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THE HOW-TO HOMEBREW BEER MAGAZINE

JULY-AUGUST 2010, VOL.16, NO.4

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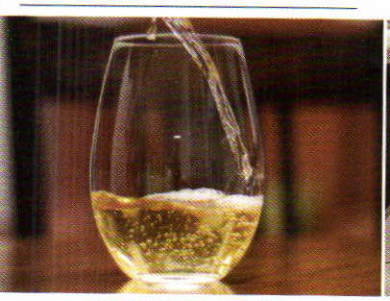

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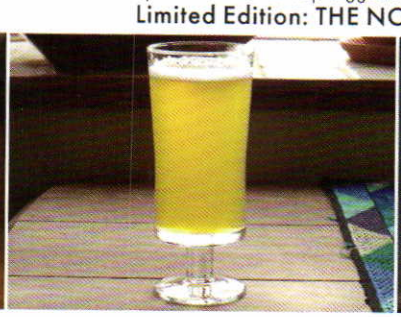

Kinderweisse
extract: #0310
all-grain: #0314

(Pseudo-Pils)
Victorious Primo
extract: #0320
all-grain: #0324

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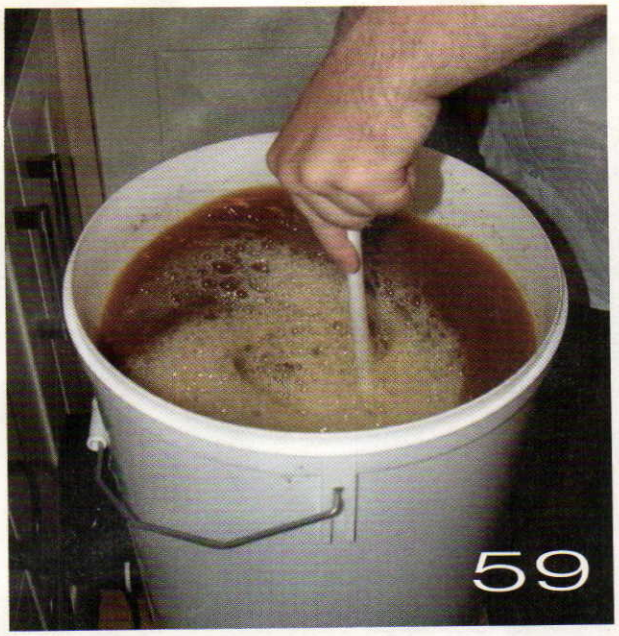

departments

where to find it

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BYO RECIPE STANDARDIZATION

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

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

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

Hops:
We calculate IBUs based on 25% hop utilization for a one hour boil of hop pellets at specific gravities less than 1.050.

what's happening at **BYO.COM**

Label Winners Past & Present

If you enjoy designing your own homebrew labels, including this year's winners on page 32, check out our online gallery of past winners. The best of the best from our annual contest!
www.byo.com/photos/category/1

Brew Gluten Free

Brewing all-grain - or even extract, is possible for celiac-intolerant beer lovers. Read about some grains and extracts that are suitable for gluten-free fanatics.

www.byo.com/component/resource/article/702

Go Easy

If you're just starting your first batches of homebrew, check out this list of the ten easiest beer styles to get started.
www.byo.com/component/resource/article/1491

Cover Photo: **Charles A. Parker**

Brew Your Own — THE HOW-TO HOMEBREW BEER MAGAZINE

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Volume 16, Number 4: July-August 2010.

mail

The decimal point was "just a bit outside"

The recipe for Zea Mays Hayes step by step calls for "0.5 oz. (14 g) of 6-row malt" but the article says "roughly 10% of the grits mixture is malt by weight." Since your recipe uses "3 lb. 6 oz. (1.5 kg) corn grits", I suspect you intended to say "5 oz. of 6-row malt." (Either that, or you really meant to say "roughly 1% of the grits . . . ")

Excellent article, by the way.

David Burton
via email

In the recipe for Zea Mays Hayes (from the story "True Grits," in the May-June 2010 issue), the amount of 6-row to mix with the grits is indeed off by a factor of 10. It should have been 5 oz. (0.14 kg), but it somehow got changed to 0.5 oz (14 g). Thanks for pointing this out and sorry for the confusion.

The point of adding crushed 6-row to the grits is so amylase enzymes from the malt can degrade some of the starches from the corn as they are heated to a boil. Remember however, until the grits are past their gelatinization temperature — which is above normal mash temperatures — much of the starch will be inaccessible to the enzymes. So, at the stage where the grits are cooked, only some of the starch is degraded. But, it can be enough to reduce the viscosity of the grits mixture. In a commercial brewery, this is important because the grits are cooked in a separate vessel and pumped to the main mash. On a homebrew scale, the grits are usually cooked in a pot and dumped into the main mash. So, you'd be better off using 5 oz. (0.14 kg) of 6-row, but — fortunately — if you follow the recipe, you'll simply end up with slightly more viscous grits, which shouldn't cause any major league problems at our scale.

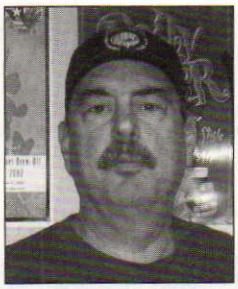
Cartoonish coffee comments

I greatly enjoyed Chris Colby's Duncan Hills Brutal Coffee Porter recipe in the most recent *BYO* (May-June 2010). I would like to add a clarification, for all you folks who like coffee. Real coffee. I suggest using coffee from the hills of Colombia. This will lend the most brutal, albeit intangible, flavors to the beer, as well as being the most "metal."

contributors

Jamil Zainascheff is a "stylish" guy. He has brewed every single style of beer described in the Beer Judge Certification Program's (BJCP's) Style Guidelines, hosted a style-related brewing podcast on the Brewing Network and co-wrote, with John Palmer, the homebrew recipe collection "Brewing Classic Styles" (2007, Brewers Publications). So, it's logical that he is *Brew Your Own*'s "Style Profile" columnist.

In this issue, on page 19, he explores two related styles — American wheat and American rye. These are clean, dry, thirst-quenching brews and Jamil explains the ingredients and techniques you need to get just the right balance and character in them. And if you want more on American wheat, check out "Tips from the Pros" on page 13 — three pros discuss this refreshing beer style.



Marc Martin lives in the Pacific Northwest — or, as some call it, The People's Republic of Cascadia — and is the "Primary Fermenter" of the Washington homebrew club Plato Republic. The region is home to the two biggest hop growing regions in the US, Yakima Valley and the Willamette Valley. And, as if he doesn't have enough access to American-style hops, Marc also grows his own at his house. Martin is also *BYO*'s "Replicator" columnist. So, when a hoppy new beer style — called Cascadian dark ale or black IPA — arose from the breweries of the Pacific Northwest, who better to get the scoop on the new style? On page 24, Marc describes the symposium he attended, where a draft of the style guidelines was produced and gives three Cascadian clones, based on information he received from style pioneering brewers.

Les Howarth is an industrial research and development scientist from Liverpool, England. His first attempt at an all-grain brew was back in 1979, without the proper equipment, and ended with grain, water, hops and wort spread out all over his mother's kitchen. He resumed brewing extract beers for two years after this, but eventually got the equipment he needed and resumed all-grain brewing. In 2002, he published "The Home Brewer's Recipe Database," a compilation of known ingredients for thousands of commercial beers. The second, updated, edition was released in 2009. Les is also a lifetime member of CAMRA, Britain's Campaign for Real Ale.

On page 48 of this issue, he gives six homebrew clone recipes of CAMRA Champion Beers of Britain based on information from his book.

For those of you who scream for your cream, I suggest adding a pound of lactose. This will make a sweeter beer, but no less brutal, that can be named Wartooth Coffee Porter.

Jason Rich
Kosciusko Kettleheads
Claypool, IN

BYO Editor Chris Colby responds: "You could indeed add lactose and add a sweet edge to the beer, if desired. However, if you are prone to slipping in and out of diabetic comas, you should avoid this."

[To BYO readers who may be wondering what this letter is about, watching the cartoon Metalocalypse (or searching for "Duncan Hills Coffee" on the internet) will shed some light on the subject.]

What kind of spruce, bud?

In the recipe for Fort George's Spruce Budd Ale (November 2009), are the weights given for the spruce buds dry weights or should I use fresh spruce tips?

Terry Baier
via email

BYO's Replicator Marc Martin responds: "Regarding your question on the weight (dry or wet) of the spruce tips; I contacted the brewer and he reports that they used the tips within a few hours of picking, so the 13 oz. quantity is 'wet weight.'

Thanks for the question — it helps me improve future articles and recipes. Also, any feedback regarding your results with this — or any Replicator batch — would be helpful, too. We are always interested in this type of information."

New to brewing, would like to lager

I am brand new to brewing (two partial grain kit batches under my belt) and have basic equipment. I have been trying to learn as much as possible about brewing as well but there is tons of info out there. I want to brew a light summer beer for the wife and found that most recipes like that are lagers. My basement is unheated and stays between 55 (winter) to 65 (summer). If I brewed a lager beer in the coming month, would the slightly higher than optimal degrees effect the beer greatly? I don't want to purchase a ton of equipment at this point just to brew lagers until I have several batches under my belt.

Tim,
Chicago

If your basement temperatures range between 55 and 65 °F (13 and 18 °C) all year, you'd be better off brewing any lager beers while the temperatures are near their lowest point. Fermenting a lager at higher temperatures will alter the character of the beer.

Specifically, higher temperatures will lead to the production of more fruity esters — aromas that are desired in ales, but preferably kept at low levels in lagers, which are supposed to smell "clean."

You don't need a bunch of extra equipment to brew lagers. You can adjust your fermentation temperature downwards by using the wet T-shirt method of cooling. To do this, simply drape a wet T-shirt over the carboy or bucket, and dip part of the shirt into a reservoir of water (for example, a mason jar filled with water). Water will evaporate from the shirt, cooling the fermenter. The degree of cooling will depend on the relative humidity of your basement. Best case, you might lower your fermenter temperature by 10 °F (5 °C). Water will wick up the shirt from the reservoir, replacing the water that has evaporated. (When using the wet T-shirt method, replace the T-shirt every few days, to prevent the growth of mold.)

Keep in mind you can also get lager-like results by using a clean ale yeast — such as Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 — or a "hybrid" yeast, such as Wyeast 2112 (California Lager) or White Labs WLP810 (San Francisco Lager).

Pilsner

Hi, I am a subscriber to your magazine. I have some questions about your Pilsner Urquell clone recipe (liquid malt version). [This recipe can be found in our new *250 Classic Clone Recipe* special issue.] This is where I'm at — Primary fermentation (bubbling in airlock) ceased after about 4 days, but I let it go for a week and a half just to be safe. Then racked to secondary, let it sit for another week. All between 55-60 degrees. Just added the corn sugar and bottled today. I had a quick taste before bottling and the Pilsner tasted a little watery. I'm a little worried I screwed something up. A few questions: How long do I let it age in the bottle? Do I keep at 55 degrees? Is it normal for it to be a little watery before aging in the bottle?

Not much I can do at this point, but I'm wondering if I'm looking at a lost batch? The instructions were a little vague, in that it just says rack to secondary, wait til beer clears, and bottle. Doesn't really say how long in secondary or how long to bottle. So I'm a little lost especially since this my first attempt at a Pilsner. Any insight would be greatly appreciated.

Doug
via email

Nothing in what you relate indicates that you have a lost batch. You should take the bottles and move them somewhere fairly warm — room temperature or slightly above — and let them carbonate for a week or two, then move them back to 55–60 °F (13–16 °C). Since you bottled after a few weeks, you should condition (lager) them for at least 6 weeks at this temperature. Good luck with your Pilsner Urquell clone. BYO

homebrew nation

BREWER PROFILE

Brewer: James Cumberworth

Hometown/State: Poplar Bluff, Missouri

Years Brewing: 11 (mead and beer combined)

Type of brewer: All-grain

Homebrew Setup (volume, style, efficiency): 70-qt (60-L) dyi modified cooler mash tun, one 7.5-gal. (28-L) kettle, one 4-gal. (15-L) kettle, a kitchen stove, and a coil chiller. Batch sparging. 73 to 75% efficiency. Multiple primary and secondary vessels.

Currently fermenting: Red Horse Rainbow (honey red)

What's on tap/in the fridge: Too much to list.

How I started brewing:
I wanted to make my own mead, which turned into wanting to add malt to my mead, which turned into making my own beer and braggot. I'm not really a beer styles person. In fact, most of my brews usually get about 45 to 60 percent of their fermentables from honey. Unless I am throwing something totally off the wall together, I just cut the base grain of particular kind of beer I like and make up the difference in honey. I really like the taste of honey and I feel it works well with a lot of different beer style flavors. It also gives my brews a unique twist. I also like most of my brews to be big on flavor and alcohol. Besides the honey, I use a lot of spices, fruits and vegetables, and other miscellaneous sugars. Right now I have a big honeyed, spiced, citrused, golden ale going, a honey ale with some rye and caraway, a butternut squash ale, another version of the recipe to the right and another honey red ale going.

PROFILE RECIPE

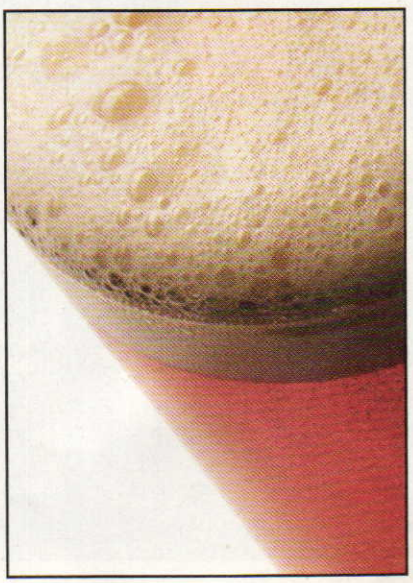
Community Nudity

(5 gallons/19 L, all-grain)
OG = 1.058 FG = 1.015
IBU = 24 SRM = 7 ABV = 5.6%

Ingredients
5 lbs. (2.27 kg) Clover honey
5 lbs. (2.27 kg) 2-row malt
0.42 lbs. (0.19 kg) Carapils® malt
0.10 lbs. (0.05 kg) extra dark crystal malt
4.8 AAU Cascade hops 0.83 oz./24 g 5.75 alpha acids (60 min.)
4.8 AAU Cascade hops 0.83 oz./24 g 5.75 alpha acids (10 min.)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast
Bottle with honey as the primer if bottling.

Step by step
This is a single infusion mash at 154 to 155 °F (68 °C). Add hops to the boil as per the ingredients. Add 2.5 lbs. (1.13 kg) of honey for 60 minutes in boil. Add the other 2.5 lbs. (1.13 kg) of honey after the burner is turned off.

Extract option
Replace 2-row and Carapils® malts with 2.75 lbs. (1.25 kg) light liquid extract and 0.83 lb. (0.37 kg) light dried extract. Steep crystal malt for 30 minutes at 158 °F (70 °C). Add extract to the boil and follow the same boil schedule as the all-grain recipe.



byo.com brew polls

How do you most often package your homebrew?

Bottles 57%
Kegs 43%

what's new?

New Malt from Briess

MALTSTER'S RESERVE SERIES

The second malt in Briess' Maltster's Reserve Series, Carabrown® Malt (55 °L) is available now through mid summer. Carabrown® is a smooth and clean tasting malt that begins with a slightly sweet malty flavor and finishes with toasted flavors. It contributes light brown and orange colors.

www.BrewingWithBriess.com/Products/SeasonalMalts.htm

Brewing TV Premieres

Brewing TV is a weekly webcast, presented by Northern Brewer, covering homebrew culture coast to coast. Devoted to presenting homebrewing as fun, accessible, and interesting, BTV's approach is to be newsy, humorous, and lightly technical and the focus will be on "who, what, why" and not "how."

www.brewingtv.com

BREWINGTV

calendar

July 3
Athens, Ohio
Deadline: Ohio Brew Week Homebrew Competition

Ohio Brew Week invites homebrewers to enter beers in this year's AHA/BJCP certified homebrew competition taking place Saturday, July 10th. Entries will be accepted between June 26 and July 3. The registration deadline is June 26. The entry fee is $7 for the first beer, $5 for each additional beer. Register at: www.HordsOfFun.Com/hbc.rw/regwiz.aspx?w=0305111B19. More information is available at www.ohiobrewweek.com/homebrew.html

July 31
Fox, Alaska
E.T. Barnette Homebrew Competition

Entries for the 14th annual E.T. Barnette competition will be accepted from July 12 through July 28. Judging will take place on Saturday, July 31st. Entry fee is $5 per entry. More information as well as entry and bottle ID forms may be found at www.mosquitobytes.com/Den/Beer/Events/Events.html. Any questions or those interested in judging can contact Scott Stihler at stihlerunits@mosquitobytes.com or (907) 474-2138.

August 20
St Paul, Minnesota
Minnesota State Fair Home Brewed Beer, Mead and Cider Competition

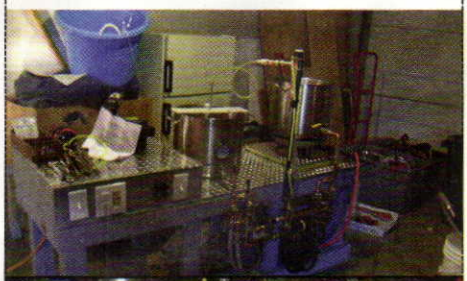
The Minnesota Home Brewer's Association (MHBA) and the St. Paul Homebrewer's Club are pleased to announce the annual AHA/BJCP sanctioned homebrew, mead and cider competition in conjunction with the Minnesota State Fair. Online registration takes place between July 21 and August 13. Registrations after August 13 will not be accepted. For additional info, please visit the MHBA website, www.mnbrewers.com.

> "As the level gets low I spray some more water in the bucket so I don't miss any of that good sugar! (If I don't, the pump will go dry and I will lose about a cup of wort . . ."

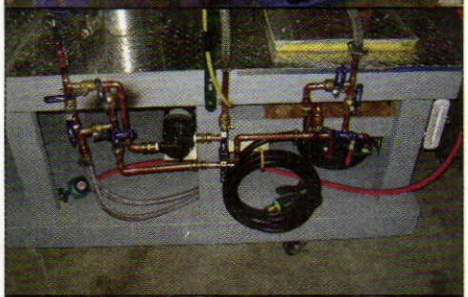
homebrew drool systems

RIMS System

edwin farr • blakeslee, pennsylvania

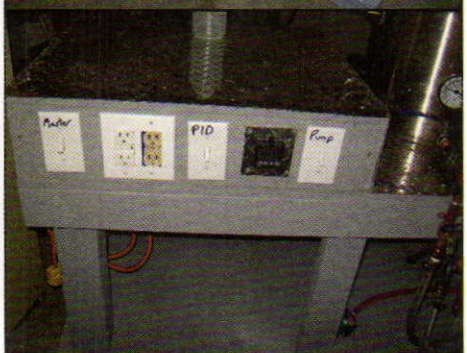


The main component of Edwin's system that makes it different is that it only has two vessels, can be continuously sparged and works off one pump for the whole system.



The system has a backwash function in the event of a stuck mash. The whole setup cost about $800 in materials to design and build (although he already had the pots and burner).

"I mash by adding heated water in kettle and preheat the mash tun. Then I add grains, stir and start recirculation with a PID controlled heat stick. You can step mash but you can only go up 2 °F (1 °C) per min with my current heat stick," he said.



The pump is a March and can be restricted with the shut off valves on the output side of the pump. "Once all the sparge water is in the mash tun, I turn off the PID and pump and drain the rest of the wort into a bucket."

"I use pump and hoses going into brew bucket to pump wort back into the kettle. As the level gets low I spray some more water in the bucket so I don't miss any of that good sugar! (If I don't, the pump will go dry and I will lose about a cup of wort — not a big deal but I like to get it all)."

hop profile

WILLAMETTE

Willamette hops are a triploid seedling of the English Fuggle variety of hops that were developed in the United States and released in 1976. They have a mild and pleasant aroma that is slightly spicy, fruity and earthy. They range in alpha acids from 3.5 to 6% and are most often used as aroma hops. Willamette actually has the most acreage grown in the US for an aroma variety. Great for pale ales, ESBs, Bitters and English-style ales, as well as porters and stouts. Possible substitutes include Styrian Golding, US Fuggle and US Tettnanger.

we WANT you

Share your tips, recipes, gadgets and stories with *Brew Your Own*. If we use it, we'll send you some *BYO* gear!
Email our editors at **edit@byo.com**

beginner's block

STEEPING MALTS

by betsy parks

After a few basic brews, many homebrewers move on to more complex recipes. And when recipes get more advanced, the practice of steeping grains inevitably comes up. Not all brewing grains can be steeped, however. Learn the difference between steepable grains and grains that need to be mashed.

Steep vs. mash

Extract brewers steep grains to add complexity to their beers that cannot be achieved with extract alone. For instance, adding caramel malts for sweetness, or dark roasted malts for bitterness. The steeping process is simply adding grains (sometimes crushed) to water to extract the flavors and colors of the grains.

Mashing, in contrast, is a process of soaking grains in hot water to activate their starch-converting enzymes, which provides the main supply of sugars for your yeast to ferment.

The category of steeping malts includes both grains that have been stewed during the malting process, as well as grains that have been kilned at high temperatures. For example, crystal malts are the most commonly steeped grains. Crystal malts are steepable because they are stewed during malting and then kilned to colors ranging from 10 to 180 °Lovibond, which converts most of the starches in the grain.

Some grains, on the other hand, are not stewed or highly kilned. These grains must typically be crushed and then soaked in hot water to convert the starch to sugar — the process known as mashing. If these grains don't go through this process, the starches will be released into the wort and cause haze, starchy flavor and can encourage bacteria or wild yeast strains. These grains are also commonly known as base malts.

How to steep

In his book, *How to Brew*, John Palmer describes steeping grains much like making tea. Soak the grains in hot water — usually in the 150 to 170 °F (65 to 77 °C) range for about thirty minutes, or according to your recipe's instructions. The best way to do this is to use a mesh or muslin grain bag, which is available at most homebrewing suppliers. When you are finished steeping, take the grain bag out of the water and let the excess water drip back into the pot — don't squeeze the bag as it can add excess tannins from the grain husks. You will then add the steeping liquid to your extract wort according to your individual recipe.

