SPECIAL 15TH ANNIVERSARY ISSUE | FIVE CLONE ANNIVERSARY RECIPES | BREWING A BALTIC PORTER

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THE HOW-TO HOMEBREW BEER MAGAZINE

SEPTEMBER 2010, VOL.16, NO.5

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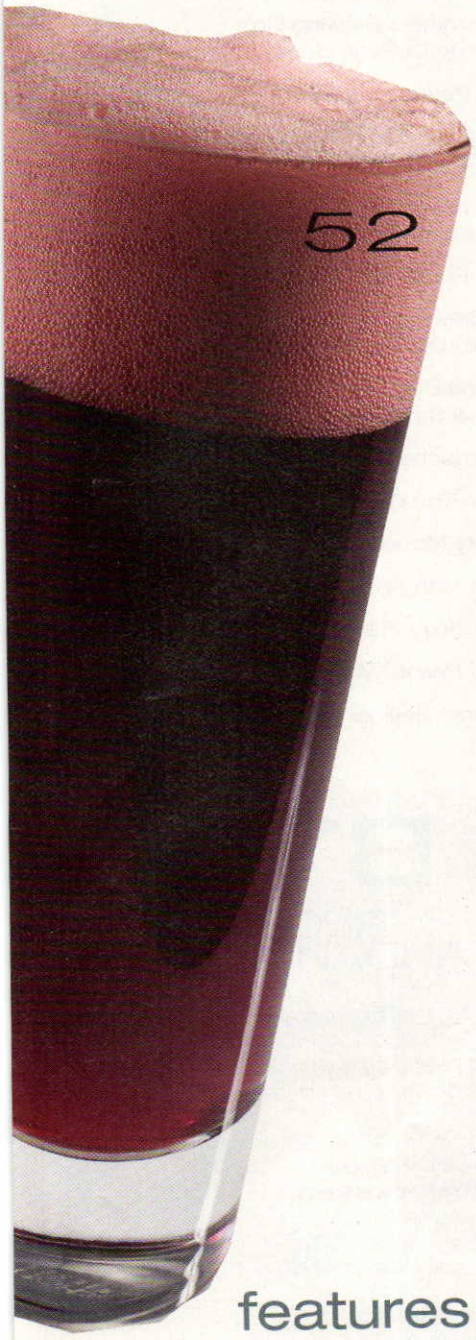
CONTENTS

September 2010 Volume 16 Number 5



features

19

departments

where to find it

RECIPE INDEX

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

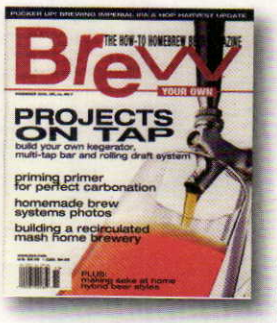
Brew Your Own — The How-To Homebrew Beer Magazine
Basic Brewing
colLABorative

BYO/Basic Brewing Experiment #5

Got 12 beers? Want to be a scientist? Well, you're in luck, because James Spencer (host of Basic Brewing Radio) and *BYO* are proud to announce the 5th in our series of *BYO*/BBR Collaborative Brewing experiments. This experiment is very straightforward, all you need to do is take 12 bottled homebrews, store them under different conditions and sample them at the appropriate times. Check out www.byo.com/blogs for details.

Check out the equipment

If there's one thing homebrewers love to do almost as much as brewing, it's building brewing equipment and expanding their homebreweries. Stop in and check out our gallery of hobby breweries — big and small. www.byo.com/photos/category/4



Browse *BYO*'s back issues

Looking for a story on a specific topic? Extra content and stories are added to byo.com every week. Check out our online index of back issues at www.byo.com/stories/issue

Cover Photo: **Charles A. Parker**

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Volume 16, Number 5: September 2010.

Cascadian controversy

I love your magazine, I read every issue. I do take exception at your depiction of a "new" brewing category being called "Cascadian" Dark Ale (July-August 2010). Such a beer has been an offering at Vermont Pub and Brewery for a long time. To give this beer a trite Northwest moniker is misleading. Did your author call Vermont Pub and Brewery for their account or look East for any research at all? I'm curious as to how much work was done to validate that Noonan's claims are "unsubstantiated," especially given the fact he isn't around anymore to ask. Proper research may have been done, but it did not show up in the article. Is there bias here?

It is time to eliminate the word "Cascadian" anyway. Shouldn't we call it Black IPA, or something a little more descriptive and a little less kitschy?

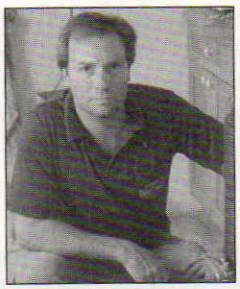
Michael Burdick
Burlington, Vermont

Author Marc Martin responds: "I do suppose that the context of this statement is somewhat vague. What is meant is that it can't be substantiated who brewed the first beer like this. Some 'old timers' (am I in this category?) say that the long defunct Crown Point Brewing Co. in Vancouver, Washington brewed one in 1987. Still others swear that another defunct brewery in Portland, Nor-Wester, brewed a "very dark IPA sometime in the early 90s." A local brewer I know claims that "Minot's Black Star Brewing in Whitefish, Montana brewed a Black Star hoppy black IPA also in the early 90s." And still another brewer I know says that, "In 1991 or 92 Star Brewing, here in Portland (also defunct), made a hoppy IPA that was almost porter like in color but had no roast flavor qualities."

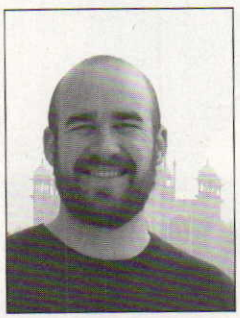
Knowing full well that Greg Noonan had brewed one "sometime," I wanted to give him credit. I placed a call in early February to the Vermont Pub and Brewery and asked if anyone knew exactly when Greg first brewed Black Watch. The lady I talked to didn't know but said she would ask the brewer and other long term employees. I gave her both of my phone numbers plus my e-mail address and told

Sean Paxton is otherwsie known as "The Homebrew Chef." He has worked as a professional chef and has been a homebrewer since 1993. Sean has prepared numerous brewer's dinners including several for the Northern California Homebrew Festival. Many of his recipes and menus can be found on his website, at www.homebrewchef.com. You can also find information on upcoming events.

On page 26 of this issue, he discusses the new Beer Cuisine — explaining how to think of beer as an ingredient in food. Sean also gives recipes for Norwegian Lamb Cakes, Savory Bread Pudding and Baltic Porter Ice Cream.



Tom Bardenwerper owns a small web development business and lives in Thiensville, Wisconsin. He has been an all-grain brewer since 1987 and is an active member and webmaster for his local homebrew club, the Trubmeisters (www.trubs.org). Tom also works part-time at his local homebrew shop and enjoys growing organic hops on a nearby farm that houses the Trubmeisters' RIMS brewery. He enjoys brewing authentic London porters, Irish reds, Belgian and smoked ales, and very hoppy IPAs. Read his first story for *BYO* on how to build a heat stick starting on page 67.



Michael Tonsmeire is a homebrewer and fermentation nerd living in Washington DC. He has been brewing beer for the last six years after getting his start by taking a student taught course his senior year of college. Michael is the blogger behind The Mad Fermentationist (www.TheMadFermentationist.com) where he posts about making beer as well as cheese, sake, vinegar, cider, and other fermentables. He is especially passionate about brewing sour beers, both in the tradition of classic European styles and in new directions that just might get his BJCP certification revoked. On page 52 of his issue, he discusses adding fruit to sour beers.

her to let me know if anyone knew the answer. I never did get any information back and was left to believe that no one could verify a specific date or year.

Since I couldn't get any verification of when Greg brewed the style, I simply stated that the date couldn't be substantiated — not that he didn't ever brew one."

Editor Chris Colby, also responds: "Yes, given that we mentioned Noonan, we should have made more of an effort to pinpoint when he first brewed Black Watch. However, the point of the article was not to trace the lineage of this beer style (if you acknowledge it as such) back to its original source. The point of the article was to relay the factual points that are catching on in the Pacific Northwest and brewers from this region are pushing for it to become a beer style, regional moniker and all. Brewing a dark version of a usually pale beer is not unusual. Dunkelweizens, schwartzbiers and American dark lagers are hardly unheard of. Tracking down the first commercial brewer to make a dark, American-style IPA is probably impossible at this point. It is also inevitable that some homebrewers will resent brewers from the Northwest trying to 'bogart' this style. Still, the fact remains that a group of Northwest brewers and beer lovers did propose that 'Cascadian Dark Ale' become a formal beer style and that's what we reported on."

Cascadian correction

In the all-grain recipe for Turmoil Cascadian Dark Ale, on page 30 of the July-Aug. issue, it lists 18oz. of Weyermann Carafa® II malt twice. In reality, there should only be a single portion of 18 oz. of dehusked Carafa® II malt (as in the partial mash recipe).

BYO for the win!

I was reading the *BYO* May-June 2010 edition "Breakfast Served Anytime!" section that talked about coffee flavoring and was pretty intrigued. Let me say this first — I don't care much for flavored beers of any kind. But I love beer and I love coffee so I thought it might work if done right. I read that article and eyed 10 gallons of brown porter finishing off in the conical fermenter. Your article mentioned a couple different ways to add coffee flavor to beer. One of them was adding freshly-brewed espresso shots right in the bottling bucket (p 36). That was it! I have an espresso machine and determined I was going to use 4 gallons of this brown porter as my first-ever experiment into the world of flavored beers.

Being that this was an experiment, I decided to go for subtle coffee flavor and hope for the best. I added the espresso shots in the bottom of the bucket, primed and bottled as any normal beer. Everything the article states

about bitterness, tannins, adding cloudiness, etc. was true. It does have a minimal effect on the beer and I can see how the wrong method (or too much) could affect the beer adversely. After a few weeks, it tasted mighty fine. While the coffee aroma was low, the flavor intensified with each sip. By the time you reached the bottom of the glass the coffee flavor was full-on and your mouth wanted more. It was fairly smooth and balanced with a little bitterness or tannin flavor on the back end as expected. I feel that the espresso shots added a slightly creamy quality to the beer that other methods would not have imparted. I loved it and received a lot of compliments on that beer so I decided to enter it in the Indiana State Fair Brewer's Cup.

I entered this beer in Spiced/Herb/Vegetable beer category and it took 2nd place. Not bad for a 1st time experiment! I've entered beers in the past, but never won at this competition. Needless to say I was really happy. I am going to try this beer again with a porter that is more true to style and add slightly more espresso next time to kick up the aroma and flavor. I just wanted to say thanks again to *BYO* and say that the value I get as a subscriber is priceless, year after year.

Frank Petrarca
Carmel, Indiana

Happy we could help. You know, when you brew that porter, you could reserve a gallon or so and infuse it with bacon. We're just sayin'. . .

Going all-grain

Kudos to Chris Colby for his article on whole grain brewing in this month's *BYO* (July-August 2010). Great article with good information. I have been whole grain brewing for about a year now, but still picked up a lot of good info. Brew on!

Drew Shattuck
Northern Virginia

Glad you liked the article. In the near future, look for an expanded version of this story to appear on our website (www.byo.com). The "Brewing Your First All-Grain Beer" article will appear along with detailed articles on "Brewing Your First Beer with Malt Extract" and "Brewing Your First Partial Mash Beer," in a section of the website intended to help new brewers have a better initial brewing experience. The longer all-grain article will give more details regarding brewing with some of the more common pieces of equipment (esp. picnic cooler mash/lauter tuns vs. heatable vessels). It will also include a few more pointers towards where to go after your first brew. BYO

homebrew nation

BREWER PROFILE

Brewer: Frank Burnette

Hometown/State: Riverside, California

Years Brewing: 1.5

Type of brewer: all-grain

Homebrew Setup: 5-gallon (19-L) converted coolers, 8-gallon (30-L) brew pot, 6.5-gallon (25-L) and a 5-gallon (19-L) glass carboy as well as two digital controlled fridges for fermenting and kegging. I use a boil volume of 7.69 gallons (29 L) with batch size of 5.5 gallons (21 L) in the fermenter. My efficiency average is 83%.

Currently fermenting: The Dragon's Gale Hefty (see recipe)

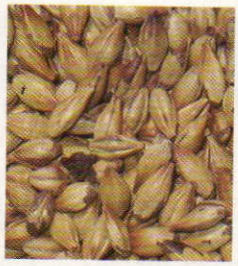
What's on tap/in the fridge: on tap the Dragon's Gale Hefty Belgian specialty and Down the Chimney saison

How I started brewing: I started brewing when my wife and kids bought a Mr. Beer kit for my Christmas present. After that I started reading a lot of books and brewing websites and talking to friends that have been brewing for a while. I knew this hobby was something I really wanted to do. So for Father's Day my family had bought me a set up from MoreBeer! My first few batches were extract and I loved it. Then came all-grain. Now every Sunday the wife goes to church, God goes surfing and I make beer.

byo.com brew polls

Do you use crystal or caramel malts in your homebrews?

Yes, all the time 53%
Yes, sometimes 43%
No, but I would like to try 3%
No, I don't 1%



PROFILE RECIPE

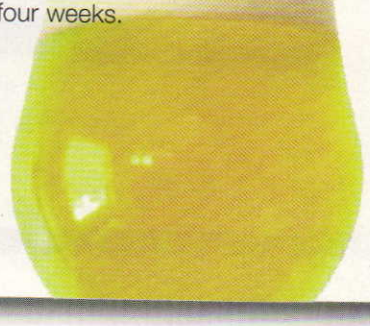
The Dragon's Gale Hefty (Belgian specialty)
(5 gallons/19 L, all-grain)
OG = 1.065 FG = 1.016
IBU = 30 SRM = 9 ABV = 8.3%

Ingredients

10.68 lbs. (4.85 kg) Belgian Pilsner malt (2-Row)
0.23 lbs. (0.10 kg) Dingemans aromatic malt
0.23 lbs. (0.10 kg) German Munich malt
0.23 lbs. (0.10 kg) Briess Special Roast malt
0.12 lbs. (0.05 kg) Gambrinus honey malt (Gambrinus)
Tradition hops 0.91 oz./26 g at 6.8% alpha acids for 55 min
Spalter hops 0.91 oz./26 g at 6.2% alpha acids for 10 min.
Tettnang hops 0.91 oz./26 g at 5.0 alpha acids for 5 min.
0.91 lbs. (0.41 kg) Brown Sugar, Light 75 min.
1 Whirlfloc Tablet 15 min.
White Labs WLP500 (Trappist Ale)

Step by step

Mash with 4.0 gallons of water at 130 °F (54 °C). Hold at 122 °F (50 °C) for 35 minutes. Decoct 2 gallons (7.6 L) of mash and heat to 205 °F (96 °C). Hold mash at 155 °F (68 °C) for 60 minutes. Decoct 2 gallons (7.6 L) of mash and heat to 189 °F (87 °C). Hold mash at 168 °F (75 °C) for 10 minutes. Sparge with 5 gallons (19 L) at 168 °F (15 °C). Ferment at 68 °F (20 °C) for seven days in the primary fermenter, then transfer to secondary for another seven days. Keg using 6.72 PSI for one week at 35 °F (2 °C). Age for at least four weeks.

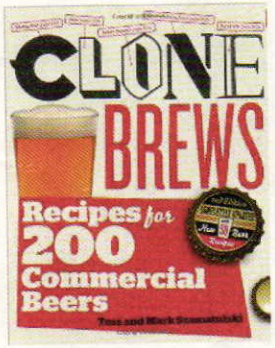


what's new?

Brewer's Best® enters partnership with "Pints for Prostates" with limited release kits

Brewer's Best® will offer a limited release homebrew ingredient kit this fall to benefit Pints for Prostates. Founded by prostate cancer survivor Rick Lyke in 2008, the campaign raises awareness among men at beer festivals, social networking and pro bono advertising. The "PSA IPA" kit will be available in September, which coincides with Prostate Cancer Awareness month. LD Carlson Company, who packages the Brewer's Best® brand of products in Kent, Ohio, has agreed to donate $3.00 from the sale of every kit to the Pints for Prostates campaign. Retailers who sell the kit will have the option to match the donation. All net proceeds raised by the group go to fighting prostate cancer and assisting men with the disease. This is the first homebrewing product to partner with the charity. More information is available at www.ldcarlson.com and www.brewersbestkits.com.

CloneBrews, Second Edition Released



Tess and Mark Szamatulski have revamped and re-released their collection of clone recipes, which includes fifty additional new clones. Homebrewers will find everything they need to brew up a batch of their own clone of Magic Hat #9, Ithaca Brown Ale, Moose Drool, Samuel Adams Boston Ale and more. The new edition also contains expanded and updated mashing guidelines and a complete review of ingredients and materials. All new to the second edition is a Food Pairing feature that recommends the best foods for every beer — an indispensable feature for the brewer who also loves to barbecue or cook. All the recipes come with separate extract, mini-mash and all-grain instructions. Available at most booksellers.
Visit www.maltose.com for more information.

calendar

September 19
Waterford, Michigan
Michigan Renaissance Festival Competition

The Michigan Renaissance Festival Competition is a state level competition held in conjunction with the Michigan Renaissance Festival and the Society of North Oakland Brewers. The entry fee is $11 for first three entries and $3 for each additional entry.
Entry Deadline: 08/29/2010
Email: brewfestorg@gmail.com
Web: www.snobsbrewclub.com/renfest/

September 25
Long Beach, California
Pacific Brewers Cup

Long Beach Homebrewers in cooperation with Strand Brewers and Pacific Gravity will be sponsoring the 14th Annual AHA/BJCP sanctioned Pacific Brewers Cup. Entry fee is $6.
Entry deadline: online registration will be open 8/12 thru 9/12. Entries will be accepted from 9/1 thru 9/12.
Email: info@PacificBrewersCup.com
Web: www.pacificbrewerscup.com

September 25-26
Central Point, Oregon
Jackson County Harvest Fair

Southern Oregon's largest homebrew competition held in conjunction with the annual Harvest Fair. Other attractions include amateur wine and soda competitions. Organizers have vowed to still move forward with the competition despite recent interpretations of Oregon liquor laws. (For more on the Oregon homebrew law story, see page 11.)
Entry deadline: September 9
Email: sales@grains-n-beans.com
Web: www.jcfairgrounds.com

> "I wanted a system that was completely self contained, could produce consistent results, and of course make awesome beer."

homebrew drool systems

"The Other Woman"

darrell malin • mesa, arizona

So here is what my wife now refers to as "the other woman" after a lot of time invested from design to fabrication. I could not have done this without the homebrew forums and hope some of my ideas can be useful for *BYO* readers. I live in Mesa, Arizona and learned brewing from Jeffrey Haines at Brewers Connection in Tempe.

I wanted a system that was completely self contained, could produce consistent results, and of course make awesome beer. The stainless tubing makes brew day fun and easy. I am very satisfied with this system as it is all right there at the turn of a handle. I learned that the stainless tubing has to be bent and flared with higher end tools. Not the junk you buy from an auto parts supplier. They are worth buying if you like to fabricate, too. I don't like compression fittings for joints that get taken apart a lot as they eventually fail. I used ⅜" tubing and wish I used ½" tubing. ⅜" moves fluid too slowly and eats up a lot of time when transferring fluids. Cost would not be much more either.

