to give you a sweeter or drier beer than will the standard. Bottling should be carried out at the same time – I assume you are not going to keg such small amounts! Priming can be a bit of a problem, since the test samples may finish up with a different CO_2 content than the standard. If they do, then using the same amount of priming sugar for all four tests will result in different levels of carbonation in the finished beer, which may mask flavor differences somewhat. There is little you can do about this, except to make sure you keep the beers in a secondary for at least a week to allow as much of the CO_2 to diffuse out as possible. Note that when you transfer to the secondary you should top off each jar with boiled and cooled water. You could top off with the cooled residual wort retained from the original split, but that will result in further fermentation, so the water option is better in my view.

Make careful tasting notes when the beer is ready; first comparing the two similar beers to each other, and then contrasting the different pairs. A good way to do this is to invite some homebrewer friends over and record their responses to the samples without telling the tasters which is which. If the two pairs are closely similar to each other then you can conduct a "difference" test with your friends. Give them each two similar samples and one different one and record their responses. Discard results from any taster who cannot pick out the different sample (don't tell them or you might lose a friend or two!), and check the results from the others to determine the real effects of the test yeast strain. That's it, simple enough, so below I'll run through an example with some real yeast strains.

Let's actually do it

I have selected an example I looked at some years ago when I wanted to check out my standard (White Labs WLP002 English Ale) against WLP023 Burton Ale yeast, thinking that the latter might become my standard for IPA (since IPA was first brewed in Burton). I deliberately opted to use a modestly hopped, relatively low gravity bitter ale so that flavor differences might stand out. I also decided to go with extract with steeped grains rather than all-grain, just to keep things as simple as possible. So here we go:

Split Infinitive Bitter
(5 gallons/19 L, extract with grains)

OG = 1.045 FG = 1.013*
IBU = 30 SRM = 12-15 ABV = 4.1%
*These figures refer only to the standard — read on

Ingredients

6 lbs. (2.7 kg) pale malt extract syrup
0.5 lb. (0.227 kg) crystal malt (60 °L)
8 AAU East Kent Goldings (60 min.)
(2 oz./57g at 4% alpha acids)
2 vials WLP002 (English Ale) yeast
2 vials WLP023 (Burton Ale) yeast
Priming sugar

Step by Step

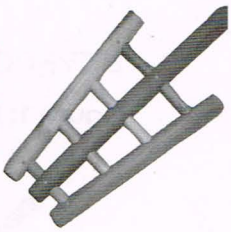
Steep crushed crystal malt in a grain bag with 3 quarts (2.9 L) of water at 150-160 °F (65.5-71 °C) for 20-30 minutes. Add liquid to boiler and rinse bag with 1 gallon (3.8 L) of hot water. Add more water to bring the volume up to 3-4 gallons (11-15 L) and carefully stir in the extract syrup, making sure it is fully dissolved. Adjust final volume to 5 gallons (19 L) and bring to a boil. Add the hops and boil 60 minutes. Switch off heat and cool the wort as quickly as possible to 65-70 °F (18-21 °C). Take four 1-gallon (3.8-L) jars, which have previously been sanitized (preferably with an iodophor), and fill each to the same level, say about ¾ full to allow enough space to minimize any loss due to frothing. Oxygenate each sample, using a carbonation stone and an oxygen bottle for two minutes. Pitch two bottles with one vial each of WLP002 (English Ale) and the other two with one vial each of WLP0023 (Burton Ale). Allow to ferment under airlock for 5-7 days, preferably in a cool, constant temperature area — I used my basement, which holds at around 60 °F (16 °C) during winter. Once fermentation ends, rack into four sterilized demijohns, taking gravity measurements on each one, and leave in these secondaries for 7-10 days, topping up as described earlier. Rack and bottle each sample, priming with a maximum of 1 oz. (28 g) sucrose or dextrose per gallon. Keep warm for 1-2 weeks to condition, then cool, taste and compare the results as described above.