Here is a breakdown of which grains to steep and which should be mashed:

Steeping grains	Mashing grains
Crystal malt (10-180 °L)	2-row or 6-row pale malt
Caramel malt (10-120 °L)	2-row or 6-row pale ale malt
Biscuit/Victory malt	2-row British pale ale malt
Dextrin malt	Amber malt
Special B malt	Rye malt
Chocolate malt	Wheat malt
Black patent malt	Pilsner malt
Aromatic malt	Vienna malt
Melanoidin malt	Munich malt
Coffee malt	Rauchmalz
Honey malt	
Debittered black malt	
Roasted barley	
Roasted wheat	
Roasted rye	

by marc martin

DEAR REPLICATOR,

Growing up and attending college in Minnesota my main exposure to beer was brands like Grain Belt, Schmidt, Schlitz and Pabst. I thought all beers tasted pretty much the same and wasn't particular about which one to drink. In the early 90s a job offer relocated me to southern California and I made two big discoveries — beers could have marvelous flavors (I've become a hop head) and you could brew them at home! This winter a buddy of mine came out to visit to escape the cold winter and brought four cans of a beer called Furious from the Surly Brewing Co. Whoever the brewer is he must have come from the West coast because this beer is hopped higher than many of the IPAs out here. Wow, what a beer! It's a "hop fix" in a can. I am hoping you can talk to someone at Surly and get the recipe so I can duplicate this wonderful brew.

STEVEN PETERSON
SAN DIEGO, CALIFORNIA

Steven, your request is one of the easier ones I have had to fulfill. Coincidently, I flew to Minneapolis to visit a friend this past September. He shares my love of good beers and we devoted a day to touring three of the local breweries. I was familiar with the Surly Furious and made sure that brewery was one of our stops. There we met the owner, Omar Ansari, and the head brewer, Todd Haug. This made for an easy follow-up phone contact to get the details on Furious.

Omar gave me the background of his experience plus the origins of the brewery and then routed the call to Todd for the brewing information.

Omar's infatuation with flavorful beers began at age 14 during a trip to Munich and the Hofbräuhaus with his mother. This experience stuck with him and he vowed that some day he would make good beer too. He received a homebrewing kit as a gift in 1994, which became the start of his dream. His first batch of extract red ale was a success and he was hooked. With two major suppliers (Northern Brewer and Midwest Supply) in his backyard, quality supplies were readily available. He graduated to brewing all-grain batches and purchased larger equipment. Soon he had outgrown his garage and needed more room. His parents owned an industrial abrasives company in a warehouse district and this spot became the new home for his ½-barrel system. He began to envision a full-fledged brewery and decided that he needed an advanced brewing education. After attending the American Brewers Guild, he spent a week at the Otter Creek Brewery in Vermont and an apprenticeship at New Holland Brewing in Michigan.

Omar met Todd Haug at the 2004 Craft Brewers Conference. Todd was brewing for the Minneapolis Rock Bottom Brewery and had a lot of brewing experience, including completing some Siebel Institute courses, brewing for five years at Summit Brewing and for ten years at Rock Bottom. Omar related his vision of a new brewery and soon convinced Todd that he should be a part of it. After a year of converting the industrial space and adding an office and tasting room, the facility was ready. They located a 30-barrel system in the Dominican Republic, and after much international paperwork wrangling it arrived. Soon after, in February of 2006, the first beer was produced. Since then growth has been phenomenal. Last year's production was 9,000 barrels and projections are for 13,000 this year. Current distribution of kegs and cans is limited to Minnesota, western Wisconsin, Chicago and Sioux Falls, South Dakota.

Todd reports that Furious is a hybrid recipe that originated from a more subdued IPA. This is definitely a hop forward beer with an aroma of fruit and pine. The aggressive dry hop additions create a rush of intense hoppiness as soon as the top is popped. A dense, rocky head sits atop a beautiful dark amber brew with garnet highlights. Todd claims that the blend of four hops adds to the complexity of the bitterness profile. This is definitely a hoppy IPA but drinks more smoothly due to a residual caramel sweetness.

Now Steven, you can get your Furious "hop fix" because you can "Brew Your Own". For further information about the Surly Brewery and their other fine beers visit the Web site www.surlybrewing.com or call them at 763-535-3330. BYO

Surly Brewing Company Furious - IPA Clone

(5 Gallons/ 19 L, extract with grains)

OG = 1.060 FG = 1.014
IBUs = 99 SRM = 15 ABV = 6 %

Ingredients

6.6 lbs. (3 kg) Muntons light, unhopped liquid malt extract
1.5 lbs. (0.68 g) Hugh Baird or Simpson Golden Promise malt
10 oz. (0.28 kg) Belgian aromatic malt (25 °L)
12 oz. (0.34 kg) crystal malt (60 °L)
2 oz. (57 g) roast barley (480 °L)
3 AAU Ahtanum hop pellets (first wort hop) (0.5 oz./14 g of 6% alpha acid)
20 AAU Warrior hop pellets (60 min.) (1.25 oz./35 g of 16% alpha acid)
4.8 AAU Warrior hop pellets (2 min.) (0.3 oz./8.5 g of 16% alpha acid)
1.5 AAU Ahtanum hop pellets (2 min.) (0.25 oz./7 g of 6% alpha acid)
2.5 AAU Amarillo hop pellets (2 min.) (0.25 oz./7 g of 10% alpha acid)
3.2 AAU Simcoe hop pellets (2 min.) (0.25 oz./7 g of 12.8% alpha acid)
0.25 oz. (7 g) Ahtanum whole leaf hops (dry hop)
0.25 oz. (7 g) Amarillo whole leaf hops (dry hop)
0.25 oz. (7 g) Simcoe whole leaf hops (dry hop)
0.1 oz. (2.8 g) Warrior whole leaf hops (dry hop)
½ tsp. yeast nutrient (last 15 min.)
½ tsp. Irish moss (last 30 min. of the boil)
White Labs WLP 007 (Dry English Ale) or Wyeast 1335 (British Ale II) yeast
0.75 cup (150 g) of corn sugar for priming (if bottling)

Step by step

Steep the crushed grain in 2 gallons (7.6 L) of water at 153 °F (67 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.8 L) of hot water. Add the liquid malt extract plus the first wort hop addition and boil for 60 minutes. While boiling, add the hops, Irish moss and yeast nutrient as per the schedule. Now add the wort to 2 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer and add the dry hops. Allow the beer condition for one week and then bottle or keg. Allow the beer to carbonate and age for about two weeks and enjoy your Furious IPA.

(Visit byo.com/component/resource/article/2061 for an all-grain option.)

All American Wheat

Brewing wheat beers in the USA

by Betsy Parks

WHAT MAKES A WHEAT BEER "AMERICAN?" THERE ARE OTHER BEER STYLES AROUND THE WORLD THAT MAKE THE MOST OF WHEAT MALT, BUT AMERICAN WHEAT STANDS ON ITS OWN AS A TASTE OF THE STATES. IN THIS ISSUE, THREE BREWERS DISCUSS THE MALTS, HOPS, YEASTS AND TECHNIQUES THAT DEFINE AMERICAN WHEAT BEER.

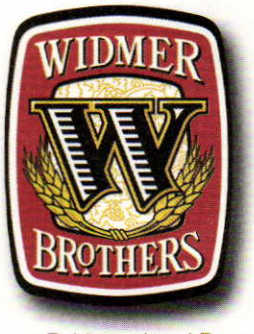
American hefeweizens or wheat beers usually carry no clove characteristics and can have low levels of banana and other fruity esters. American wheat can also run the gambit when it comes to hopping; low to moderate levels of bitterness and aroma, from either American or noble hops.

We use pale two-row barley malt, wheat malt and a touch of Extra Special malt for color in Widmer Hefeweizen. Wheat malt makes up a little less than half of our grain bill. We use a northwest soft white wheat variety called Madsen, which is grown in the Palouse region of Eastern Washington. The barley malt is a blend of three different varieties of two-row, Metcalfe, Kendal and Copeland.

I would recommend a fairly neutral yeast strain in regards to ester and phenol profile for an American wheat. I would keep the temperature of fermentation in the mid to upper 60s Fahrenheit (18 to 20 °C) to dampen ester production.

We use Alchemy (hop blends made for Widmer) for bittering, and Cascade and Willamette hops for aroma. We have been playing around with Citra hops. The Citra hop has an amazing grapefruit aroma. I would also consider Chinook or Crystal.

If you want to make an American wheat at home, there are some other tips to keep in mind. First, use non-flocculent yeast. Second, don't be afraid to grind the wheat finer than the pale malt. Keep your grain bed shallow for lautering and you should be able get by without rice hulls.



Doug Rehberg, Lead Brewer at Widmer Brothers Brewing Co., Portland, Oregon. After graduating from the University of Washington, started dabbling in homebrewing. He started working for Widmer Brothers sixteen years ago as a cellarman and worked his way up to Lead Brewer. He has also completed brewing courses at UC-Davis.

American brewers have learned to use the American wheat style as somewhat of a platform for innovation. From my experience, the best way to stamp the ol' Stars-n-Stripes on a beer style is simply go big, go clean and add copious amounts of Washington-grown hops.

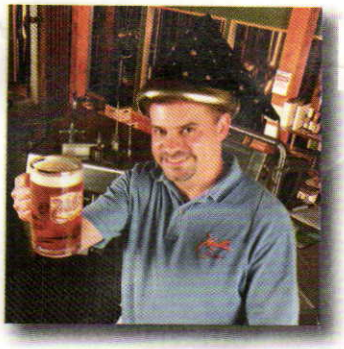
Our American wheat consists of Canadian 2-row malted barley base malt, along with 20–50% American soft white winter wheat, and no more than 5% 60 °L caramel malt. Most of your fermentable sugar will come from the base, while the wheat will provide that "bready" flavor and dry texture. The caramel gives the finished beer that moderate malt back to balance everything out a bit.

Most American ale yeast strains should be suitable for brewing American wheat. I typically prefer strains similar to Chico or PacMan, that is to say a strain with a high rate of attenuation, moderate fruity ester production, with the capacity to clean up any diacetyl production.

I love American wheat brewed and dry hopped with a single variety of American hops. Being a true hophead, I use the Southern Tier Hop Sun to showcase one of my all time favorite hops, Centennial. I would recommend using any dual hop with an aroma that you are fond of — dry hop to let those hops shine!

Good sanitation should go without saying. Keep in mind that American wheat is one of the lightest of all ale styles, and any beer spoiling critters are going to be really easy to taste. Use this style to show off your favorite fruit and spice combination, or spotlight your favorite hop.

Paul Cain, Director of Brewing Operations at Southern Tier Brewing Company in Lakewood, New York. Paul started out at Southern Tier six years ago on the packaging line and is now in charge of their 25-barrel brewhouse and 2,000 barrel cellar.



Ashton Lewis, Master Brewer at Springfield Brewing Company and Process Engineer for Paul Mueller Company in Springfield, Missouri. Ashton is also *BYO*'s own "Mr. Wizard" columnist, and has answered hundreds of brewing questions in his popular column since the magazine launched in 1995. He holds a master's degree in brewing science from UC-Davis.

The primary difference between German weizens and American wheat is the yeast strain used. While Bavarian weizen beer is fermented using an ale strain noted for aromas like banana and clove, American wheat beer is usually fermented with a rather neutral yeast strain. Some brewers use a lager yeast for American wheat, although most consumers assume that all wheat beers are ales. American wheat can also be contrasted to Belgian wit and Berliner Weisse. American wheat has no spices, like Belgian wit beers, and is not sour as is the case with Berliner Weisse.

When I drink our best selling beer, Mueller Wheat, I find that it is extremely refreshing, clean and balanced. To me those are the key attributes of a great American wheat beer. For this style I like a dry beer with a little acidity and a very clean bready aroma flavor from the yeast that remains in the beer.

In order to get the dry, slightly acidic palate we use a blend of 2-row pale malt (50%), malted wheat (40%) and raw wheat (10%). The raw wheat is very easy to use in infusion or step mashes since the starch gelatinizes at normal mash temperatures; in other words boiling is not required to use this adjunct. We use a step mash profile with rests at 50 °C (122 °F), 60 °C (140 °F), 68 °C (154 °F) and a mash-off temperature of 76 °C (169 °F). This gives us very fermentable wort with a gravity of 11.25 °Plato that typically ferments down to 1.8 °Plato.

We use WLP001 from White Labs as our stock ale yeast for most of the ales we brew, including our wheat. I like this strain for several reasons; it ferments reliably, it is very clean, is happy in our brewery and is not too flocculent. Although our wheat is not really turbid it does have a consistent cloud and this yeast helps with the impossible goal of defying gravity. I think other clean strains with medium to high attenuation work well for this beer style.

I don't like American wheat beers that are over-hopped. We shoot for about 14 IBU using Northern Brewer or Perle for bitterness. I like a subtle hop spiciness to complement the slight acidity of our wheat and we use Hallertau Tradition or Liberty for the second and third hop additions. The result is a balanced bitterness and nice spicy note in the nose. BYO

Tasting Fermentation

Higher alcohols, bulk aging

by Ashton Lewis

Q Would you recommend tasting your home brew towards the end of fermentation to see where it's at in the process to ensure quality? Do professional brewers taste along the way?

ZACK ROWLAND
BOISE, IDAHO

A Hmmmm, let me think about this for a nanosecond . . . yes and yes! I absolutely recommend tasting beer while "in process" and professional brewers certainly taste their beer as it moves through the brewery. I could write a book on tasting throughout the process but don't have the space or time for such an endeavor. I will give you a few reasons for tasting while beer is transformed from wort to beer.

The first basic reason for tasting beer before bottling day is to spot problems that can be fixed. For example, if you taste your beer during aging and smell diacetyl or acetaldehyde you can easily respond to this by extending your aging process (assuming that you don't want diacetyl or acetaldehyde in the finished beer).

In contrast, if you filter this hypothetical batch of beer and do so prematurely there is no remedy. Let's say you're brewing a batch of IPA and you have really beefed up the bitterness in the kettle and plan to balance the hop bitterness with a big hop punch from dry hopping. But you messed up and did not add enough hops during aging to get the aroma you desire. The brewer who tastes during the process easily spots the deficiency, adds more hops and ends up with a really nice beer. These are pretty obvious examples; brewing is not so complicated, and if you think of how to use your senses to monitor brewing you will discover all sorts of really good uses, including the application of the most useful of senses . . . common sense.

Another check during process that I like to remind new brewers to keep an eye on is specific gravity. Too, too many homebrew recipes are written in such a way that implies that fermentation happens like clockwork. "Ferment for seven days and transfer to the secondary" — these types of directions really should not be followed literally. If you follow a recipe without doing any tasting along the way your chances of disappointment increase with every key point that is not checked.

Brewers also want to taste along the way to spot problems that cannot be solved. Whether you are a homebrewer or a professional brewer there is no sense in shepherding a batch of beer through the entire process if it isn't good. You want to spot the certain loser as soon as possible and cut bait.

Another consequence of not spotting errant batches is the potential that the cause of the problem was more than bad luck. If you have a systematic problem, like bad yeast, or a problem with your cleaning regimen that recently popped up, you really want to identify the problem and get it solved before you end up with lots of bad beer. This attention to in-process detail is diligently practiced by the world's best brewers — from Anheuser-Busch to Sierra Nevada.

One very real note of caution is not to contaminate your batch by using poor sampling methods. Another thing to be careful about is the temptation to over sample, especially for those batches that are really showing promise. You don't want to wake up to bottle that great batch of IPA only to realize that your yield is a case short!

In conclusion, yes, do taste your beer during fermentation and throughout the brewing cycle and use the data you collect to make decisions to move the beer through the process.

"If you follow a recipe without doing any tasting along the way your chances of disappointment increase with every key point that is not checked."

help me mr. wizard

Q I recently started drinking mead that I brewed and have been aging for about a year. Some friends that I have let try it have mentioned that it smells like nail polish remover. As far as taste goes it tastes good and I would love to keep drinking it, however, I read an article in BYO that mentioned higher alcohols. I understand this process and it is quite possible this is the reason why my mead smells like nail polish remover. So my real question is can I safely keep drinking this mead or is it something I should pour down the drain? More directly, are fermented drinks that have higher alcohols safe to drink?

MATT MILLWARD
TUCSON, ARIZONA

A Before you dump your mead down the drain, please read my answer! The aroma you describe is the distinctive scent of ethyl acetate. This nail-polish smelling compound is the most common acetate ester found in beer for one very simple reason; ethyl acetate is formed during fermentation when ethanol is enzymatically coupled with the acetate moiety of acetyl-CoA (a key intermediate in the EMP Pathway). In general, an ester results when an organic acid and an alcohol combine in a condensation reaction. In fermentation, ester production is catalyzed by enzymes.

Esters are normal to fermented beverages and are responsible for much of the aroma derived during fermentation. Many people do not like beer, wine, mead, sake, etc. that has very strong ester notes. Certainly nail-polish remover is not something I want to take note of when I want to enjoy one of my beers. Other esters include isoamyl acetate, ethyl hexanoate and ethyl heptanoate just to name a few. These compounds contribute fruity aromas such as banana, pear drop, apple and cherry to the nose of fermented beverages. Most people associate esters with fruitiness and not solvents.

Higher alcohols, also called fusel oils, are totally different than esters. The name "higher" alcohol comes from the fact that these

compounds have a higher molecular weight than ethanol, which is the most common alcohol formed during alcoholic fermentation. While ethanol is the result of glucose fermentation by yeast, higher alcohols are primarily the by-products of amino acid metabolism. Higher alcohols are often described as spicy, vinous and alcoholic.

One reason people speak ill of higher alcohols is because when they are present in high levels they lead to headaches and hangovers. During the distillation process it is desirable to remove higher alcohols by controlling which cuts from the still are collected. White distillates, like vodka, should be very pure, and anything collected except ethanol and water is pretty much avoided, although pure ethanol and water mixtures are usually not what you find in most bottles of vodka. Brown spirits like whiskey get much of their aroma from higher alcohols, and producing a super clean distillate is not the goal of these types of distillation operations. Indeed the equipment used, such as pot stills, Armagnac stills and Cognac stills, are not designed to produce pure distillates. So even if your mead was chock full of higher alcohols it still would not be cause for sending it to the sewer.

Higher alcohols can react with organic acids and their metabolic cousins that are attached to coenzyme-A to form esters other than ethyl acetate. Long chain fatty acids (a type of organic acid) are involved in lipid metabolism. When yeast cells are growing they must synthesize fatty acids for the production of cell walls and there is a ready supply of fatty acids attached to coenzyme-A in the cell (coenzyme-A helps move fatty acids through metabolic pathways and catalyzes chemical reactions involving fatty acids). The result is that there is a wide spectrum of esters in beer.

I personally don't like beers that are too rich in esters or higher alcohols. If you study the biochemistry of fermentation you will learn that these compounds are formed when certain pathways become backed up. Without geeking out on pathways, the key thing to note is that it is fairly easy to influence the production of esters and higher alcohols by changing wort oxygen levels, changing yeast pitching rate, changing wort amino acid concentrations, accelerating fermentation rate by increasing temperature and changing wort lipid concentrations; this brief list just scratches the surface of how biochemical pathways can be influenced by the brewer. Meads are known to suffer from nutrient deficiency and this can certainly cause higher than normal ester levels. Many mead makers add yeast nutrients in order to have healthier fermentations. The next time you make mead, consider using a yeast nutrient blend.

My point is that having an understanding of yeast biochemistry has a real practical use when brewing and fermenting. If you want to have a lower ester profile you can help achieve this goal by increasing aeration before fermentation, increasing yeast pitching rate and keeping the fermentation from getting too warm.

Q I have gotten into a habit of aging my beer for two to four weeks after fermentation is finished and the flavor has been good. I brew brown ale, Irish stout and porters. Is this necessary to achieve mellow (not green) flavor?

JESSE CAREY
CONSTANTINE, MICHIGAN

A In my humble brewer's opinion, I believe that aging for extended time periods makes perfect sense if it has a quantifiable affect on beer.

You brew ales that are not real high original gravity styles. Depending on the yeast strain you choose one of the most important things that will happen during the aging of these styles is the reduction of acetaldehyde and diacetyl that form during fermentation. Some British ale strains are noted for their production of diacetyl and their relative difficulty in reducing diacetyl

during aging. My experience with these strains indicates that much of the difficulty with reduction of diacetyl is caused partly by the strong flocculation characteristics of many British ale strains. Since many of these strains are used to produce unfiltered ales that are normally fairly clear, it makes sense that brewers have selected flocculent yeast strains over the years for unfiltered ales.

A good rule of thumb is to keep your ale fermentation at around 68 °F (20 °C) for at least three days following the termination of primary fermentation. After this rest period the beer is moved forward in the process. If you are using a yeast strain that does not reduce diacetyl quickly, however, then you may need a longer rest after fermentation is complete.

By the way, the phrase "diacetyl reduction" is batted about very frequently and new brewers may get the impression that time is responsible for mellowing this flavor. The same impression is tied to acetaldehyde (green apple) reduction. Time alone does not polish the rough notes out of your beer's flavor landscape. Rather, reduction is a biochemical term describing how yeasts metabolize diacetyl and acetaldehyde. Both of these flavor active compounds are found in the liquid beer after fermentation; yeast cells transport these compounds across the cell wall and into the cell. Acetaldehyde is reduced by converting it to ethanol and diacetyl is reduced by converting it to 2,3 butanediol. In the process of reducing these compounds, $NADH + H^+$ is oxidized to NAD^+ and 2 hydrogen atoms are added to each molecule of acetaldehyde and diacetyl, respectively. These reactions regenerate NAD^+ and allow for more carbon to flow through myriad metabolic paths.

While it may seem odd for brewers to focus so much attention on what seems to be a simple reaction, acetaldehyde and diacetyl reduction is arguably the most important reaction that occurs during beer aging as measured in a modern brewery; one that brews beers with typical alcohol levels and that uses some sort of beer clarification device, such as a centrifuge (also called a separator) and/or a filter or filters.