Clean up is pretty easy and then it can be just wheeled away for storage. Right now I have a great German-style hefeweizen on tap and I am ready to do a 10-gallon (38-L) batch of stout next to keep the kegs full. My next goal is a good sized "keezer" to house a bunch more kegs on tap at once.

All my ⅛" wall tube steel was free but weighs a bunch when assembled. I would use thinner wall and smaller tube next time. I would also start out with the largest burner system I could reasonably use for both the HLT and boil kettle. I originally had the little jet engine sounding noise makers on there before and they did not provide enough BTUs. Other than that, the system runs awesome!

homebrew news

OREGON BEER LAW UPDATE

Recent interpretation of Oregon's liquor law by state officials now restricts homebrew to the home where it was brewed; no competitions, no club tastings, or any event can take place outside the home. The Oregon Homebrew Alliance is currently working on several fronts with the legislature and other state officials to write a new law that will allow homebrewers and home winemakers to transport their homebrew and homemade wine outside the home. However, they need the help of all homebrewers. Visit http://oregonhomebrewersalliance.org for more information about the efforts to fix laws in Oregon against transporting homebrew.

we WANT you

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Email our editors at **edit@byo.com**

beginner's block

MALTING BASICS

by betsy parks

By now you know that beer is made by fermenting the malted sugars in grains, but what exactly is malting, and how does it work?

What is malting?

In order to make the sugar in a grain useful to a brewer, it must go through the malting process. This is because a raw grain is made up of a combination of proteins and complex carbohydrates (starches) that are not fermentable, and the hull of the grain must be heated to give it color. When a grain goes through the process of germination, it causes enzyme production, which break down the starches during brewing. One of the big differences between letting the seed grow on its own and malting, is that the maltster stops the germination when enough of the enzymes are present, but before the plant starts to grow — locking them in until a brewer is ready to make beer.

How it works

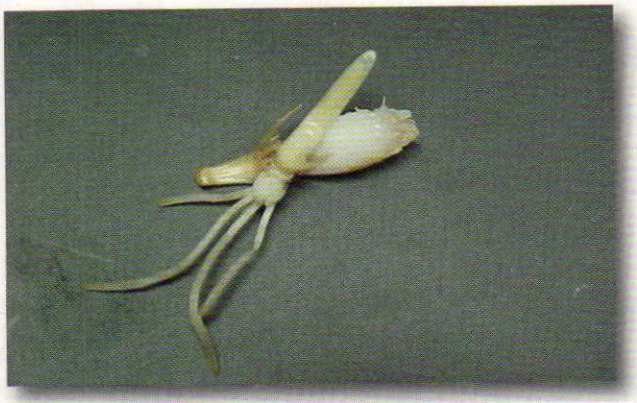
The malting process is broken into four steps: steeping, germination, drying and kilning.

The first phase, steeping, consists of two parts - hydrating the grains to the point where they will germinate, and air rests. Raw barley grains generally have 12 to 13 percent moisture, and they need to have around 42 to 46% to germinate. To get to these levels, the maltster steeps the raw grains in cool water (around 50 to 60 °F/10 to 15 °C) for several hours — somewhere between eight and sixteen. Following the initial steep, the grains are removed from the steeping water and allowed to rest for eight to ten hours in a cool place (50 to 70 °F/10 to 21 °C). Following the rest, the grains are again steeped for several hours until they reach the optimum moisture level.

Once the grains are hydrated, they are allowed to germinate. This is when shoots begin to emerge from the kernel. During this phase, enzymes inside the kernel in the starchy endosperm are released. These will break down the complex carbohydrate chains of the starch and convert them to sugars during the mashing stage of brewing. This enzyme release process is called modification. The maltster allows the grains to grow for a period of a few days until the grain's enzymes are released - or "fully modified."

Once the grain is modified, it is immediately dried to stop the sprouting process, which locks the enzymes in the grain until a brewer is ready to brew. The grains are dried at temperatures below 125 °F (52 °C) until the malted barley, which is now "green malt," is around 10 to 12% moisture or less.

When the malt is dried, it is ready for kilning. Kilning is the roasting step that defines each malt. All malts are kilned — even base malts — but each malt is kilned to various levels. For instance, standard pale base malts are kilned for around three to five hours at 175 to 185 °F (79 to 85 °C), which will result in grains on the low end of the Lovibond scale (which is the measure of malt color). Malts can be kilned at higher temperatures and for longer periods of time to produce darker, more aromatic malts.



One of the stages of malting is germination, which allows the grain to sprout and the grain to release enzymes which will convert the starch.

by marc martin

DEAR REPLICATOR,

DURING A RECENT TRIP TO CHICAGO I DISCOVERED A BEER IN A BAR NEAR WRIGLEY FIELD CALLED DOMAINE DUPAGE, A FRENCH COUNTRY ALE FROM TWO BROTHERS BREWING. I FELL IN LOVE WITH IT RIGHT AWAY. I BOUGHT A CASE AND TOOK IT HOME TO KANSAS CITY. IT DIDN'T LAST LONG, THOUGH, AS MY HOCKEY TEAMMATES DRANK IT ALL AFTER A GAME. IT WAS REDDISH BROWN AMBER IN COLOR, LIGHTLY HOPPED WITH JUST A LITTLE BIT OF OAK FLAVOR. IT ALSO HAD SOMEWHAT OF A TOASTY FLAVOR. IT IS WHAT I WOULD CALL A TRUE BIERE DE GARDE. I WOULD REALLY LIKE TO BREW THIS BEER AS I DO NOT GET UP TO CHICAGO VERY OFTEN. CAN YOU HELP?

JOE LYNCH
KANSAS CITY, MISSOURI

In my former corporate life I made several trips to Chicago and, as with any city I visit, always sought out the local breweries for good craft beer. Limited time and transportation dictated that places like The Piece Brewery, Goose Island and Rock Bottom were the only stops within a couple of miles of the downtown loop. You can be assured that next trip I will make the 30-mile trek west to Warrenville to sample the Two Brothers' beers.

Many owners of breweries are difficult to contact but I was fortunate enough to have my call handled by one of the two brothers, Jason. I discovered that not only is he very personable and open to sharing information but he is also a hands-on owner who is supportive of the local homebrewers.

Most siblings I have known don't seem to agree on much. That was definitely not the case with Jim and Jason Ebel; upon returning home after attending universities and touring Europe in the late 80s they both agreed that Midwest beers just couldn't compare. Jim thought that they may be able to replicate some of those fine European flavors by brewing their own beer. After some successful batches, Jason too felt that this might be a good hobby. Soon they decided that a homebrew supply store might be a profitable business and in 1992 they opened the Brewers Coop (also now located in Warrenville, Illinois).

By 1994 Jason had become completely hooked on brewing and relocated to Denver to brew at the Tabernash Brewery. Jim stayed home to attend law school and continued to run the homebrew store along with his wife and his mother. After a year Jason moved back home to become the brewer at Mickey Finns in Libertyville, Illinois and help with the growing business at their store. The brothers continued to dream of having their own full-scale brewery. Jason took the next step in 1996 by attending and graduating from the Siebel Institute of Technology. With his brewing experience and Jim's knowledge of law and business the plan for a brewery became a reality.

Jason designed and built a 15-barrel system to replicate the traditional 3-vessel systems of Germany. Their grandfather had retired from a dairy farm so they used the milk tanks for the aging and fermentation tanks. Rapid growth over the next twelve years necessitated several expansions. Jason reports that they expect to produce almost 20,000 barrels this year.

Now Joe, you won't have to make that long drive to Chicago because you can "Brew Your Own." For further information about the Two Brothers Brewery and their other fine beers visit the website www.twobrosbrew.com or call them at 630-393-4800. BYO

Two Brothers Brewing Company Domaine DuPage

(5 Gallons/ 19 L, extract with grains)

OG = 1.059 FG = 1.014
IBUs = 24 SRM = 12.2
ABV = 5.9%

Ingredients

6.6 lbs. (3 kg) Briess light, unhopped, malt extract
4 oz. (113 g) light dried malt extract
12 oz. (0.34 kg) Vienna malt
6 oz. (0.17 kg) Munich malt
10 oz. (0.28 kg) Carawheat® malt (50 °L)
5 oz. (0.14 kg) CaraMunich® malt (40 °L)
5 oz. (0.14 kg) melanoidin malt
2.25 AAU Northern brewer hop pellets (60 min.) (0.25 oz./7g of 9% alpha acid)
6.5 AAU Mt. Hood hop pellets (25 min.) (1 oz./28 g of 6.5% alpha acid)
6.5 AAU Mt. Hood hop pellets (10 min.) (1 oz./28 g of 6.5% alpha acid)
½ tsp. yeast nutrient (last 15 minutes of the boil)
½ tsp. Irish moss (last 30 minutes of the boil)
White Labs WLP072 (French Ale) or Wyeast 3711 (Belgian Saison) 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 152 °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 and dried malt extracts and boil for 60 minutes. 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. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding splashing. Allow the beer to condition for one week and bottle or keg. Allow the beer to carbonate and age for two weeks. Visit byo.com/component/resource/article/2106 for an all-grain option.

Beer and Cheese

Pointers for pairings

by Betsy Parks

A GREAT BEER STANDS ALONE, BUT IT IS ENTIRELY MORE ENJOYABLE WITH FOOD — ESPECIALLY A PIECE OF CHEESE. IN FACT, BEER AND CHEESE HAVE A LOT OF COMPLEMENTARY AND CONTRASTING CHARACTERISTICS. THESE THREE CHEESE AND BEER EXPERTS SHARE SOME OF THE BASICS FOR PAIRING YOUR HOMEBREW WITH CHEESE.

When we're pairing anything, we're looking for the sum of the two elements giving us something new and enjoyable beyond what we get from each element on its own. For instance, carbonation can obliterate or enhance a cheese's texture; it also tends to embolden flavors as they spread across your palate with the help of so many creamy bubbles.

Two of the key rules of pairing are 1) find characteristics from the beer and the cheese that complement each other or 2) find characteristics that contrast with one another.

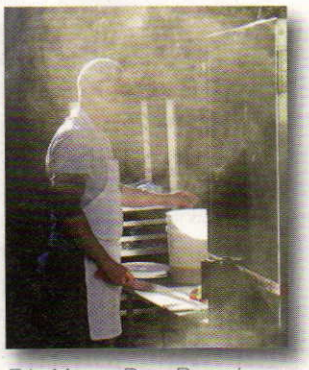
Complementary examples:

* Nut brown ales pair well with the nutty flavors in some cheeses
* Sour beers — try these with bright and citrusy goat's milk cheeses

Contrasting examples:

* Stouts work well because they have some sweeter and darker notes that work well with stronger blue cheeses
* Sour beers — try these with nice and rich cheeses (especially some with stronger flavors) to get the interplay of the acidity and the creaminess

Understanding beer styles is important when pairing. For example, if you are talking about a traditional lager style you already have a decent idea of what the beer will look, smell and taste like. The same goes for cheese. Some of my personal favorite beer and cheese combinations include Cabot Clothbound Cheddar paired with Brooklyn Local 1, Bayley Hazen Blue with Dogfish Head World Wide Stout and Twig Farm Tomme with Jack d'Or American Saison.



Eric Meyer, Beer Buyer/ BBQ Pitmaster at Formaggio Kitchen in Boston, Massachusetts. Eric loves beer indiscriminately, prefers hickory smoke to apple, went to music school and thinks venison is acceptable payment for services rendered.

When I approach a pairing, I taste the cheese first and let it meld on my palate and think about its flavors, then I imagine how different beer styles might play well with that specific set of flavors. I'm also a fan of bridge ingredients and condiments - such as warmed raw honey drizzled over Gorgonzola cheese and paired with a honey brown ale, or toasted hazelnuts with Cheddar and a hazelnut brown ale to bring out the mellow flavors in the aged cheese.

It's easiest to slice cheese when it is cold, and then bring it to room temperature before tasting — and also to serve beer (40–45 °F/4–7 °C) at near cellar temperatures, to let the flavors in the butterfat emerge. If the beer is too cold, the butterfat in the cheese will not be smooth, and I find that the chalky, mineral flavors of cheeses can be more pronounced. Also, if the cheese has a rind wash or ripened aromas, those will be most prominent at room temperature.

Try to find a cheese shop or retailer who will slice cheese at the time of purchase — the flavors of artisan cheeses are so intense that you don't really need to break the bank by purchasing a huge amount.

As for some of my personal favorites, I'm partial to an unfiltered farmstead ale matched with the rind-washed brick cheese by Widmer Cellars. Also, the Capital Brewery amber ale with a burger topped with Roelli's Dunbarton Blue.

Lucy Saunders is the author of three cookbooks, including *The Best of American Beer & Food*, (Brewers Publications, 2007). She edits the websites, beercook.com and grillingwithbeer.com, from her home in Milwaukee, Wisconsin.

Ruth Milller has been a homebrewer since 1994 and since developing an interest in artisanally-produced cheeses has become "The Beer & Cheese Maven." She hosts beer and cheese pairing events for brewpubs, brewers, restaurants and festivals, including the Vermont Cheese Council and the Vermont Brewers Association. She lives in Richmond, Vermont.

having some knowledge of beer styles helps you to pair cheeses with similar taste profiles, or create contrasting ones. Knowing what types of ingredients and adjuncts are typical for certain beer styles can help get you to a great pairing more quickly, or at least get you "in the ballpark" to explore the pairings further, using a standard pairing as a launch point. Conversely, learning something about cheese styles can work the same way from the other end. Also, don't ignore geographic or historical aspects about styles from certain regions being compatible.

That said, there is a beer style for every cheese, with one caveat: strong hops in beer, and high salt content in certain cheeses can spell gustatory chaos for some tasters, so take care with those pairings. Styles that are malt-forward lend themselves well to big, stinky cheeses because the residual sweetness can tame the funk of a big cheese. Alternatively, a sharp, dry style like a geueze, lambic or Berliner weisse can contrast nicely with a soft, creamy bloomy rind or rich triple cream cheese. Also, I've found Belgian beers with their low-hopping, fruitiness and yeasty profiles are outstanding partners for many kinds of robust cheeses, as well as bloomy rinds. There are several beer-washed-rind cheeses that work with not only their respective beers, but others of similar style or point of origin as well — Trappists being a classic example. Hoppy beers are very compatible with cheddars as the hops echo cheddar's grassy, fruity taste. Wheat beers pair beautifully with goat cheeses like fresh chevre and crottins, as their citrusy aspects play well with the tartness of those cheeses, and their high effervescence is a foil for the sticky, fresher versions. Hard, nutty cheeses like aged goudas, cloth-bound cheddars and Parmegiana Reggiano, with their butterscotch diacetyl flavors and crunchy amino acid crystals are wonderful with supermalty beers. Stouts and porters are a fabulous pair for blue cheeses. The salt, malt sweetness and butteriness all scream chocolate-chip cookie dough to me! BYO

Turn Up the Heat

Equipment for going all-grain

by Ashton Lewis

Q What does one alpha acid unit relate to or what does one IBU relate to? Is this like one Scoville unit in hot sauce?

JOHN O'DONNELL
GIRARD, OHIO

A The Scoville unit was developed by American chemist Wilbur Scoville in 1912 to rank the hotness of peppers. The test is organoleptic and is a limit of detection type sensory method using dilution. This is basically a process where the test sample is diluted and the dilutions are tasted until no perceptible "hotness" is detected. The limit of detection is a known (I don't know this number) and the undiluted level is calculated by multiplying the limit of detection by the dilution factor in the test. Like many sensory methods used to assign quantitative results this method has the problem of using human judges. Not all judges have the same perception and there is another phenomenon in this type of sensory study known as response bias that leads some judges to delay indicating their perception of a stimulus until it becomes obviously present. So there are difficulties with these types of methods. Modern methods for pepper hotness use liquid chromatographic columns to separate various compounds found in peppers and a detector to quantify the amounts of the various components that are separated by the column. This method allows for the quantification of capsaicin; the stuff the makes peppers hot.

The measurement of bitterness in beer is similar to the direct measurement of capsaicin in peppers, except the compounds being measured are different. The bench top analytical method used for years to measure hop bittering compounds in beer involves solvent extraction of these compounds using isooctane and then measuring absorption of ultraviolet light at 275 nm by the solution (this method published by the American Society of Brewing Chemists is more involved than this description, but the details of the method are not critical for this discussion). After crunching numbers using a simple formula you obtain the result of the test and the units are presented as International Bitterness Units. Supposedly one IBU is equivalent to 1 mg of iso-alpha acid per liter of beer. The problem with this is that there is a wide range of iso-alpha acids found in beer so this method is not a direct measurement of any one specific compound.

Over the last twenty years or so high performance liquid chromatography (HPLC) has become more common for the analysis of beer. As with the measurement of capsaicin it is quite common to directly analyze for the various components of beer, including specific iso-alpha acids. While an HPLC is not a cheap analytical tool, it is very useful for a wide range of analytical uses. HPLCs (and gas chromatographs) are now common in medium and larger breweries.

Whether using the older UV spectrophotometer method or HPLC techniques, there is still the complication that IBUs do not really correlate with perceived bitterness because other aspects of beer affect the perception of bitterness. For example, two beers containing 25 IBUs will be perceived very different with respect to bitterness if one beer had an O.G. of 10 °Plato and finished at 1.5 °Plato and the other beer had an O.G. of 12.5 °Plato and finished at 2.5 °Plato. Begin varying the malt bill by adding

"The measurement of bitterness in beer is similar to the direct measurement of capsaicin in peppers, except the compounds being measured are different."

crystal malt, for example, and changing the content of various water salts and things become even muddier. This is the reason that measures like the IBU are extremely useful when used within a population of similar beers, but not so handy when looking at very different populations.

The alpha acid unit really has nothing to do with IBUs and certainly does not resemble a Scoville unit. Some large brewers have hop schedules that are based on pounds of alpha. This is a handy measure because it is easy to vary the hop bill as alpha varies from bale to bale. Ten pounds of hops with 10% alpha represent 1 pound of alpha just as 20 pounds of hops at 5% alpha do. The alpha acid unit is a bit different; if you add 10 AAUs to a batch of beer using 10% alpha hops you add 1 ounce. The caveat is that the AAU is specific to a 5-gallon (19 L) batch. The same 10 AAUs could be added by using 2 ounces (57 g) of 5% alpha hops to a 5-gallon (19-L) batch.

I personally do not like the AAU because it is pegged to the 5-gallon (19-L) batch. I suppose it doesn't have to be since it is really just the ounce equivalent of pounds alpha, but it often is assumed that the batch size is 5 gallons (19 L). When most homebrewers were brewing 5-gallon (19-L) batches this measure was handy to many, but some homebrewers today are brewing smaller batches and many others are brewing larger batches. I think this is why the IBU has become much more common, since the IBU calculation includes the batch size as part of the equation and 20 IBUs is 20 IBUs, whether you are brewing 5 gallons (19 L) or 25,000 gallons (94,635 L) per batch (common size for many of the largest US breweries).