My results

First, there was little discernible difference between the two separate pairs, so my technique had been at least reasonably consistent! The Burton yeasts gave slightly more attenuation — the two samples having fermented down to 1.010 and 1.011. That's not significant in this beer but could make up to 0.5% alcohol by volume (ABV) extra in a beer with an OG of 1.070-1.080. The English Ale yeast samples were thought by some tasters to be a little fuller on the palate, and again that difference might be more noticeable in a bigger beer. The Burton yeasts certainly did not flocculate as well as the standard, so the beers from them were somewhat hazy when tested. From those results alone the Burton yeast might work fairly well in an IPA I thought. But the biggest difference was that the Burton yeast beers were very estery — banana and pear drops in particular — to the extent I did not like them at all. As a result, I have never used this yeast in an IPA again. Given what I learned about the difference in the two yeasts, I would say that my experiment told me what I needed to know! BYO

Malt Modification

The biochemistry of barley in brewing



Malted barley is the heart and soul of beer. The characteristics of finished beer are strongly dependent upon the quality and type of the malted barley that is used to make the beer. Malting is the process of biochemically changing the barley. During the malting process, cell walls within the barley kernel are degraded, proteins are modified and enzymes are produced. The enzymes that are produced during malting play an important role later in the brewing process (during mashing) when starch degradation occurs and longer-molecular-length starches within the barley are converted to shorter, simpler, unbranched starch molecules that are then available to be readily converted to sugar by yeast cells.

The term "modification" refers to the physical and chemical changes that occur to barley during the malting process. During the malting process, barley is steeped in water and the individual barleycorns are allowed to germinate for an appropriate length of time. Germination is then halted by a drying process known as kilning.

I will discuss the three steps in the malting process and a description of the biochemical changes that are occurring within the barley during each step.

Steeping

The first step in the malting process is steeping or soaking the barley in water for between 40 and 120 hours under controlled temperature, air humidity, and oxygenation conditions. Steeping is usually carried out in two or three wetting and draining cycles in order to allow rapid and uniform water uptake by the barley, while allowing sufficient air contact with the barley to ensure that the absorbed water is properly oxygenated. At the end of the steeping process, barley typically contains about 45–50% water by weight. Since water is the medium in which the biochemical reactions take place, the final moisture content of the barley at this step strongly influences the rate and extent of modification of the malt.

Germination

After steeping is complete, the water is drained away from the barley and the barley is then allowed to sprout (germinate). Germination is typically carried out three to five days at a temperature of between 50–68 °F (10–20 °C). The embryonic sprout produces plant hormones called gibberellic acid and abscisis acid. These plant hormones both stimulate and modulate the production of enzymes of modification. Gibberellic acid (Figure 2, pg. 77) is a strong, naturally occurring hormone that controls development in plants. Gibberellic acid stimulates the germinating barley to produce mRNA molecules that code for numerous hydrolytic enzymes. Abscisis acid (Figure 1, pg. 76) plays a role in the modifications of proteins in the barley kernel.

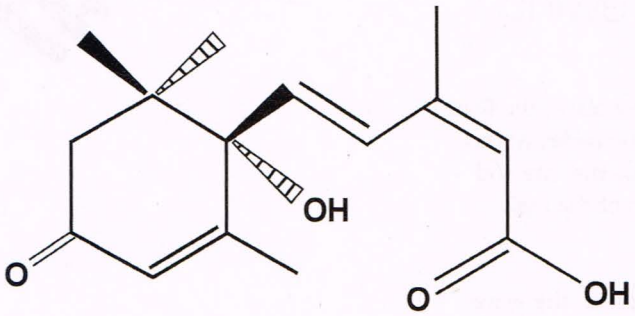
> "The term 'modification' refers to the physical and chemical changes that occur to barley during the malting process."

It is these enzymes that cause the modification of the malt. The enzymes produced include α-amalyase, β-glucanases and proteases. The enzyme that converts starch within the barley to maltose and dextrinxs during mashing is α-amalyase. The enzymes that break down beta glucan are β-glucanases. Proteinases are the enzymes that break down large protein molecules into smaller protein molecules and amino acids.

Bottom line: The enzymes are produced and preserved. These enzymes play a critical role during the mashing process.

Photo by Jon Stika

Figure 1: Molecular Structure of Abscisis Acid



Kilning

After malt modification has progressed to the extent desired by the maltster, the malted barley is dried (kilned) in order to halt the germination process and stop the biochemical reactions responsible for the modification of the malt and preservation of enzymes. Kilning also produces new flavor, aroma and color-producing compounds within the malt. The types and amounts of flavor, aroma and color-producing compounds that develop during the kilning stage are affected by the temperature at which kilning is done, and by the duration of the kilning process. Longer, high-temperature kilning produces darker, more intensely flavored malt, while shorter, lower-temperature kilning produces lighter malt with less flavor intensity.