The styles you currently brew could easily be fermented, aged and packaged in three weeks. Add another one to two weeks for carbonation to occur in the bottle and you are ready to drink your beer. If you are in a real pinch you could probably ferment and age in two weeks and keg using force carbonation and be drinking two-week-old beer with a big smile on your face. This is a common time period for many brewpubs. For instance, our number one seller at Springfield Brewing Co. is our unfiltered wheat and it is usually about two weeks old when it goes on tap. Pale ale is our number two seller and it is usually about two and a half weeks old when it goes on tap since we filter it and allow a few extra days for yeast to settle before filtration. BYO

Brew Your Own Technical Editor Ashton Lewis has been answering homebrew questions since 1995. Do you have a question for the Wizard? Send it to wiz@byo.com.

American Wheat/Rye

Refreshing and easy drinking

by Jamil Zainasheff

The other day, my neighbor stopped by and as usual, I offered him a beer. He asked for something "light and refreshing," so I offered him a bottle of a fine commercial American wheat beer. Even though it is an American-style wheat beer, the label says "hefeweizen" and my neighbor balked, "I don't like hefeweizen. I don't like all those weird wheat beer flavors."

I used to try to explain the differences between wheat beer styles and how wheat adds little flavor. Most of the flavor in other wheat-based styles, such as German hefeweizen and Belgian witbier, come from fermentation and other ingredients. Of course, my explanation left most folks with a glassed over look. I think it adds to the confusion when breweries label American wheat beer as hefeweizen. Labeling a beer hefeweizen may even scare some consumers away if they do not care for the characteristic flavors of a hefeweizen. American wheat beer is vastly different from traditional hefeweizen. Yes, the grist is similar, but fermentation and hopping are dramatically different. American wheat has none of the spicy phenols and fruity esters of a hefeweizen and it often has more hop character as well.

Some brewers make the same mistake as many consumers, by assuming that American wheat beer should be similar to German hefeweizen. While this style can have a light fruity character (up to a moderate level of fruitiness), the fruitiness should never be pronounced and banana-like as in a German hefeweizen. As for the spicy phenolic note of a German hefeweizen, there should be none in American wheat. American rye can have a very slight spicy note from the rye, but it is never as strong or clove-like as that which comes from German hefeweizen yeast. Some commercial examples of American wheat include Widmer Hefeweizen from Widmer Brothers Brewing and Mueller Unfiltered Wheat from Springfield Brewing Company in Springfield, Missouri.

American wheat or rye beer should always be easy drinking and refreshing. This is a moderate alcohol beer (4 to 5.5% ABV) with medium-light to medium body and medium to high carbonation. Appearance ranges from straw to light gold and from clear to hazy. Good examples can vary widely from sweet to dry, but they all exhibit some grainy wheat or rye character reminiscent of crackers. The hop flavor and aroma are also variable, with some versions having no hop character, while others have a noticeable citrus, spice or floral flair. While some examples might feature prominent hoppiness, it should not overwhelm the wheat or rye character to the point where the beer drifts into the world of India pale ale. American wheat and rye should be even more balanced, easier drinking, light and refreshing.

The grist for this style is very simple: a blend of domestic two-row, wheat, and sometimes rye. You want the beer to have a subtle bready note, similar to crackers or white bread. One trick that I find useful in this style is replacing a portion of the domestic two-row with continental Pilsner malt (around ⅛th of the total grist). Pilsner malt lends a slightly sweet, grainy malt character to a beer. If you are an extract brewer, use a wheat extract that uses Pilsner malt for the non-wheat portion. A beer like this does not have specialty malts to hide behind, so little tricks like this can stand out in a crowd. When all the other beers at the table have the same malt note, one with a touch of grainy flavor and aroma stands out as more "wheaty." I would not use something like British pale ale malt, but I would consider replacing some of the domestic two-row with domestic pale ale malt. The pale ale malt is kilned a little darker and adds some biscuit notes. If you go this route, keep it to less than ⅛th of the total grist. That is all you need for American wheat. If you are making a rye version, you can swap out rye for wheat in whatever portion you feel is right. I like to replace about half of the wheat with rye, for a subtle spicy rye note and a touch of silkiness to the mouthfeel. If you really want the rye character to stand out, use rye for 50% of the total grist.

Continued on page 21

american wheat/rye by the numbers

OG:	1.040–1.055 (10–13.6 °P)
FG:	1.008–1.013 (2.1–3.3 °P)
SRM:	3–6
IBU:	15–30
ABV:	4–5.5%

American Wheat
(5 gallons/19 L, all-grain)

OG = 1.052 (12.8 °P)
FG = 1.012 (3.0 °P)
IBU = 20 SRM = 4 ABV = 5.3%

Ingredients

5 lb. 5 oz. (2.4 kg) Great Western wheat malt (or similar) (2 °L)
2 lb. 10 oz. (1.2 kg) Great Western American two-row malt (or similar) (2 °L)
2 lb. 10 oz. (1.2 kg) Durst continental Pilsner malt or similar (2 °L)
4.15 AAU Willamette pellet hops (0.83 oz./24 g of 5% alpha acids) (60 min.)
2.25 AAU Centennial pellet hops, (0.25 oz./7 g of 9% alpha acids) (0 min.)
1.25 Willamette pellet hops, (0.25 oz./7 g of 5% alpha acids) (0 min.)
White Labs WLP320 (American Hefeweizen), Wyeast 1010 (American Wheat) or Fermentis Safale US-05 yeast

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 152 °F (67 °C). Hold the mash at 152 °F (67 °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 (24.4 L) and the gravity is 1.040 (10 °P).

The total boil time will be 90 minutes. 30 minutes after the wort starts boiling, add the bittering hops. Add Irish moss or other kettle finings with 15 minutes left in the boil. Add the last hop additions just before shutting off the burner. Chill the wort rapidly to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

Use 9 grams of properly rehydrated dry yeast, two liquid yeast packages, or make a starter. Ferment at 65 °F (18 °C). When finished, carbonate the beer to approximately 2.5 volumes.

American Wheat
(5 gallons/19 L, extract)

OG = 1.052 (12.8 °P)
FG = 1.012 (3.0 °P)
IBU = 20 SRM = 5 ABV = 5.3%

Ingredients

7 lb. (3.2 kg) Briess wheat liquid malt extract or similar (3 °L)
4.15 AAU Willamette pellet hops (0.83 oz./24 g of 5% alpha acids) (60 min.)
2.25 AAU Centennial pellet hops, (0.25 oz./7 g of 9% alpha acids) (0 min.)
1.25 Willamette pellet hops, (0.25 oz./7 g of 5% alpha acids) (0 min.)
White Labs White Labs WLP320 (American Hefeweizen), Wyeast 1010 (American Wheat) or Fermentis Safale US-05 yeast

Step by Step

Mix enough water with the malt extract to make a pre-boil volume of 5.9 gallons (22.3 L) and a gravity of 1.044 (11 °P). 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 bittering hops. Add Irish moss or other kettle finings with 15 minutes left in the boil. Add the last hop additions just before shutting off the burner. Chill the wort rapidly to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. Follow the fermentation and packaging instructions for the all-grain version.

American Rye
(5 gallons/19 L, all-grain)

OG = 1.055 (13.6 °P)
FG = 1.013 (3.4 °P)
IBU = 26 SRM = 5 ABV = 5.5%

Ingredients

5.5 lb. (2.5 kg) Great Western American two-row malt or similar (2 °L)
3.75 lb. (1.7 kg) Briess rye malt or similar (4 °L)
3 lb. (1.4 kg) Great Western wheat malt or similar (2 °L)
3.25 AAU Simcoe pellet hops (0.25 oz./7 g of 13% alpha acids) (60 min.)
3.5 AAU Amarillo pellet hops, (0.35 oz./10 g of 10% alpha acids) (15 min.)
4.55 AAU Simcoe pellet hops (0.35 oz./10 g of 13% alpha acids) (15 min.)
5 AAU Amarillo pellet hops (0.5 oz./14 g of 10% alpha acids) (0 min.)
White Labs WLP320 (American Hefeweizen), Wyeast 1010 (American Wheat) or Fermentis Safale US-05 yeast

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 152 °F (67 °C). Hold the mash at 152 °F (67 °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 5.9 gallons (22.3 L) and the gravity is 1.047 (11.7 °P).

Once the wort is boiling, add the bittering hops. The total wort boil time is one hour after adding the bittering hops. Add Irish moss or other kettle finings and the 15 minute hop additions with 15 minutes left in the boil. Add the last hop addition just before shutting off the burner. Chill the wort rapidly to 65 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

Use 10 grams of properly rehydrated dry yeast, two liquid yeast packages or make a starter. Ferment at 65 °F (18 °C). Carbonate the beer to approximately 2.5 volumes.

Many brewers want to add specialty grains to this style, such as crystal, biscuit, aromatic malts. You should avoid the urge to add specialty grains, as they can add too much sweetness or too much malt character for this style. If you are not getting enough malt character from just domestic two-row and wheat/rye, then you should review your fermentation. Poor fermentation will result in a beer that is "flabby" and it masks the character of the grain. High quality malt is only apparent when you have high quality fermentation. Keep in mind this beer is more about the clean wheat/rye malt character and fermentation flavors so don't hide that with specialty malts. Almost any specialty grain is too much in this style.

American wheat/rye has a medium to medium-light body. All-grain brewers should target a mash temperature around 152 °F (67 °C), which strikes a nice balance between fermentable and non-fermentable sugars. For extract brewers, most light colored extracts will ferment out to the right level. If your extract does not attenuate enough, you should first review your fermentation parameters. Some brewers worry about protein rests when using wheat, but I do not find it necessary. Keep in mind wheat and rye malt is huskless, so if your equipment is prone to stuck mashes, you might want to add a volume of rice hulls equal to the volume of wheat and rye used.

> "While hop character in American wheat is usually restrained, it can range up to moderate levels with a floral, spicy or citrus hop aroma and flavor."

While hop character in American wheat is usually restrained, it can range up to moderate levels with a floral, spicy or citrus hop aroma and flavor. While it is not required, most brewers tend to use less hop character in wheat versions and more hop character in rye versions. You can stick with citrusy American hop character (e.g., cascade, Amarillo, Centennial), but almost any pleasant hop flavor and aroma will work well. My friend Mike McDole likes to use American wheat as a testing ground for new hops. Whatever the hop variety, the clean and easy background of American wheat beer allows the hop character to come through. This is sometimes a problem in making a great American wheat/rye beer. It can be too easy to overwhelm the malt and fermentation character with hops. You want the drinker to still get at least a hint of the wheat or rye character, balanced in there with the hop bittering, flavor

and aroma. A bittering addition at the beginning of the boil is all that is required. If you want more hop character, you can follow it with one or two small additions later in the boil. One or two ¼ to ½ ounce (7 to 14 g) additions per 5 gallon (19 L) batch is plenty. While you can dry hop this beer, be careful that it doesn't send it over the top. Remember, this is not a West Coast pale ale or an IPA. When making this as a rye version, you can go with a bit more hop character. I'm not sure why, but the idea of rye tends to make everyone go with more of everything.

Bittering ranges from subtle to firm. Remember, the goal is to keep the beer refreshing and highly drinkable. If you are making a rye version, the drier the finish, the more the rye character will stand out. Too much or too little bitterness or sweetness can impact drinkability and send the beer into a different style. The bitterness-to-starting gravity ratio (IBU divided by OG) ranges widely, between 0.3 and 0.7, although most brewers will want to shoot for 0.4.

The right fermentation character for this style is clean and neutral. While esters are present, they should not be over the top. Any American-type strain should give acceptable results and even lager yeasts will perform adequately. However, the best choice is the American wheat strains from White Labs (WLP320 American Hefeweizen Ale) and Wyeast (1010 American Wheat). These yeasts provide the right balance of attenuation, have a restrained ester production and give a light crispness to the finish. I have heard that these strains are derivatives of Kölsch yeast and if you cannot source them, a Kölsch strain is an excellent choice. Other American-type yeasts like White Labs WLP001 California Ale, Wyeast 1056 American Ale or Fermentis Safale US-05 provide a decent result, but they tend to lack the subtle fruitiness and refreshing crispness that the American wheat and Kölsch yeasts provide. Whatever yeast you use, remember that your fermentation conditions affect what flavors and aromas the yeast produce. Pitching rate, oxygen level, nutrients, and temperature are like dials on your control panel of fermentation flavor. Starting with a healthy pitch of yeast, aerating or oxygenating, and controlling temperatures is key to getting a well attenuated beer that allows the subtle malt flavors to shine through. With these American wheat yeasts I like to ferment in the mid-60s Fahrenheit. You may find a higher or lower temperature gives you the ideal result, so do not be afraid to tweak the parameters until you get it right. (For some tips from commercial American Wheat brewers, read "Tips from the Pros" on page 13 of this issue.) BYO

Jamil Zainasheff is host of Can You Brew It, *a show about cloning your favorite commercial beers and* Brew Strong. *Both can be found on the Brewing Network (www.thebrewingnetwork.com).*

Web extra:

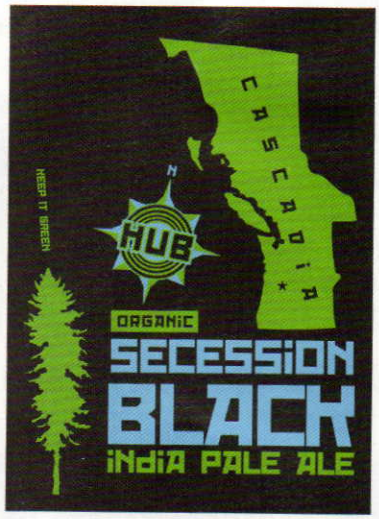
For more information about brewing different beer styles, visit BYO online:

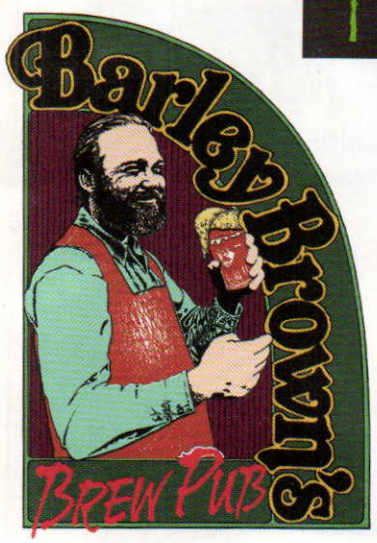
www.byo.com/stories/beer-styles

by MARC MARTIN

BIRTH OF A NEW STYLE

CASCADIAN DARK ALE





Variety is the spice of life. For hundreds of years, wine drinkers have enjoyed many different wine varieties and a vast array of vintages. Beer aficionados, especially those in the US, have not been so lucky. It has only been since the late 70s and early 80s that a wider variety of beer styles have become readily available. We are now blessed with 78 beer styles, many with sub-categories, recognized by the Great American Beer Festival (GABF). Most of these have been around for many years, with fewer styles being recent additions. That is what makes the birth of a new beer style exciting.

This brings us to the great Pacific Northwest, home to vast fields of barley and, of course, the two largest hop producing regions in North America — the Yakima Valley and the Willamette Valley. With the most breweries of any city in the world, it is easy to understand why beer-loving residents refer to Portland, Oregon as "Beervana." What better place for the beginnings of a flavorful new beer style?

On January 23rd, I was fortunate to be invited to a beer symposium to discuss Cascadian dark ale. Seven other beer writers and thirteen brewers gathered at one of the most famous bottle shops in the northwest, Belmont Station, to discuss this new style. The meeting was lead by Abram Goldman-Armstrong, a local beer writer and volunteer point man for promoting this new beer style. Nineteen examples of the proposed new style were present for a tasting and to serve as a basis for evaluating the limits of the style parameters. Industry leaders like Rob Widmer of Widmer Brewing were among the attendees to offer their support and feedback. The plan was to finalize the style descriptors and basic recipe guidelines. Once completed, this information would be forwarded to the Brewers Association (BA), organizers of the GABF, and also to the Beer Judge Certification Program (BJCP) for their consideration.

> “Nineteen examples of the proposed new style were present for a tasting and to serve as a basis for evaluating the limits of the style parameters.”

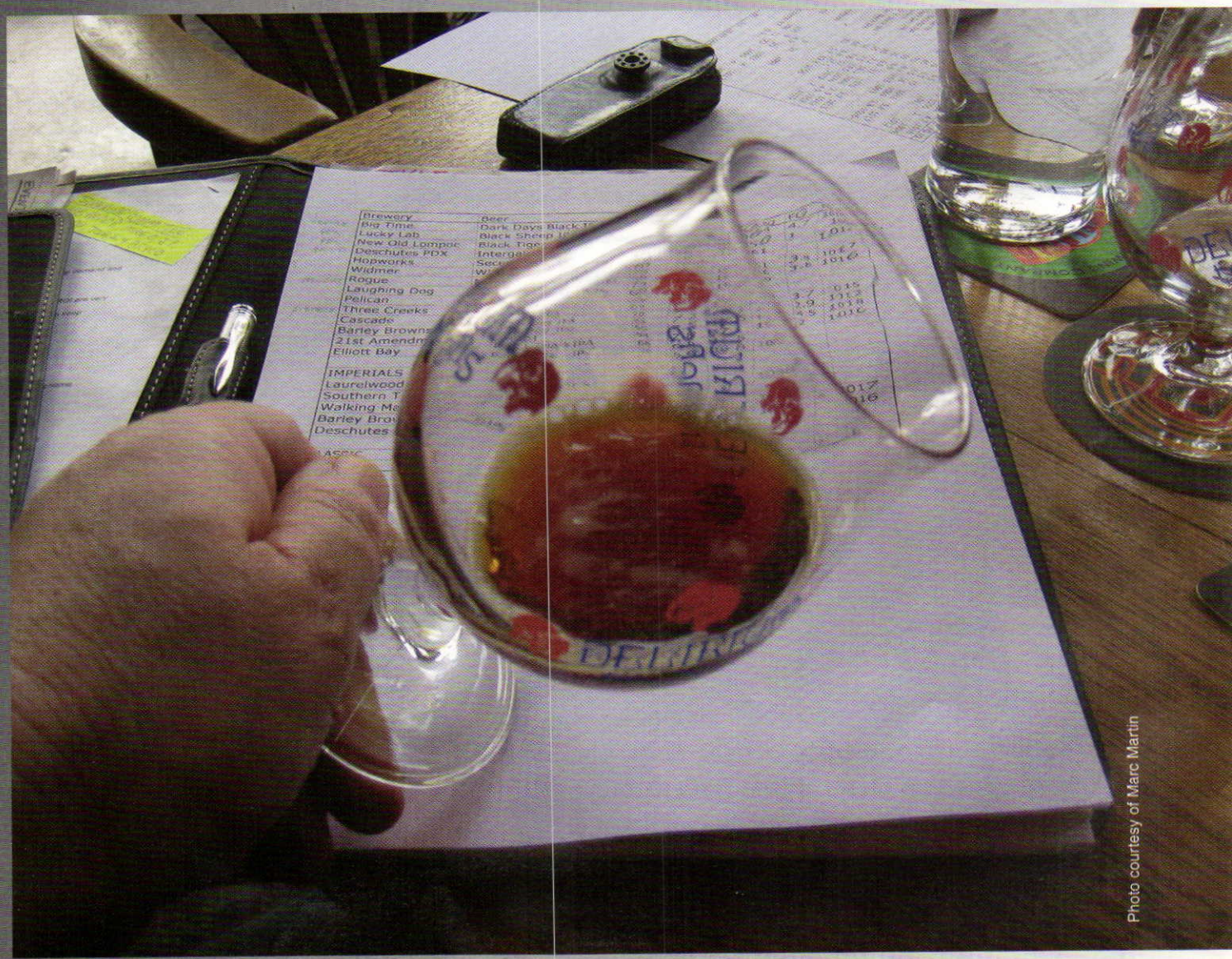


Photo courtesy of Marc Martin

The proposed beer name was Cascadian Dark Ale. The term "Cascadia" is derived from the Cascade Mountain Range. It is used to describe a self-designated region that encompasses British Columbia, Washington, Oregon, western Idaho and northern California. This area, also known as "The Peoples Republic of Cascadia," has been the source of many stories and rumors. There has been talk of seceding from the union in order to protect the hop supply. A Cascadian flag has even been created featuring a tall evergreen tree and three colors, blue, white and green representing blue sky, white capped mountains and green forests.

Who brewed the first version of this style is a point of great debate. Some say Greg Noonan of Vermont brewed one in the early 90s, but this can't be substantiated. What we do know is that the first two widely-known examples came from the Northwest. In 2003, John Maier of Rogue Brewing in Newport, Oregon made Skull Splitter, a black interpretation of his Brutal Bitter strong IPA. About that same time Matt Phillips, owner of Phillips Brewing in Victoria, British Columbia brewed Black Toque which he labeled an India Dark Ale. (Dogfish Head's Indian Brown Ale, a beer with a similar mix of dark grains and extensive hops, has been available since 1999.)

Since then, many dark brown to black beers of IPA proportions have been brewed by Northwest breweries, usually as a specialty beer for a festival. The style gained greater exposure when Widmer Brewing's W-10, also know as Pitch Black IPA, won a gold medal in last year's Great American Beer Festival (GABF). Now this beer is part of their bottled line up and distributed in several states. Probably the biggest indicator of the popularity of this style was that nineteen breweries produced the examples we tasted for this symposium. So, what is so special about this beer?

A quick review of the specifications we proposed will provide your first clue:

Color = 30+ SRM
Original gravity = 1.060–1.080
Final gravity = 1.010–1.016
Bitterness = 50–90 IBU
Alcohol by volume = 6.0–8.5%

Your second clue is a list of the proposed style descriptors:

Aroma – Prominent Northwest variety hop aromas – resinous pine, citrus, sweet malt, hints of roast malt, chocolate and/or Carafa®, can include mild coffee notes, dry hopped character is often present.

Appearance – Deep brown to black with ruby highlights. Head varies from white to tan/khaki.

Flavor – A balance between citrus like and spicy Northwest hop flavor, bitterness, caramel and roast, chocolate, or Carafa® type malts. Any roast character should be subdued. Black malt is acceptable at low levels but should not be astringent. Any burnt character is not appropriate. The finish should be dry with caramel malt as a secondary flavor. Diacetyl should not be present. The main emphasis should be on hop flavor.

Mouthfeel – Light to medium, hop bitterness and tannins from roast malts combine to create a dry mouthfeel. Resinous character from high levels of dry hopping may create a tongue coating sensation.