Q I'm about to take the next step from extract brewing with grains to all-grain brewing and I have seen many systems in your magazine. I am wondering about the dos and don'ts when it comes to putting an all-grain system together, like which sort of pump, pipes and connections are best when building a new system.

GARY WEBER
HOBART, TASMANIA, AUSTRALIA

Today I wear my Mr. Wizard hat and my job is to help homebrewers in their pursuit of brewing as a hobby. I wear a different hat when I go to work, however, (believe me, just look at my picture and you'll remember why!) where I work with commercial brewers on technical solutions required for brewing. These two challenges are totally different and my advice to homebrewers like you is nothing like the advice I would offer a commercial brewer.

First allow me to briefly digress. Brewing, like any hobby, requires experimentation in order for the brewer to know what works best for them. This is not too different when young children are first introduced to musical instruments. They all start with "student" instruments that are really designed to allow these young musicians to learn the fundamentals of their instruments. Those musicians who advance beyond the basics begin to understand what they need in an instrument to better express their musical ideas and begin fine-tuning their rigs.

I think all-grain brewers should all begin with a basic setup so that they can learn the basics of all-grain brewing and so that as they invest more time and money into the hobby they know more about their needs in equipment. We as modern brewers are lucky in that the infusion mashing method works quite well for brewers all over the world. This has not been the case for long, but thanks to advances in barley breeding, selection and farming there are barley varieties that have excellent malting properties. Maltsters have taken these varieties and produced evenly and fully modified malts that work very well in infusion mashing.

I suggest beginning with an infusion mash set up, whether you purchase one or build your own. There are certain things that are pretty easy to build and a very nice mash tun can be easily assembled using a cooler, copper pipes, a few copper tees and a simple valve (read about converting a cooler in the July-August 2008 issue of *BYO*). This type of mash tun works well for infusion mashing, produces clear wort when properly milled malt is used, and is easy to operate during wort collection. You can build a functional sparge system using a copper pipe similar to the type used for the "false bottom" or you could buy a sparge head.

For wort collection I would not get too carried away with anything fancy because the volumes of wort involved for most homebrewers is simply not large enough to warrant much in the way of transfer lines. A couple of pitchers work well to collect wort and allows the brewer to swap the pitchers without touching the outlet valve on the mash tun.

Where I would spend most of my money is on my kettle and wort chiller. I think for all-grain brewing you really need to have a kettle with at least 30% additional volume so that the likelihood of boiling over is minimized. You also need a decent heat source so that you can have a rolling boil and a decent evaporation rate of somewhere around 6% per hour (this is normally not an issue in small kettles).

Safety is very important to me and my ideal kettle for a 5-gallon (19-L) batch size is a 7.5-gallon (28-L) kettle with an outlet valve installed using either a bulk head fitting or welded tri-clamp ferrule. The latter is my preference, but you need to find a welder who knows how to weld thin gauge stainless if you choose to use a cooking kettle since these are normally made from thin stainless. Legally obtained kegs work well for kettles, but I think they are really too thick and heavy for what really works best.

The place to buy this sort of thing is either at a homebrew shop or outdoor cooking store or web site. In the United States the "Cajun Cooker" is well known to outdoor cooks who like boiling crawfish, crabs, shrimp and other shellfish, or who endeavor to deep fry that Thanksgiving turkey. I would also suggest coupling the

> "Safety is very important and my ideal kettle for a 5-gallon (19-L) batch size is a 7.5-gallon (28-L) kettle with an outlet valve installed using either a bulk head fitting or welded tri-clamp ferrule."

investment of a larger kettle with a well designed and built wort cooler, be it an immersion cooler or counter-flow heat exchanger. I would want to have a way of connecting the outlet valve of the kettle to the wort cooler. While tri-clamp ferrules are very common in commercial breweries, especially smaller breweries, these types of fittings can be expensive for the homebrewer. Another handy connection type is the "Swagelok" connection and similar designs that are based on compression fittings. These types of connections can be purchased at specialty fitting stores and you can get stainless steel compression fittings with hose barbed ends that allow you to make hoses to connect between valves with these threaded fittings.

Personally, I would not start off with much more when switching from extract with grains to all-grain. Use your basic set-up and add to it, replace certain components or refine designs as you know what you want for your type of brewing. We all have preferences for certain brewing techniques and these preferences in technique will find their way into your brewing rig as time passes and you gain more experience. BYO

Brew Your Own Technical Editor Ashton Lewis has been answering homebrew questions since 1995. A collection of his columns are available in his book, *The Homebrewer's Answer Book*, available online at www.byo.com/store.
Do you have a question for the Wizard? Send it to wiz@byo.com.

Baltic Porter

Malty, rich and dark

by Jamil Zainasheff

I wasn't very impressed with the first few commercial examples of Baltic porter I tasted. They were oxidized and a bit too sweet from long travels and time spent sitting on the store shelf. Then a friend living in Finland brought me every beer he could find with the word "porter" on the label. It was an eye opening experience and convinced me that Baltic porter not only was its own style, but a wonderful one as well.

In most examples, Baltic porter is a malty-rich, slightly roasty beer with a fair amount of alcohol. Its color ranges from dark reddish copper to opaque dark brown. Even though the beer often has an initial sweetness, it finishes drier due to the roast grains and bittering hops.

Some brewers wrongly assume that Baltic porter is just a bigger robust porter. Yes, Baltic porter is bigger, richer, sweeter and more alcoholic than robust porter, but robust porter is usually hoppier and roastier than Baltic porter. They really are two very different beer styles. In Baltic porter, the fruity esters range from low to medium-high. It can have a variety of esters, but the ones that fit well with the style are dark, dried fruit flavors such as raisin, prune, fig and currants. There is also a lower gravity variant of Baltic porter, sort of like a cross between a brown porter and a classic schwarzbier. These lower alcohol examples generally have little in the way of esters, while the higher alcohol examples often carry lots of dark fruit notes. Malt character might include caramel, toffee, molasses, chocolate, bready or biscuit, and perhaps even subtle hints of coffee or licorice. Imported samples often have some Sherry or Port type notes from age and transportation stress, but don't let that fool you into thinking that oxidation makes the beer better or somehow is part of the style.

While most examples are full-bodied with a touch of creamy texture, the lower gravity versions are somewhat thinner and with less apparent alcohol. In any case, Baltic porter should never be syrupy-thick or cloying and the alcohol character should never be hot or harsh.

There are recipes out there with various base malts, but I prefer to use a healthy portion of light-to-medium color Munich malt (6–10 °L) along with some continental Pilsner malt. This gives the beer a bready, rich background malt character. You can experiment with different proportions and different suppliers until you find the blend that works best for you. I use about twice as much Munich as Pilsner and have used Vienna malt instead of Munich with nice results as well. Extract brewers can use a light-colored, blended Munich malt extract with excellent results. All-grain brewers can use a step or single infusion mash as long as the saccharification rest is low enough so that the resulting beer does not end up too viscous. A temperature range of 149 to 154 °F (65 to 68 °C) works well. Use a lower temperature when using lower attenuating yeasts or high starting gravities. Use a higher temperature when using the higher attenuating yeasts or lower starting gravity beers.

While Baltic porter will have some roasted malt notes, the roast character should be restrained. Shoot for a character somewhere between a robust porter and a classic German-type schwarzbier. You want a dark, rich flavor with no highly burnt or acrid notes. The trick is to use de-bittered black malt for a portion of the grain bill. A little chocolate malt (1 to 2%) plus some de-bittered chocolate malt (2 to 3%) will provide a touch of dark malt character and a deep brown color. While the BJCP guidelines suggest no more than a dark brown color, judges seem to prefer beers on the darker end, even nudging their way toward black. You should avoid using highly kilned grains except in very

Continued on page 21

baltic porter by the numbers

OG:	1.060–1.090 (14.7–21.6 °P)
FG:	1.016–1.024 (4.1–6.1 °P)
SRM:	17–30
IBU:	20–40
ABV:	5.5–9.5%

Zek's Porter

(5 gallons/19 L, all-grain)

OG = 1.089 (21.3 °P)
FG = 1.018 (4.6 °P)
IBU = 38 SRM = 30 ABV = 9.4%

There are great Baltic porters made in Russia, which happens to be where my grandparents came from before the communists took power. My grandparents fled Russia with one of them later being captured and imprisoned in the gulag after fighting against the Soviets. The colloquial name for a Soviet gulag inmate was "zek." This recipe is for those who died under communism, especially those that died in the gulag. Raise a pint and be sure to say something out loud that the Soviet communists would have hated . . . which is pretty much anything.

Ingredients

11 lb. (5 kg) Durst Munich malt (or similar)
6 lb. (2.75 kg) Durst Pilsner malt (or similar)
7 oz. (200 g) Great Western crystal malt (or similar) (60 °L)
7 oz. (200 g) Dingemans Special B malt (or similar) (140 °L)
5.3 oz. (150 g) Weyermann Carafa® Special II malt (430 °L)
3.5 oz. (100 g) Briess chocolate malt (or similar) (350 °L)
8.4 AAU Lublin hops (2.4 oz./68 g at 3.5% alpha acids) (60 min.)
2.94 AAU Lublin hops (0.84 oz./24 g at 3.5% alpha acids) (15 min.)
White Labs WLP885 Zurich Lager, White Labs WLP830 German Lager, Wyeast 2206 Bavarian Lager or Fermentis Saflager S-23 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 150 °F (66 °C). Hold the mash at 150 °F (66 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.4 L) and the gravity is 1.069 (16.8 °P).

The total wort boil time is 90 minutes, which helps reduce the S-Methylmethionine (SMM) present in the lightly kilned Pilsner malt and results in less Dimethyl sulfide (DMS) in the finished beer. Add the bittering hops with 60 minutes remaining in the boil. Add the second hop addition and Irish moss or other finings with 15 minutes left. Chill the wort rapidly to 53 °F (12 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. The proper pitch rate is 30 grams of properly rehydrated dry yeast, six packages of liquid yeast or two packages of liquid yeast in a 10-liter starter.

Ferment at 53 °F (12 °C) until the beer attenuates fully. With healthy yeast, fermentation should be complete within a week, but do not rush it. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2 to 2.5 volumes.

Zek's Porter

(5 gallons/19 L, extract with grains)

OG = 1.089 (21.4°P)
FG = 1.018 (4.6 °P)
IBU = 38 SRM = 30 ABV = 9.4%

Ingredients

7.5 lb. (3.4 kg) Weyermann Munich liquid malt extract
4.4 lb. (2 kg) Pilsner liquid malt extract
7 oz. (200 g) Great Western crystal malt (or similar) (60 °L)
7 oz. (200 g) Dingemans Special B malt (or similar) (140 °L)
5.3 oz. (150 g) Weyermann Carafa® Special II malt (430 °L)
3.5 oz. (100 g) Briess chocolate malt (or similar) (350 °L)
8.4 AAU Lublin hops (2.4 oz./68 g at 3.5% alpha acids) (60 min.)
2.94 AAU Lublin hops (0.84 oz./24 g at 3.5% alpha acids) (15 min.)
White Labs WLP885 Zurich Lager, White Labs WLP830 German Lager, Wyeast 2206 Bavarian Lager or Fermentis Saflager S-23 yeast

Step by Step

Most Munich malt extract is sold as a blend of Munich and Pilsner or two-row malts. I specify 100% Munich liquid malt extract (LME) and Pilsner LME in my recipes so you will know which blends might work best for your brew. If you use a blend, replace both the Munich and Pilsner extracts with 11.9 lb. (5.4 kg) of the blend. If you cannot get fresh liquid malt extract, it is better to use an appropriate amount of dried malt extract (DME) instead.

Mill or coarsely crack the specialty malt and place loosely in a grain bag. Avoid packing the grains too tightly in the bag, using more bags if needed. Steep the bag in about 1 gallon (~4 liters) of water at roughly 170 °F (77 °C) for about 30 minutes. Lift the grain bag out of the steeping liquid and rinse with warm water. Allow the bags to drip into the kettle for 15 minutes while you add the malt extract. Do not squeeze the bags. Add enough water to the steeping liquor and malt extract to make a pre-boil volume of 5.9 gallons (22.3 liters) and a gravity of 1.076 (18.4 °P). Stir thoroughly to help dissolve the extract and bring to a boil.

The total wort boil time is 60 minutes. Add the bittering hops with 60 minutes remaining in the boil. Add the second hop addition and Irish moss or other finings with 15 minutes left. Chill the wort rapidly to 53 °F (12 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly. The proper pitch rate is 30 grams of properly rehydrated dry yeast, six packages of liquid yeast or two packages of liquid yeast in a 10-liter starter.

Ferment at 53 °F (12 °C) until the beer attenuates fully. With healthy yeast, fermentation should be complete within a week. Follow the packaging and carbonation instructions in the all-grain version of this recipe.

small percentages, as too much will push the beer toward a robust porter or stout character. If you are struggling to differentiate your Baltic porter from others, try experimenting with different chocolate-type malts from different suppliers before adding a lot of higher color malts.

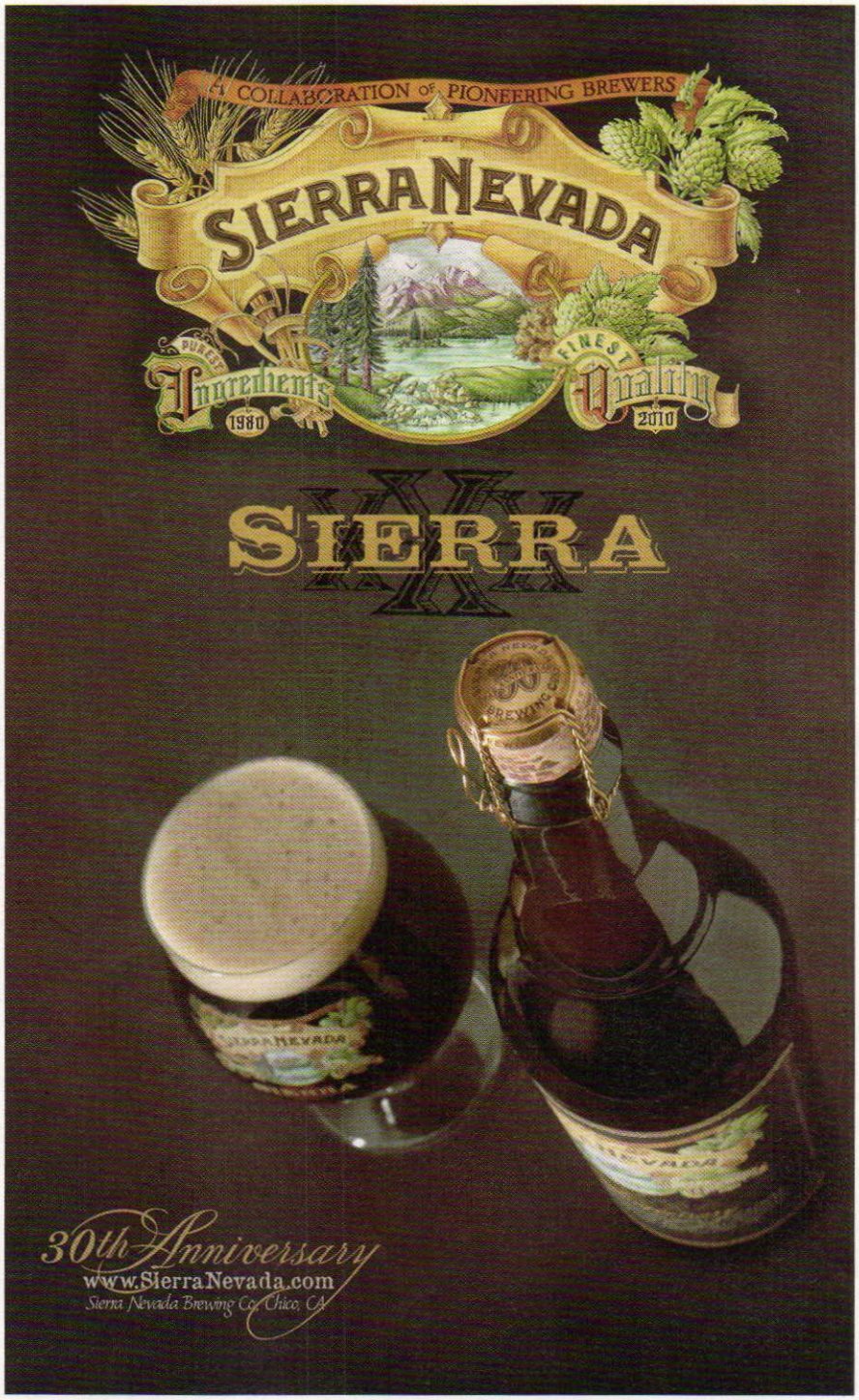
Another trick in developing the necessary rich malt character without too much roastiness is to add a little crystal malt. The sweetness of crystal malt adds to the perception of richness in the beer. For caramel flavors, I always use dark crystal (80 to 150 °L) as it adds those dark, raisin-plum notes that go so well in this style. I also like to include some mid-color crystal (40 to 60 °L), which adds some caramel flavors and some residual sweetness to help balance the bitterness of the roast grains and hops. Watch the total amount of crystal malt in your recipe. If the total amount exceeds 6% of the grist, it can result in an overly sweet and heavy beer. Remember that the goal is a little sweetness up front with a general malt balance and a dry finish. If the beer does not seem dry enough, it is going to be a poor example of the style. If you have already limited your specialty grains and still have trouble reaching a proper level of attenuation, replace a small portion of the base malt with simple sugar to help the beer finish a bit drier.

If you are looking for more complexity or increased head retention, you can add other malts as well. Wheat malt, Victory, biscuit and more are common additions in many recipes, but restraint is important so that the beer does not become saturated with non-fermentable dextrins and cloying flavors. Keep the total of all specialty grain additions to less than 10%.

Hop flavor and aroma is restrained in this style. Late hop additions are acceptable, but they should not show up in the aroma and should not result in more than a moderate level of spicy or floral hop flavor. Typical hop additions for this style are Lublin or Saaz types. Any spicy or floral hop is acceptable as long as you keep the overall level of hop character within the limits. You can bitter with a wide variety of hops, whether it is spicy and floral or clean and neutral. Magnum is a nice choice if you want to use a higher alpha hop for bittering.

Baltic porter should have a medium-low to medium bitterness, and the residual sweetness should result in a balanced beer. The bitterness to starting gravity ratio (IBU divided by OG) can range anywhere from 0.25 to 0.5 or more, but I like to target approximately 0.4. I use less bittering in smaller beers and more bittering in bigger beers. Keep in mind that beers designed for long-term aging should target the higher end of the scale, as a good amount of the bitterness can drop out of the beer over time.

While Baltic porter should have some dark, fruity esters, it is similar to bockbier, where much of that character comes from the malt and alcohols, not from using an



estery yeast strain. Try for a clean, cooler fermentation, focused on proper attenuation of the higher than average starting gravity. The most important aspect is avoiding hot, unpleasant alcohols or an overly sweet finish. You do not want the drinker recoiling from harsh alcohol. Instead, you want them to drink the beer and then feel a gentle warming as the beer settles in their stomach.