Extent of modification

During the malting process, enzymes break down the cell structure of the endosperm, releasing nutrients necessary for yeast growth and making the starch available for enzyme degradation during mashing.

Fully modified malt is the balance point at which most all of the long-chain, branched starches have been converted to simpler starches that are available for conversion into sugar during the mash, but the simpler starches and sugars have not yet began to be consumed by the germination of the barley. The basic indices used to measure malt modification are the Kolbach index (this is an index) of protein modification, acrospire length (this indicates how much activity has occurred within the kernel), endosperm appearance (mealy vs. steely indicates cell wall degradation) and friability (hardness is directly related to cell wall degradation. Fully modified malt is what we seek as homebrewers because it simplifies our brewing process.

Practical considerations

Understanding the degree to which modification has occurred in malted barley is key to the production of good beer. If a brewer is forced to use an under modified malt,

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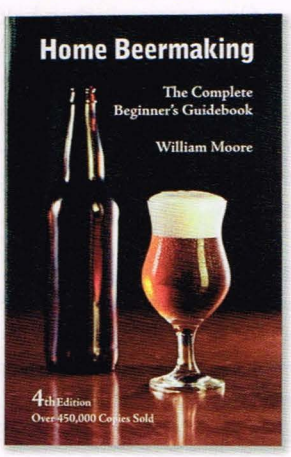

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then the malt may need to be mashed using a protein rest to break down any large proteins into smaller proteins and amino acids, and to further convert the longer-chain starches to simpler starches. If a malt is already fully modified, then mashing the malt using a protein rest may further act upon the remaining proteins in the wort and negatively impact the body of the finished beer, leaving it more watery and thin.

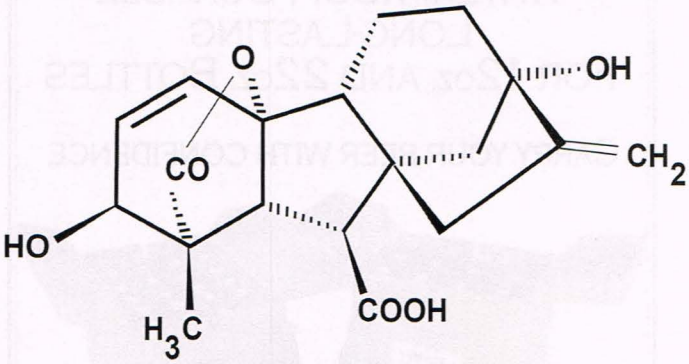
Fortunately, we live in a time when most malts that are commercially available to homebrewers are fully modified. For fully modified malts, a simple infusion mash will usually work very well for most beer styles, and will allow a brewer to create excellent beer. Other mashing techniques (for example, multiple temperature step, decoction) can be employed if you are brewing a beer using less than completely modified malt. (For more information about brewing with decoction mashing, visit http://byo.com/story537.) BYO

References:

1) Rhodes, Christine, *The Encyclopedia of Beer*, Henry Holt and Company, 1995

2) Briggs, D.E., et. al., *Malting and Brewing Science, Volume I, Malt and Sweet Wort*, Chapman and Hall, 1981

Figure 2: Molecular Structure of Gibberellic Acid



Related links:

• If you want to take your homebrew one step closer to 100 percent homemade, become a maltster. If you have a kitchen oven and large baking pan and can read a thermometer, then you possess all the equipment and skills required to make your own malt from scratch: http://byo.com/story1092

• Are all Pilsner malts the same, regardless of the variety of barley malted? *BYO* author Horst Dornbusch sat on a panel in Germany and tasted four Pilsner beers made from four different barley varieties: http://byo.com/story552

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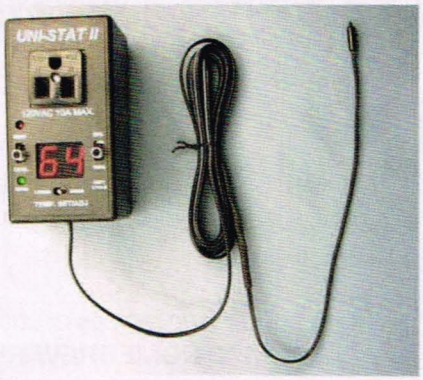