Comments – Some brewers prefer to cold steep the dark grains to achieve a very dark beer without the tannin contribution of adding these grains to the mash. The use of Sinamar® color extract to enhance the color is common.

What differentiates Cascadian dark ale from a hoppy porter or stout? There are really three main differences. The first would be the basic hop profile. These beers are brewed using traditional IPA bittering, flavor and aroma hops with citrus, spice and floral characteristics. Typical hop selections would be Columbus, Centennial, Chinook, Amarillo, Simcoe and Cascade or hybrids of these like Warrior or Magnum. The second would be the vastly reduced roast malt flavor contributions. The use of debittered Carafa® malts instead of black patent or roast barley. This provides color without the harsher, burnt flavor profiles of robust porters or stouts. And finally, the third is the much drier finish. This is achieved through the use of very little light caramel malts and highly attenuative yeasts.

It should be easy to see that this is a big, dark, hoppy beer of proportions that certainly puts it in a classification of its own. The 19 examples we evaluated had interesting names such as Dark Days Black, Arctic Apocalypse, Black Sheep, Hop In The Dark, and Chaos Imperial Dark. After tasting each one, our panel discussed the

flavor profile to see how they compared. It was agreed that one of the key characteristics of this style was that the dark malts are so subdued that, if you closed your eyes during a sip, you would not suspect that the beer was black. We also noted that the interaction of the debittered dark malts and citrusy Northwest IPA hops like Cascade, Simcoe and Amarillo exposed unsuspected flavors. Some picked up a minty flavor while others used descriptors of herbal and rosemary-like. The professional brewers all agreed that a neutral yeast of the American ale variety was advisable to use.

By the end of the tasting, the guidelines were finalized and Abram forwarded these to the BA and BJCP. In a letter dated February 11th sent from Chris Swersey, competition manager of the GABF, the good news was received. Charlie Papazian had completed the style update for 2010 and included this new style. The name "Cascadian" was deleted as it was felt that non-Northwestern brewers may be turned off to the style if it hinted of regional exclusivity. The accepted name is American-Style India Black Ale. The style descriptors remained relatively unchanged but some of the basic specifications were scaled back. Here are the finalized GABF numbers:

Color = 25+ SRM
Original Gravity = 1.056–1.075
Final Gravity = 1.012–1.018
Bitterness = 50–70 IBU
Alcohol by volume = 6–7.5%

The BJCP does not update their style guidelines yearly, as the GABF does, and Cascadian dark ale has not been accepted as an official BJCP beer style. Unofficial feedback from BJCP officials indicates that, if examples of this beer start showing up at homebrew contests at a reasonable frequency, it could be included in the next style guideline revisions. (If you choose to compete with this style, enter it in Category 23 and describe the beer as a Cascadian dark ale, an India Black Ale or Black IPA.)

Now that you understand the origins of the style, take a look at the recipes to see how to brew one. Remember that you were present for the birth of a new style and now you can be the first in your area to "Brew Your Own" Cascadian dark ale.

Three Cascadian dark clone recipes follow starting on the next page.

RECIPES

Widmer Brewing Co. Portland, Oregon — W-10 Pitch Black IPA

Rob and Kurt Widmer were local Portland, Oregon homebrewers with a big dream. Brew lots of good beer and make money with their favorite hobby. The year was 1984. The brothers, along with other local breweries like Bridgeport and Portland Brewing, helped to start a grassroots brewing revolution that has swept the country. In 2005 they began to brew a special annual beer called the W series. Test batches of several different beers were brewed so Widmer brewers and employees could vote for their favorite. In the spring of 2009, the popular vote went to what would later become the Pitch Black IPA.

Since it is local for me, I stopped down at the brewery to get the details first hand. Rob Widmer was my contact and I discovered that he is still very much in tune with the homebrew scene. Each year they participate in a "collaborator competition" and the winning homebrewer's recipe is brewed on their pilot system as one of the seasonal beers. Rob referred me to two of his lead brewers, Doug Rehberg and Ben Dobler. Both have been with Widmer for over fourteen years and, like Rob, were homebrewers prior to starting at Widmer.

They were happy to share the recipe details and information. This has been the most successful beer of the W series beers. Since its release in January, they have brewed twenty five batches of 230 barrels (7,100 gallons/27,000 L) each. It has become so popular that it will now become a year round product without the W-10 designation. There are plans to enter it in the 2010 GABF.

Ben reports that they use the Sinamar® black extract as a source for some of the color in this beer. For the homebrew recipe, however, he offered a slight recipe modification in which only dark grains are used. They also use a proprietary hop blend called "alchemy," but helped with a very close substitution for homebrewers. Both brewers also recommend a longer boil for full flavor development.

I found this beer to be well-balanced, but with a nod toward the hop side. The roast and dark malt character are well hidden behind a caramel finish. A citrus lemon and orange aroma dominates the nose and a tight tan head hangs to the bottom of the glass.

W-10 Pitch Black IPA clone

(5 gallons/19 L, extract with grains)

OG = 1.064 FG = 1.014
IBU = 65 SRM = 30 ABV = 6.5%

Ingredients

7.75 lbs. (3.5 kg) Briess light, unhopped, liquid malt extract
1.5 lbs. (0.68 kg) caramel malt (10 °L)
12 oz. (0.34 kg) Weyermann dehusked Carafa® II malt (450 °L)
10 oz. (0.28 kg) Briess special roast malt (50 °L)
16 AAU Warrior hops (75 mins) (1.0 oz./28 g of 16% alpha acid)
1.4 AAU Cascade hops (2 mins) (0.25 oz /7.1 g of 5.8% alpha acid)
12 AAU Warrior hops (2 mins) (0.75 oz /21 g of 16 % alpha acid)
0.25 oz. (7.1 g) Warrior hops (dry hops)
0.50 oz. (14 g) Cascade hops (dry hops)
½ tsp. yeast nutrient (15 mins)
½ tsp. Irish moss (30 mins)
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis US-05 yeast
0.75 cup (150 g) corn sugar (for priming)

Step by Step

Steep the crushed grain in 2.0 gallons (7.6 L) of water at 150 °F (66 °C) for 30 minutes. Remove grains from the wort and rinse with 2.0 quarts (1.8 L) of hot water. Add the liquid malt extract and boil for 75 minutes. While boiling, add the hops, Irish moss and yeast nutrient as per the schedule. During the boil, use this time to thoroughly sanitize a fermenter. Now add the wort to 2.0 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5.0 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer and add the dry hops. Allow the beer condition for 1 week and then bottle or keg. Allow the beer to carbonate and age for 2 weeks and enjoy your W-10 Pitch Black Ale.

W-10 Pitch Black IPA clone

(5 gallons/19 L, all-grain)

OG = 1.064 FG = 1.014
IBU = 65 SRM = 30 ABV = 6.5%

Ingredients

10.5 lbs. (4.8 kg) 2-row pale malt
1.5 lbs. (0.68 kg) caramel malt (10 °L)
12 oz. (0.34 kg) Weyermann dehusked Carafa® II malt (450 °L)
10 oz. (0.28 kg) Briess special roast malt (50 °L)
12.8 AAU Warrior hops (75 mins) (0.8 oz./23 g of 16% alpha acid)
1.4 AAU Cascade hops (2 mins) (0.25 oz /7.1 g of 5.8% alpha acid)
12 AAU Warrior hops (2 mins) (0.75 oz /21 g of 16 % alpha acid)
0.25 oz. (7.1 g) Warrior hops (dry hops)
0.50 oz. (14 g) Cascade hops (dry hops)
½ tsp. yeast nutrient (15 mins)
½ tsp. Irish moss (30 mins)
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis US-05 yeast
0.75 cup (150 g) corn sugar (for priming)

Step by Step

This is a single step infusion mash using 10.5 lbs. (4.8 kg) of 2-row pale malt to replace the liquid malt extract in the first recipe. Mix the crushed grains with 4.0 gallons (16 L) of 161 °F (72 °C) water to stabilize at 150 °F (66 °C) for 60 minutes. Sparge slowly with 170 °F (77 °C) water. Collect approximately 6.5 gallons (25 L) of wort runoff to boil for 75 minutes. The 75-minute Warrior hop addition is reduced to 0.8 oz. (23 g) (12.8 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.

Barley Brown's Brewing Co. Baker City, Oregon — Turmoil Cascadian Dark Ale

This was easily my favorite of the nineteen samples as I am a fan of big, hoppy beers. If you want an example of the style that goes to the extreme, this is the one to brew. If you want a brewer that consistently stretches the limits of any beer style, it is brewmaster Shawn Kelso.

Founded in 1998 by Tyler Brown, Barley Brown's is located in far eastern Oregon. He has found that in order to compete with all the Portland breweries, you have to brew big and unusual beers. In spite of the remote location and relatively small brewing system, they consistently crank out some outstanding beers. In fact, their Shredders Wheat beer just received a gold medal

in the American-style wheat beer category at the 2010 World Beer Cup.

Like many professional brewers, Shawn began his beer odyssey as a homebrewer five years prior to coming to Barley Brown's. With no formal brewing education, he has honed his skills and developed recipes to maximize the quality from their four-barrel (120-gallon/454-L) brew house. Many of his bigger beers can only be three-barrel (93-gallon/350-L) batches due to the size limitations of the mash tun. Currently he produces five standard beers in combination with several seasonal and specialty beers. It is not uncommon to find ten of their beers on tap at the brewpub.

Shawn designed his black IPA to exhibit noticeable hop forward qualities. It is easy to see from the aggressive and massive hop bill that he has achieved that goal with five different hops being added at seven separate stages. At 7.9% alcohol by volume and 94 IBU, it pushes some of the style guidelines making Turmoil the extreme example to brew at home.

During my sampling, I noted that even though the numbers are high, it was a smooth, easy drinking beer. In a blind tasting, you would not suspect that this beer is so dark. Any roast notes are so light they are barely noticeable. The nose is dominated by the citrus and spicy profile of the dry hops. While the hop bitterness does dominate, it is not overpowering and gives way to a solid malt backbone. Overall, a prime example of a big India Black Ale to age for a year or two.

Turmoil Cascadian Dark Ale clone

(5 gallons/19 L, extract with grains)

OG = 1.070 FG = 1.010
IBU = 94 SRM = 35 ABV = 7.9%

Ingredients

6.6 lbs. (3.0 kg) Muntons light, unhopped, liquid malt extract
1 lb. 2 oz. (0.51 kg) Briess light dried malt extract
18 oz. (0.51 kg) Weyermann dehusked Carafa® II malt (450 °L)
18 oz. (0.51 kg) Munich malt
8.0 oz. (0.23 kg) crystal malt (40 °L)
12 oz. (0.34 kg) wheat malt
3.0 AAU Columbus hops (first wort hops) (0.2 oz./5.7 g of 15% alpha acid)
1.3 AAU Simcoe hops (first wort hops) (0.1 oz./2.8 g of 12.8% alpha acid)
9.8 AAU Magnum hops (60 mins) (0.7 oz /19.8 g of 14% alpha acid)
6.4 AAU Simcoe hops (60 mins) (0.5 oz /14 g of 12.8% alpha acid)
5.0 AAU Amarillo hops (30 mins) (0.5 oz /14 g of 10% alpha acid)
2.6 AAU Cascade hops (15 mins) (0.5 oz /14 g of 5.25% alpha acid)
2.6 AAU Cascade hops (2 mins) (0.5 oz /14 g of 5.25% alpha acid)
3.9 AAU Cascade hops (0 mins) (0.75 oz /21 g of 5.25% alpha acid)
1.25 oz. (35 g) Amarillo hops (dry hops)
½ tsp. yeast nutrient (15 mins)
½ tsp. Irish moss (30 mins)
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis US-05 yeast
0.75 cup (150 g) corn sugar (for priming)

Step by Step

Steep the crushed grain in 2.0 gallons (7.6 L) of water at 152 °F (67 °C) for 30 minutes. Remove grains from the wort and rinse with 2.0 quarts (1.8 L) of hot water. Add the liquid and dry malt extract and boil for 60 minutes. While boiling, add the hops, Irish moss and yeast nutrient as per the schedule. Add first wort hops (FWH) to your brewpot as you are first heating it to a boil. Now add the wort to 2.0 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5.0 gallons (19 L).

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

Turmoil Cascadian Dark Ale clone

(5 gallons/19 L, all-grain)

OG = 1.070 FG = 1.010
IBU = 94 SRM = 35 ABV = 7.9%

Ingredients

11.5 lbs. (5.2 kg) 2-row pale malt
18 oz. (0.51 kg) Weyermann Carafa® II malt (450 °L)
18 oz. (0.51 kg) Weyermann dehusked Carafa® II malt (450 °L)
18 oz. (0.51 kg) Munich malt
8.0 oz. (0.23 kg) crystal malt (40 °L)
12 oz. (0.34 kg) wheat malt
3.0 AAU Columbus hops (first wort hops) (0.2 oz./5.7 g of 15% alpha acid)
1.3 AAU Simcoe hops (first wort hops) (0.1 oz./2.8 g of 12.8% alpha acid)
7.0 AAU Magnum hops (60 mins) (0.5 oz /14 g of 14% alpha acid)
6.4 AAU Simcoe hops (60 mins) (0.5 oz /14 g of 12.8% alpha acid)
4.0 AAU Amarillo hops (30 mins) (0.4 oz /11 g of 10% alpha acid)
2.6 AAU Cascade hops (15 mins) (0.5 oz /14 g of 5.25% alpha acid)
2.6 AAU Cascade hops (2 mins) (0.5 oz /14 g of 5.25% alpha acid)
3.9 AAU Cascade hops (0 mins) (0.75 oz /21 g of 5.25% alpha acid)
1.25 oz. (35 g) Amarillo hops (dry hops)
½ tsp. yeast nutrient (15 mins)
½ tsp. Irish moss (30 mins)
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis US-05 yeast
0.75 cup (150 g) corn sugar (for priming)

Step by Step

This is a single step infusion mash using 11.5 lbs. (5.2 kg) 2-row pale malt to replace the liquid and dry malt extract. Mix the crushed grains with 19 quarts (18 L) of 163 °F (73 °C) water to stabilize at 152° F (67 °C) for 60 minutes. Sparge slowly with 170 °F (77 °C) water. Collect approximately 7.0 gallons (26 L) of wort runoff to boil for 90 minutes. Add first wort hops (FWH) as you are collecting your wort. Reduce the 60-minute Magnum hop addition to 0.5 oz. (14 g) (7.0 AAU) and the 30 minute Amarillo hop addition to 0.4 oz. (11 g) (4.0 AAU) to allow for the higher utilization factor of a full wort boil. The remainder of this recipe is the same as the extract with grains recipe.

Hopworks Urban Brewery Portland, Oregon — Secession Black IPA

While Christian Ettinger was the brewmaster at Laurelwood Brewing in Portland, he dreamed of owning his own eco-friendly brewpub where he would have full control of the recipes.

That dream became reality in 2007, when he located a vacant bulldozer repair building in an area of town that was becoming revitalized. A year was spent deconstructing and refitting the entire building, incorporating as many environmentally-friendly systems as possible. The result is possibly the greenest brewpub in the nation. Using the waste pizza oven heat for the brewery mash water is just one example of the many innovations used. All the beers are certified organic, as are many of the foods on their excellent menu.

Even though his first love is brewing, the majority of his time is now spent managing what has become

one of the most popular brewpubs in Portland.

Head brewer Ben Love met me at the brewery to provide the details and recipe for their contribution to the new style, Secession Black IPA. After learning an appreciation for quality craft beers at the famous Horse Brass Pub in Portland, he decided that brewing beer might be a viable vocation.

His brewing career began at the now defunct Alderbrau Brewing Co. in Appleton, Wisconsin, where he offered to work for free to get experience. Realizing he needed more brewing education, he completed the American Brewers Guild Brewing Science course. After searching for jobs that would get him back to Oregon, he was hired by Pelican Pub and Brewery in Pacific City. Three years were spent there and the need for a brewer at Hopworks brought him back to Portland, where he now creates unique organic beers on their 20-barrel (620-gallon/2,350-L) system.

Secession Black Ale was originally brewed for the 2009 Portland Organic Ale Fest. It was so popular at that event that they decided to brew it again this past winter. They have now brewed over a dozen batches and also have made it available in bottles. The name references that aforementioned local rumor of "The Peoples Republic of Cascadia" seceding from the union. Unlike many of the other examples of this style, Hopworks uses Pilsner malt as the base malt. Another major difference is that black and chocolate malts are used instead of Carafa®.

This produces a flavor profile that exhibits more roast character than any of the other nineteen examples. Another departure is the use of an English Ale yeast, creating a more fruity finish. As the hop selection and IBU levels are very similar to the others, notes of pine and grapefruit are prevalent in both the aroma and flavor. While bitterness levels would seem high, the residual sweetness of the caramel malt serves as a good balance. A solid, medium tan head with small bubbles holds to the bottom of the glass. While this recipe has some major differences, the beer still fits squarely within the style guidelines.

Secession Black IPA clone
(5 gallons/19 L, extract with grains)

OG = 1.064 FG = 1.014
IBU = 70 SRM = 29 ABV = 6.5%

Ingredients

6.6 lbs. (3.0 kg) Muntons light, unhopped, liquid malt extract
1 lb. 4 oz. (0.57 kg) Briess dried malt extract
1.0 lb. (0.45 kg) Pilsner malt
8.0 oz. (0.23 kg) black barley malt (530 °L)
12 oz. (0.34 kg) crystal malt (60 °L)
4.0 oz. (0.11 kg) chocolate malt (350 °L)
11 AAU Magnum hops (60 mins) (0.8 oz./23 g of 14% alpha acid)
6.5 AAU Mt. Hood hops (30 mins) (1.0 oz./28 g of 6.5% alpha acid)
3.0 AAU Amarillo hops (30 mins) (0.3 oz./8.5 g of 10% alpha acid)
6.4 AAU Simcoe hops (30 mins) (0.5 oz./14 g of 12.8% alpha acid)
3.9 AAU Cascade hops (0 mins) (0.75 oz./21 g of 5.25% alpha acid)
4.0 AAU Amarillo hop pellets (0 mins) (0.4 oz./11 g of 10% alpha acid)
5.1 AAU Simcoe hop pellets (0 mins) (0.4 oz./11 g of 12.8% alpha acid)
0.5 oz. (14 g) Amarillo hops (dry hops)
0.5 oz. (14 g) Cascade hops (dry hops)
0.3 oz. (8.5 g) Simcoe hops (dry hops)
½ tsp. yeast nutrient (15 mins)
½ tsp. Irish moss (30 mins)
White Labs WLP 013 (London Ale) or Wyeast 1318 (London Ale III) yeast
0.75 cup (150 g) corn sugar (for priming)

Step by Step

Steep the crushed grain in 2.0 gallons (7.6 L) of water at 152 °F (67 °C) for 30 minutes. Remove grains from the wort and rinse with 2.0 quarts (1.8 L) of hot water. Add the liquid and dried malt extract and boil for 60 minutes. While boiling, add the hops, Irish moss and yeast nutrient as per the schedule. Now add the wort to 2.0 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete.

When primary fermentation is complete, rack beer to a carboy, avoiding any splashing to prevent aerating the beer and add the dry hops. 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 Secession Black IPA.

Secession Black IPA clone
(5 gallons/19 L, all-grain)

OG = 1.064 FG = 1.014
IBU = 70 SRM = 29 ABV = 6.5%

Ingredients

11.5 lbs. (5.2 kg) Pilsner malt
8.0 oz. (0.23 kg) black barley malt (530 °L)
12 oz. (0.34 kg) crystal malt (60 °L)
4.0 oz. (0.11 kg) chocolate malt (350 °L)
8.4 AAU Magnum hops (60 mins) (0.6 oz./17 g of 14% alpha acid)
6.5 AAU Mt. Hood hops (30 mins) (1.0 oz./28 g of 6.5% alpha acid)
3.0 AAU Amarillo hops (30 mins) (0.3 oz./8.5 g of 10% alpha acid)
3.8 AAU Simcoe hops (30 mins) (0.3 oz./8.5 g of 12.8% alpha acid)
3.9 AAU Cascade hops (0 mins) (0.75 oz./21 g of 5.25% alpha acid)
4.0 AAU Amarillo hop pellets (0 mins) (0.4 oz./11 g of 10% alpha acid)
5.1 AAU Simcoe hop pellets (0 mins) (0.4 oz./11 g of 12.8% alpha acid)
0.5 oz. (14 g) Amarillo hops (dry hops)
0.5 oz. (14 g) Cascade hops (dry hops)
0.3 oz. (8.5 g) Simcoe hops (dry hops)
½ tsp. yeast nutrient (15 mins)
½ tsp. Irish moss (30 mins)
White Labs WLP 013 (London Ale) or Wyeast 1318 (London Ale III) yeast
0.75 cup (150 g) corn sugar (for priming)

Step by Step

This is a single step infusion mash using 11.5 lbs. (5.2 kg) Pilsner malt to replace the liquid and dried malt extract. Mix the crushed grains with 17 quarts (16 L) of 163 °F (73 °C) water to stabilize at 152 °F (67 °C) for 60 minutes. Sparge slowly with 170 °F (77 °C) water. Collect approximately 6.0 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the 60-minute Magnum hop addition to 0.6 oz. (17 g) (8.4 AAU) and the 30-minute Simcoe hop addition to 0.3 oz. (8.5 g) (3.8 AAU) to allow for the higher utilization factor of a full wort boil. Cool the wort to 68 °F (20 °C). Pitch your yeast and aerate the wort heavily. Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer and add the dry hops. 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. BYO

2010 LABEL CONTEST WINNERS

THERE ARE LOTS OF WAYS TO SHOW THE WORLD THE GREATNESS OF YOUR HOMEBREWS, BUT A WELL-MADE LABEL IS KING. WHETHER IT IS A SIMPLE, HAND-DRAWN DESIGN OR A COMPUTER-GENERATED LOGO, A BEER LABEL IS YOUR HOMEBREW'S FIRST IMPRESSION ON POTENTIAL DRINKERS. THIS YEAR, AS IN YEARS PAST, WE RECEIVED MANY, MANY ORIGINAL, THOUGHTFUL AND FUNNY HOMEMADE DESIGNS FOR OUR ANNUAL LABEL CONTEST. IN FACT, IF WE DIDN'T KNOW BETTER WE COULD HAVE SWORN SOME OF THIS YEAR'S LABELS WERE FRESH OFF OF A COMMERCIAL BOTTLING LINE, THUS PROVING THAT HOMEBREWERS ARE NOT ONLY AN INDUSTRIOUS BUNCH, THEY ARE ALSO ENDLESSLY CREATIVE. THIS YEAR, THE GRAND PRIZE WENT TO A WILD, WILD WEST THEME FROM FORT WAYNE, THE GOLD TO A DRIPPY, DREAMY DESIGN FOR A SMOKED LAGER, SILVER TO A TARANTULA-TASTIC SPIDER-SCAPE FROM A HOMEBREWER'S DAUGHTER AND BRONZE TO AN OVERSIZED TRIBUTE TO BELGIAN-STYLE BEERS AND KRYPTOZOOLOGY. CONGRATULATIONS TO EVERYONE WHO ENTERED — YOUR IMAGINATIVE IDEAS MADE THIS YEAR'S CONTEST JUDGING A GREAT DEBATE. THANKS ALSO TO OUR MANY CONTEST SPONSORS FOR PROVIDING ALL THE GREAT HOMEBREWING PRIZES!