You can use a clean ale yeast at cooler temperatures, such as White Labs WLP001 California Ale, Wyeast 1056 American Ale or Fermentis US-05. These yeasts tend to attenuate well even in big beers and produce low ester levels at a range of temperatures. However, my preference is to use lager yeast, which tends to attenuate even better than these ale yeasts and provides a signature character similar to many commercial examples. White Labs WLP885 Zurich Lager, White Labs WLP830 German Lager, or Wyeast 2206 Bavarian Lager all work well in this style. If you are fermenting with lager yeast, use a cool fermentation temperature of 50 to 55 °F (10 to 13 °C). If you are using ale yeast, try fermenting around 65 to 70 °F (18 to 21 °C) depending on the yeast strain and recipe. Try to pick a temperature and stick with it. Controlling temperature is important to getting a proper level of attenuation and avoiding off-flavors, especially if you are making a bigger beer. Letting the beer go through large temperature swings can result in the yeast flocculating early or producing solventy and/or overly estery beers. However, raising the temperature a few degrees near the last third of fermentation will help the yeast clean up some of the intermediate compounds that were produced during fermentation and it will encourage the yeast to complete attenuation.

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 malt flavors to shine through. Do not be afraid to tweak the parameters until you get it right.

If you are brewing a higher alcohol version, the beer will mellow and develop a bit of complexity over time. If you are making a smaller version, then it should be ready to drink when carbonated. For this style, I like to brew bigger versions and age it for three or more months. Time affects the balance and intensity of flavors, mellowing some of the harsher aspects and exposing some of the more delicate aromas and flavors. With time, it is also possible to develop vinous or Port-like qualities, which add to the complexity. BYO

Jamil Zainasheff is host of "Can You Brew It?" and "Brew Strong." Both can be found on the Brewing Network.

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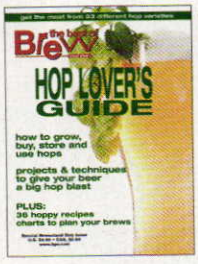

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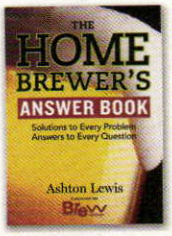

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Norwegian lamb cakes with spiced Baltic porter gravy on top.

Story and Photos by **SEAN PAXTON**

Cooking with Homebrew

The brewer, home or professional, has total control over every aspect of a beer's creation. He or she can brew to style, hitting the gravity, the IBUs and the flavor specifications. Alternatively, the brewer can go crazy and throw caution to the wind and brew a never heard of before beer, playing up unique ingredients that can only be found at an eclectic ethnic market. He can brew a lower alcohol beer to fill a gap in the tap line-up or brew a beer for the holidays that will make everyone merry with cheer. But when it all comes down to it, the brewer will brew what they like or want to drink.

As with beer styles, each cuisine from around the world has a style or specific trait that makes it different from others.

As with beer styles, each cuisine from around the world has a style or specific trait that makes it different from others. Once an understanding of what each individual ingredient adds to a dish or glass of beer is established, a dish or beer can be designed around a protein, flavor combination or an inspired idea. Expand your flavor imagination and think French, German, Spanish, Mexican, Italian cuisines along with beer styles: Biere de Garde, bock, Vienna, pale ale, Flanders red and tripels. When looking deeper into a recipe, whether it be a beer or food, attributes that make those beers work with its counterpoint cuisine, emerge into sight. This article will examine important aspects to consider when cooking and pairing with beer.

Malt

Malt is the backbone of most brews. Base malts from different regions add depth to a brew. Popular malts like Maris Otter or Castle Pils, can radically change how the beer will taste, its body and its ethnic origin flavor. This flavor profiling can also be achieved in cooking. Translate the idea of malt in a brew to using onions, shallots, garlic or fennel as the base flavor profile of a dish. Think about how the bulbs are cooked, the longer they are in the pan, how does the flavor change? As these cooking ingredients braise, sauté, stew, roast or fry, they transform from a mild starchier counterpoint to a sweet depth of flavor that can be used to balance out bitterness or add a contradiction to sour. In an Indian curry (Murgh Masala), the onions and tomatoes are cooked so long, that they dissolve and become the sauce. Or in contrast, a Belgian carbonnade where the onions add a caramelized sweetness that is balanced out with red currant jelly that gives a sweet sourness to the beef or lamb in the dish. The classic French *mirepoix* (carrots, onions and celery) act the same way, giving intensity to stock, a base to sauces and intelligence to a dish. Other vegetables that can also add body and backbone to the flavor profile are leeks, pearl onions, turnips, beets, winter hard squashes and bell peppers.

By manipulating these ingredients, a dish can be changed to complement or contrast with a beer pairing. We can add a beer to do the same (complement or contrast) to add a great variable to a dish, making the flavors pop, accentuating or dulling them to achieve the desired taste. This experimentation is the joy of cooking, much like brewing.

Bitterness

The next element in cooking and pairing that is critical to look at is bitterness. To understand how the taste of bitter has evolved on our palates, it is important to look at the past. History indicates that our early ancestors were nomads. In order to survive, these nomads foraged through the hills, plains and meadows for food. Their initial exposure to bitterness created a negative effect and a theory emerged that when bitterness was tasted, an association between toxins and bitterness found in food should not be eaten. Over time this theory evolved as the species domesticated and became more knowledgeable of plant life attributes and began to change about the taste of bitterness.

To understand how the taste of bitter has evolved on our palates, it is important to look at the past.

Bitterness can be real tricky when cooking with beer. Broccoli rabe, bitter melon, sorrel, dandelion greens, coffee, Belgian endive, kale are just a few things that we now enjoy on our plates today. It turns out that many bitter vegetables are very high in antioxidants that help with our over indulgences. Even sugar can become bitter. As sugar is cooked and caramelized, the sweetness drops and is replaced by bitterness, making caramels, brittles and other candies not as sweet and adding depth to the food being consumed. With beer, bitterness is added to balance out the sweetness of the wort. The byproduct of this addition, can determine the lasting flavor of the beer. Grassy/earthy, herbal, citrusy, fruity, spicy or evergreen/piney hop "seasonings" can be added to our beers by picking what hop profiles are present in our final beer. Understanding IBUs, the blend of hops used, and when they are added, controls the hops bitterness, flavor and aroma.

Just like adding hops, we can add bitterness to a dish to enhance a pairing. For example, understanding what hop was used in the beer, maybe Chinook or Northern Brewer, the chef can add rosemary to the dish to enhance the piney flavors represented in those hops. Or add refreshing qualities to a dish and spike the citrus component with orange, lemon or grapefruit; then pair a beer that has been brewed with Cascade, Summit (in late hopping) or Sorachi Ace.

Hops can also be used in food recipes too, just be careful how they are used. A hop extract can be created by soaking hop cones in a neutral alcohol for a few days to a week. This creation can act like a substitute for vanilla in baking, or be added like "dry hopping" at the end of cooking a dish, enhancing the hop characters in the beer being cooked with or the pairing brew. Hop salt can be made by layering a coarse sea salt with cones and letting sit for a few weeks, then sifting out the hops, creating a finishing salt that again can compare or contrast the flavors in the final dish. Think hop ice cream to add a touch of bitterness along with its varietal attributes to balance a dessert's sweetness.

This is where tasting our food and beer is so important. When we brew, we have a good understanding of math to figure out bitterness. When we cook, especially with beer, the liquid evaporates, but the hop oils reduce and intensify. This can work in the final dish, if taken under consideration. We add more vegetables, that when cooked become sweet, embrace the bitterness or use it to bring out a flavor like an acid (vinegar). Just remember to taste and evaluate the flavor balance in the dish. If the bitterness in a dish is too pronounced, one can add sweetness — from dried or liquid malt extract, dark candi sugars or syrups, honey, simple syrup, raw sugar, brown sugar, molasses, stevia or other sweeteners — to bring the dish back into harmony.

Astringency

Analyzing astringency is also essential when cooking with beer. In addition to

bitter, coffee, tea, vegetables (artichokes, asparagus, some olives), some herbs (turmeric, marjoram), fruits (pomegranate, cranberries) have astringent characters. In brewing, beers can be made astringent if one cracked the grain too finely, the water pH is too high, over sparges the mash, boils the grain, or just over hops the wort. When pairing or cooking with a beer that has some astringent qualities, the final dish will be out of balance and will need some sweetness to help add equilibrium. This is also important when thinking about dark/roasty beers like porters, stouts, some brown ales, rauchbier, dark IPA and schwarzbier as the roast grains (depending on their color and their percentage in the grist) also have a certain level of astringency from the kilning process.

Beer Cuisine

The above information guides brewers and chefs when pairing and cooking with beer. A new cookery style has evolved, called Beer Cuisine. Instead of looking at the generic "add a can of beer" to a recipe, think about the style of beer, along with the cuisine of the food and what the flavor of the protein all add. The resulting dish will be layered with extra complexity that cooking without a beer will be noticed. To help understand this cuisine better, it is important to look at beer as an ingredient, not just a liquid or line item in a recipe. Respect that ingredient and think of the beer overlaying its flavor profile to a dish, the resulting fare will have enhanced characteristics. If the beer is an ingredient, the inherent flavors of the brew being used can contribute a seasoning that can't be reproduced with any culinary herb, ingredient or combination of food products.

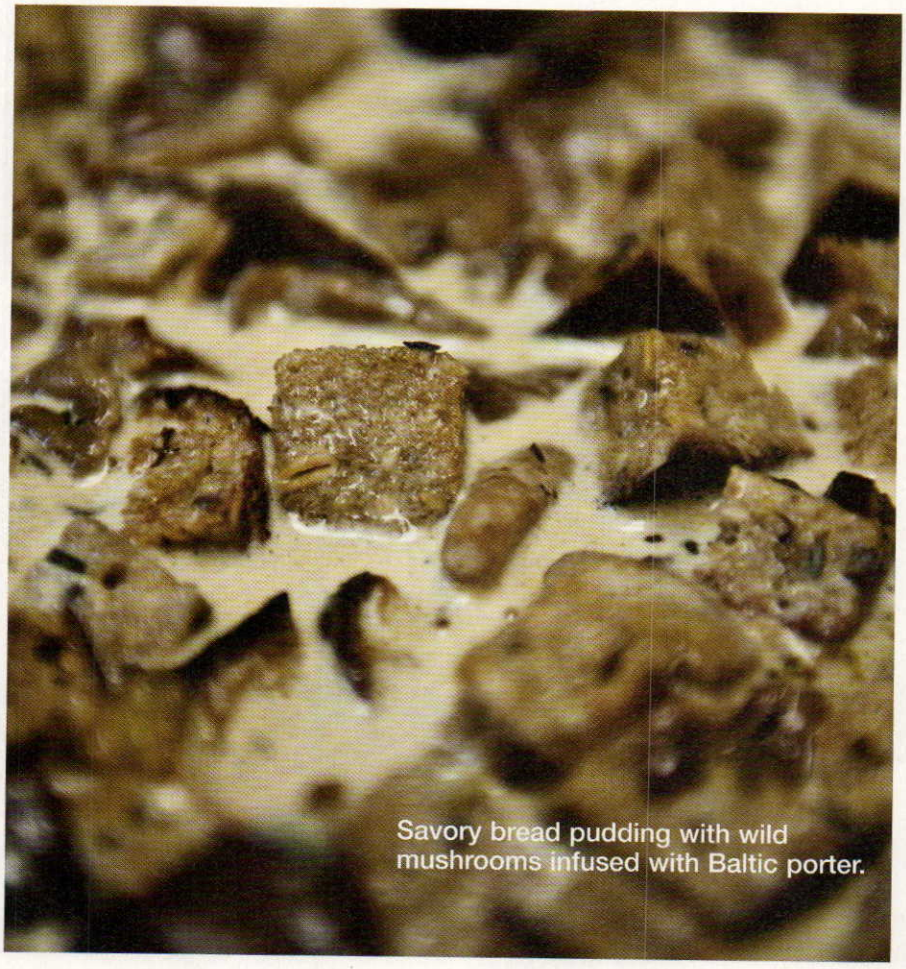
An error I see often in the information given on cooking with beer is absolutes. Any style of beer can be used for cooking if the style's attributes are understood. To appreciate how the amount of perceived sweetness and bitterness adds to the nuances of the style's malt character, what the pH of the beer is (especially with sours), and finally how the beer will be used in a dish is very important.

A hoppy pale, IPA or double IPA can be used in cooking. However, think about how that flavor will be expressed in the final dish. Instead of reducing the beer, a tight seal to prevent evaporation might be a better choice. Alternatively instead of cooking with heat, cook with citrus juices, like a ceviche and use the beer to flavor or marinate the protein.

The recipes in this article — that begin on page 32 — use the beer style Baltic porter, that Jamil Zainasheff discusses in his "Style Profile" column, which starts on page 19. You can use either homebrewed Baltic porter, or commerical examples, for these recipes. When looking at this style of beer, the flavors of malt, toffee, caramel, roast, earthy, dried fruits, unami, licorice and coffee add a unique component to these recipes. These dishes were designed around this style of beer to raise the bar in the complexity of the dishes and showcase what Beer Cuisine can be. I hope you enjoy.

Sean Paxton is also known as The Homebrew Chef. His website can be found at www.homebrewchef.com. This is his first article for BYO.

Any style of beer can be used for cooking if the style's attributes are understood.



Savory bread pudding with wild mushrooms infused with Baltic porter.

More On Cooking with Beer and Pairing Beer With Food

People have likely been cooking with beer since shortly after it was invented. Until recently, though, cooking with beer in the United States was mostly limited to boiling brats in beer, adding a can of beer to a chili recipe (or otherwise using a fizzy yellow lager as a replacement for water) or making beer can chicken.

For books that delve more deeply into either cooking with good beer, or pairing quality beer with food, check out these books:

"The Brewmaster's Table: Discovering the Pleasures of Real Beer with Real Food" by Garret Oliver (Ecco, 2005)

"The Best of American Beer and Food: Pairing & Cooking with Craft Beer" by Lucy Saunders (Brewers Publications, 2007)

"Grilling with Beer: Bastes, BBQ Sauces, Mops, Marinades & More Made with Craft Beer" by Lucy Saunders (F&B Communications, 2006)

"An Appetite for Ale: Hundreds of Delicious Ways to Enjoy Beer with Food" by Fiona Beckett (CAMRA books, 2008)

"The Beerbistro Cookbook" by Brian Morin and Stephen Beaumont (Key Porter Books, 2009)

"Stephen Beaumont's Brewpub Cookbook: 100 Great Recipes from 30 Great North American Brewpubs" by Stephen Beaumont (Siris Books, 2005)

"The Microbrew Lover's Cookbook" by Jay Harlow (Sasquatch Books, 2002)

HOMEBREW FOOD RECIPES

Norwegian lamb cakes (top) searing in a sauté pan. The lamb cakes with spiced Baltic porter gravy (below). You could vary this recipe by substituting ground goat meat for the ground lamb.

Norwegian Lamb Cakes With Spiced Baltic Porter Gravy

Serves: 4 as an entrée

This old world recipe dates back to the 1850s, with roots in my family heritage. I grew up enjoying this dish and have tweaked it a touch, by adding beer to enhance the overall flavor portfolio on the palate.

Ingredients

- 1 pound lamb or goat meat, ground
- 1 egg, large
- ¾ cup milk, whole
- ¼ cup Baltic porter
- 1 teaspoon sea salt
- ½ teaspoon black pepper, freshly cracked
- 1 yellow onion, large, peeled and grated
- 2 tablespoons all purpose flour
- 1 ½ tablespoons cornstarch
- 2–3 tablespoons shortening, rendered fat (bacon or duck fat)
- 2–3 tablespoons all purpose flour
- ½ teaspoon clove, ground
- ½ teaspoon cinnamon, ground
- ½ teaspoon allspice, ground
- ¼ teaspoon ginger, ground
- 1 cup Baltic porter
- 1 cup beef stock, hot
- sea salt and black pepper to taste

Directions

In a bowl of an electric mixer, add ground lamb, egg, milk, ¼ cup porter, salt and pepper. Mix on medium speed until light and fluffy, about 3 minutes. Add diced onion, flour and cornstarch. Mix thoroughly.

In a large heavy skillet, over medium high heat add the shortening/fat. Portion the meat mixture in 2–3 tablespoon size patties and carefully add into hot fat. Cook on each side until browned, about 2-3 minutes before flipping. Resist the temptation to move them, shaking the pan or peeking. By doing so will destroy the patties brown crusty coating. Flip carefully and cook an additional 2–3 minutes (depending on the sizing). Once fully cooked, remove to oven-proof dish and place in a preheated 300 °F (150 °C) oven. Repeat until all the meat mixture has been cooked.

To make the gravy, lower the heat to medium and add 2–3 tbsp of flour to the pan drippings, stirring with a whisk to combine and keep stirring until the mixture has turned a light golden brown color. This is similar to making a *roux*. Add spices and cook for 1 minute more. Add 1 cup porter and hot stock, whisking until smooth. Bring to a boil, cooking until gravy thickens and the flour taste is cooked out, about 5 minutes. Check the seasoning of the final sauce.

To serve, arrange the meat patties on a platter and spoon the spiced porter gravy over the top. Garnish with some chopped parsley. A perfect side dish to serve with these patties is savory bread pudding with wild mushrooms, wild rice or mashed potatoes infused with porter and mushrooms.

Variations

For the gravy, add 1 pound of sliced mushrooms (mixed varieties) to the pan drippings. Cook for 4–5 minutes over medium heat and the mushrooms are lightly browned around the edges. Add flour and cook for 2–3 minutes, until golden brown. Omit spices and add porter and beef stock, cooking until the sauce thickens. Instead of a porter, substitute a stout or smoked porter in the recipe for a unique twist to the recipe.

Savory Bread Pudding with Wild Mushrooms Infused with Baltic Porter

Serves: 6-8 guests as a side dish

When wonderful bread meets earthy mushrooms and a malt forward brew

with a touch of roast combine: flavors mingle together to create an exciting dish that could replace mash potatoes or rice.

Ingredients

loaf artisanal/rustic bread, about 1 pound, cubed
½ cup olive oil or unsalted butter
1 onion, yellow, large, peeled and chopped
4 shallots, peeled and sliced
6 garlic cloves, peeled and minced
2 pounds mushrooms (Shiitake, Oyster, Portobello, Morel, Hen of the Woods), cleaned
1 bunch thyme, leaves only
1 tablespoon soy or tamari sauce
8 eggs, large
2 cup Baltic porter, porter or stout, preferably homebrewed
1 cup cream

Savory bread pudding with wild mushrooms infused with Baltic porter. Try it with Shiitakes or Portobellos.

Directions

Preheat the oven to 300 °F (150 °C). With a serrated bread knife, cut the rustic bread into 1 inch cubes. Place onto a sheet tray in a single layer and place in the oven to dry out the bread. This will help the bread act like a sponge and absorb all the liquid, making for a better bread pudding. Remove the bread

from the oven after 30 minutes. If you have some left over stale bread, omit this step.