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Carboy Cleaner

A "car wash" inside your carboy

by Jeffrey Skaggs

I honestly can't pinpoint exactly what got me started in home-brewing. I was looking for a new hobby and literally stumbled into it. I kid you not, before I brewed a batch, before I had bought a single grain, I had already transformed a cooler into a mash lauter tun, made a copper immersion wort chiller, and modified a previously unused turkey fryer to make it brew-friendly. That's one of the things that attracted me to this wonderful hobby 2-½ years ago; the ability to personalize your equipment and the freedom of knowing that your process or setup may be different from everyone else's, but it works for you and you end up with good brew.

When I finally started brewing, I learned quickly that a carboy brush is designed to spackle the walls, surrounding cabinets, and the user with undesirable crustiness from within. Sure, it does a good job cleaning the kräusen ring and it's cheap, but I was sure there was a better way. I scrounged DIYs on various Internet forums in search of a better way and found that soaking it with OxiClean overnight seemed to be the default for most folks. For the first few batches, I did just that — I waited. I'd fill a carboy up half way with some sort of detergent then carefully flip it over and balance it in a bucket to let the suds do the work. Most of the time the place I picked to let the carboy sit and clean itself was in the way of my wife or I, but I couldn't dare move it out of fear of spilling the water all over the counters and the floor, not to mention dropping a carboy could be catastrophic. I needed a better way; a way to speed up that process because leaving carboys soaking in the kitchen for an extended time wasn't an option in my world anymore.

Driving through the automatic car wash one day, as I watched the giant spinning cloths, I wondered, 'why not try to make a small one of these to clean the innards of my carboys?' The only thing I had on hand was a Shammy cloth in my stash of car washing supplies, so before heading to the local hardware store I drew up a quick sketch of how to attach the cloth to the end of a rod. I realized I could attach the other end of the rod to my power drill. With a design in mind, I spent about 10 minutes at the hardware store and gathered $16 worth of supplies, including an aluminum rod. When I was about to leave, I realized the aluminum rod was long enough to cut in half and I had enough Shammy material to make an extra, so I bought two additional nuts, flat washers, and lock washers and made one for a buddy that brews. The thread protector already came in a two-pack, so for a grand total of $18 (add $6-$8 more if you have to buy a Shammy) and an hour of my time, I had a tool for me and a gift for a friend, and you can, too!

> "'. . . I wondered, 'why not try to make a small one of these to clean the innards of my carboys?'"

Tools:

Tube cutter (or simple scoring tool)
Scissors
Vice grips
Small slip-joint pliers
Thread cutters (die, ¼-inch, fine or coarse)
Sand paper
Drill

Materials:

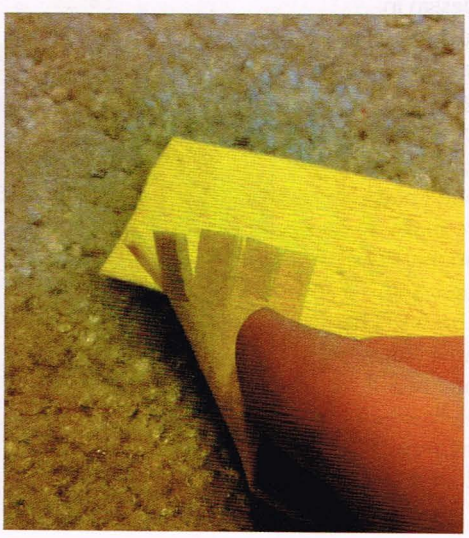
(1) 18-inch (46-cm) aluminum rod, ¼-inch diameter
(2) nuts, ¼-inch (use same thread pattern as the die you used)
(2) flat washers, ¼-inch I.D., ¾-inch O.D.
(2) external tooth lock washers, ½-inch I.D.
(1) thread protector, ¼-inch
(1) Shammy cloth

1. CUT THE ALUMINUM ROD

Gather all of the tools required for this build, which can be found in the picture to the left. Using the tube cutter, cut your aluminum rod to the desired length. I made mine about 18 inches (46 cm) long, which is long enough to reach the bottom of a glass carboy without being too long. You just need to score the rod enough to bend it with your hands. Clean up the new end with sandpaper to remove any sharp edges.