GRAND

BRIDGET FORTE

Fort Wayne, Indiana

Bridget designed a series of labels for her homebrewing coworker, Kyle Alberta. "I was watching 'The Assassination of Jesse James by the Coward Robert Ford' at the time and wanted to evoke that era's typography and overall feel while still making it fresh and contemporary," she explained.

Prizes: 50-lb. bag of Pilsen Malt from **Briess Malt and Ingredients Co.**; Gift certificate from **Grape and Granary**; Gift card from **Maryland Homebrew**; 7.5-gallon stainless brew pot with lid from **Murrieta Homebrew Emporium**; Gift certificate from **Midwest Homebrewing & Winemaking Supplies**; A Carboy Cleaner from **Carboy Cleaner**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **Quality Wine and Ale Supply**; BrewMometer and beer gloves from **Blichmann Engineering**

GOLD

KAT EATON
Broken Arrow, Oklahoma
Kat and her husband Brad designed this label as part of a series of beer and wine labels to celebrate Brad's homebrewing and winemaking efforts. Kat hand sketched the "drippy" graphics and then digitized them, adding type and graphics. "They reflect our company's current vintage/retro theme," she said.

Prizes: Gift certificate from **High Gravity**; Beer ingredient kit and T-shirt from **Kettle to Keg**; Party Pig set-up package from **Quoin Industrial**; A Carboy Cleaner from **Carboy Cleaner**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Above the Rest Homebrewing Supplies**

SILVER

ANNA LISA SCHNEIDER • Fennville, Michigan
Anna Lisa designed a series of labels featuring a giant spider crawling over a cityscape for her father's homebrews based on old horror movie posters, incuding "Tarantula, Earth Versus the Spider."

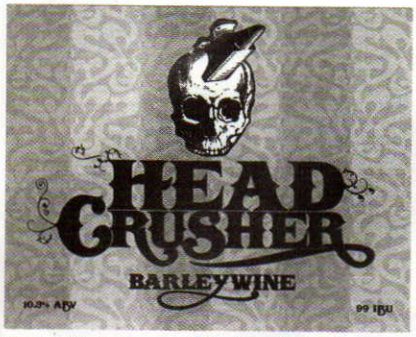
Prizes: Copper immersion wort chiller from **Central Homebrew Supply**; Gift certificate from **Midwest Homebrewing & Winemaking Supplies**; Gift certificate for labels from **Noontime Labels**; A Carboy Cleaner from **Carboy Cleaner**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Above the Rest Homebrewing Supplies**

BRONZE

KRIS MERRILL
Sandy, Utah
Kris and his homebrewing partner Michael Baker designed this Yeti-friendly label to express the oversized personality of their homebrewed Belgian-style specialty ale. Billed as their home brewery (Berrill Maker)'s "most shockingly festive homebrew ever," Abomin-ale was brewed and bottled in November and December 2009 as Berrill Makers' winter spiced ale. Their advice for enjoying this ale? "Always keep the snowman cold."

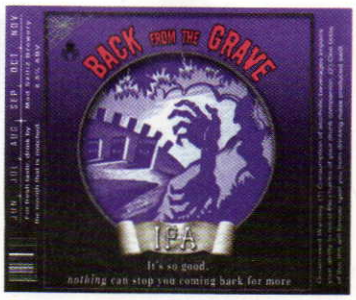
Prizes: 25th Anniversary Double IPA ingredient kit from **Home Brewery (MO)**; Gift certificate from **Bader Beer & Wine Supply, Inc.**; Ten sachets of Safale yeast from **Brew-U**; A Carboy Cleaner from **Carboy Cleaner**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Above the Rest Homebrewing Supplies**

HONORABLE MENTION



Andy Melchers • Cincinnati, Ohio
Prizes: Gift certificate from **The Flying Barrel**; A Carboy Cleaner from **Carboy Cleaner**

Carolyn Greener
Nampa, Idaho
Prize: Gift certificate from **High Gravity**



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San Carlos, California
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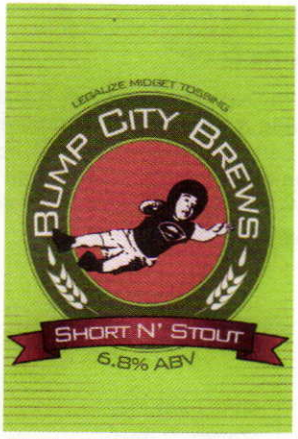
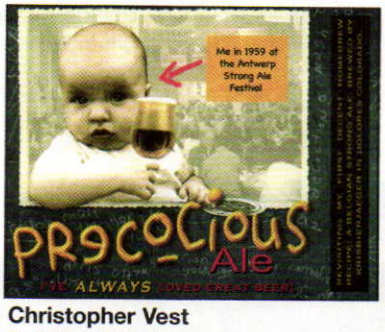
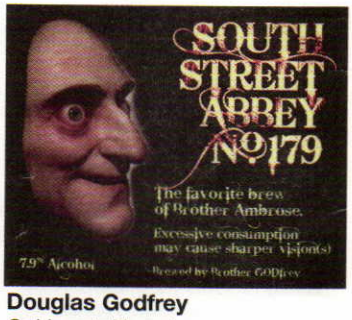


Bobby Bump
Seattle, Washington
Prize: Gift certificate from **Bader Beer & Wine Supply, Inc.**



Christopher Vest
Dolores, Colorado
Prize: Gift certificate and books from **Home Brew Party**



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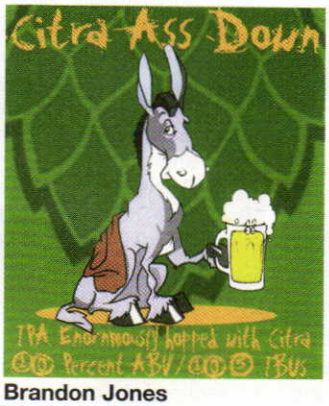

Brandon Jones
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Prize: Gift certificate from **Brewmasters Warehouse**

Christopher Wyatt
Yellow Springs, Ohio
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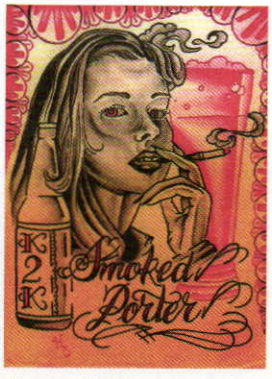
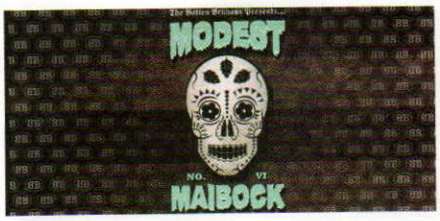


Jesse Mertz
Suncook, New Hampshire
Prize: 5-gallon KEGlove sleeve and ice blanket from **KEGlove, LLC**



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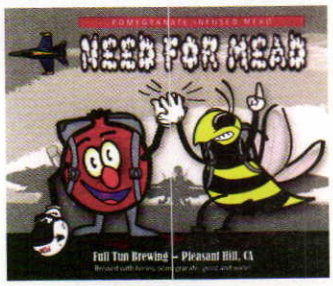
Prizes: Gift certificate from **Point Brew Supply & O'so Brewing Co.**; A Carboy Cleaner from **Carboy Cleaner**



Rawn Rhoades
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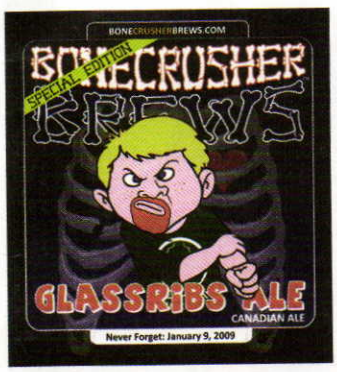
Todd McCallister • San Diego, California
Prize: Beach Blonde ingredient kit from **O'Shea Brewing Company**



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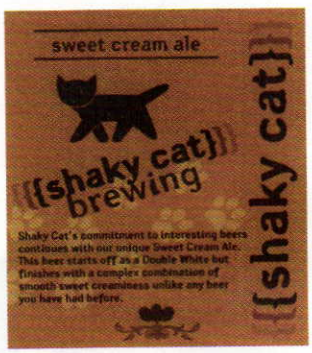

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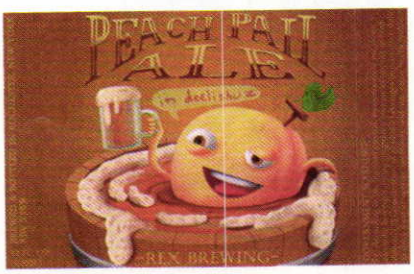
Prize: Oktoberfest True Brew ingredient kit from **The Fermentation Trap, Inc.**



Sam Rex • Fairport, New York
Prize: Autumn Pumpkin Ale ingredient kit from **Arbor Wine & Beer Making Supply**

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Cincinnati, Ohio
Prize: Gift certificate from **Keystone Homebrew Supply**

Zachary VanDeHey
Roseburg, Oregon
Prize: Gift certificate from **Grains Beans & Things**

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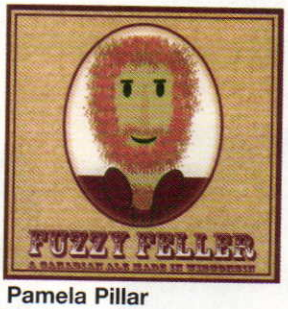

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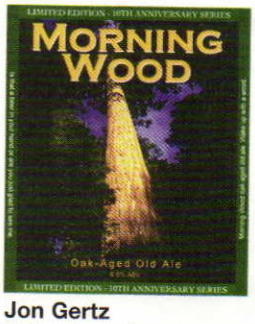

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If you're smart enough to read this, you're smart enough to get tested.

Knowing your PSA (prostate-specific antigen) score can save your life. Each year more than 200,000 men in the U.S. find out they have prostate cancer. Early detection through an annual PSA blood test and prostate health screening can catch prostate cancer when treatment is nearly 100% successful.

Be a man. Call your doctor and schedule an appointment today. Then tell your friends. The more men we reach, the more lives will be saved.
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Prostate Cancer. No Joke. Get Tested.

by **CHRIS COLBY**

FROM GRAIN TO GLASS

BREW YOUR **FIRST** ALL-GRAIN **BEER**

There are a couple of different ways to approach your first all-grain brew day. There is a vast amount of information in the homebrew literature about all-grain brewing, and you could try to read most of it first and then proceed. Or, you could jump right in. Having tried the former approach, back when I started, I think jumping right in is a much better option.

Firstly, although there is a lot of interesting technical information out there, you really only need to grasp a few key ideas to get started. As you continue to brew, you can keep learning and fill in any gaps in your education.

Secondly, learning to brew well at home requires some practical experience that you can only get by actually brewing . . . on your equipment, with your water, etc. Getting to know the mechanics of brewing — including the quirks of your setup — is just as important, in terms of beer quality, as knowing many of the more advanced academic ideas. Acquiring knowledge along both these paths at the same time will speed your journey from novice to experienced brewer.

In this article, I'll cover the bare minimum of technical information you need to get started and give a practical guide to successfully brewing your first all-grain beer. I will assume that you are already familiar with brewing with malt extracts.

Required Knowledge (The Minimum)

All-grain brewing differs from extract brewing mainly in the wort production stage. As an extract brewer, you made your wort by dissolving malt extract in water, and likely steeping some specialty grains to add some additional flavors. As an all-grain brewer, you will make your wort from malted grains and water. The basic idea behind all-grain wort production is this:

You soak crushed, malted grains in hot water, then drain away the resulting liquid, which is your wort.

That's it. There are, of course, subtleties that you will learn about later — how finely do you crush the malt, how hot should the grain and water mixture be, how fast do you drain the wort, etc. — but that's the basic idea.

If you have been boiling a dense wort of dissolved malt extract and then diluting it to working strength in your fermenter, you will now be boiling (and cooling) your full wort volume as well. Once your wort is in the fermenter, fer-

mentation and conditioning is handled in the same way as in extract brewing.

Equipment

A typical all-grain homebrew set up includes three vessels. First, a vessel to heat all the water for your brewing session. As brewing water is sometimes called brewing liquor, the name of this vessel is the hot liquor tank, or HLT. Second, a vessel to hold the grains for both mashing (soaking the crushed grains) and lautering (separating the wort from the spent grains). This is called a mash/lauter tun. (In commercial brewing, these are often separate vessels.) This needs to have a false bottom or some sort of manifold installed to let the wort flow from the vessel while retaining the spent grains. You will also need a large paddle to stir the mash. Lastly, you need a vessel to boil the wort in, called the kettle.

A 5.0-gallon (19 L) brewery can consist of three 10-gallon/40-quart (38-L) vessels. Systems such as this work well for most average to moderately-big brews.

If you don't already have a wort chiller, you will need one. Quickly cooling your wort improves beer quality and a wort chiller works much faster than putting the kettle in a bathtub of cool water.

Finally, you will need a heat source capable of boiling your entire pre-boil volume of wort vigorously. For 5.0-gallon (19-L) batches, you will need to boil at least 6 gallons (23 L), more if you want to make high-gravity beers. For many all-grain homebrewers, the heat source of choice is a propane burner.

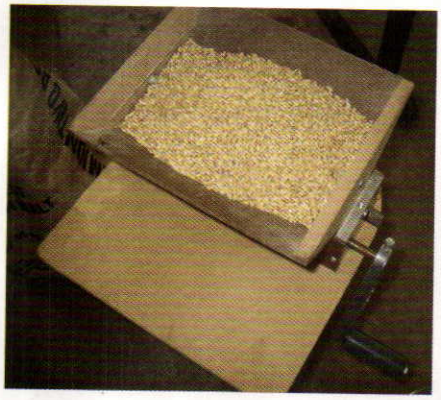
There are a lot of options when it comes to choosing all-grain equipment, too many to detail here. Keep in mind that great homebrew has been made on a wide variety of brewing setups.

Calibration and Calculations

Before your frist brew day, you should make a dipstick (or calibrate your sight glasses, if your brewery has those) so that you can measure the volume of liquid in your HLT and kettle. Likewise, calibrate any thermometers that you will be using.

Before starting any brew day, there are two easy calculations you should make —

Photo by Charles A. Parker/Images Plus



One option for all-grain homebrewers is to buy a grain mill and crush their grains themselves. Grain mills add to the up front costs of your all-grain brewing setup, but could end up saving you money in the long run as you can buy malt by the sack (which is cheaper) and store it for up to 8 months or more. Grain mills can by cranked by hand, powered with a drill or motorized using a motor, pulley and sheaves. Crushing your own grain allows you to adjust the gap setting on your mill and fine tune your crush. More finely crushed malt provides a higher yield, but also makes lautering more difficult. Finding the right balance on your system takes time. For beginners, slightly undercrushed malt will help with lautering. As you gain more experience, try narrowing your mill gap until you run into trouble.

the amount of strike water (water to mix with the crushed grains) and the amount of sparge water (water to rinse the grain bed) you will need. These are explained later.

The Crush

For your first all-grain brew, you will probably buy crushed malt or get the malt crushed at your homebrew shop. When it's time to brew, take a handful of malt and look at it. With a good crush, you should see almost no whole kernels. Most kernels should be broken into two to four pieces.

If you've bought, or have access to, a grain mill, you will gain experience over time adjusting it to get the best crush for you. For your first crush, however, see if the mill has a "default" setting. This is usually 0.045 inches (0.11 cm). This should give you a good crush and you can start fiddling with adjusting the mill gap when you get more experience.

The goal of the crush is to break the malt kernels open so that the hot strike water can dissolve the starchy endosperm in the malt. You don't need perfectly crushed grain to a have a successful first brew day, so don't worry about this too much. Do, however, examine your crushed grains every time you brew. When the time comes to really start fine-tuning your brewing procedures, this will be valuable to you. Make a note in your brewing notebook about how the crush looked to you.

Water Heating and Mash In

Once your equipment is set up, you will need to start heating your strike water. The amount of water required varies between 0.95 and 2.4 quarts of water per pound of grain (2.0–5.0 L/kg), and a good consistency — or mash thickness — for most beers is 1.25 and 1.375 qts./lb. (2.6-2.9 L/kg). So, to figure out how much water you need, take the weight of your grains and multiply by some number between 1.25 and 1.375 (or 2.6 through 2.9, if you use the metric system). The lower numbers will give you a little thicker mash than the higher numbers, although the specified range is all in the "moderate" range of mash thickness.

If your mash vessel has a false bottom, add the volume under your false bottom to the amount of strike water you need to heat. For example, if there is a gallon (3.8 L) of space under your false bottom, add this extra 1.0 gallon (3.8 L) of water to your strike water. All-grain brews require heating larger volumes of water than most extract brews, so be prepared for this step to take longer than you might think. If you have a metal mash paddle, set it in the HLT while the strike water is heating.

Mixing the crushed grains and hot strike water is called mashing in. The goal is to mix the crushed malt and water so that the grain bed settles in at your target temperature (which will be given in the homebrew recipe) and that this temperature is as uniform as possible throughout the grain bed.

The initial temperature after mash in depends mostly on the temperature of the strike water, the temperature of the crushed malt and the temperature of your mash vessel. There are equations that can help you calculate the temperature of your strike water, but most homebrewers "solve" this problem by using a generic recommendation and refining it with trial and error. One generic recommendation works fairly well if your grain and equipment are in the vicinity of "room temperature," and you use a mash thickness between 1.25 and 1.375 qts./lb. (2.6-2.9 L/kg). This is to heat your strike water to 11 °F (6 °C) above your target mash temperature. This assumes no, or minimal, heat loss when transferring your water to your mash tun.

An improved recommendation — one that works better if your equipment is stored somewhere that is not temperature-controlled — is to adjust the temperature of your strike water once it is in your mash vessel. Heat your strike water to 15–18 °F (8–10 °C) over your target temperature and add the strike water to your mash vessel. Let it sit for two minutes and take the temperature. Adjust the temperature downward, towards 9–10 °F (5–5.5 °C) higher than your target temperature, by removing a couple cups of hot water and replacing it with the same volume of water around room temperature. Aim for 9 °F (5 °C) over if your mash thickness is 1.375 qts/lb. (2.9 L/kg), 10 °F (5.5 °C) over if your mash thickness is 1.25 qts./lb. (2.6 L/kg). Stir the water, take the temperature and repeat until you hit your target. This still assumes that your grain is near room temperature.

Once you've heated the measured amount of strike water and transferred it to the mash vessel, check again to see that it's in the right range (9–10 °F/5–5.5 °C above

SAFETY

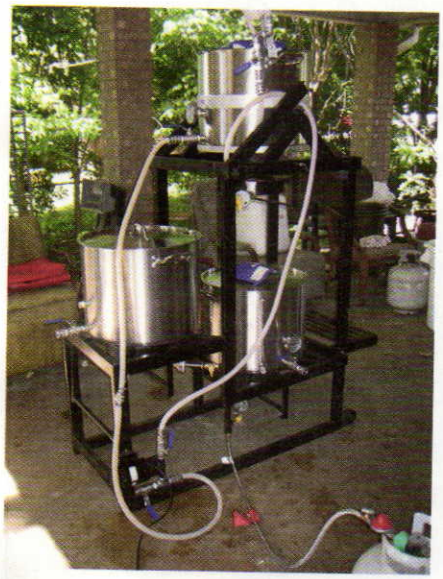
As with anything, there are risks involved with all-grain brewing. However, if you are aware of what the dangers are and how to avoid them, you can brew safely for years without incident.

In commercial brewing, exposure to fumes from cleaning or sanitizing solutions can be a hazard. On the homebrew scale, this is rarely a concern, but — just to be safe — you should always mix or use any cleaning or sanitizing solutions in a well-ventilated area, and never mix products. With more and larger vessels, you will be making larger volumes of your usual solutions.

Burns and scalds are a risk in homebrewing, but a few rules of thumb will help you avoid these. Be aware that metal surfaces that are hot enough to burn you look just like cold surfaces. Before you transfer hot liquid (water or wort), from one vessel to another, make sure the valve on the receiving vessel is closed. Likewise, never start pumping hot liquids unless you know where the outflow is directed.

When you set up your brewing vessels, make sure they are not likely to tip over and are resting on a support capable of holding them when full. Try to route your tubing so that it is not likely that you, or anyone else, could get entangled and pull a vessel of hot liquid onto yourself. Likewise, be aware of tubing near ground level (such as the line from a propane tank) being a potential trip hazard.

In all-grain brewing, carrying vessels of hot liquid (for example, your kettle to a cold water bath for chilling) is not a good idea. Five gallons (19 L) of wort weighs over 40 lbs. (18 kg) and sloshing hot liquid can easily scald you. Try to set up your all-grain brewing equipment so that the vessels do not need to be moved during your brew day.