In a large pot or Dutch oven, placed over medium heat, add the oil. Just before the oil starts to smoke, add the prepped onions and cook for 4 minutes, stirring frequently. Add the shallots and cook, seasoning lightly with salt and cook for another 4–5 minutes, until they start to caramelize. Add in the garlic and mix for 1 minute. Remove from the pan and place into a large bowl. Add some more oil to the pan, increase the heat to medium high and sauté the mushrooms (cut into bite size pieces) and a few pinches of salt, cooking for 6–8 minutes, or until the edges start to turn golden brown and most of the liquid from the mushrooms has been released and evaporated. Add the thyme and soy sauce, stirring to combine and cook for another minute. Remove from the heat and add to the large bowl. Mix the mushrooms with the caramelized onions to combine, then add the dried bread cubes and toss to mix well. In a separate bowl, add the eggs, porter and cream: using a whisk, blend well. Pour the egg mixture on the mushroom bread mixture and toss to coat. Let sit for 30 minutes, to absorb the beer cream. Transfer the mixture to a baking dish, about 9 X 13 inches, lightly coated with butter. Lightly press the bread into the corners and help the bread soak up as much of the beer cream as possible. Up to this point, can be made one day in advance, sealed with plastic wrap and refrigerated until ready to cook.

Place bread pudding into a 350 °F (175 °C) oven and bake for 1 hour uncovered. The bread pudding will be golden brown, lightly crunchy on the outside, but tender and fluffy on the inside. Let cool for 15 minutes before serving.

Variations

Instead of baking in a 9 X 13 casserole pan, muffin tins can be used for individual servings. Lightly brush each muffin tin with butter and fill each with the bread pudding mixture. Bake at 350 °F (175 °C) for 35–40 minutes.

Cheese can also be added to this recipe. Try a smoked gouda, aged cheddar or tangy goat cheese. Add the cheese to the bread and mushroom mixture, then top with the beer cream. Bake as directed.

Give your Baltic porter a new twist as an ice cream (top). This ice cream is made even better when accompanied with a sour cherry scotch ale caramel ripple (bottom). This brings out the beer's toffee notes.

Baltic Porter Ice Cream With a Sour Cherry Scotch Ale Caramel Ripple Makes: 1 Quart

When thinking about the flavor profile of a Baltic porter, ice cream came to mind, with all the dried fruit and toffee/caramel lingering sweetness.

Sour Cherry Scotch Ale Caramel Ingredients:

- 1 cup sour cherries, dried
- 12 ounces Scotch style beer
- 1 cup sugar
- 4 tablespoon butter, unsalted
- 1 cup cream, heavy

Baltic Porter Ice Cream Ingredients:

- 16 ounces Baltic porter
- 2 cups organic cream, un-homogenized
- 1 cup organic half and half, un-homogenized
- ¼ cup dried malt extract (DME) or Carnation Malt Powder
- ¼ cup organic sugar
- 2 tablespoons molasses
- 1 tablespoon honey
- 1 tablespoon cocoa powder
- 1 pinch sea salt
- 4 organic egg yolks

Sour Cherry Scotch Ale Caramel Directions

In a sealable jar, add the cherries and beer and let soak overnight to re-hydrate the cherries and infuse the flavor into the beer.

In a medium sized pot, over medium heat, strain the cherries from the beer (reserving the cherries) and bring to a simmer. Reduce the beer to 4 ounces, about 10 minutes. Add the sugar and butter and bring back to a simmer. Cook this mixture till it reaches 240 °F (115 °C) or a soft ball stage.

Next, add in the cream, being careful as the moisture in the cream will cause the beer caramel to spit and steam. The mixture will seize slightly. Keep over the heat and the caramel will melt back into a liquid, cooking for a few minutes to thicken. Remove from the heat and stir in the reserved cherries. Transfer to a sealable container and cool completely before using as a ripple. This can also be used as a tasty sundae topping.

Baltic Porter Ice Cream Directions

In a medium sized pot, over low heat, add the Baltic porter. Bring to a low simmer and reduce by three fourths (4 ounces). Then add the cream, half and half, malt powder, sugar, molasses, honey, cocoa and salt, increasing the heat to medium. Stir to dissolve the sugars and bring mixture to 180 °F (80 °C) and remove from heat. In a separate

bowl, add egg yolks and whisk for a minute, until fluffy and pale yellow in color. Ladle in 2 ounces of hot cream mixture to the yolks and whisk to temper them. Add another 2 ounces, whisking to prevent cooking the mixture. Pour yolk mixture back into the remaining cream mixture, whisking to incorporate.

Bring the heat slowly back up to 165 °F (75 °C), stirring with a wooden spoon, until the mixture thickens and coats the back of the spoon. Strain mixture through a fine sieve into another bowl, to remove any cooked yolk and create a silky smooth texture. Chill mixture in either an ice/water bath or refrigerator, until mixture is very cold. The colder the mixture is before it is added to the ice cream machine, the fewer ice crystals will develop, making the texture smoother on the tongue.

Follow the manufacturer's directions on the ice cream maker. As the ice cream is freezing, place a metal bowl and spatula into the freezer to chill. Once the ice cream is a soft semi-frozen consistency, remove from the ice cream machine and place into the chilled bowl. Spread out the ice cream up the sides of the bowl. Then drizzle the cooled sour cherry Scotch ale caramel equally over the ice cream.

Using the spatula, fold the ice cream over onto itself and swirl lightly. Do not over mix or the ripple will be lost. Transfer this mixture into a sealable container and place into the freezer, letting cure to infuse the flavors for at least four hours before consuming.

Other ideas with the ice cream

Try making this ice cream into an ice cream sandwich by splitting a raised doughnut glazed with chocolate. Then fill the doughnut with a ice cream patty, then placing into the freezer until solid. Or, instead of using the Scotch ale, try using a Port with the cherries, creating a sour cherry Port caramel. BYO

by **GLENN BURNSILVER**

15TH ANNIVERSARY CLONES

15 years ago, *Brew Your Own* magazine published our very first issue. That same year, the five breweries featured in this story — Carolina Brewing Company, Big Sky, Elysian, Ska and Weyerbacher — were also just starting out, each having been founded by homebrewers. In this article, we present five clone beers from these homebrewer-founded breweries that started out the same year we did.

At *Brew Your Own*, we take brewing seriously, but we also like to have some fun at the same time. Joe Zonin, John and Greg Shuck, co-owners of Carolina Brewery, do too — for example, by brewing a special celebratory beer every Groundhog Day — and it's this kind of fun and whimsical attitude that they believe has helped keep their brewery going for 15 years.

"Be equally serious and ridiculous," agrees Dick Cantwell, head brewer at Elysian Brewery in Seattle, Washington. "It's just beer. We all love what we do, but we shouldn't take it too seriously."

Each of these brewery owners began their now-lengthy careers as homebrewers, moving from "the home garage to the commercial garage," as Ska brewing co-founder Bill Graham puts it. Along the way, each brewer discovered a passion within, and this has helped keep them going after they turned commercial. Keeping it fun over 15 years wasn't always easy. To say the least, each was faced with many challenges. Still, each brewer offered a positive snapshot of their first 15 years. "Amazing, difficult, fun, everything. The gamut of emotions and experiences," Graham says, while Big Sky Brewing co-founder and president Neal Leathers calls his first 15, "quite a rollercoaster ride."

Dan Weirback, founder and president of Weyerbacher Brewery in Easton, Pennsylvania, adds that for him, "It's been a wild and crazy ride, but we made it!" Cantwell says it has been "pretty exciting and challenging," whereas Zonin gushes, "Things have gone great for the first 15 years!"

All of the brewers interviewed here agreed variety is a key ingredient in not only the personal fun of brewing, but for the longevity and success of their breweries. There is the marketplace to consider, and the lowest common denominator beer drinkers, but who really wants to brew a beer they wouldn't want to drink themselves?

BIG SKY BREWING CO.®
MISSOULA, MONTANA

15TH BYO ANNIVERSARY

BREWS FROM 5 BREWERIES THAT TURN 15 IN 2010

"We will brew only beers . . . that we have a passion to brew and drink," Weirback says simply.

"We have always believed in brewing for ourselves," Leathers adds, "rather than trying to guess where the marketplace is heading."

Certainly these days the marketplace is very supporting to progressive brewers. Cantwell indicated his brewery can turn out approximately 40 beers each year because craft brew drinkers are now more educated and informed about beer, and maybe more importantly, willing to take chances with unusual styles.

As if almost to prove that point, Zonin notes that Carolina is brewing three beers for their anniversary. Actually, it's two — an imperial stout and a malty, hoppy beer called Wiggo — but both will be blended to create the interesting Wigsout.

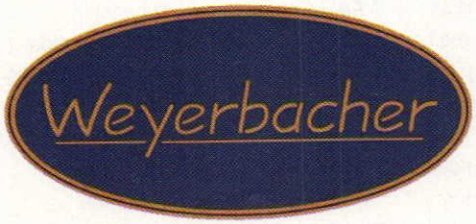
Over the past 15 years, *BYO* has covered not only how to brew classic styles of beer at home, but unusual and experimental beers as well — and the breweries featured here share that spirit of experimentation.

"Beers that don't fit style guidelines very well," adds Weirback, who is brewing a smoked imperial stout for his brewery's anniversary, "are quite intriguing beers."

"It's nice that the craft brew marketplace is always being pushed by ourselves and the rest of the brewers in the country," Graham says, "and that the consumers respond to these innovative beers."

As for the clones presented here, Graham is offering up a special Kingpin Double (Imperial) Red Ale as Ska's special anniversary brew. The guys from Carolina are offering their proposed (but not yet brewed) Imperial Stout and Weirback gave us their Fifteen, the previously mentioned smoked beer. At press time, Leathers and Cantwell have not made a decision about a special celebratory beer. Instead, Cantwell's recipe — The Wise ESB — is the first beer Elysian turned out in 1995. Rounding out the clone package is one of Big Sky's flagship beers, Moose Drool Brown Ale.

Glenn BurnSilver is an award-winning journalist, frequent BYO *contributor and features editor with the* Fairbanks Daily News-Miner *in Alaska. Unlike many of his local homebrewing peers, however, he does not use spruce tips in his creations.*



15TH ANNIVERSARY CLONE RECIPES

Ska Brewing Company Kingpin Double Red

(5 gallons/19 L, all-grain)

OG = 1.083 FG = 1.023
IBU = 58 SRM = 25 ABV = 8.4%

Ingredients

1.5 lb. (0.68 kg) amber dried malt extract
11 lb. (5.0 kg) pale ale malt or 2-row malt
1 lb. 6 oz. (0.62 kg) Carapils® malt
1 lb. 4 oz. (0.57 kg) caramel malt (80 °L)
0.50 lbs. (0.23 kg) caramel malt (120 °L)
0.50 lbs. (0.23 kg) red wheat malt
10 AAU German Tradition hops (80 mins)
(2.25 oz./62 g of 4.5% alpha acids)
7 AAU Crystal hops (30 mins)
(2.0 oz./57 g of 3.5% alpha acids)
1.5 oz. (43 g) Willamette hops (5 mins)
1.0 oz. (28 g) Cascade hops (0 mins)
White Labs WLP007 (Dry English Ale) yeast

Step by Step

Mash, sparge and kettle fill as always. We try to hold the mash at 154 °F (68 °C) for 45 minutes and recirculate for 15 minutes before kettle run-off, 1 hour in the mash tun. Add amber dry malt extract to achieve desired gravity. (This can be dropped completely, it is included in this recipe because our pilot system at Ska has a hard time achieving our desired pre-boil gravity with this much grain.) Boil 90 minutes and wait for hot break before first hop addition, hence the "80 minute." Follow the hopping schedule and cool to fermenter. Pitch White Labs 007 Dry English Ale Yeast and ferment at 69 °F (21 °C).

We force carbonate this beer to 2.45 volumes of CO_2. We have a temperature controlled 12-gallon (45 L) conical fermenter in our pilot system, so after final gravity is met, we drop from fermentation temperature in stages down to 45 °F (7.2 °C), then drop yeast and cold condition the beer, and will finally age the beer at 35 °F (1.7 °C) for the last few days before it heads to the keg for force carbonation. We prefer to fine with Biofine S to insure the beer is vegan, but isinglass will do the trick.

Ska Brewing Company Kingpin Double Red

(5 gallons/19 L, extract with grains)

OG = 1.083 FG = 1.023
IBU = 58 SRM = 25 ABV = 8.4%

Ingredients

1.5 lb. (0.68 kg) amber dried malt extract
3.0 lbs. (1.4 kg) light dried malt extract
4.0 lbs. (1.8 kg) light liquid malt extract
1 lb. 6 oz. (0.62 kg) Carapils® malt
1 lb. 4 oz. (0.57 kg) caramel malt (80 °L)
0.50 lbs. (0.23 kg) caramel malt (120 °L)
0.50 lbs. (0.23 kg) red wheat malt
10 AAU German Tradition hops (80 mins)
(2.25 oz./62 g of 4.5% alpha acids)
7 AAU Crystal hops (30 mins)
(2.0 oz./57 g of 3.5% alpha acids)
1.5 oz. (43 g) Willamette hops (5 mins)
1.0 oz. (28 g) Cascade hops (0 mins)
White Labs WLP007 (Dry English Ale) yeast

Step by Step

Place crushed grains in a steeping bag and steep in 3.0 qt. (2.9 L) of water at 154 °F (68 °C) for 45 minutes. Remove grain bag and rinse with 1.5 qt. (1.4 L) of water at 170 °F (77 °C). Add water to "grain tea" to make 3.5 gallons (13 L), stir in both dried malt extracts and bring to a boil. Boil for 90 minutes, adding hops as soon as the hot break appears. Keep a small pot of boiling water handy and do not let boil volume drop below 3.0 gallons (11 L). Stir in liquid malt extract during final 15 minutes of the boil, stirring constantly until extract has dissolved completely. Add flavor and aroma hops according to schedule.

Cool wort and transfer to fermenter. Top up to 5.0 gallons (19 L) and aerate. Pitch yeast and ferment at 69 °F (21 °C). If possible, cold condition the beer for a few days before packaging. If kegging, carbonate to 2.45 volumes of CO_2. If bottle conditioning, use 5.5 oz. (160 g) of corn sugar.

Carolina Brewing Company Imperial Stout

(5 gallons/19 L, all-grain)

OG= 1.084 FG = 1.024
IBU = 45 SRM = 78 ABV = 8.1%

Ingredients

14.5 lbs. (6.6 kg) 2-row pale malt
2.0 lbs. (0.91 kg) caramel malt (60°L)
6.5 oz. (180 g) black malt
1 lb. 3.0 oz. (0.54 kg) roasted malt
12 AAU Nugget hops (90 min)
(1.0 oz./28 g of 12% alpha acids)
0.25 oz. (7 g) Willamette hops (10 min)
0.25 oz. (7 g) Willamette hops (5 min)
0.25 oz. (7 g) Willamette hops (1 min)
Wyeast 1056 (American Ale) yeast

Step by Step

Mash for 60 minutes at 152 °F (67 °C). Boil for 90 minutes. Ferment at 68 °F (20 °C) for 3 weeks, then drop temperature 10 °F (5 °C) degrees per day until it reaches 30 °F (-1.1 °C), then hold at 30 °F (-1.1 °C) for 1 week.

Carolina Brewing Company Imperial Stout

(5 gallons/19 L, extract with grains)

OG= 1.084 FG = 1.024

IBU = 45 SRM = 78 ABV = 8.1%

Ingredients

3.5 lbs. (1.6 kg) light dried malt extract
5 lb. 14 oz. (2.7 kg) light liquid malt extract
2.0 lbs. (0.91 kg) caramel malt (60°L)
6.5 oz. (180 g) black malt
1 lb. 3.0 oz. (0.54 kg) roasted malt
12 AAU Nugget hops (90 min) (1.0 oz./28 g of 12% alpha acids)
0.25 oz. (7 g) Willamette hops (10 min)
0.25 oz. (7 g) Willamette hops (5 min)
0.25 oz. (7 g) Willamette hops (1 min)
Wyeast 1056 (American Ale) yeast

Step by Step

Place crushed grains in a steeping bag and steep in 5.0 qt. (4.6 L) of water at 152 °F (67 °C) for 45 minutes. Remove grain bag and rinse with 2.5 qt. (2.4 L) of water at 170 °F (77 °C). Add water to "grain tea" to make 3.5 gallons (13 L), stir in dried malt extract and bring to a boil. Boil for 90 minutes, adding hops at the appropriate times. Keep a small pot of boiling water handy and do not let boil volume drop below 3.0 gallons (11 L). Stir in liquid malt extract during final 15 minutes of the boil, stirring constantly until extract has dissolved completely.

Cool wort and transfer to fermenter. Top up to 5.0 gallons (19 L) and aerate. Pitch yeast and ferment at 68 °F (20 °C). If possible, cold condition the beer for a few days before packaging. If bottle conditioning, package beers with 5.0 oz. (140 g) of corn sugar.

Weyerbacher Fifteen (Smoked Imperial Stout)

(5 gallons/19 L, all-grain)

OG = 1.101 FG = 1.025
IBU = 52 SRM = 101 ABV = 9.7%

Ingredients

15 lbs. (6.8 kg) smoked malt
1 lb.14 oz. (0.85 kg) CaraAroma® malt
1.25 lbs. (0.57 kg) Carafa® Special Type II malt
1.25 lbs. (0.57 kg) rye malt
1.25 lbs. (0.57 kg) pale malt
0.75 lbs. (0.34 kg) black malt
0.75 lbs. (0.34 kg) roasted barley
15.75 AAU Centennial hops (90 mins) (1.5 oz./44 g of 10.5% alpha aids)
1.0 oz. (28 g) Fuggles hops (2 mins)
Wyeast 1272 (American Ale II) yeast

Step by Step

Mash in to 130 °F (54 °C), rest for 20 minutes, then up to 154 °F (68 °C) for 30 minutes rest. Raise temperature to 172 °F (78 °C) to mash out. Preboil gravity is 1.092 SG, post boil is 1.106. Boil time 90 minutes. Ferment at 68 °F (20 °C) with American Ale II yeast from Wyeast.

Elysian The Wise

(5 gallons/19 L, all-grain)

OG= 1.061 FG = 1.015
IBU = 32 SRM = 18 ABV = 5.9%

Ingredients

10.5 lbs. (4.7 kg) Great Western Premium 2-row pale malt
1.0 lb. (0.45 kg) Crisp crystal malt (77 °L)
1.0 lb. (0.45 kg) Weyermann Munich malt
4.0 oz. (0.11 kg) Weyermann Cara-Hell® malt
2.0 oz. (57 g) Special B malt
8.4 AAU Chinook hops (60 mins) (0.70 oz./20 g of 12% alpha acids)
½ oz. (14 g) Cascade hops (2 mins)
½ oz. (14 g) Centennial hops (2 mins)
½ oz. (14 g) Cascade hops (whirlpool/end of boil)
½ oz. (14 g) Centennial hops (whirlpool/end of boil)
Wyeast 1056 (American Ale) yeast

Step by Step

Mash at 154 °F (68 °C) for 60 minutes; run off for 90 minutes; boil 90 minutes; pitch attenuative American ale yeast, such as Wyeast 1056. (Elysian uses Siebel BR96, a relative.)