2. THREAD ONE END OF THE ALUMINUM ROD

While holding the rod with your vice grips, cut threads on one end. You'll need to thread about 1-1 ¼-inch (2.5-3.2 cm) of one end of the rod. The aluminum cuts very easily so you should be able to do it without cutting oil or lube for this small task.

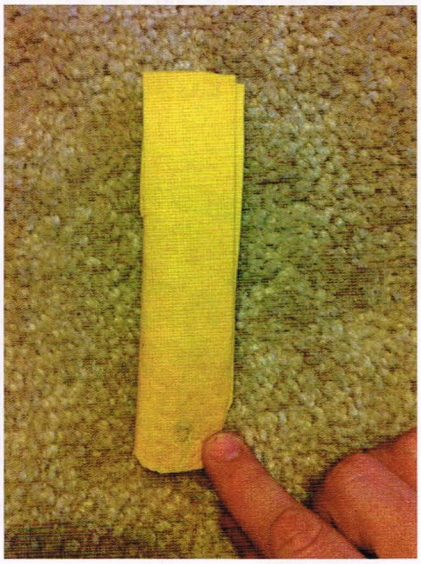


3. CUT SLITS AT END OF CLOTH

Cut and shape the Shammy. You will not use the whole Shammy, just cut at least 4 strips, roughly 4 inches by 7 inches (10 cm by 18 cm). Once you've got your strips of Shammy cloth cut, fold each in half lengthwise and feather one end by cutting several ½-inch to ¾-inch (1-cm to 2-cm) slits with your scissors.

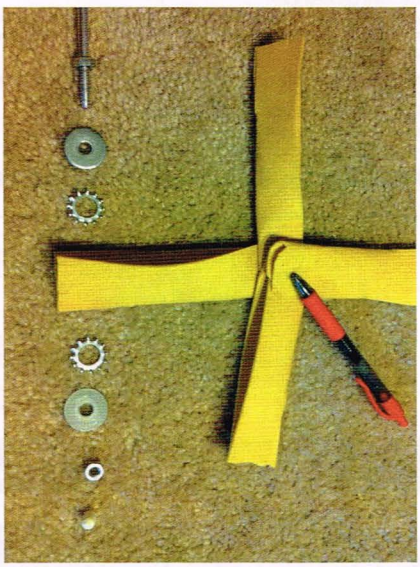
4. CUT HOLE AT THE OTHER END TO SLIDE CLOTH ONTO ROD

Round off the other end of the folded over Shammy by cutting the corners and then poke a small hole, approximately ½-inch (1 cm) from the rounded edge, so you can slide it over the rod. Repeat this step for all four strips and set them aside for use in a moment.



5. ASSEMBLE YOUR CARBOY CLEANER

Assembly time! Start by threading on one nut, then the flat washer, and then the lock washer. Add all of the Shammy pieces in some sort of a symmetrical pattern to aid in balance. I had four pieces of Shammy, so a cross pattern suited my application just fine. Place the other lock washer on top and finish the stack with the flat washer and nut. The very last thing to put on is a thread protector. This isn't just for aesthetics; it will prevent the sharp aluminum threads from contacting and etching the glass on your carboy. The picture to the right shows the order of assembly.



6. PUT IT TO USE

Make sure the Shammy is damp. Add one gallon (3.8 L) of warm water and OxiClean (or your cleanser of choice) and gently lay your carboy on its side. Put your new carboy cleaner in the carboy and attach the other end to your drill. Run your drill on its lowest setting to prevent the Shammy from just wrapping around the aluminum rod. Periodically roll the carboy to ensure the entire kräusen ring is exposed to the cleaner. BYO

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OG: 1.053 FG: 1.012 ABV: 6.6% ABW: 5.3% IBU: 35 COLOR(L): 8

DESCRIPTION: Recipe designed and brewed by Colby Chandler of Ballast Point Brewing Co. White Labs donates 19¢ per vial sold to the charity Beer for Boobs for the month of October. **Recipe for 5 US gallons (19L)**