As you mash in, the wort will foam a bit, but this will quickly subside. A probe thermometer in your mash tun will allow you to monitor the temperature during the mash, but keep in mind it is only reading at one point in the grain bed. Recirculation clarifies your wort, but you do not need to recirculate until it is crystal clear. In fact, a small amount of suspended solids at this stage may contribute to yeast nutrition later.

your target). Then, stir your crushed grains into the strike water. To do this, simply add a pound or so of grain to the water, give a quick stir with your mash paddle until it dissolves and repeat until all the grain is stirred in. Stir the grain for 20–30 seconds, looking to even out any temperature differences and break up any clumps of dry malt sticking together. Then, take the temperature and place the lid on your mash tun to conserve heat. Record the volume of the strike water, its temperature in your mash tun just prior to mashing in and the initial mash temperature.

Resting

Now, you let the mash sit (or rest) for awhile. (The recipe should specify the length of this rest; often, it's one hour.) During the mash rest, your goal is to hold the grain bed at a constant, uniform temperature. Odds are, however, you won't be able to do this. At a homebrew scale, the mash will lose heat over the time of the rest. And, the sides of the grain bed will cool off faster than the center. Fortunately, a small change in temperature is not going to hurt the quality of your beer. After your first mash, quickly take the temperature near the side of the mash vessel, and then near the center. Stir the mash to even out any temperature differences and take the temperature again. Record all three temperatures in your brewing notebook.

If your overall mash temperature drops more than 2 °F (1 °C), or the temperature difference within the mash is greater than 4 °F (2 °C), you should insulate your mash tun better next time. You can use towels or blankets for this. If your mash vessel is heatable, you can also add heat directly during the mash. If you do, stir the mash and do not heat too quickly.

During the rest, you have the option of stirring. Stirring ensures a more even mixture of grain and liquid and evens out temperature differences across the grain bed. Unfortunately, opening the mash vessel releases heat to the environment. Likewise, using a "cold" mash paddle absorbs more heat from the mash. As such, most homebrewers simply leave their mash undisturbed during this rest. (If you overshot your mash temperature by a few degrees, stirring a couple times is great way to gradually bring the temperature down.)

Most homebrew recipes specify a one-hour rest for single infusion mashes.

Sparge Water

While the mash is resting, begin heating the water you will use to rinse the grain bed (the sparge water). How much sparge water will you need? I would recommend heating an amount equal to the target pre-boil volume of your wort, plus about 20%. This might seem like a huge amount, but this will allow you to collect your full pre-boil kettle volume, keep the grain bed in the mash/lauter vessel submerged throughout the wort collection process and have some extra water that serves as buffer against water in the "dead spaces" (tubing, etc.) loss to evaporation or small amounts of spillage. Running out of sparge water is a pain, whereas leftover hot water can be used for cleaning equipment. So, I try to err on the side of heating too much sparge water. For a 5.0-gallon (19-L) batch, this may mean 7.5 gallons (28 L) or more. If you want to try to leave your grain bed dry at the end of sparging, subtract the volume of strike water from this amount. Also, if you mash out by adding boiling water to the grain bed (see the next section), subtract this volume from the required volume of sparge water.

Your goal should be for the sparge water to be at the correct temperature when the mash is over and the wort has been recirculated. Use the length of time it took to heat the strike water to estimate how long it will take to heat the sparge water.

Mash Out

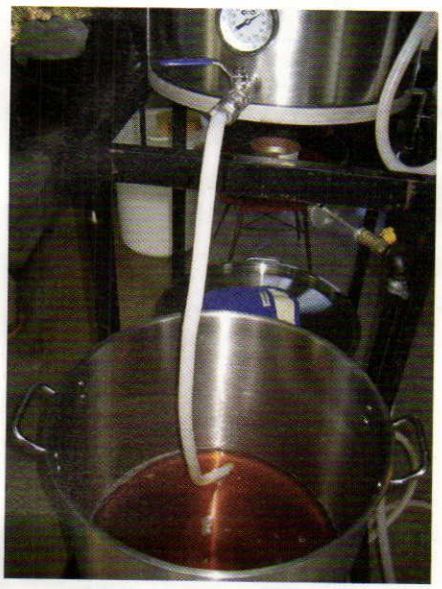
At the end of the mash, you have the option of performing a mash out. To mash out, you raise the temperature of the grain bed to 170 °F (77 °C). Mashing out makes the wort less viscous, and easier to collect. This can be done either by applying direct heat or by stirring in boiling water. If you heat the mash, be sure to stir as you do. If you add boiling water, you will need a volume that is approximately 40% of the volume of your strike water. Sometimes, the size of your mash tun will preclude you from adding enough water to reach 170 °F (77 °C). This is fine as you can simply rinse with hotter sparge water to compensate for this. Once you arrive at 170 °F (77 °C), or have added all the water your mash/lauter tun will hold, let the grain bed rest for 5

WATER

As you get to be a better brewer, water chemistry is a topic you will want to explore. But what do you need to know as a beginner?

Obviously, your water needs to be potable and taste good, but you also need to be aware of chlorine. Municipal water supplies are protected by chlorination and the most common chlorinating agent is chloramine. If you do not remove this from your brewing liquor, it can lend off flavors to your brew. There are two ways you can do this, by carbon filtration or by neutralizing the chloramine. If you have a large, under-the-sink water filter, this should be sufficient to reduce chloramine levels to a level that your water can be used. Small filters, like the ones that attach to faucets or are used in pitchers, will not work for this. You can also treat your water with potassium metabisulfite. This is a sanitizer and anti-oxidant used by winemakers and is sold in tablet form as Campden tablets. One Campden tablet dissolved in 20 gallons (76 L) will remove the chloramine almost instantly. You may wish to let the water sit overnight before using it, to let the hydrogen sulfide gas — released by the tablets — diffuse out of your water. However, if your water smells fine after treatment, you can skip this step.

The minerals dissolved in your water also effect the flavor of the beer. Water chemistry is complex, but simply knowing that some water is better suited for certain beers can help you in your early all-grain brews. If your water is soft (contains few dissolved minerals), you will probably have the best luck brewing pale beers. If your water has a lot of hardness from carbonates, it is better suited to brewing dark beers. Once you've mastered the basics of all-grain brewing, examining the role of water chemistry and wort pH in brewing will help you improve.



After recirculation, you may see a layer of grey, fluffy material (called teig) on top of your grain bed. If this layer is thick, you should take a knife and make a few cuts through it so that it doesn't block the flow of sparge water. Sparge water can be poured on top of the grain bed, or delivered via a "sparge arm" — in the photo, a ring of copper tubing. Some sparge arms act as little sprinklers. You should monitor the temperature of your grain bed and try to keep it at 170 °F (77 °C). As you collect wort, you should be applying heat to your kettle. There's no sense in waiting until you've collected all your wort to start heating it. Aim for the wort coming to a boil just as wort collection wraps up.

minutes and then you are ready to recirculate. Record the details of your mash out — final temperature and volume of boiling water added (if any).

Recirculation

The aim of recirculation is to draw some wort off from the bottom of the grain bed and return it to the top. Once enough wort has been recirculated in this way, the wort clears up substantially. To recirculate manually, open the spigot to the mash/lauter tun slightly and slowly collect wort in a beer pitcher or similar vessel. Keep a timer running and collect wort at a rate that would fill the pitcher in about 5 minutes. Once full, gently pour the pitcher back on top of the grain bed. Repeat this until the wort looks clearer or 20 minutes have passed. Some homebrew rigs allow you to recirculate using a pump.

Wort Collection

Once recirculation is finished, it's time to start collecting wort. To do this, slowly open the valve on your mash/lauter tun and let the wort start trickling in to the kettle. If your lauter tun is not positioned above the kettle, you can let the wort flow into a pitcher and then pour wort into the kettle. Collect the wort at a rate such that takes about 60–90 minutes to collect the entire volume. To do this, keep the dip stick in the kettle and check on it every few minutes. Write down the time you start collecting wort and the time you cross the 1-gallon mark, 2-gallon mark, 3-gallon mark, etc.

You might think that simply leaving the ball valve on the spigot in the same position would keep the flow rate steady, but a lot changes as you are collecting wort. It gets progressively thinner, it may change in temperature and the amount of pressure from the water above the grain bed changes with the level. The grain bed itself can get compressed, slowing the flow of wort, So, especially on your first few brews, take a look every couple minutes at the amount of wort in the kettle and adjust the valve, if needed, to keep the wort flowing at the proper rate. Be especially careful to check your kettle after opening the valve to increase the flow of wort; if it starts to flow too quickly, you can drain the mash tun in a matter of minutes. Don't worry if wort collection doesn't go as planned on your first brew day. If you collect the wort too quickly, the only harm would likely be an original gravity slightly lower than you would have achieved otherwise.

When you first start collecting wort, there is a layer of water above the grain bed. Once the liquid level falls to almost the top of the grain bed, you should start applying sparge water. Your goal when sparging is to rinse "the good stuff" out of the grain bed, while not rinsing so extensively that you start extracting anything "bad."

The basic idea with continuous sparging is to apply water to the top of the grain bed at the same rate as it drains from the lauter tun. In theory, that should be simple. In practice it can be hard to match the flow rates. A simple way around this problem is to focus on getting the flow rate from the mash/tun to the kettle correct, then apply sparge water at a faster rate in intermittent bursts. On my old setup, I used to pour a couple pitchers of water on top of the grain bed, then, about 10 minutes later — right before the grain bed would be exposed — I'd add another two pitchers. During this time, wort would be flowing from the lauter tun to the kettle at a steady rate. Now, I do essentially the same thing by turning on and off my pump. Adding your sparge water in "pulses," rather than trying to get the flow rate to match the outflow from your mash/lauter tun is simple and lets you focus how fast your kettle is filling.

You should heat your sparge water to the point that, as you sparge, the temperature of the grain bed approaches 170 °F (77 °C). If you mashed out to 170 °F (77 °C), and your lauter tun was well insulated, your sparge water should be 170 °F (77 °C) at the point that it is added. In this case, it may have to be hotter than 170 °F (77 °C) in the HLT if it travels through tubing (where it will lose temperature) on the way to your lauter tun. If your grain bed is cooler than this, then sparging with water at 190 °F (88 °C) or higher is appropriate until the grain bed reaches 170 °F (77 °C). Write down the details of your sparging in your brewing notebook.

When to Stop

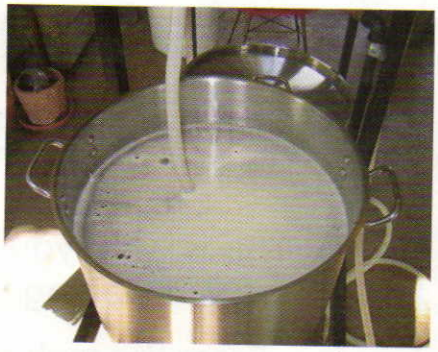
There are a few ways to determine when to stop collecting your wort. For average-strength beers, the easiest way is just to quit collecting when you've got the full pre-boil wort volume in your kettle. With a propane burner, on homebrew-sized batch-

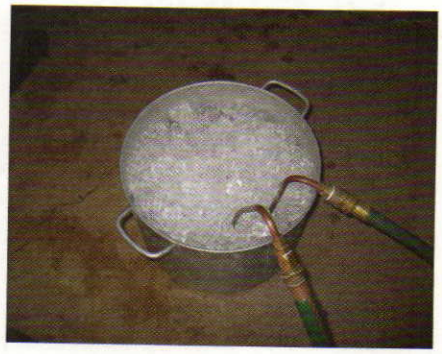
SPARGING

The type of sparging described in the article is called continuous (or fly) sparging, but homebrewers have a variety of methods to choose from. A very simple all-grain brewing method is the brew-in-a-bag method. In it, the crushed grains are all contained in a large sack, similar to a steeping bag. After the grains are mashed, the bag is hoisted out of the mash vessel and allowed to drain. The brewer then proceeds to use the mash vessel as his kettle, heating the wort it contains.

No-sparge brewing is a method that, as the name implies, does not use sparge water. In its simplest form, a very thin mash is performed. Then, after recirculation, the wort is drained from the lauter tun without sparging. A twist on this is to mash at a normal mash thickness, but then add a dose of very hot water to both mash out and yield the full pre-boil wort volume once the wort is collected. As before, the wort is recirculated and run off. In no-sparge brewing, the wort is typically run off as fast as possible, as there is no advantage to collecting it slowly.

In batch sparging, the wort is run off in two (or more) portions. After mashing, the wort is recirculated and the first wort is collected, without sparging, until there is no more wort left in the grain bed. The grain bed is then rehydrated with hot water and again the wort is recirculated and the second wort is run off. Many no-sparge brewers attempt to collect first and second worts of the same volume, and to end up at their pre-boil wort volume after doing so. To do this, a small amount of water is added after the first mash. The amount of water added for the second wort is such that the liquid in the lauter tun is at the same level as before the first wort was run off.





As wort collection draws to a close, your your full volume of wort should be just about ready to boil. As with extract brews, the kettle can boil over if you don't watch it carefully. Stir the wort or cut the heat if a boil-over looks imminent. A wort chiller is needed to quickly chill the wort and there are several kinds of chillers available, including immersion chillers, counterflow wort chillers and plate chillers. In the picture, wort is being pumped from the kettle past the chiller, to aid in cooling. In warmer climates, a pre-chiller may be required to get the wort down to pitching temperature. An immersion chiller in an ice bath (such as in the picture above), placed in line before the wort chiller, will allow you to cool all the way down to lager temperatures even with warm tap water.

es you can expect to boil off about a gallon an hour with a full rolling boil. So, for a 5-gallon (19 L) batch, you could collect 6 gallons for a one-hour boil or 6.5 gallons for a 90-minute boil.

A better way to know when to stop collecting wort is to monitor when you've gotten everything you reasonably can from the grain bed. The easiest way to do this is to take the specific gravity of your late runnings (the stream of wort you are collecting from the grain bed) and wait until they fall to about 1.008-1.010. If you do this, you may end up with more or less wort than your planned pre-boil wort volume. If you are low, as happens on many low-gravity brews, just add water. If you have collected more wort than you planned, you can extend the length of your boil.

When you are done collecting wort, write down the volume of wort in your kettle, the time you quit collecting and the original gravity of the wort. Also record if you needed to add any water to reach your target pre-boil volume.

Boiling and Beyond

For extract brewers who do full wort boils, the rest of your brew day is identical to what you are used to. If not, just expect that heating and cooling a larger volume of wort will take longer.

Now you've got your first all-grain brew day under your belt. You also have a record of all the relevant volumes, temperatures and times of your first all-grain batch. Before you grab a celebratory beer, write down any other observations that you feel may help you with future brews. Later, before your second brew, review your notes and determine what aspects of your brew day you want to improve upon. Knowledge comes quickly at first, so be sure to write absolutely everything down for your first several beers. BYO

Chris Colby is Editor of BYO. *Read his blog at byo.com/blogs/blogger/Chris Colby/.*

RECIPE

Here is a very forgiving pale ale recipe to consider for your first all-grain brew day.

Maiden Voyage Pale Ale

(5 gallons/19 L, all-grain)
OG = 1.055 FG = 1.014
IBU = 46 SRM = 11 ABV = 5.3%

Ingredients

10 lb. 11 oz. (4.8 kg) US 2-row pale malt
12 oz. (0.34 kg) crystal malt (40 °L)
2.0 oz. (57 g) crystal malt (60 °L)
7.4 AAU Magnum hops (60 mins) (0.46 oz,/13 g of 16% alpha acids)
8 AAU Centennial hops (15 mins) (0.80 oz./23 g of 10% alpha acids)
1.0 oz. (28 g) Cascade hops (5 mins)
0.75 oz. (21 g) Amarillo hops (0 mins)
1 tsp. Irish moss (15 mins)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05
⅞ cup (175 g) corn sugar (for priming)

Step by Step

Start with 16 quarts (15 L) of water in your mash tun at 161 °F (72 °C). Stir in crushed grains and let rest for 40 minutes. The initial temperature should be 152 °F (67 °C). Begin heating 8.0 gallons (30 L) of sparge water. Heat mash or stir in 4.0 gallons (15 L) of boiling water to mash out to 170 °F (77 °C). Recirculate and begin collecting wort. Sparge with hot water, with the aim of keeping the grain bed near 170 °F (77 °C), or heating it to this temperature. Aim to collect 6.5 gallons (25 L) of wort over 60 minutes (a little over a gallon every 10 minutes). Boil wort for 90 minutes. If you have less than 5 gallons (19 L) of wort at the end of your boil, add water to top up. Cool wort, aerate and pitch yeast. Ferment at 67 °F (19 °C).

by **LES HOWARTH**

CAMRA CHAMPION CLONES

CLONES OF AWARD-WINNING BRITISH BEERS

In 1971, four British journalists, on holiday in Dunquin, Ireland, sat in Kruger's Bar and hatched a plan. Reacting to the decline of traditional, cask-conditioned ales in British pubs, they formed the Campaign for the Revitalisation of Ale in an attempt to reverse this trend. By 2010, membership in their group — which changed its name to the Campaign for Real Ale (or CAMRA) in 1973 — had grown to over 100,000. Today, CAMRA continues to advocate for real ale, real cider, traditional British pubs and consumer rights. Every year since 1974, they have published the "Good Beer Guide" and in 1977, they started the annual Great British Beer Festival (GBBF). Starting in 1978, they began awarding the Champion Beer of Britain (CBOB) awards. CAMRA judges visit pubs all over the UK and sample ales in their native pubs. Outstanding beers advance to regional panels and finally to the judging at the GBBF. CBOB awards are now given in 13 categories, with a gold, silver and bronze medal additionally being awarded to the three beers judged best overall.

From the list of past winners, I have constructed six award-winning British beer clones based on information from my book, "The Home Brewer's Recipe Database" — which contains information on the ingredients and statistics of numerous commercial beers — and the "2009 Good Beer Guide." I took the list of winning beers from CAMRA's web site and first eliminated any beers for which homebrew clones were already available. I then screened out beers for which I didn't have sufficiently complete data to produce a well-informed recipe. Fortunately, the resulting "short list" contained a number of beers for which all the relevant data was available. The one missing component in all cases is the yeast, but I have suggested yeasts to try based on the tasting notes in the "Good Beer Guide." Whether or not you serve these as real ales, enjoy these clones.

Les Howarth is the author of "The Home Brewer's Recipe Database," now in its second edition. It is also available as an e-book, found at www.lulu.com/content/paperbackbook/the-home-brewers-recipe-database/7297456.

CAMPAIGN FOR REAL ALE

Photos courtesy of CAMRA

CAMRA CLONE RECIPES

Bateman's XXXB Bitter

won Gold in the Premium Bitter/Special Bitter/Strong Bitter category in 1986, 1987, 1988, 1989 and 1997. It is described as "A brilliant blend of malt, hops and fruit on the nose with a bitter bite over the top of a faintly banana maltiness that stays the course. A russet-tan brown classic." From this I would suggest a yeast that provides a fruity character. The data I have for this beer is: OG: 1.048–1.049. Malt bill: 72–87% Pipkin or Maris Otter pale malt, 7.5–12% crystal malt, 0–3% wheat flour, 15–18% invert sugar. Hops: Challenger, Goldings. IBU: 37. EBC: 40–42.

Bateman's XXXB Bitter Clone

(5 gallons/19 L, all-grain)

OG = 1.049 FG = 1.012
IBU = 37 SRM = 12 ABV = 4.8%

Ingredients

7.0 lbs. (3.2 kg) Pipkin or Maris Otter pale malt
15 oz. (425 g) crystal malt (60 °L)
1.25 oz. (35 g) wheat flour
1 lb. 3 oz. (538 g) invert sugar
6 AAU Challenger hops (90 mins) (0.75 oz./21 g of 8% alpha acid)
2.5 AAU East Kent Goldings hops (90 mins) (0.50 oz./14 g of 5% alpha acid)
2 AAU Challenger hops (10 mins) (0.25 oz/7.1 g of 8% alpha acid)
2.5 AAU East Kent Goldings hops (10 mins) (0.5 oz./14 g of 5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP022 (Essex Ale), White Labs WLP005 (British Ale), Wyeast 1099 (Whitbread Ale) or Wyeast 1318 (London Ale III) yeast

Step by Step

Mash grains (and flour) at 154 °F (68 °C) for 60 minutes. 90-minute boil time, with sugar addition in the last 15 minutes of boil. Ferment at 70–72 °F (21–22 °C).

Bateman's XXXB Bitter Clone

(5 gallons/19 L, extract with grains)

OG = 1.049 FG = 1.012
IBU = 37 SRM = 12 ABV = 4.8%

Ingredients

0.75 lbs. (0.34 kg) Muntons Light dried malt extract
3.3 lbs. (1.5 kg) Muntons Light liquid malt extract (late addition)
1.0 lb. (0.45 kg) Pipkin or Maris Otter pale malt
15 oz. (425 g) crystal malt (60 °L)
1.25 oz. (35 g) wheat flour
1 lb. 3 oz. (538 g) invert sugar
6 AAU Challenger hops (90 mins) (0.75 oz./21 g of 8% alpha acid)
2.5 AAU East Kent Goldings hops (90 mins) (0.50 oz./14 g of 5% alpha acid)
2 AAU Challenger hops (10 mins) (0.25 oz/7.1 g of 8% alpha acid)
2.5 AAU East Kent Goldings hops (10 mins) (0.5 oz./14 g of 5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP022 (Essex Ale), White Labs WLP005 (British Ale), Wyeast 1099 (Whitbread Ale) or Wyeast 1318 (London Ale III) yeast

Step by Step

Steep crushed grains and flour in 3 qts. (~3 L) of water at 154 °F (68 °C) for 45 minutes. Combine "grain tea," water and dried malt extract to make 3.0 gallons (11 L) of wort. Boil for 90 minutes, adding sugar and liquid malt extract in last 15 minutes of the boil. Ferment at 70–72 °F (21–22 °C)

Mauldon's Black Adder

won Supreme Champion Gold in 1991 and is described as a "Superbly balanced dark, sweet ale, but with rich vine fruit throughout." I would again suggest a yeast that provides a fruity character. The data I have for this stout is OG: 1.053–1.055. Malt bill: 46% Maris Otter pale malt, 46% Halcyon pale malt, 3% crystal malt, 5% black malt. Hops: Challenger, optional Goldings. IBU: 27–37. EBC: More than 300.