Elysian The Wise

(5 gallons/19 L, extract with grains)

OG= 1.061 FG = 1.015
IBU = 32 SRM = 18 ABV = 5.9%

Ingredients

2.75 lbs. (1.3 kg) light dried malt extract
4.0 lbs. (1.8 kg) light liquid malt extract
1.0 lb. (0.45 kg) Crisp crystal malt (77 °L)
1.0 lb. (0.45 kg) Weyermann Munich malt
4.0 oz. (0.11 kg) Weyermann Cara-Hell® malt
2.0 oz. (57 g) Special B malt
8.4 AAU Chinook hops (60 mins) (0.70 oz./20 g of 12% alpha acids)
½ oz. (14 g) Cascade hops (2 mins)
½ oz. (14 g) Centennial hops (2 mins)
½ oz. (14 g) Cascade hops (whirlpool/end of boil)
½ oz. (14 g) Centennial hops (whirlpool/end of boil)
Wyeast 1056 (American Ale) yeast

Step by Step

Steep crushed grains in 2.9 qt. (2.8 L) of water at 154 °F (68 °C) for 45 minutes. Rinse with 1.5 qt. (1.4 L) of water at 170 °F (77 °C). Add water to "grain tea" to make 3.5 gallons (13 L), stir in dried malt extract and bring to a boil. Boil for 90 minutes, adding hops according to schedule. Stir in liquid malt extract during final 15 minutes of the boil. Cool wort and transfer to fermenter. Top up to 5.0 gallons (19 L) and aerate. Pitch yeast and ferment at ale temperatures. If bottle conditioning, use 5.0 oz. (140 g) of corn sugar.

Big Sky Moose Drool Brown Ale

(5 gallons/19 L, extract with grains)

OG = 1.052 FG = 1.013
IBU = 26 SRM = 38 ABV = 5.1%

Ingredients

2.5 lbs. (1.1 kg) light dried malt extract
3.75 lbs. (1.7 kg) light liquid malt extract
1 lb. 2 oz. (0.5 kg) crystal malt (75 °L)
5.0 oz. (0.14 kg) chocolate malt
0.33 oz. (9.4 g) black malt
6 AAU East Kent Goldings (60 mins) (1.2 oz./34 g at 5% alpha acids)
0.5 oz. (14 g) Liberty hops (5 mins)
0.5 oz. (14 g) Willamette hops (5 mins)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast

Step by Step

Steep grains at 154 °F (68 °C). Boil wort for 70 minutes, adding hops at times indicated. Reserve liquid malt extract for final 15 minutes of the boil. Ferment beer at 70 °F (21 °C). BYO

BREW OUR 15TH ANNIVERSARY ALE

by **CHRIS COLBY**

It's *Brew Your Own's* 15th anniversary and we have a celebratory beer recipe for all of our readers. For our 10th anniversary, we presented a recipe for a big (10% ABV) American-style stout. The recipe for this can be found at: http://www.byo.com/stories/recipes/article/indices/51-recipe-exchange/409-byos-10th-anniversary-ale.

For our 15th Anniversary Ale, I initially decided to formulate and brew a big (15% ABV) ale. The basic idea was to brew a 12% ABV ale, then "feed" the fermenting beer until it reached 15%. Two friends and fellow Austin ZEALOTS, Ed Peters and Dan Dewberry, stopped by my house and helped me brew the base beer earlier this year. The brew day went well and we also took the opportunity to sample what was probably the last bottle of *BYO's* 10th Anniversary Ale from the 2005 batch. (Dan had it in his beer fridge.) As it turned out, the test batch of 12% ABV base beer was wonderful on its own, while the 15% version took a lot more work for little payoff.

15TH BYO ANNIVERSARY

So, *BYO's* 15th Anniversary Ale is a big (12% ABV), dark and malty ale. It is not strongly roasty. The big maltiness is balanced by a firm hop bitterness and the beer is very highly attenuated, so it isn't syrupy sweet.

Enjoy brewing this anniversary ale celebrating 15 years of beer with *BYO*. We're looking forward to 15 more years of homebrewing with you!

15TH ANNIVERSARY RECIPE

BYO 15th Anniversary Ale

(5 gallons/19 L, all-grain)

OG = 1.114 FG = 1.020

IBU = 47 SRM = 28 ABV = 12%

Ingredients

10 lbs. (4.5 kg) domestic 2-row pale malt
7.5 lbs. (3.4 kg) Vienna malt
1 lb. 14 oz. (0.85 kg) Munich malt
15 oz. (0.42 kg) wheat malt
8.0 oz. (0.23 kg) aromatic malt
4.0 oz. (0.11 kg) crystal malt (60 °L)
3.0 oz. (85 g) chocolate malt
1.5–4.0 lbs. (0.68–1.8 kg) cane sugar (amount depends on wort gravity after wort collection)
¼ tsp yeast nutrients (in boil)
¼ tsp yeast nutrients (in fermenter)
15 AAU Summit hops (90 mins) (0.94 oz./27 g of 16% alpha acids)
Wyeast 3787 (Trappist High Gravity) or White Labs WLP530 (Abbey Ale) yeast (2 qt./2 L yeast starter)
Wyeast 1728 (Scottish Ale) or White Labs WLP028 (Edinburgh Scottish Ale) yeast (2 qt./2 L yeast starter)

Step by Step

Step mash with an initial rest at 140 °F (60 °C) for 40 minutes. Heat the mash to ramp the temperature up to 152 °F (67 °C) and hold for 15 minutes. Stir mash while it is being heated. Ramp temperature to 170 °F (77 °C). Recirculate and run off wort, sparging with water hot enough to keep grain bed at 170 °F (77 °C). Collect 7.0 gallons (26 L) of wort — or whatever pre-boil volume will yield 5.0 gallons (19 L) of wort after a 90-minute boil. (Note: If you collect 7 gallons (26 L) of wort, you can run off 3 gallons (11 L) of the remaining wort and make a second, weaker beer.) Boil for 90 minutes, adding hops once the wort has boiled long enough that hot break begins appearing. Add first dose of yeast nutrients with 15 minutes left in boil. As the boil nears the end, take a specific gravity reading and add cane sugar so that the post-boil gravity is SG 1.114. (You will most likely need at least 1.5 lbs/0.68 kg, but may need more depending on your extraction efficiency.) Cool wort to 65 °F (18 °C) and transfer to fermenter. Aerate thoroughly, preferably with oxygen, and pitch yeast from yeast starters. Eight to 12 hours later, before high kräusen is reached, aerate a second time for 30–45 seconds. Ferment at 65 °F (18 °C), watching that the fermentation temperature doesn't climb. (The Trappist yeast will start producing too many "Belgian-y" characteristics, and the Scottish ales more esters than you want, as you approach 70 °F/21 °C). The day after high kräusen, add the second dose of yeast nutrients. (Boil them in water for 5 minutes before adding. Use as little water as possible for this.) When fermentation slows greatly, let temperature climb to 70 °F. When fermentation finishes, let beer sit at 70 °F (21 °C) for 3–4 days (just to make sure it really has finished), then cool and transfer to a keg for carbonation.

This beer conditions quickly, even though it is a strong ale.

BYO 15th Anniversary Ale

(5 gallons/19 L, extract with grains)

OG = 1.114 FG = 1.020

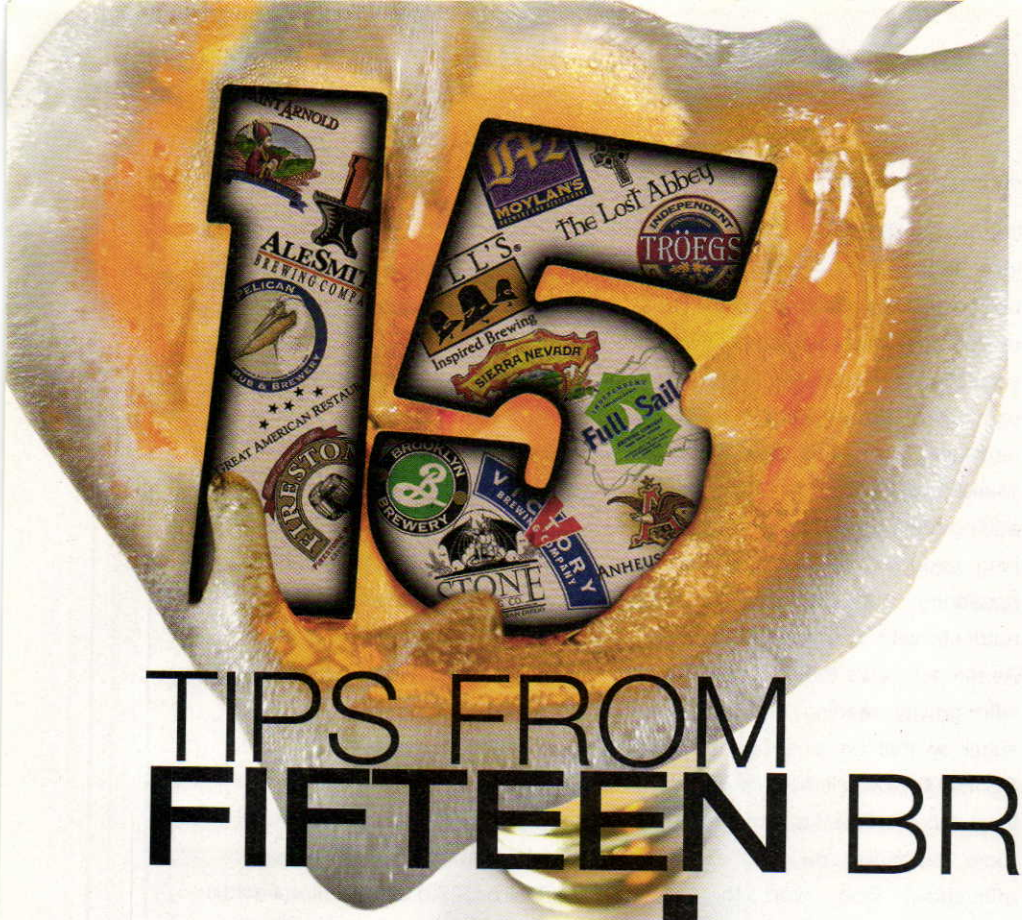
IBU = 47 SRM = 28 ABV = 12%

Ingredients

8.75 lbs. (4.5 kg) light dried malt extract
1 lb. 14 oz. (0.85 kg) Munich malt
15 oz. (0.42 kg) wheat malt
8.0 oz. (0.23 kg) aromatic malt
4.0 oz. (0.11 kg) crystal malt (60 °L)
3.0 oz. (85 g) chocolate malt
2.0 lbs. (0.91 kg) cane sugar
¼ tsp yeast nutrients (in boil)
¼ tsp yeast nutrients (in fermenter)
15 AAU Summit hops (90 mins) (0.94 oz./27 g of 16% alpha acids)
Wyeast 3787 (Trappist High Gravity) or White Labs WLP530 (Abbey Ale) yeast (2 qt./2 L yeast starter)
Wyeast 1728 (Scottish Ale) or White Labs WLP028 (Edinburgh Scottish Ale) yeast (2 qt./2 L yeast starter)

Step by Step

In a large steeping bag, steep the crushed grains at 152 °F (67 °C) for 45 minutes in 5.0 qts (4.8 L) of water. Rinse grain bag with 2 qts. (2 L) of water at 170 °F (77 °C). Add water to make 3.0 gallons (11 L) and heat wort to a boil, adding roughly half the malt extract at boil start. Boil for 90 minutes, adding hops near beginning. If wort volume dips below 2.5 gallons (9.5 L), top up with boiling water. Add sugar, nutrients and remaining extract for final 5 minutes of boil. Cool wort and transfer to fermenter. Top up to 5 gallons (19 L), aerate and pitch yeast. See all-grain instructions for fermentation details.



TIPS FROM FIFTEEN BREWERS

by **BETSY PARKS**

This is *Brew Your Own's* 15th anniversary. Over this time, we've tried to bring homebrewers the best information possible on brewing with topics ranging from equipment to ingredients to techniques to beer styles. We've been aided in this endeavor by the help of the numerous professional brewers who have appeared in our "Tips from the Pros" column. Through the "Tips" column, homebrewers not only get to read what the pros would recommend on a given topic, but they can also survey a slice of the diversity of opinion in the field.

The knowledge that commercial brewers possess often stems from professional training, but it is augmented by their practical experience brewing beer day in and day out. In addition, many professional brewers in the United States started out as homebrewers. So, despite the differences in focus (homebrewers don't have to worry about selling their beer) and scale, the brewers we have featured have been able to dispense valuable information for our readers.

For this story, we've collected tips from 15 top brewers on topics that are right up their alley. Tomme Arthur kicks things off with a discussion of "flavor-driven" beers. Ron Barchet and Bill Covaleski discuss the impact that different yeast strains can have on the same wort. Matt Brynildson spells out the merits of keeping hoppy beers simple. Nathaniel Davis explains the benefits of mastering a beer style. Darron Welch gives a hop usage tip that has worked well for him. Andrew Dickson provides some tips on brewing a great wheat beer. Steve Dresler explains his preference for whole hop cones in brewing. Nick Funnell gives insight into using water chemistry to brew a balanced session beer. John Harris discusses how to choose the right crystal malt for your beer. Denise Jones explains why imperial beers benefit from the addition of different types of specialty malts. John Mallet talks about the merits of getting to know the fermentation characteristics of your favorite yeast strain and Garrett Oliver discusses how much yeast you should pitch. Mitch Steele tells brewers how to get the most impact from their hop additions. Brock Wagner explains the how and the why of keeping fermentations cool and finally Peter Zien discusses beer tasting and evaluation. Thanks to all the brewers who have contributed their time and experience over the years!

15TH BYO ANNIVERSARY

Tomme Arthur

The Lost Abbey

1. Tomme Arthur on Focusing on Flavor

Tomme Arthur, Director of Brewery Operations for Port Brewing and The Lost Abbey in San Marcos, California. Tomme is known for creating many award-winning beers by experimenting with oak aging of beers, using fruits, herbs and spices along with fermenting with wild yeasts and bacteria.

In my quest to become a brewer, I always chased flavor as an ingredient with a sense of purpose. These days, all of our beers are incredibly expressive and many of them manifest a particular flavor. Some are driven by the quality of the raisins we're using. Others may be focused on a blend of spices or the certain way that hops interact with each other. But the one thing they all share in common is that each beer is driven and ultimately structured around a key flavor component.

Over the years, I have come to call our beers "flavor-driven" beers. It's somewhat silly in that all beer should have flavor, except that not all beers do. And moreover, when I think about the flavors in our beers, I am really talking about the way that a particular flavor is "large and in charge." For me, flavor-driven beers are bold, they are expressive and completely extroverted in their makeup. Are they bombastic in their approach? Most likely they are. But the one thing they don't lack is flavor. The difficulty in brewing with such zeal is that often one ingredient can come to overwhelm the beer.

At Port Brewing and The Lost Abbey, we focus on flavor-driven beers with one goal in mind — pushing a beer to the limits and trying not to go over the proverbial edge. Doing this at home is easily accomplished by focusing your energies on a singular flavor group before moving on to the next one. A successful beer requires a well-structured foundation before layers can be laid on top. Much like a great chef working with the best ingredients, all of the same malts, hops and yeast are available to us. How well (skillfully) we tie them together is the strength of our business. In our brewing, we identify and target certain areas for flavor gain. We start with the malt basis. Then we move on to the hop constituents. Of course within this realm we have to work with yeast(s) and what they provide in the beer. Finishing off a recipe might involve the addition of spices, fruit or even barrel aging the beer. Yet, each step is a foundation for the next that builds momentum and supports the flavors each area, ingredient or process provides.

Ron Barchet and Bill Covaleski

VICTORY BREWING COMPANY

2. Ron Barchetand Bill Covaleski on Experimenting with Yeast Strains

Ron Barchet and Bill Covaleski, Founders of Victory Brewing Co. in Downington, Pennsylvania. Bill and Ron founded Victory in 1996. Today Victory produces around twenty individual beers, which are made from a stable of more than 30 different yeast strains.

We all know yeast makes the beer, right? Brewers make wort and yeast makes beer. So, when we talk about malts, hops, mashing, lautering and cooling, we are really only talking about making wort. Sure, it's important that care is taken in creating wort, as the sole purpose of making wort is to make the yeast thrive so it makes the beer we want to create (drink).

We have often felt brewers talk too much about certain processes and ingredients, but it is the rare brewer that digresses on and on about *Saccharomyces*. That is a shame, because the yeast is the cornerstone of any ale or lager.

The obvious examples are some of the original Belgian strains, which produce the phenolic soup responsible for the "Belgian" flavors and aromas. It is the Bavarian yeast strain, simply known as #68, not the wheat malt, which creates the flavors that we associate with German wheat beers. Even the same strain can behave differently. We purchased the same strain three times from the same source and had different results; one year we brewed a separate batch with each strain. We picked our favorite, and now we use that particular strain of the strain every year with consistent results.

Some yeasts are more subtle, but equally interesting. A few years ago, we made a 25-barrel batch of pale ale, and fermented using different yeasts. Same wort, but one fermented with American ale yeast and the other with English ale yeast. They were packaged separately and sold as a pair to local restaurants. The differences were stunning in that the beers made from the same wort tasted quite different. Hardly subtle differences either; with the English yeast producing a softer, more minerally hoppiness. In contrast, the American ale yeast accentuated the citrus qualities of the hops and finished crisper.

If you don't have access to multiple strains, you can still be creative with yeast. Experiment with pitching rates, aeration amounts and temperature. We have experimented with all of these parameters and have seen major effects across the flavor and aroma spectrum. I encourage all brewers to consider fermentation and yeast as the most critical aspect of making beer. Don't be afraid of this ingredient; it is the cheapest ingredient in the brewery and works as hard as any brewer.

Matthew Brynildson

3. Matt Brynildson on Keeping Hoppy Beers Simple

Matthew Brynildson, Brewmaster of Firestone Walker Brewing Co., in Paso Robles, California. Matt began his brewing career with KALSEC (Kalamazoo Spice Extraction Company) as a hop chemist. In 2001 Matt joined the Firestone Walker Brewing Company as Brewmaster.

In my short brewing career I have somehow been pinned with the badge of being the guy to go to when there is a question about hops. I love hops, I study hops and I use a lot of hops in my day job but I do not consider myself an expert; however, I have learned a few hop-related brewing tricks along the way. Firestone Walker makes some great hoppy beers and our success with those beers, both in competition and on the street, can be attributed to two key practices.

First of all, we like to keep it simple. I'm not a fan of recipes with ten malts and ten hops. I don't like performing any more mash rests then are needed and I don't like moving a beer unless there is a real purpose. I love beers that are one or two malts, spiced with one or two hop varieties, which allow the spirit, skill and attitude of the brewer, along with the nuances of the hop, to shine through. Specialty malts can be over used and I often suggest to brewers that they reduce non-fermentables to allow the yeast and the hops to be expressed.