QUANTITY	INGREDIENTS	COMMENT
8 lbs	Briess 2-Row Brewers Malt	
1 lb	Briess Bonlander® Munich Malt	
0.5 lb	Briess Caramel Malt 20L	
1 oz	Galaxy Hops (13.0%AA hop)	60 min boil
1 lb	Orange Blossom Honey	Prior to Knockout
1.5 lbs	Oregon Fruit Products Cherries	Day 3
0.25 oz	Hibiscus Flowers	Day 4
1 oz	Fresh Lime Juice	Day 4
1 vial	White Labs WLP005 British Ale Yeast	
1 capsule	Servomyces Yeast Nutrient	10 min boil

BREWING PROCEDURES:

1. Mash grains at 148°F for 60 minutes
2. Heat to 170°F 3. Lauter
4. Boil with bittering hops for 60 minutes
5. Prior to knock out, add and stir well to dissolve honey without overcooking
6. Cool to 66°F, oxygenate wort
7. Pitch 1 vial WLP005 British Ale Yeast
8. On day 3 of fermentation add cherries
9. On day 4, make a tincture of hot water, lime juice, and hibiscus, flower then add to beer

FERMENTATION:

Primary: 2-3 weeks at 66°F Day 3: Add Cherries Day 4: Add Tincture
Secondary: 2 weeks (preferably at 36°F) Bottle condition with cane sugar or force carbonat

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OG: 1.062 FG: 1.016 ABV: 5.9% ABW: 4.8% IBU: 25 COLOR(L): 19

DESCRIPTION: This recipe packs in eight trade-marked Briess malts. Fermented and hoped as an Oktoberfest it is set apart by its distinct nutty and subtle roasted character. **Recipe for 5 US gallons (19L)**

QUANTITY	INGREDIENTS	COMMENT
5 lbs	Briess Goldpils® Vienna Malt	
3.5 lbs	Briess Ashburne® Mild Malt	
2 lbs	Briess Bonlander® Munich Malt	
0.5 lb	Briess Carapils® Malt	
10 oz	Briess Victory® Malt	
6 oz	Briess Caracrystal® Wheat Malt	
5 oz	Briess Carabrown® Malt	
0.5 oz	Briess Blackprinz® Malt	
1.5 oz	Hallertau Tradition (7.0%AA hop)	60 min boil
0.5 oz	Hallertau Taurus (14.0%AA hop)	20 min boil
0.5 oz	Hallertau Taurus (14.0%AA hop)	5 min boil
2 vials	White Labs WLP820 Oktoberfest/Märzen Lager Yeast	
1 capsule	Servomyces Yeast Nutrient	10 min boil

BREWING PROCEDURES:

1. Mash grains at 148-152°F for 45 minutes
2. Heat to 170°F
3. Lauter
4. Boil with bittering hops for 40 minutes
5. Add second hop addition, boil 15 minutes
6. Add third hop addition, boil 5 minutes
7. Cool to 54°F, oxygenate wort
8. Pitch 2 vials WLP820 Oktoberfest/Märzen Lager Yeast

FERMENTATION:

Primary: 2-4 weeks at 54°F • Secondary: 1 month at 36°
Force Carbonate or Bottle Condition with ¼ pack of WLP82

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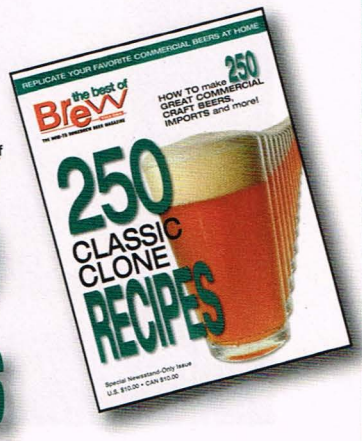

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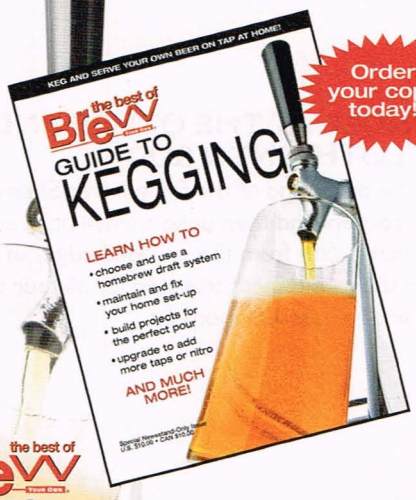