Mauldon's Black Adder Clone

(5 gallons/19 L, all-grain)

OG = 1.055 FG = 1.014
IBU = 37 SRM = 32 ABV = 5.3%

Ingredients

5 lb. 4 oz. (2.4 kg) Maris Otter pale malt
5 lb. 4 oz (2.4 kg) Halcyon pale malt
5.0 oz. (141 g) crystal malt (60 °L)
8.25 oz (233 g) black malt
9.5 AAU Challenger hops (90 mins) (1.4 oz./39 g of 7% alpha acid)
5 AAU East Kent Goldings hops (0 mins) (1.0 oz./28 g of 5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP022 (Essex Ale), White Labs WLP005 (British Ale), Wyeast 1099 (Whitbread Ale) or

Wyeast 1318 (London Ale III) yeast

Step by Step

Mash grains at 154 °F (68 °C) for 60 minutes. Boil wort for 90 minutes. Ferment at 70 °F (21 °C).

Mauldon's Black Adder Clone

(5 gallons/19 L, extract with grains)

OG = 1.055 FG = 1.014
IBU = 37 SRM = 31 ABV = 5.3%

Ingredients

2 lb. 6 oz. (1.1 kg) Coopers light dried malt extract
3 lb. 12 oz. (1.7 kg) Coopers Light liquid malt extract
1 lb. 3 oz. (0.54 kg) pale malt (Maris Otter, Halcyon or blend of the two)
5.0 oz. (140 g) crystal malt (60 °L)
8.25 oz (233 g) black malt
9.5 AAU Challenger hops (90 mins) (1.4 oz./39 g of 7% alpha acid)
5 AAU East Kent Goldings hops (0 mins) (1.0 oz./28 g of 5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP022 (Essex Ale), White Labs WLP005 (British Ale), Wyeast 1099 (Whitbread Ale) or Wyeast 1318 (London Ale III) yeast

Step by Step

Steep crushed grains in 3 qts. (~3 L) of water at 154 °F (68 °C) for 45 minutes. Combine "grain tea," water and dried malt extract to make 3.0 gallons (11 L) of wort. Boil for 90 minutes, adding liquid malt extract in the last 15 minutes of the boil. Ferment at 70 °F (21 °C).

Coach House Post Horn Premium Ale

won Gold for Strong Bitter/Ale in 1994. It is described as a "Dry golden bitter with a blackcurrant fruitiness and good hop flavours leading to a strong, dry finish." From this I would suggest a yeast that provides a dry character.

The data I have for this beer is OG: 1.050. Malt bill: 94.5% Maris Otter pale malt, 5.5% pale crystal malt. Hops: Fuggles, Target. Dry hops: Yes. IBU: 38. EBC: 18.

Coach House Post Horn Premium Ale Clone

(5 gallons/19 L, all-grain)

OG = 1.050 FG = 1.011
IBU = 38 SRM = 9 ABV = 5.0%

Ingredients

9 lb. 10 oz. (4.4 kg) Maris Otter pale malt
8.5 oz. (240 g) crystal malt (40 °L)
7.2 AAU Target hops (90 mins) (0.65 oz./18 g of 11% alpha acid)
2.3 AAU Fuggles hops (90 mins) (0.5 oz./14 g of 4.5% alpha acid)
9 AAU Fuggles hops (0 mins) (2.0 oz./57 g of 4.5% alpha acid)
1 tsp. Irish moss
White Labs WLP005 (British Ale), Wyeast 1098 (British Ale) or Wyeast 1335 (British Ale II) yeast

Step by Step

Mash at 150 °F (66 °C) for 60 minutes. 90 minute boil time. Ferment at 70 °F (21 °C).

Coach House Post Horn Premium Ale Clone

(5 gallons/19 L, extract with grains)

OG = 1.050 FG = 1.011
IBU = 38 SRM = 9 ABV = 5.0%

Ingredients

1.75 lbs. (0.79 kg) Briess Light dried malt extract
3.75 lbs. (1.7 kg) Briess Light liquid malt extract (late addition)
1.5 lb. (0.68 kg) Maris Otter pale malt
8.5 oz. (240 g) crystal malt (40 °L)
7.2 AAU Target hops (90 mins) (0.65 oz./18 g of 11% alpha acid)
2.3 AAU Fuggles hops (90 mins) (0.5 oz./14 g of 4.5% alpha acid)
9 AAU Fuggles hops (0 mins) (2.0 oz./57 g of 4.5% alpha acid)
1 tsp. Irish moss
White Labs WLP005 (British Ale), Wyeast 1098 (British Ale) or Wyeast 1335 (British Ale II) yeast

Step by Step

Steep crushed grains in 3 qts. (~3 L) of water at 150 °F (66 °C) for 45 minutes. Combine "grain tea," water and dried malt extract to make 3.0 gallons (11 L) of wort. Boil for 90 minutes, adding liquid malt extract in the last 15 minutes of the boil. Ferment at 70 °F (21 °C).

Timothy Taylor Best Bitter

won Supreme Champion Silver in 1993. Its description is "Hops and fruit combine well with a nutty malt character in this drinkable bitter. Bitterness increases down the glass and lingers in the aftertaste." The data I have for this beer is OG: 1.037. Malt bill: 95% Golden Promise pale malt, 5% roast crystal malt. Hops: Fuggles, Goldings. Late hops: Styrian Goldings. EBC: 27–29.

Timothy Taylor Best Bitter Clone

(5 gallons/19 L, all-grain)

OG = 1.037 FG = 1.008
IBU = 29 SRM = 11 ABV = 3.7%

Ingredients

7 lb. 2 oz. (3.2 kg) Golden Promise pale malt
5.75 oz (163 g) crystal malt (120 °L)
3.8 AAU East Kent Goldings hops (90 mins) (0.75 oz./21 g of 5% alpha acid)
3.4 AAU Fuggles hops (90 mins)

(0.75 oz./21 g of 4.5% alpha acid)
5.4 AAU Styrian Goldings hops (0 mins)
(1.0 oz./28 g of 5.4% alpha acid)
1 tsp. Irish moss (15 mins)
Wyeast 1028 (London Ale) or
Wyeast 1098 (British Ale) yeast

Step by Step

Mash at 152 °F (67 °C) for 60 minutes. Boil for 90 minutes. Ferment at 68 °F (20 °C).

Timothy Taylor Best Bitter Clone

(5 gallons/19 L, extract with grains)

OG = 1.037 FG = 1.008
IBU = 29 SRM = 11 ABV = 3.7%

Ingredients

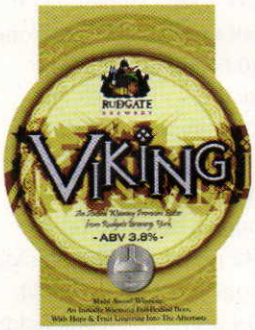
0.5 lbs. (0.23 kg) Muntons Light dried malt extract
3.3 lbs. (1.5 kg) Muntons Extra Light liquid malt extract (late addition)
1 lb. 10 oz. (0.74 kg) Golden Promise pale malt
5.75 oz (163 g) crystal malt (120 °L)
3.8 AAU East Kent Goldings hops (90 mins)
(0.75 oz./21 g of 5% alpha acid)
3.4 AAU Fuggles hops (90 mins)
(0.75 oz./21 g of 4.5% alpha acid)
5.4 AAU Styrian Goldings hops (0 mins)
(1.0 oz./28 g of 5.4% alpha acid)
1 tsp. Irish moss (15 mins)
Wyeast 1028 (London Ale) or
Wyeast 1098 (British Ale) yeast

Step by Step

Steep crushed grains in 3 qts. (~3 L) of water at 152 °F (67 °C) for 45 minutes. Combine "grain tea," water and dried malt extract to make 3.0 gallons (11 L) of wort. Boil for 90 minutes, adding liquid malt extract in the last 15 minutes of the boil. Ferment at 68 °F (20 °C).

Rudgate Viking *won Silver in the Bitter category in 2002 and is described as "An initially warming and malty, full-bodied beer, with hops and fruit lingering into the aftertaste."*

The data I have for this beer is OG: 1.039. Malt bill: 90% Halcyon pale malt, 10% crystal malt. Hops: Fuggles, Northdown or Challenger, Goldings. Late hops: Goldings. IBU: 24. EBC: 24–30.



Rudgate Viking Clone

(5 gallons/19 L, all-grain)

OG = 1.039 FG = 1.010

IBU = 24 SRM = 11 ABV = 3.8%

Ingredients

7 lb. 4 oz. (3.3 kg) Halcyon pale malt
12 oz. (340 g) crystal malt (60 °L)
4.0 AAU Northdown hops (90 mins)
(0.48 oz./13 g of 8.4% alpha acid)
2.0 AAU East Kent Goldings hops (90 mins)
(0.4 oz./11 g of 5% alpha acid)
5 AAU East Kent Goldings hops (0 mins)
(1.0 oz./28 g of 5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP037 (Yorkshire Square Ale) or Wyeast 1099 (Whitbread Ale) yeast

Step by Step

Mash at 154 °F (68 °C) for 60 minutes. Boil for 90 minutes. Ferment at 68 °F (20 °C).

Rudgate Viking Clone

(5 gallons/19 L, extract with grains)

OG = 1.039 FG = 1.010

IBU = 24 SRM = 11 ABV = 3.8%

Ingredients

14 oz. (0.40 kg) Muntons Light dried malt extract
3.3 lbs. (1.5 kg) Muntons Extra Light liquid malt extract (late addition)
1.25 lbs. (0.57 kg) Halcyon pale malt
12 oz. (340 g) crystal malt (60 °L)
4.0 AAU Northdown hops (90 mins)
(0.48 oz./13 g of 8.4% alpha acid)
2.0 AAU East Kent Goldings hops (90 mins)
(0.4 oz./11 g of 5% alpha acid)
5 AAU East Kent Goldings hops (0 mins)
(1.0 oz./28 g of 5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP037 (Yorkshire Square Ale) or Wyeast 1099 (Whitbread Ale) yeast

Step by Step

Steep crushed grains in 3 qts. (~3 L) of water at 154 °F (68 °C) for 45 minutes. Combine "grain tea," water and dried malt extract to make 3.0 gallons (11 L) of wort. Boil for 90 minutes, adding liquid malt extract in the last 15 minutes of the boil. Ferment at 68 °F (20 °C).

Holden's Black Country Bitter

won Silver in the Bitter category in 2005 and is described as "A medium-bodied, golden ale; a light, well-balanced bitter with a subtle, dry, hoppy finish." The data I have for this beer is:

OG: 1.039. Malt bill: 85–95% Maris Otter pale malt, 0–10% crystal malt, 0–5% torrefied wheat, 0–2% brewing sugar. Hops: Fuggles, optional Goldings. Dry hops: Fuggles. EBC: 24–26.

Holden's Black Country Bitter Clone

(5 gallons/19 L, all-grain)

OG = 1.039 FG = 1.010
IBU = 27 SRM = 9 ABV = 3.8%

Ingredients

7 lb. 4 oz. (3.3 kg) Maris Otter pale malt
6.0 oz. (170 g) crystal malt (60 °L)
3.0 oz. (85 g) torrefied wheat
1.25 oz. (34 g) invert sugar
6.8 AAU Fuggles hops (90 mins) (1.5 oz./43 g of 4.5% alpha acid)
2.2 AAU Fuggles hops (dry hops) (0.5 oz./14 g of 4.5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP005 (British Ale), Wyeast 1098 (British Ale) or Wyeast 1335 (British Ale II) yeast

Step by Step

Mash grains at 154 °F (68 °C) for 60 minutes. Boil 90 minutes, adding sugar for the final 15 minutes of the boil. Ferment at 70 °F (21 °C).

Holden's Black Country Bitter

(5 gallons/19 L, extract with grains)

OG = 1.039 FG = 1.010
IBU = 27 SRM = 9 ABV = 3.8%

Ingredients

7.0 oz. (198 g) Coopers light dried malt extract
3 lb. 12 oz. (1.7 kg) Coopers Light liquid malt extract (late addition)
1 lb. 7 oz. (0.65 kg) Maris Otter pale malt
6.0 oz. (170 g) crystal malt (60 °L)
3.0 oz. (85 g) torrefied wheat
1.25 oz. (34 g) invert sugar
6.8 AAU Fuggles hops (90 mins) (1.5 oz./42 g of 4.5% alpha acid)
2.2 AAU Fuggles hops (dry hops) (0.5 oz./14 g of 4.5% alpha acid)
1 tsp. Irish moss (15 mins)
White Labs WLP005 (British Ale), Wyeast 1098 (British Ale) or Wyeast 1335 (British Ale II) yeast

Step by Step

Steep crushed grains in 3 qts. (~3 L) of water at 154 °F (68 °C) for 45 minutes. Combine "grain tea," water and dried malt extract to make 3.0 gallons (11 L) of wort. Boil the wort for 90 minutes, adding sugar and liquid malt extract in the last 15 minutes of the boil. Ferment at 70 °F (21 °C). BYO

Historical Porter

Brewing a classic with *Brettanomyces*

by Terry Foster

For many years I have been on a quest to find out all I can about porter. This has meant hours and hours of study in places like the National Brewing Library in England, the British Library in London, and the Beinecke Rare Book Library at Yale. All of which has yielded filing cabinets full of notes about the origin of the beer, who made it, what it was made from, where it was made, and so on. But it never answered that most important of questions — what did porter taste like in the 18th century?

Aside from the difficulties of reproducing raw materials from that time, there is the problem of knowing what happened to porter during storage. In those times porter was stored in wooden vats for months, or even years, before it was sold. So it might well have developed various flavors through the action of bacteria or "wild" yeasts present in the wood, or even in the beer itself before storage. It has been suggested by one British researcher that the high hop alpha-acid levels in porter would have inhibited the bacteria, such as those producing lactic acid, and the major effects of storage on flavor come from yeasts other than *Saccharomyces* species.

There is no direct evidence of this, but there is some good secondary evidence. In the early part of the 20th century a Dane, N.H. Claussen identified a yeast species as being responsible for the secondary fermentation in British Stock Ales. He called it *Brettanomyces*, and it was later named *B. claussenii* in his honor, as other variants of the species were later discovered, notably in Belgian "spontaneously-fermented" beers.

Stock Ales were high alcohol beers stored in wooden vats for long periods, during which they underwent a slow secondary fermentation, as the *Brettanomyces* yeast consumed polysaccharide molecules which *Saccharomyces* species could not ferment. It was considered that this was what gave British stock ales their characteristic taste, later found to be largely due to high levels of fatty acid ethyl esters, notably ethyl acetate and ethyl lactate, which were produced by this yeast. One writer has suggested that the relatively high levels of these esters may have given the beer a narcotic effect, making it appear stronger than its alcohol level would suggest. Claussen's work proved there were at least two different yeasts at work in these beers, which lead many English brewers to refute Hansen's suggestion of using single culture yeasts, a practice which soon became common in Continental Europe. Ironically, not much later British brewers phased out Stock Ales almost entirely, and turned to brewing only "running" beers, which were shipped out of the brewery and drunk before there was time for the slow *Brettanomyces* secondary fermentation to occur.

Therefore, with perhaps a little stretch it seems that *Brettanomyces claussenii* might well have made a significant contribution to the flavor of vatted 18th century porters. So it seemed to me that I needed to experiment with *Brettanomyces* in a porter. I am not the first person to have done this — check out http://www.byo.com/component/resource/article/2032-piatzs-historic-porter for another version.

For the record, three varieties of *Brettanomyces* are available to us:

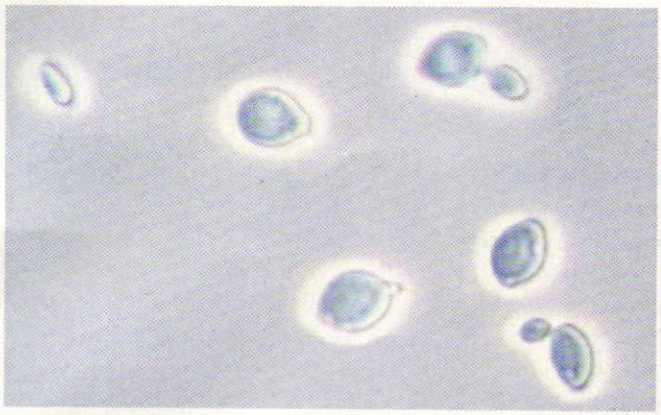
• *B.claussenii* (White Labs WLP645); this is reckoned to give a relatively mild and subtle *Brett* character, with the accent on aroma rather than flavor, the aroma being estery/fruity, reminiscent of pineapple according to some.

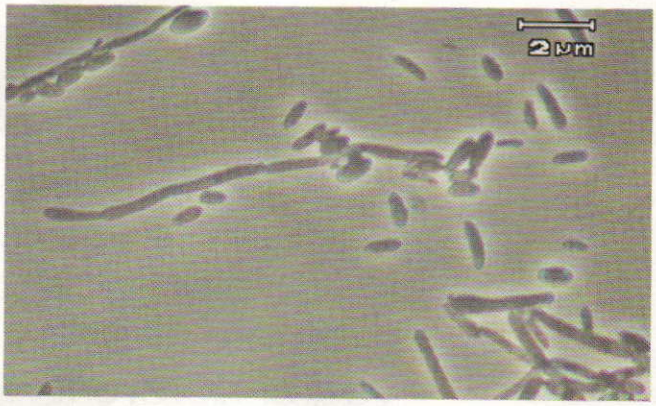
• *B.bruxellensis* (White Labs WLP 650, Wyeast 5112); classed as a stronger *Brett* character than the former, giving the notorious horse blanket flavor, and quoted as being used for secondary fermentation of Orval Trappist ale as well as in lambic beers.

• *B.lambicus* (White Labs WLP 653, Wyeast 5526); produces the most distinctive *Brett* flavors and aromas, sometimes described as "like cherry pie;" it is found in lambic beers and Belgian sour brown ales.

> "In those times porter was stored in wooden vats for months, or even years, before it was sold."

18th Century porters were possibly affected flavor-wise by the presence of *Brettanomyces* present in the oak barrels used to transport the beer.





To try and recreate an 18th Century porter in modern times, homebrewers can try experimenting with using one of the three commercial strains of *Brettanomyces* available from Wyeast or White Labs. *Brett* (pictured under a microscope to the left) has a notorious reputation, especially among winemakers, as a troublesome "wild" yeast and can contaminate a home brewery without proper sanitation practices.

All of these, particularly the last two, also produce some acidity, and all of them take upwards of three months for full flavor development, although as might be expected the rate of secondary fermentation increases with increasing temperature.

The first point about these yeast strains is that, leaving the Belgians aside, most brewers consider them to be undesirable wild yeasts. Also, once a *Brett* strain becomes established in a brewery it is very difficult to eradicate, which is probably why such yeast are suitable for the Belgian "spontaneous fermentation" approach. Therefore, if you plan to be primarily a brewer of regular ales, stouts, and lagers and to only occasionally dabble with *Brett*-fermented beers, you MUST be scrupulous about cleanliness and sanitation (which you should be anyway). I have spoken to many British brewers who were aghast at the idea of using more than one *Saccharomyces* species in their brewery, let alone a *Brett* species. But many American craft brewers use more than one yeast variety and quite a number have used *Brett* yeasts without cross-contamination problems. If you use only stainless steel and

glass your normal cleaning and sanitizing techniques should ensure you have no contamination problems.

For my experiment I used an 1850 recipe from Whitbread, one of the great London porter brewers. I didn't use any of my 18th century recipes as you might have expected, because these call for the use of 100% brown malt. Modern brown malts are not made in the same way as those from that time, and cannot be mashed on their own. So for a brew of 5 gallons (19 L) my malt bill consisted of 80% pale malt, 5% black malt, and 15% brown malt, with OG 1.060 (14.7 °P). I opted to keep the bittering hops low, at an estimated 25 IBU, so as not to mask other tastes. I used Wyeast 1098 for the primary fermentation, which finished at SG 1.022 (5.5 °P) in two weeks time. I could have added the *Brett* in the primary, but I had already decided that I would split the batch into two and add the *Brett* to only one half. I had also decided I would use *B.claussenii* WLP645. My research had indicated that there was a difference of opinion as to whether or not it was necessary to make a starter with this yeast. I decided not to do so for two reasons, the first being that I would be pitching only half the brew with the *Brett* yeast, thus needing less than for a full batch. My second reason was that I was concerned about possible contamination of my brewery with the *Brett*, during the various operations needed to prepare a starter, and decided that it was not worth the risk at that point.

Since the beer was going to be in secondary for some months, it seemed to me that it would be best conducted in a stainless steel soda keg. That way the keg could be kept sealed and the beer brought into condition by the *Brett* fermentation, and there would be less chance of contamination with bacteria which might confuse the issue. At first I had thought that I might dedicate a keg to *Brett* fermentations, as I have some spare, having picked them up very cheaply. But these are 5-gallon kegs and I should only be putting 2.5 gallons in it, leaving a lot of head space with a consequent risk of oxidation masking other flavors. Instead I went for a 3-gallon keg (which is more expensive than any of the fives, and in shorter supply in my brewery!).

I racked half of the brew into the pre-cleaned and sanitized keg, and took it into the far corner of my basement, well away from the brewing area. I oxygenated the beer for about 30 seconds before adding the *Brett* culture, for two reasons. First, I wanted to give the culture a head start, as I was not going to prepare a starter, and second I didn't want to oxygenate the beer after adding the culture, in order to simplify cleaning of the diffusion stone. Once the *Brett* culture was in I sealed the keg and I left it for six months. My basement is generally around 60–65 °F (15.6-18.3 °C) most of the year, so quite satisfactory for a slow secondary fermentation. The remainder of the beer I bottled, along with a little dextrose as priming.

So then came the moment of truth. I took two glasses, a bottle of the non-*Brett* beer, and the keg with the *Brett*-impregnated beer. To sample the latter I used a picnic tap, which even after cleaning I have since reserved solely for *Brett* beers. That may be

> "Brewing authentic reconstructions of old beers is fraught with difficulties . . ."

overkill, as I could simply have replaced the tubing and cleaned and sanitized the tap and beer outfitting in the usual way. Then I filled the glasses each with one of the beers, and set about comparing them as closely as I could. The non-*Brett* beer was a sound robust porter, well-balanced, with a hint of the almost chewy effect brown malt typically gives, and background roasted notes from the black malt; overall it was a good beer, although a little thinner than I had expected. Then to the *Brett*-beer, which was not at first markedly different, with the above flavor notes still noticeable. It did have a more intense aroma, mainly fruity from what appeared to be various esters, but not what I should describe as "pineapple," and I could detect no hint of "horse blanket." It did taste a little fuller than the other beer, again probably due to fatty acid esters produced by the *Brett*. On the down side, there seemed to me to be a slight greasy aroma and flavor which I did not like; that might well be subjective, as I have handled quite a lot of pure ethyl lactate, and never really liked its aroma! There was also an apparent increase in acidity, making the beer quite tart, although not unbearably so; it was certainly less tart than a typical lambic beer, which I generally do not like.