The most intriguing character of the hop is locked in its essential oils, which are very fragile and volatile. These oils are best infused into the beer through late hopping and dry hopping, which is the second key step that I would highlight. In the brewhouse I like to minimize early kettle hop additions to allow for larger late hopping charges, which provide plenty of bitterness while preserving hop oils. Hot wort and fermented beer are two very different mediums when it comes to hopping and I believe that dry hopping is key to hoppy beer styles. Only dry hop with your freshest and best smelling hops. Try dry hopping your beer on the warm side, at fermentation temperatures, toward the end of primary fermentation.

Nathaniel Davis

4. Nathaniel Davis on Mastering Beer Styles

Nathaniel Davis holds a Bachelor of Science in Microbiology and Immunology from McGill University, Montreal, is a graduate of the Master Brewers Program at UC-Davis, and received his Executive MBA from Olin School of Business at Washington University, St. Louis. He joined Anheuser-Busch in 1999 and he is currently responsible for brewing and packaging innovations for the North American zone.

One of the joys of homebrewing is variety — trying new things, different ingredients and exploring unfamiliar styles or inventing new ones. However, exercising the discipline to vary only one aspect at a time on a single beer style can reveal 1.) nuances of recipe changes, 2.) your ability to control flavor profiles and 3.) the "house character" of your particular setup. I use this approach now that I have my dream job helping invent new beers at Anheuser-Busch. When developing a new recipe, whether for Budweiser American Ale, Bud Light Golden Wheat, or a new seasonal in the ever-growing family of Michelob beers, we map out the core profile we want to achieve, then brew a series of recipes varying only one aspect at a time. In my early homebrewing days, I spent nearly a year brewing nothing but American-style pale ales – about thirty of them in a row. Starting with my interpretation of the "classic": (90% pale malt, 10% crystal malt (60 °L), Wyeast 1056 (American Ale) strain, 100% Cascade hopping — kettle and dry hopping — at a targeted 40 IBU). Then each session, I varied only one aspect at a time so I could compare the flavor impact to a previous brew. Occasionally I had to rebrew the "baseline" version to keep it fresh or replenish stocks. By the end of that year-long experiment, I had explored all kinds of unique avenues starting from that central point of my version of a "classic" APA, such as hop varieties (kettle additions or dry hops), other specialty malt additions (a little chocolate malt, 20 °L versus 60 °L versus 120 °L caramel malts), spices (cardomom, juniper, grains of paradise), new processes (mash hopping, bottle hopping), unexpected yeast strains (how about a Bavarian wheat strain in an APA?), and other ingredients (mangoes, strawberries, espresso). The idea is to anchor in a style that you love and remain disciplined enough to vary only one (ok, maybe two) element(s) at a time. You will actually learn faster and become more comfortable in your ability to control flavor outcomes.

Darron Welch

5. Darron Welch on Timing Hop Additions

Darron Welch, Brewmaster for Pelican Pub & Brewery in Pacific City, Oregon. Among the many awards Pelican beers have earned over the years, Kiwanda Cream Ale has been a star at the Great American Beer Festival, World Beer Cup and North American Beer Awards.

One unusual technique I developed here at the Pelican, originally for our Kiwanda Cream Ale, is adding the entire hop charge at the whirlpool stage. I've frequently told other brewers about this technique, but many still don't believe that it works!

The way it works is that we add the hops right at boil stop and then initiate a vigorous 5-minute whirlpool, which takes about 25–30 minutes to spin down. We end up with around 25 IBUs, which we have verified over and over in the laboratory.

This technique is great for maximizing the hop aroma while keeping the bitterness low enough to provide a clean snappy finish that is neither too bitter nor sweet. I think that sometimes blonde or golden ales can tend to be too sweet, and it is hard to keep the bitterness low while also keeping the beer snappy and aromatic, but this seems to do the trick.

In our 15-barrel brewhouse, we use 11 pounds (5 kg) in a batch of Kiwanda, so that would work out to about 2 ounces (57 g) when scaled to a 5-gallon (19-L) batch. We've gotten great results with this technique in a variety of brands and styles.

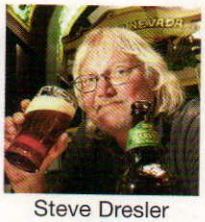
6. Andrew Dickson on Giving Wheat a Chance

Andrew Dickson, Head Brewer at Tröegs Brewing Co. in Harrisburg, Pennsylvania. Tröegs Brewery was founded in 1996 by brothers John and Chris Trogner and Andrew joined the crew later. Among Tröegs roster of award-winning beers is DreamWeaver Wheat Ale, which is currently rated as one of the top ten wheat beers on beeradvocate.com.

Brewing a good, consistent weissbier is challenging. A weissbier should contain at least 50% wheat. In DreamWeaver, we use only white wheat; this results in a higher extract and a nice doughy flavor. A higher mash pH of 5.7–5.8 will help increase the phenols. A low mash-in temperature of 95–100 °F (35–38 °C) followed by a 10-minute ferulic acid rest at 108 °F (42 °C) will also help improve the phenolic flavors of your beer. The weizen yeast converts the ferulic acid into 4-vinyl guaiacol to accentuate the clove flavor and aroma. Because of the high percentage of wheat in the grist, be sure to run off slowly. A weissbier should have only two hop additions — bittering and aroma — and should be no more than 12–14 IBU.

The most important element to brewing a good weissbier is the yeast since small changes can lead to dramatic flavor differences. Yeast selection, generation, aeration, and pitching and fermentation temperature are all equally important. Many craft breweries use Weihenstephan Weizen 68 (Wyeast 3068 or WLP 300) because it produces high levels of isoamyl acetate, the ester responsible for the banana flavor and aroma. This yeast will create a high kräusen so be sure to leave room in your carboy. If reusing yeast and not top-cropping only use this yeast two or three times; overuse can lead to various off flavors including an unpleasant tartness. If aerating the wort, pitch approximately 4–7 million cells/mL; without aeration pitch at least 50% more yeast.

To change the flavor profile, manipulate the level of aeration — the more oxygen, the stronger banana flavor and aroma. For DreamWeaver Wheat, our brewers aerate at only 2–3 ppm (approximately half of what we do for most of our beers) to increase the pepper and clove flavor and aromas. I recommend pitching your yeast at 60 °F (16 °C) and fermenting at 68–70 °F (20–21 °C); anything above 72 °F (22 °C) will result in an unpleasant medicinal/band aid aroma and a bubble gum flavor.



Steve Dresler

7. Steve Dresler on Brewing with Whole Hop Cones

Steve Dresler, Brewmaster at Sierra Nevada Brewing Co. in Chico, California. Steve graduated from California State University-Chico in 1981 with dual degrees in Biology and Chemistry. He was hired on the bottling line at Sierra Nevada in January of 1983 and is now Brewmaster.

The two most important things in brewing are quality and flavor. I realize this comes off as cliché, but when you get down to it, this is what beer is all about. Quality is a no-brainer. When brewers call and ask for advice, the first thing I tell them is before you think about brewing you had better have some sort of a lab in place. Quality was one thing Ken obsessed over in the early days at Sierra Nevada, and it is probably the reason we've outlasted so many of our peers. First and foremost, quality is key. This quality testing at Sierra Nevada has proven to me that whole hops are superior.

Here at Sierra Nevada, flavor tends to skew towards hops. Ken's original recipe for pale ale, and its distinct Cascade hop aromas, really set the tone for the brewery. Our hop-forward focus has always been flavor and aroma over bitterness (although there's some of that, too), and this is why we insist on using only whole-cones. The use of whole-cone hops has largely fallen out of favor, but I truly believe that for us, it made all the difference. Hop cones add depth and complexity that I have never found from pelletized versions or from hop oil extract. We do extensive sensory trials involving double-blind tasting of whole-cones versus pellets, and over 90% of our tasters can negatively pick out the beers made with pellets. There are thousands of volatile aroma compounds in every varietal of hops, that easily fade through mishandling or through the pelletizing process. The bottom-line is, if you brew with whole-cone hops, you expect the whole-cone flavor. If you brew with pellets, you get flavors, just not cone flavor.

I realize on the homebrew level, whole-cone hops can be scarce. I try to encourage everyone to go out into the backyard and plant some hops of their own. If for no reason, than to taste a beer made with truly fresh whole-cone flavors. I've been growing my own now for twenty-five years, and they served as part of the inspiration for our Harvest Series of beers. Fresh hops can be used all at once as "wet" or undried cones, but on a homebrew level, they can also be easily dried and stored in the freezer for use in another beer. A long length of day will produce the best quality crop, but hops will grow almost anywhere.

Nick Funnell

SWEETWATER TAVERN

GREAT AMERICAN RESTAURANTS

8. Nick Funnell on Achieving Balance Through Chemistry

Nick holds a chemistry degree from the University of Leeds in the United Kingdom. After refining his beer-making skills in the U.K., Nick moved to the States and was hired as Great American Restaurants' first brewer in 1996, where he is currently Head Brewer.

No marketing man worth his salt would come up with a beer called bitter or mild. However, in this age of extreme beers there is definitely a place for these two of my favorite styles. These are the beers I grew up drinking and the words I most frequently associate with them are subtlety and balance. There is little to hide behind when making them, but enough flavor for most drinkers. They challenge the brewers' art because the slightest flaw will stand out.

Looking at the style guidelines in the WBC/GABF Competition handbook, you will see that balance is described as a key part of almost every style from the American sour ale ("balanced complexity") through imperial IPA ("though the hop character is intense it's balanced") to herb and spice beers ("positive evaluations are significantly based on perceived balance of flavors").

Balance all starts with the water. These styles are lower in alcohol, so they are higher in water content and the flavor impact of the brewing liquor is very apparent. Water quality and mineral content are crucial, and the difference between a great beer and one that is harsh flavored is disappointment. We cannot cover here all the different beer styles and their water requirements, but a rough guide for a starting point for most beers would recommend alkalinity being less than 50 ppm, calcium levels of around 50 ppm in the mash water and of course a good clean taste. Once this is accomplished, adjustments could be made for style. Generally, if the beer is dry and hoppy, calcium sulfate will accentuate that, and for a smooth malty beer calcium chloride will help round out the flavor. A truly great beer is one where the glass is suddenly empty without the drinker realizing. There is a place for all beer styles, but a great session beer can be enjoyed any time and any place. When making and drinking beer, always try and keep your balance.

John Harris

Full Sail BREWING COMPANY

9. John Harris on Experimenting with Crystal Malts

John Harris, Brewmaster at Full Sail Brewing Co. in Hood River, Oregon, manages Full Sail's Riverplace brewery in Portland, Oregon, which produces the small-batch Brewmaster Reserve and Brewer's Share lines of beers and serves as a research and development center.

Crystal or caramel malts are produced by roasting wet germinated barley. As heat is applied the endosperm liquefies and then is "caramelized" to different degrees of color. I have had the pleasure of taking part in the roasting of crystal malts and it is a tricky art indeed. Malt varieties behave differently and some do not make good crystal malt. I tend to like ones produced with 2-row barley. I believe they add more body and flavor than 6-row malts.

Use crystal malts sparingly. Depending upon the style it is easy to go overboard. When you use too much the beer can take on a metallic burnt character. These malts should never be the leader; they should be used in a supporting role. Red and amber style ales are known for having a rich "caramel" profile. This is best achieved by using medium roast 60–80 °L crystals with lighter ones to help round the roasty flavors.

Many red ales I have tried appear to use darker crystal malts. I feel these are too strong in flavor for red ales leaving some flavors associated with oxidation in the beer. A somewhat burnt acrid flavor.

Also, all colors are not equal. A British specialty malt supplier I worked with once referred to specialty malts as "just color." I disagree with him. Specialty malts are our spices and can add way more than color to the beer. They can impart flavors from toffee to raisins to the beer. Ten pounds of 120 °L malt does not have the same taste effect as 20 pounds of 60 °L malt. The color units might be the same but the effect on the beer will be different. I like to work with a blend of different crystal malts to get more complexity in the beer. I use lighter roasts to add body, medium roasts for flavor and some darker roasts to add color but also a richer depth of flavor to different styles.

Use trial and error to find a complementary blend. I have found through the years that in pale beer styles crystal malt can stand alone in the beer. I have also found that by using other malts in concert you can build up the beer's flavor.

I feel that the richer malty–biscuit flavors that these malts lend helps amplify the sweet nature of crystal malt. Honey malts are also good complementary malt.

Denise Jones

10. Denise Jones on Why Imperials Need Extra Ingredients

Denise Jones, Brewmaster at Moylan's Brewery in Novato, California, was the first female graduate of the American Brewers Guild in 1995. She oversees production of Moylan's many award-winning, and often high-gravity, beers including Kilt Lifter Scotch Ale (8.0%), Hopsickle Imperial IPA (9.2%) and Old Blarney Barleywine Style Ale (10%).

It's been said by many legendary brewers that a good place to start when brewing a high-gravity beer is with a solid recipe. With that said, many of the specifics can be ramped up in anticipation of the stronger version. Malt bills can not only increase in base malt to achieve higher gravity but specialty malts that offer flavor and rich body are indeed just as important to consider. More alcohol in the final beer will tend to thin the body and mouthfeel out; dextrin malts as well as mid-to-highly-kilned specialty malts can offer added structure and malt presence to the amped up example.

The hop question is rather different. Just doubling up on hop usage may be a disastrous decision when it comes to the extreme example. Choosing a higher alpha hop in the base bittering can be a life saver when considering increases in hop balance for increased gravity. Increased grist and hop additions will precipitate more trub and will inevitably make whirlpool and transfer much more difficult. Hop increases can be approached judiciously and can be adjusted later on with post fermentation dry hop efforts.

Yeast will be your largest concern. Some varieties of yeast are known for attacking large gravity beers whilst some are better served with medium gravity styles. Choosing a yeast that can attenuate in the toxic pool of increased alcohol and maltose may mean that the brewer chooses a different yeast than the normal "go-to" strain. Alcohol tolerance, vitality, viability and temperature range employed will greatly affect the final flavor and balance of the beer. A larger packed cell volume (more yeast) will be necessary as well, not to mention increased aeration and nutrition to ensure that the beer doesn't fall short of the attenuation goals.

John Mallett

Inspired Brewing™

11. John Mallett on Fermentations

John Mallett, Plant Manager at Bell's Brewery, joined Bell's in 2001 and manages operations for the brewery in Comstock, Michigan. John is the founder and president of SAAZ, a brewing equipment and service provider and serves on many technical committees, including the MBAA and the American Malting Barley Association, Inc.

As brewers, we are all dependent on the work done by our constant companions, the yeast. Quietly, uncomplainingly and diligently they turn the raw wort into delicious (and alcoholic) beer. But far beyond merely transforming sugar into alcohol, they also function as prolific producers of a wide variety of flavor active compounds. Like all of us, they have basic requirements to function at their optimum condition. Although I have never knowingly produced a specifically valine-deficient wort, I have had fermentations go terribly wrong. Basic specific gravity testing aside, one of the best metrics for yeast performance I have found is simple, visual observation. Is the fermentation taking off? How vigorous is it? Different yeasts have different fermentation characteristics and the more I work with a given yeast strain, the more I understand what a healthy fermentation looks like. The earlier we can spot variation from ideal, the better the chance that corrective action can be taken.

The key is knowing what that fermentation should look like, and you as a brewer need to watch each fermentation to build up your knowledge of how they look. Years ago, while walking through the vast open fermentation cellar at Schneider Weisse I was impressed at the ability of the brewer to assess the fermentation time of any tank to within a four hour window by simply glancing at it. Drawing on the experience of yourself and others for what to look for allows for optimum fermentation performance, and ultimately a better glass of beer.

Some yeast throws sulfur, others loft trub in a dense head. If yeast is performing slowly, obviously we as the brewer have not done our job sufficiently. After all, aren't we just setting the table for a terrific dinner party? Correct temperature, proper nutrients and sufficient quantities of viable partygoers are all required. Deficiencies in any will show up quickly. In my first brewing job (where we used "open squares" for fermentation) I found that if the fermentation is generally up and down in four days for a given yeast we don't need to wait even two days to see if fermentation will start. Early intervention had a huge impact on the ultimate flavor of the beer.

Garrett Oliver

12. Garrett Oliver on Pitching Rate

Garrett joined the Brooklyn Brewery as a partner and as Brewmaster in 1994. Many of his beers have won national and international awards and he has served as a judge for the Professional Panel Blind Tasting of the Great American Beer Festival for fourteen years.

We brew a variety of styles at Brooklyn, and I would say that the most important factor to brewing any style, at home or professionally, is making sure you start from the very beginning with a healthy population of yeast.

You should see the fermentation take off sooner rather than later. For example, for most ales, you ought to see a very active fermentation in under twelve hours. The less time you leave your vulnerable wort to sit and wait for fermentation to begin, the better.

A beer from a struggling fermentation has a certain flavor. It's one of the main things that tends to distinguish what a professional might say is a homebrew flavor. In most cases if brewers were to use two smackpacks for a 5-gallon (19-L) batch, or pitch their own yeast at higher rates (from a previous batch), the resulting beer would have a much cleaner flavor. The average amount of yeast that's provided on the homebrew scale — whether it's dry or in a liquid smackpack — will get the job done eventually, but it can be too little to start the fermentation as vigorously as you would like to see it. You always want to start out strong.

Mitch Steele

13. Mitch Steele on Amplifying Your Hops

Mitch Steele, Stone Brewing Co., Production Manager/Head Brewer at Stone Brewing Co. in Escondido, California. Before coming to Stone, Mitch worked as the Assistant Brewmaster for Anheuser-Busch's Merrimack, New Hampshire facility. Over the last fifteen years, Stone has won many awards for their big-profile, complex and intense beers.

When brewing hoppy beers, a more pronounced hop flavor can be obtained by brewing at a lower conversion temperature to get a drier finish. Less sweetness in your beer will allow the hop character to come through more, and allows bitterness to dominate the palate with less interference from dextrins. If brewing a double IPA, for example, I recommend mash rests at 148–150 °F (64 °C), for 60 to 90 minutes, to target a terminal gravity of 2.5–3 °Plato (1.010–1.012 S.G.). This also helps drive the alcohol content up, and higher alcohol beers carry more hop flavors than lower alcohol beers.

Also, minimize the use of specialty malts. Crystal malts and roasted malts can either mask over or clash with fresh hop flavors. This impact becomes more pronounced as beer ages. As the flavors in crystal malts oxidize to the more prominent raisiny and toasted notes, hop flavors will quickly fall to the background. Hop flavors are the first thing to disappear as a beer ages, so anything that can be done to emphasize hop flavors will help with the retention.

Some other hints:

1. Multiple dry-hops: pull your hops out after a few days and dry-hop with a fresh batch of dry hops. This great technique maximizes fresh hop flavors in your dry-hop.
2. Don't go over seven to ten days of hop contact time when dry-hopping. This will help avoid leaching excessively vegetal/stemmy hop character in your beer.
3. Use hop blends to add more complexity to your hop character.
4. Remove much (not necessarily all) of your yeast before doing any dry-hopping. Yeast cell walls tend to soak up hop resins.

Brock Wagner

14. Brock Wagner on Keeping Fermentations Cool and Controlled

Brock Wagner, of St. Arnold Brewing Co., develops the recipes for the Saint Arnold beers based on his own homebrewing experience in the hot, humid climates of Gulf Coast-area Texas.