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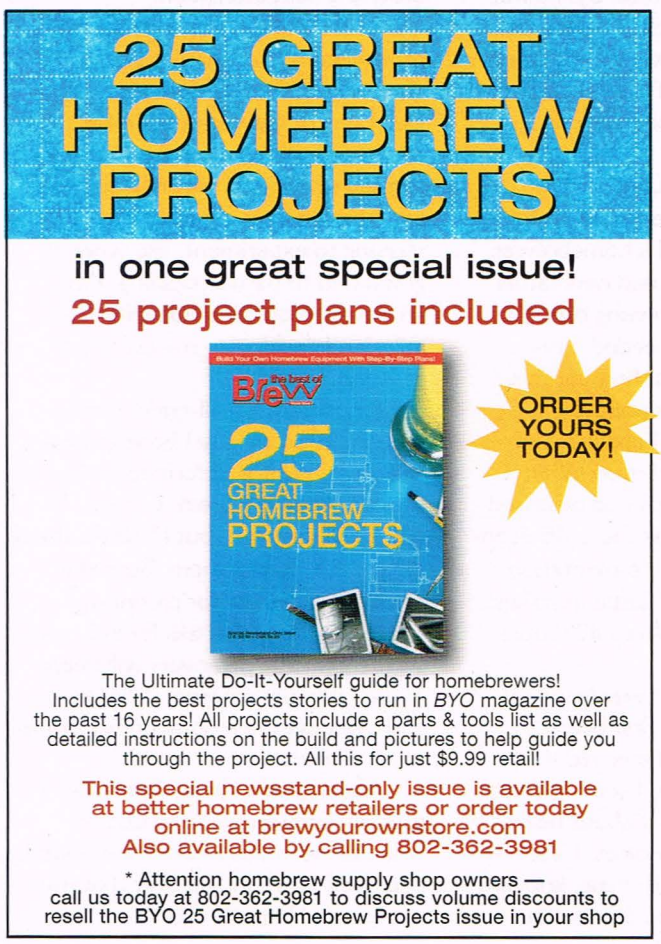


last call
by Shawn E. Marchese

Brewing & Parenting

Father channels his inner-homebrewer

In April, I became a father. Before my son was born, my wife and I read countless books and websites to learn the "right" way to parent. It was like starting a new hobby, like I did before my first homebrew. When Lucian finally arrived, I consulted those resources constantly. Was he eating enough? Was I holding him correctly? Did I really have to stick the thermometer *there*?

Uncertain and exhausted, I sometimes made little mistakes. That's normal, but in the middle of the night with your ears ringing from a baby's cry, the smallest mistakes seem huge. Occasionally when I couldn't calm him, I worried that I was ruining him forever.

Then one night, Lucian wouldn't stop crying. We tried every trick we knew with no success, growing more exhausted and desperate. By 4 a.m., I was a nervous wreck. And for just a moment, I wished I were somewhere else. Back in time. Off in space. Someplace sunny with good beer on tap would be nice.

That sudden thought of beer awoke something deep in me, reminding me that I was still a homebrewer, not just an overwhelmed new father. Memories of homebrewing brought the mental escape I needed. I remembered my earliest homebrews, when everything was unfamiliar. When I read Charlie Papazian and John Palmer over and over. When I searched online for tips and obsessed over every detail. Was the LME evenly dissolved? Was my fermentation temperature perfect? Little mistakes seemed huge. I wondered if I would ever get it right.

I know now that I was learning from experience. My first beers weren't perfect, but I enjoyed them because I made them. I soon realized that homebrewing isn't about being "right," but making choices. I learned to be comfortable with mine, knowing my beer would be fine despite the occasional little mistake.

Lucian's cry brought me back to reality, and I looked down at him. That's when it hit me: parenting is like brewing a person.

Sure, it's a bigger commitment and the stakes are higher, but both involve a similar mix of careful control and blind faith. Brewers make wort and create the best fermentation conditions possible. Parents lay the groundwork for the best life we can give our children. But at some point, you have to leave it up to factors you can't completely control: The yeast you pitch, or the free will of the little human being you made.