However, I did feel that the *Brett*-fermented beer was not one that I would like to drink by the pint. So my next step was to blend the two beers, and I did this in the simplest way, at the point of serving. This was often done with porter in earlier days, but usually with an old and a young brew, and in my case I was using two old beers, one with and one without *Brett* treatment. I poured about one-tenth of a pint of the *Brett* beer into a pint glass and then added a half-pint of the other beer, and swirled them together a little before tasting. This was something of a revelation, with all the malt characteristics of the porter showing through as before, but now a little fuller on the palate, and just a little bite from the extra acidity adding an extra touch of interest.

Although my experiment did not perhaps result in a great revelation about 18th Century porter, I had never expected that it would do so. As I pointed out at the beginning, brewing authentic reconstructions of old beers is fraught with difficulties, even when recipes have been uncovered and deciphered. You have to try to solve the puzzle one step at a time, and this experiment is one more piece in place. BYO

Terry Foster is the author of the "Pale Ale" and "Porter" books in the Classic Beer Style Series (Brewers Publications).

Whirlpool Dynamics

The physics of trub removal

by Chris Bible

Whirlpooling is a method for separating trub from wort that is widely used by homebrewers and commercial brewers. In commercial breweries, trub-containing wort is pumped tangentially into a tank with a flow rate that is sufficient to initially induce a spinning, circular flow pattern. As wort is pumped into the tank, the suspended trub moves along with the liquid, but when the pumping is stopped, the trub collects into a cone-shaped pile in the middle of the vessel. Homebrewers achieve this same whirlpool effect by rapidly stirring their wort in a circular motion and then stopping.

But why does the trub collect in the middle of the vessel? Why doesn't it move outward and collect against the wall of the vessel? In order to explain why trub moves to the center of the tank instead of to the edges, we must first understand the details of the fluid dynamics that are at work within the system.

To explain how this phenomena works I will use the representative physical system of loose leaves being stirred in a teacup and discuss the physical forces at work within it. When the tea is stirred, the leaves are rotating around the bottom of a cup, following the motion of the water that is caused by stirring. When the stirring is stopped and the spoon is removed, the leaves begin to move towards the center of the cup and collect on the bottom, exactly like a brewer's trub collects in the center of the whirlpool. When the tea is being stirred, the liquid level (and pressure) near the side walls of the cup or brewing vessel is higher than the liquid level in the center when the tea is rotating. The concave surface of the tea is evidence of this. This level and pressure variation is the result of the centripetal acceleration that balances the centrifugal acceleration of the rotating liquid. It is this pressure gradient that induces a vortex effect within the system, and this vortex causes the solids to move to the center of the rotating liquid.

The pressure gradient within the liquid exists because liquid near the bottom and sides of the cup cannot move as freely as the rest of the liquid within the cup. The liquid moves much more slowly near the bottom and sides of the cup because of frictional resistance. The net result of this fluid friction is that the angular momentum of the liquid near the bottom is not enough to oppose the effect of the radial pressure field created by the rotating liquid away from the bottom boundary layer. The pressure variation is such that it pushes the liquid (and any entrained solids) near the bottom of the cup towards the center.

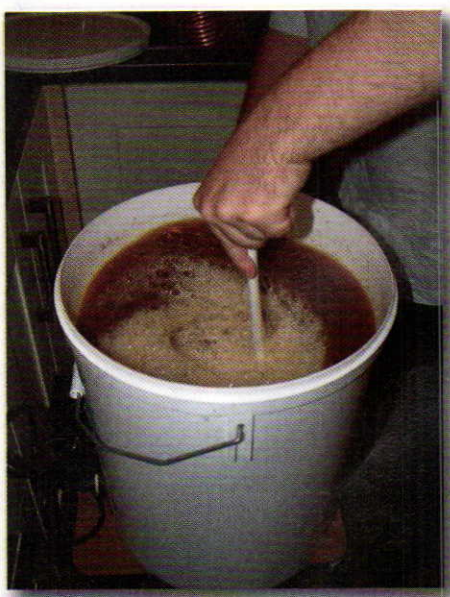
Because mass flow is conserved, the liquid moving towards the center of the cup then collides with liquid from the opposite side of the cup and turns upward towards the surface. When the liquid is near the surface, it then turns towards the side wall and finally moves down towards the bottom, replenishing the liquid that was originally there.

The tea leaves recirculate with the water and eventually become entangled with one another near the bottom-center of the cup. Eventually the solids clump together enough so that the upward movement of the liquid near the center is no longer sufficient to create a buoyant force that can overcome the force of gravity acting upon the solids. When this happens, the solids remain on the bottom and at the center of the cup.

The tempest in the teacup

A vortex is induced because liquid near the top of the vessel is pushed out "harder" because there is less fluid friction at the top of the liquid. The liquid near the bottom of the vessel is pushed out less because there is more friction and less force near the bottom to push it out. The weaker force at the bottom of the vessel induces a pressure gradient that creates an inward, recirculating flow. This inward recirculation is usually called the Bödewadt layer, after the German scientist who described the motion of a rotating fluid over an infinite wall at rest. Albert Einstein, however, was the first to give an explanation of this phenomenon in 1926 in the case of the teacup and his explanation is also correct for trub in a whirlpool.

> "The angular momentum of the liquid near the bottom is not enough to oppose the effect of the radial pressure field."



Photos / Illustrations courtesy of Chris Bible

Simple stirring creates some complex fluid dynamics. The upshot is that a cone of trub is deposited in the center of the vessel.

figure 1a

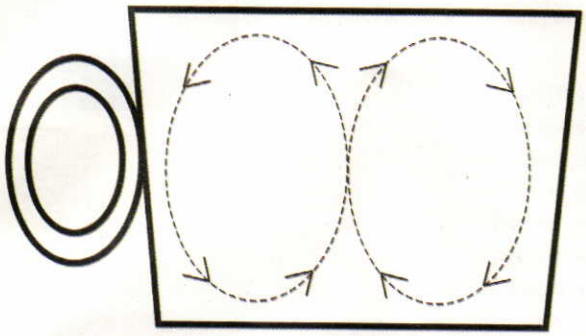
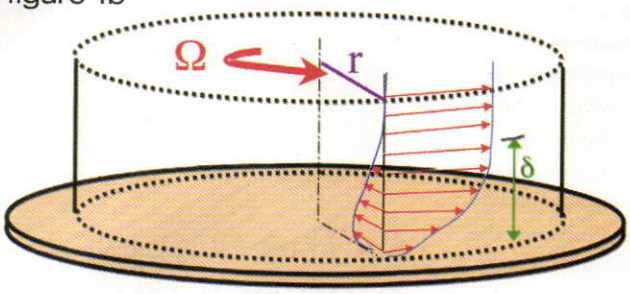


figure 1b



An illustration of the fluid flow situation within a system in which the fluid has been set into circular motion and then allowed to experience these frictional effects is shown in Figures 1a and 1b. The fluid slowed by wall friction is called a boundary layer, and this boundary layer plays a key role in the fluid mechanics of this system. The boundary layer thickness, δ, is given by the lengthscale where the imposed rotation Ω is diffused by viscosity in the intermediate fluid layers. In the ideal case of a fluid rotating over an infinite wall, the balance between centrifugal and viscous forces yields $\delta \sim (\nu/\Omega)1/2$ (where ν is the kinematic viscosity of the fluid), which is a constant, independent of the radius r.

The mathematics describing this system are complex and involve solving numerous, simultaneous-differential equations. Thankfully, the power of modern computers coupled with commercially available computational fluid dynamics software is able to provide us with a good picture of the velocity profiles within our stirred teacup example. The velocity profiles for the stirred cup — seen in Figures 2 and 3 — are good analogues for what we could expect for velocity profiles within our trub-removing whirlpools.

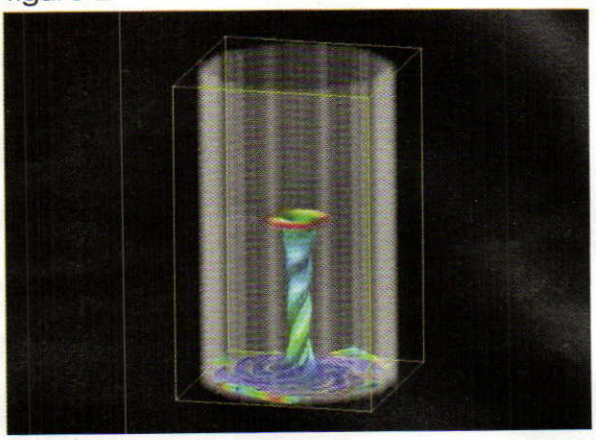
Figure 2 shows the velocity profiles for fluid flow near the bottom of the cup. Figure 3 shows velocity profiles across a cross-section of the cylindrical cup. In these figures, red represents relatively fast-moving fluid elements, and blue represents slower moving fluid elements. There are several factors that are important to consider when operating a whirlpool vessel: geometry, feed velocity and rotation time. Vessel geometry is an important considera-

tion for a whirlpool vessel because it directly impacts the fluid dynamics within the system. Commercial breweries usually use cylindrical or slightly cone-bottomed vessels with a depth:diameter ratio of between 1:1 to 1:5. Feed velocity and rotation time also affect the final results of the whirlpool. If the initial rotational velocity is too low, a poorly-compacted trub cone will be formed. If the initial rotational velocity is too high, the inertial forces caused by the fast-moving liquid may cause the trub cone to not hold together. Initial rotational velocities generally are determined by trial and error. Rotation time is important because all of the fluid-dynamic-induced forces must have time to work. Generally, commercial breweries allow a rotation time of between 10 and 40 minutes. Smaller tanks generally require less rotation time.

The optimum rotational velocity and rotation time for a homemade whirlpool system in your home brewery depends upon the geometry of your vessel, the amount of friction between the wort and your vessel and the clumping properties of the trub. It also depends slightly on the OG of your wort; whirlpool effectiveness decreases as the OG increases because the relative density differential between the wort and the trub decreases with increasing wort density. To ensure good cone formation within your whirlpool, add Irish moss or other flocculation aids and leave the vessel alone for at least 10 minutes. BYO

Chris Bible is a regular contributor to Brew Your Own *and writes "Advanced Brewing" in every issue.*

figure 2



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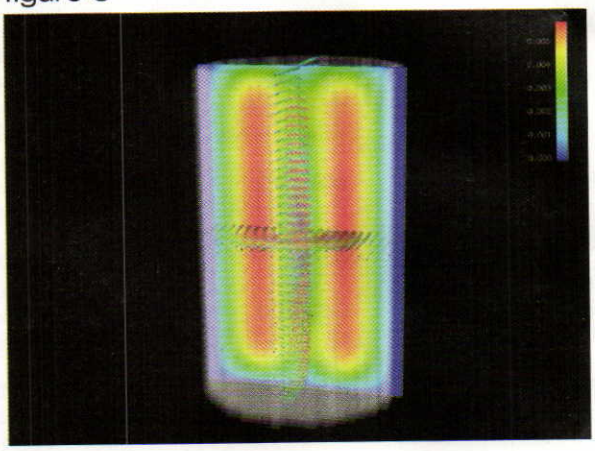

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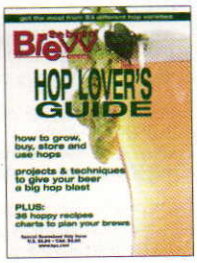

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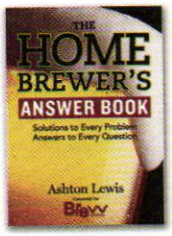

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Beer From the Sun

A solar homebrewing pioneer

by Kristin Grant

First, there was the guy who invented the wheel. Then the Wright brothers brought us flight. And now Joseph Bair has introduced the world to another important first, only this one involves something some would consider way more important: beer. After much thought and trial-and-error, Bair rigged up a contraption using a special lens typically found in items such as lighthouses and projection televisions, and in the process, became the world's first solar homebrewer.

"I use a Fresnel lens because the more light you collect, the more you can funnel it into power," explains Bair, cutting-edge homebrewer and owner of Princeton Homebrew in Trenton, New Jersey. These lenses, the "secret" to Bair's solar brewing, collect so much light with their complex, stamped design that the focused beam they generate can reach temperatures upwards of 800 °F (427 °C). Although the imprinted pattern is complex, the actual size of the acrylic lens Bair uses is relatively small, just a few feet per side. He can easily wheel it around in a basic wood frame he crafted to fit around the lens.

When the sun is shining, the lens captures light and converts it into power. The intense beam created by the lens can easily cook his barley and boil his water. Bair simply places anything he needs heated directly in the light ray, which efficiently heats all items in its path. And with that, he can brew. Bair even enhances the flavor of his fresh hops by roasting them first using the same solar method, imparting a distinct smoky flavor to his beer.

Furthermore, he says any homebrewer can use this technique to brew great beer and help the environment in one fell swoop. "Homebrewers understand that this easy home project that uses an existing recycled projection TV lens has so many environmental benefits." Solar energy creates no pollution, generates no noise and can be used for other household purposes as well. "Once a brewer has a functioning large Fresnel lens, it can be used for many cooking and heating endeavors, including blow torch applications." Bair has been known to demonstrate this application by literally burning designs into wood using nothing but the concentrated beam. Aside from the practical and environmental benefits of this method, using solar energy also significantly reduces costs.

To boil the water, Bair puts the kettle in an old refrigerated case — the kind with the glass front door — to keep the heat in as the Fresnel lens zaps it with the intensely hot beam. Aside from the energy source, the rest of the brewing process remains unchanged.

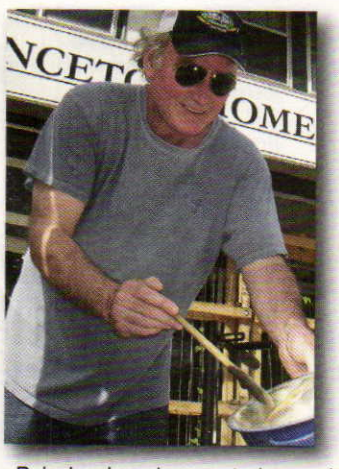
Homebrewers who opt to use solar energy for brewing must always take into account one major factor: the weather. "It only works when the sun is shining," Bair says. Checking the forecast first is a must to avoid losing energy midway through the process. Once a bright, sunny day arrives, roll out the lens and the kettle and brew away. Bair can swivel his lens to different angles via the hand-made rolling frame so that he can position it to directly face the sun at any time of day.

Not only is the system fairly simple, but Bair explains it has numerous other advantages as well. "This heating method is a free, clean, renewable and a wizard-like energy source," he says. "Using solar energy to brew will help slow down the mad rush to use up all the non-renewable fossil fuels which create carbon dioxide."

His efforts have not gone unnoticed. Bair has been nominated for a New Jersey Clean Energy award for the steps he has taken to make his business, which is primarily solar-powered, eco-conscious. However, as word spreads of his new brewing method, he will likely be honored in many more ways — on back porches and in living rooms across the country — as people raise glasses of solar-power-made ales, Pilsners, and stouts in his name: "To Joe Bair, brewing pioneer. Thanks to you, we can finally brew cost-effective, environmentally friendly beer."

Joe Bair has offered to answer questions about this new technique. He can be reached at: joe@solarhomebrew.com. BYO

> "Homebrewers who opt to use solar energy for brewing must always take into account one major factor: the weather."



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Joe Bair developed a way to brew with the power of solar energy.

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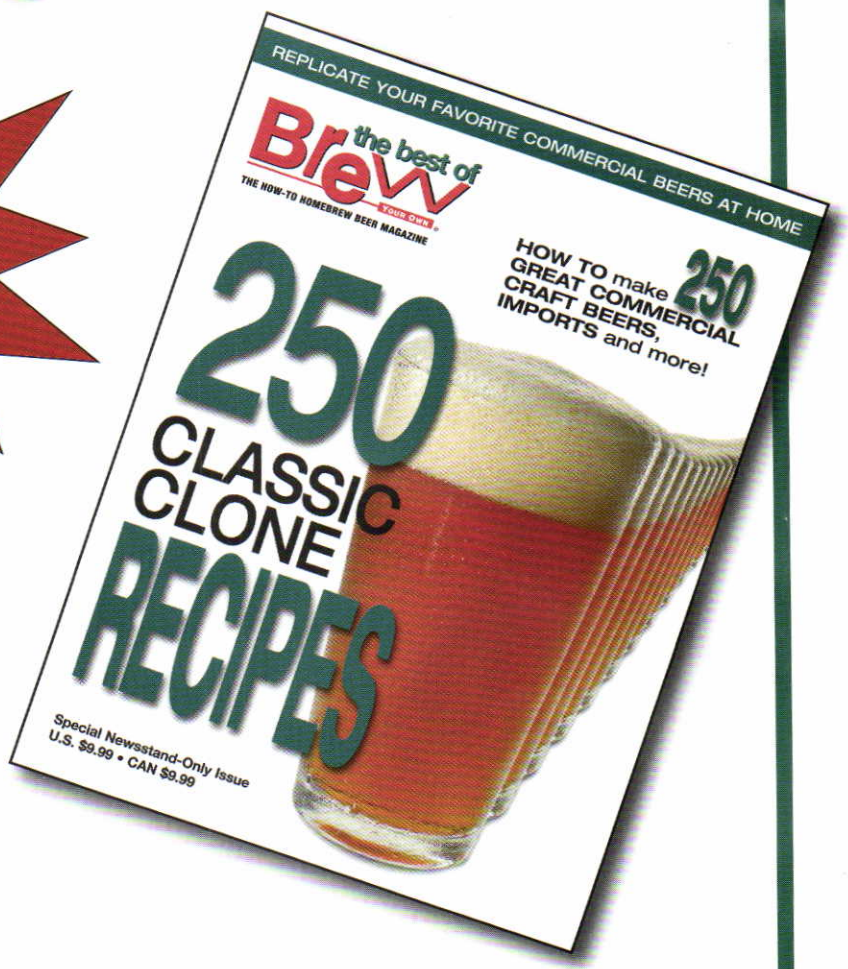

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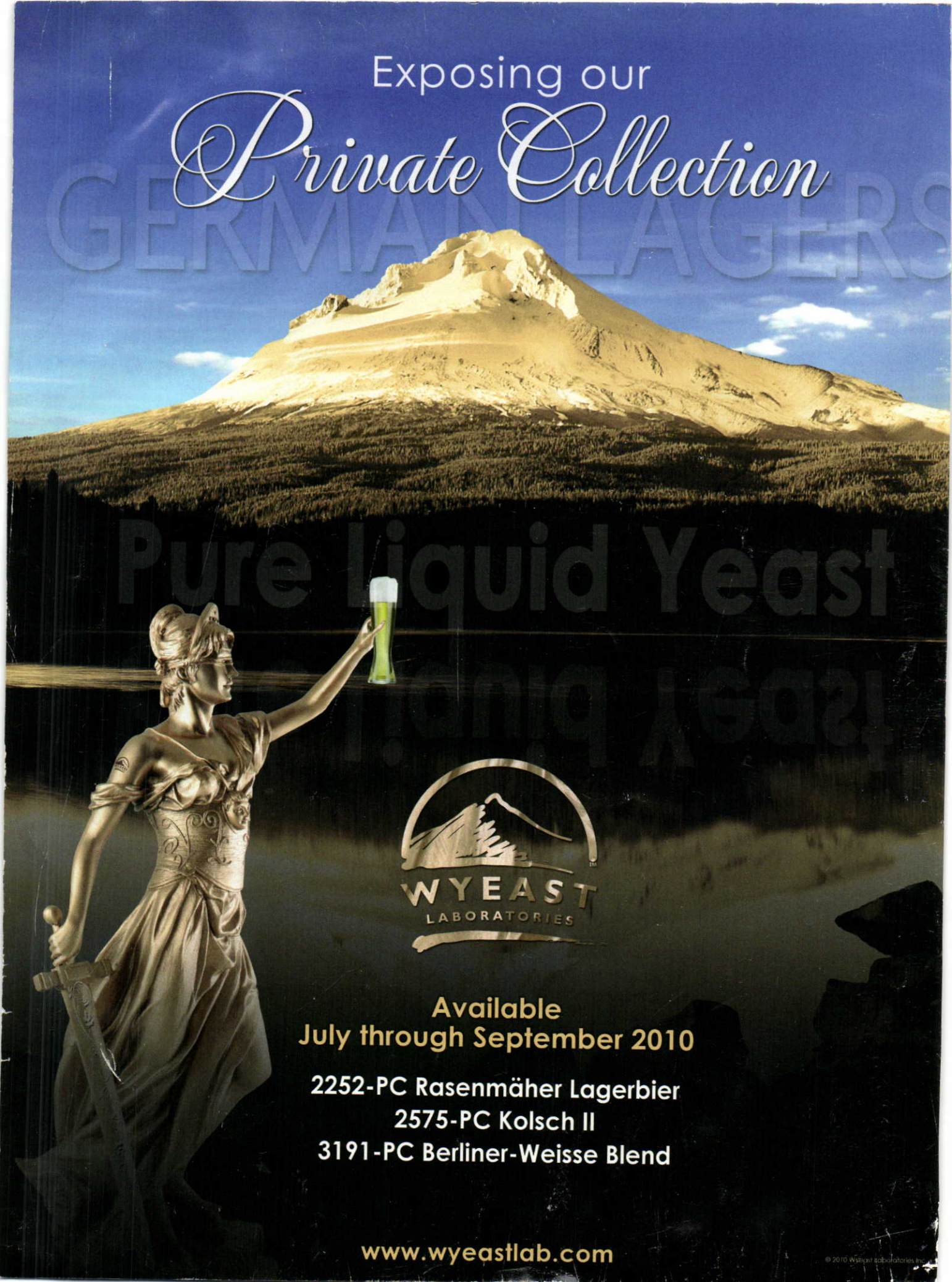
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