Then I remembered the famous words of Charlie Papazian: "Relax. Don't worry. Have a homebrew." So I did. Well, I relaxed and stopped worrying at least. I drank the homebrew the next afternoon.

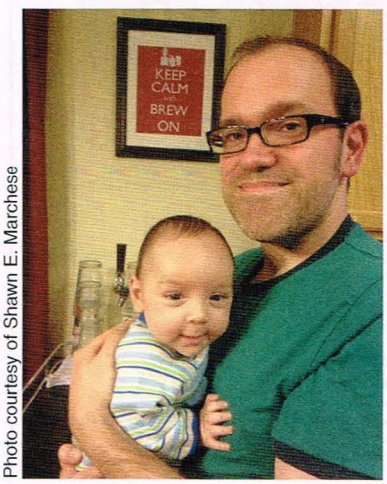
And I realized that with a little modification, Papazian's mantra is great advice for parents too: Relax. Don't worry. Be with your child.

Months later, it's getting easier. I can tell a hunger cry from a diaper cry, and I can turn it into a smile. I'm starting to experiment, like when I graduated to partial mashing. I'm improving processes, adjusting variables and developing my own style as a dad.

I'm already an all-grain homebrewer, but someday I hope to be an "all-grain" parent. Informed and experienced, I'll rarely break a sweat. I'll still make mistakes, but I'll shake them off and learn from them. Someday, friends will beg me for parenting advice like they now ask for beer recommendations. Strangers will heap praise upon my paternal skills like gushing judges at a homebrew competition. *Someday.*

And someday years from now, I'll pass my knowledge on to Lucian when he becomes a dad. Maybe when I do, we'll be sharing a beer that my son brewed himself. BYO

> "Lucian's cry brought me back to reality, and I looked down at him. That's when it hit me: parenting is like brewing a person."



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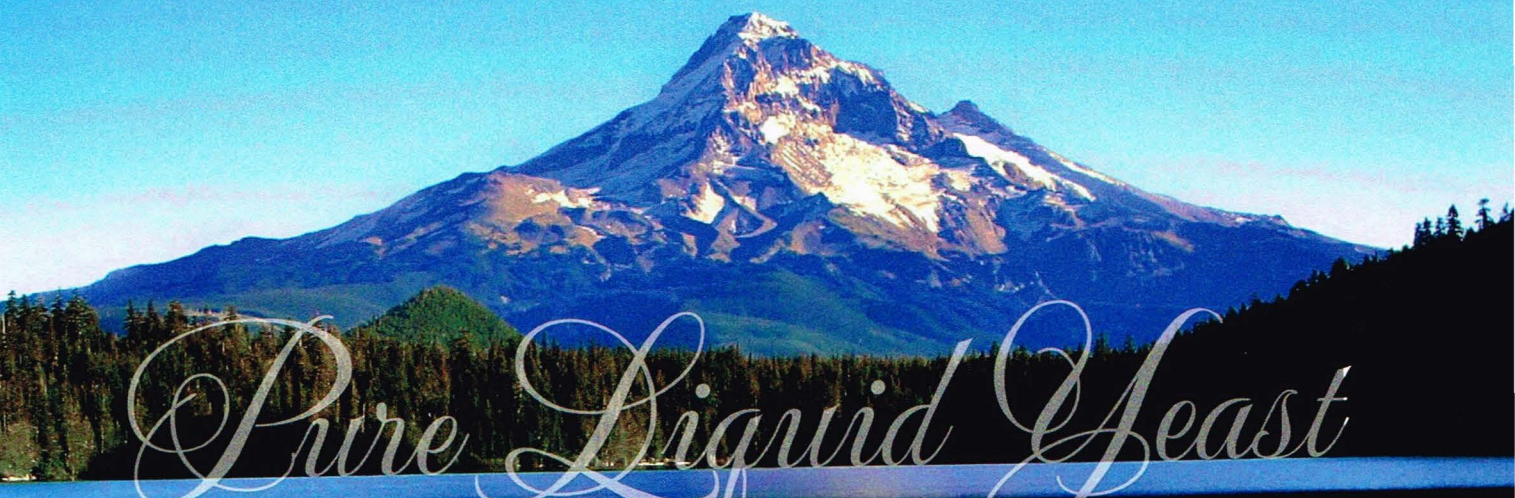

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