Homebrewers, buy a fermentation refrigerator! For those of you who already have one, you are probably saying "Duh!" But living and learning to homebrew in Houston, I found that this is a necessity. Attempting to ferment in a closet or garage when it's 95 °F (35 °C) outside with 95% humidity and the A/C unit is straining to get the temp down to 76 °F (24 °C) inside, you'll be hard pressed to make a decent beer without a refrigerator in any warm climate. The primary flaws I taste most often in homebrews are fermentation issues, and typically these are the result of either underpitching yeast or lack of fermentation temperature control.

Most ale yeasts have a sweet spot of 68 to 70 °F (20 to 21 °C). Even if your room temperature is in this range, the beer temperature will actually be higher. This is because fermentation is exothermic, and at peak fermentation, the liquid in the carboy will be around 5 °F (3 °C) higher than the surrounding air temperature. This is also important to consider as you set the temperature controller for your fridge. If you want the wort to ferment at 70 °F (21 °C), you probably want to set the controller at 65 °F (18 °C). The caveat is that as the fermentation slows down, it is not nearly as exothermic and you may want to bump up the temp in your fridge a few degrees so the fermentation finishes quickly and cleanly.

The fridge also opens up the world of lagers, something impossible anywhere without a fridge. Also, you can cold condition the beer after fermentation, aiding in dropping the yeast and precipitating proteins for a cleaner beer. If you filter, chilling the beer is important, as your beer will be chill-haze protected at the temperature at which you did the filtering. I recommend doing this as cold as possible — we try to get our beer to 31 °F (-0.5 °C).

The setup is simple: get a used fridge (but not ancient — really old ones will suck ridiculous amounts of electricity) and a remote temperature controller. Most homebrew shops carry controllers. Typically these consist of a controller with a thermal probe. You run the thermal probe inside the refrigerator and plug the refrigerator into the controller.

Peter Zien

ALESMITH BREWING COMPANY

15. Peter Zien on Tasting and Evaluating

Peter Zien, Owner and Brewmaster of AleSmith Brewing Co. in San Diego, California. Peter is San Diego County's only BJCP (Beer Judge Certification Program) "Grand Master" Level One Beer Judge, one of their highest ratings.

A consistent method of evaluating every beer that you drink is the best way to experience the beer as the brewer intended. We know that not every beer drinker will like every beer style, and proper beer evaluation should be as objective as possible.

Proper beer evaluation is holding your perceptions up to the written description of the beer style and analyzing whether they match up. Try to develop a consistent method of evaluating every beer every time you taste, and remember to compare what you perceive to the written description of the beer style.

My evaluation method is as follows: 1.) perceive the aroma (sniff); 2.) evaluate the appearance (look); 3.) perceive the flavors (taste); 4.) re-smell and re-taste and 5.) evaluate the mouthfeel (body, carbonation-level). Approaching every beer with the same method of evaluation each time is the key to understanding the differences and similarities that make up the wonderful world of beer styles. Over time, you will train your palate and senses to incorporate the characteristics of a wide spectrum of beer styles. BYO

by MICHAEL TONSMEIRE

ADDING FRUIT TO SOUR BEERS

The experience of biting into a ripe piece of fruit is one of my favorite parts of summer. Natural bright acidic flavors and complex aromas allow us to experience the season in taste and smell.

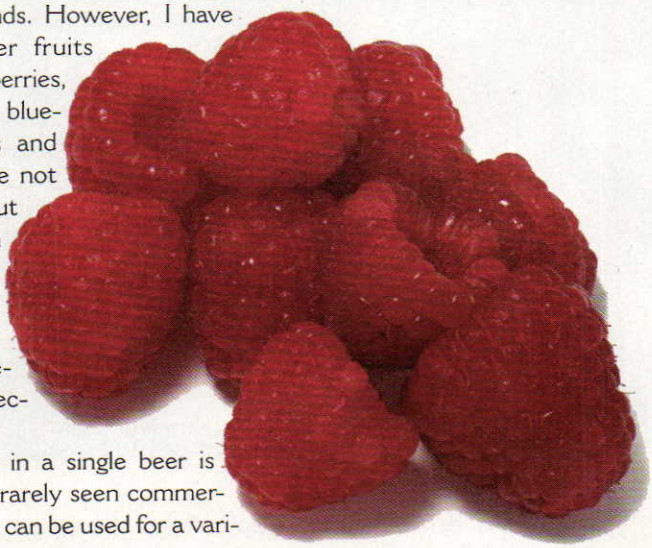
Using real fruit in beer offers a great depth of flavor as well as providing the color to allow us to "taste with our eyes." However, even real fruit won't provide enough acidity to counterbalance all of the malt that goes into brewing a "regular" (non-sour) beer. For this reason, sour beers — such as lambic, Flanders red, and Berliner weisse — are superior choices when brewing with fruit. There are a few commercially available brews that successfully bear this combination out, but the best examples retail for $15 or more for a 750 mL bottle; are hard to find; and generally are limited to a handful of commonly used fruits. The best solution to expanding your sour fruit beer options is to brew your own at home using traditional methods and high quality fruit.

What Variety of Fruit to Use

While framboise (raspberry) and kriek (cherry) lambics are the most common commercial examples of fruited sour beers, the best combinations I've brewed and tasted over the years include my Blackberry Flanders Red, Cabernet Sauvignon Lambic, Peach Honey Wheat Sour, and Funky Belgian Strong Dark with Sour Cherries. Don't

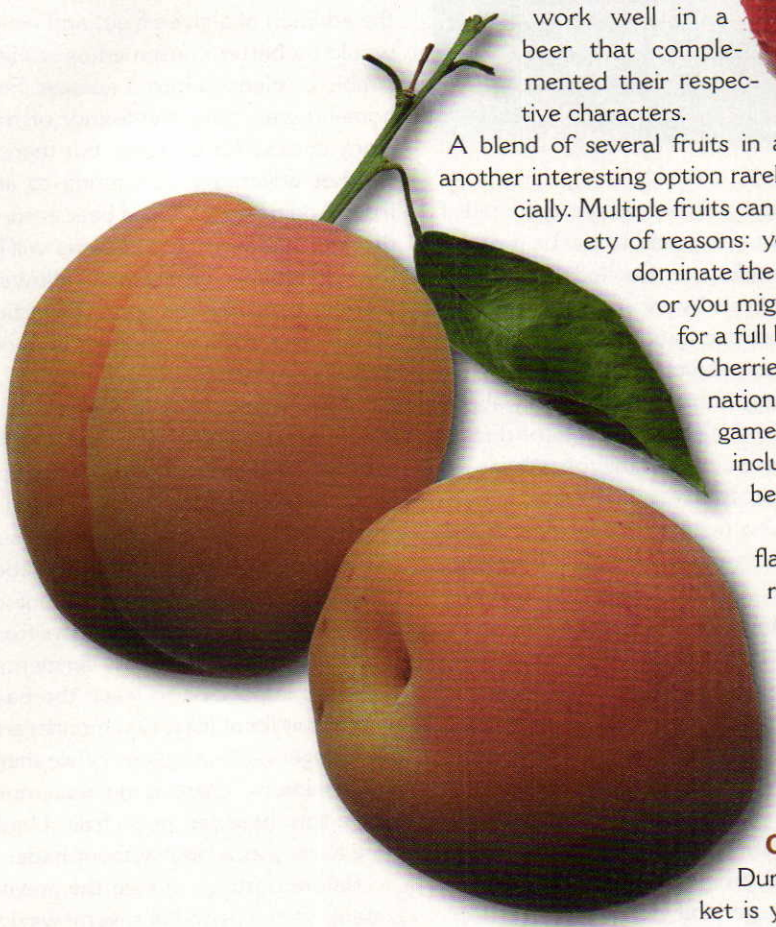
constrain yourself to either a "classic" style or the scattering of fruits that are commonly used in commercial fruit beers.

Most varieties of fruit work well when paired with the right sour beer, but berries (raspberry) and stone fruits (sour cherry, apricot and peach) are the easiest to work with. Each offers a good balance of acidity and sweetness, as well as a complement of distinct aromatic compounds. However, I have had good results with other fruits including wine grapes, blackberries, pluots (a plum-apricot hybrid), blueberries, dark cherries, dates and even butternut squash. I have not used any tropical fruits yet, but there is no reason that high quality kiwi, mango, guava, or papaya would not work well in a beer that complemented their respective characters.



A blend of several fruits in a single beer is another interesting option rarely seen commercially. Multiple fruits can be used for a variety of reasons: you may not want to dominate the flavor of a beer with a "loud" fruit like raspberries; or you might not have enough of a certain fruit as you need for a full batch, or you might want to add extra complexity. Cherries and raspberries are a classic duo, but any combination that works well in a pie or smoothie would be fair game. Some of the combinations I would like to try include peach-blueberry, honeydew-cantaloupe, cranberry-apple and guava-pineapple-orange.

Try to pick fruits with similar or complementary flavors to the beer you are brewing. For example, the rich flavors of an oud bruin pair well with "darker" fruits like figs, dates or raisins, while a bright Berliner weisse works best with delicate fruits like apricots, peaches or melons. The balsamic tones of Flanders reds match beautifully with sour cherries or blackberries. Let your palate guide you when coming up with your own combinations.



Getting the Fruit Into the Beer

During the summer, ripe fruit from a local farmers market is your best choice both for eating and for brewing. High quality ripe fruit offers the best flavor, especially when using subtle fruit like peaches. However, when fresh fruit isn't an option, good quality puree, juice, frozen and dried fruit can all make good additions to sour beers alone or in combination. These processed fruit forms work especially well in complex beers or where a restrained fruit flavor is the goal. I do not recommend using fruit extract. It is not worth compromising quality to save a couple of dollars or a bit of effort when you consider the amount of time that goes into making a sour beer.

When using berries, or other fruits small enough to fit down the neck of a carboy, I wash and vacuum-pack the fruit in plastic bags and freeze until the beer is ready. I

let the fruit defrost in the fermenter for a couple hours before racking the beer onto it to avoid cold shocking the yeast/bacteria. This process allows you to buy fruit in season when it is ripe and relatively inexpensive, even if you don't have a beer ready for it. Furthermore, the ice crystals formed during freezing rupture the cell walls of the fruit allowing the yeast and bacteria in the beer easy access to the sugars.

Larger fruits should be sliced up (removing any pit or core), then muddled with a spoon before transferring a beer onto them. Leave edible skin on as it provides additional flavor as well as tannins which add complexity to the mouthfeel. In addition, this approach saves the time and effort of skinning. If you leave the skin on, remember to thoroughly wash the fruit before adding it to the beer to remove all dirt, pesticides and wax. Using just the zest of citrus fruits can be an effective way to add an additional layer of complexity to other fruit based beers or a hint of fruitiness to a plain sour beer.

Fruit can be added at various points throughout brewing and fermentation, but, as a general rule, the later in the process you add fruit, the more of the fresh aromatics will carry through into the finished beer. Many of the esters will be lost or modified if your fruit is exposed to the heat of the boil (yielding a cooked flavor) or scrubbed out by escaping CO_2 during primary fermentation.

When making a non-soured fruit beer, many homebrewers worry about adding fresh fruit in secondary due to the presence of wild microbes living on fresh fruit. However, with a sour beer there is no need to worry due to the fact that various non-*Saccharomyces* microbes are already at work in the beer. If anything, the sugar loving yeast and bacteria present on the fruit skins will give your sour beer a subtle local character.

How Much Fruit to Use

The optimal amount of fruit depends on the variety, quality, freshness, base beer and amount of fruit flavor you want. In general, for whole fresh or frozen fruit, 0.5 lbs. per gallon (61 g/L) is the low end amount good for assertive fruits and pale or mild beers; 2.5 lbs/gallon (300 g/L) is the high end good for subtler fruits and bigger/darker base beers. Pound for pound, less puree is required because of the higher surface area while more juice is needed since the flavorful solids are removed.

If you are unsure how much fruit flavor you want in a batch, I suggest making a concentrated fruit beer using a high ratio of fruit to beer, but with only a portion of your base beer. Once you are ready to bottle make measured blends of the fruited beer and the base beer, pick your favorite ratio and scale up for the whole batch. Any leftover beer can be bottled as is, or saved for future blending sessions.

Timing the Fruit Addition

Most commercial lambic producers wait until their beer has already been fermenting for a year or longer before adding fruit. This allows the blender to pick which barrels would benefit from the addition of a given fruit, and which would be better consumed as straight lambic or blended into a gueuze. Few homebrewers have the luxury of that many choices for blending, but there is another advantage to waiting to add fruit. Adding fruit to aged beer ensures that the wild yeast and bacteria will be the dominant organisms, allowing them to consume the greatest portion of the fruit sugars, resulting in more sourness and ester production.

After a beer ages 6–12 months, it should taste mildly sour and at this point you will know that the lactic acid bacteria are hard at work. This is a great time to add fruit, but as a result of the low pH, the remaining microbes often take a considerable amount of time to consume all of the sugars from the fruit. Due to this slow fermentation, it is important to leave the beer on the fruit for at least two months and even longer is often better. While there is a minimum, there is no maximum time a sour beer can sit on fruit, I have gone as long as a year without issue.

Before bottling, ensure the gravity is stable over a period of several weeks. If you bottle too early, you risk overcarbonation. Even a few additional gravity points of fermentation can lead to an explosive level of carbonation. Be especially careful when you are using whole fruit, and even more so when that fruit has not been frozen. If the fruit disintegrates completely, you should rack the beer off the fruit and into another fermenter to reduce the amount of pulp that reaches your bot-

tles or keg.

One of my favorite fruit beer techniques is to split a batch, adding fruit to half and leaving the other half without. This practice yields two beers for the effort of one. You also have an opportunity for some interesting comparisons. Sometimes I prefer the fruited half, other times the plain half is better. I generally let the batch age a few months before I split it, but sometimes I'll wait even longer, until the beer is ready to bottle plain, then I can rack just the right amount onto fruit before bottling the remainder.

Final Thoughts

Adding fruit will not fix a sour beer that has off-flavors or too much sourness (as I found out from adding blueberries to my first batch of lambic), but it can help a beer that hasn't soured enough. The acids in the fruit will lower the pH while the simple sugars will feed the lactic acid bacteria causing them to produce more acid.

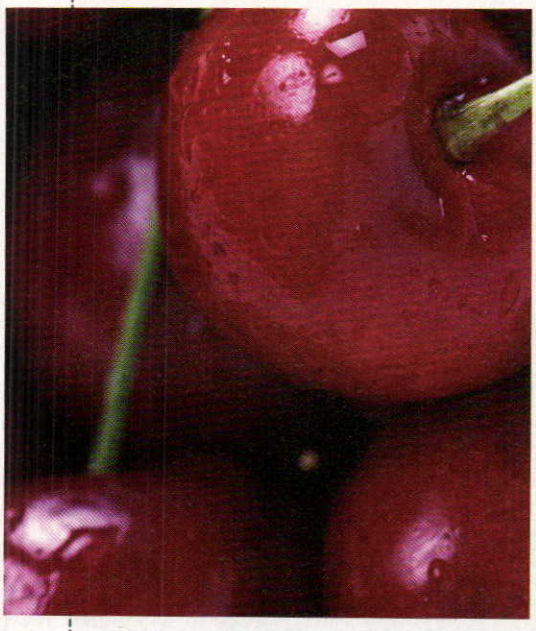
Adding fruit to a sour beer and letting it ferment completely, as I'm advocating, will not result in a tart-sweet beer like those from Lindemans, Liefmans or New Glarus. To get a beer like that you need to kill the yeast and bacteria present in the beer using heat or filtration before all of the fruit sugars are consumed. If this seems too difficult, you can simply add fruit juice to a plain sour beer in the serving glass.

Even if I haven't convinced you to brew a long-aged sour base beer, consider increasing the acidity to your fruit beers by using a sour mash, or adding food-grade lactic acid or winemaker's acid blend to taste at packaging.

Adding fruit to sour beers has produced some of my best batches of homebrew. Hopefully by following the advice and recipes on the next few pages you'll be able to quench your thirst on a warm summer day or store away a little piece of summer to brighten a cold winter night when you are sick of drinking imperial stouts and big, malty barleywines.

Michael Tonsmeire is the author of the Mad Fermentationist blog, found at www.themadfermentationist.com.

HOMEBREW SOUR FRUIT BEER RECIPES



Sour Cherry Flanders Red

(5 gallons/19 L, all-grain)

OG = 1.060 FG = 1.008
IBU = 15 SRM = 18 ABV = 6.8%

This beer was brewed as a group project. Seven homebrewers, including myself, contributed beer to be aged in a used red wine barrel from a local vineyard. After the combined beer soured in the barrel for a year, most of it was bottled straight in November 2009, but I racked half of my share onto sour cherries that had been vacuum-sealed and frozen five months earlier. The beer already had some cherry/plum character, so it didn't take many sour cherries to make that impression stronger.

Ingredients

3.5 lbs. (1.6 kg) German Pilsner malt
3.5 lbs. (1.6 kg) German Munich malt
3.5 lbs. (1.6 kg) German Vienna malt
1.0 lb. (0.45 kg) wheat malt
1.0 lb. (0.45 kg) CaraMunich® malt
0.5 lbs. (0.23 kg) Special B malt
4.2 AAU Crystal hops (75 min) (1.0 oz./28 g of 4.2% alpha acids)
Wyeast 3763 (Roeselare Blend) and the dregs from 2 unpasteurized sour beers (such as Lost Abbey Red Poppy and Jolly Pumpkin La Roja)

Step by Step

Use your usual technique to produce the wort, mashing at 157 °F (69 °C) for 60 minutes. Boil wort 90 minutes. Once the wort is chilled to below 70 °F (21 °C), pitch the Roeselare Blend and bottle dregs. Transfer the beer into a barrel after fermentation settles down, about 2 weeks. If you don't have the effort or space to deal with a 60-gallon (230-L) oak barrel, soak 1.0 oz. (28 g) of medium-toast French oak cubes in 4.0 oz. (120 mL) of the red wine of your choice while the beer is in primary. Add the oak along with the wine (or fresh wine if you want less oak character) to the beer when you rack to secondary in a carboy.

After 6–9 months in secondary, rack onto ½ lb. of sour cherries (stems removed) per gallon (60 g/L). If you can't get fresh sour cherries locally then consider using frozen fruit, puree or 100% sour cherry juice at a similar rate. Blackberries are another great choice for this beer if you want a subtler fruit character. Age on the fruit until the desired flavor and terminal gravity are reached, 3–4 months. Bottle condition with 1 oz. of table sugar per gallon (7.5 g/L) for moderate carbonation.

Honey Peach Wheat Sour

(5 gallons/19 L, all-grain)

OG = 1.056 FG = 1.005
IBU = 16 SRM = 5 ABV = 6.7%

The subtle aroma of orange blossom honey melds with fragrant white peaches backed up by enough lactic sourness to strike a beautiful refreshing balance. Make sure to avoid buying cling-stone peach varieties which have pits that are a chore to remove.

Ingredients

5.5 lbs. (2.5 kg) German Pilsner malt
3.0 lbs. (1.4 kg) wheat malt
0.50 lbs. (0.23 kg) crystal malt (10 °L)
0.25 lbs. (0.11 kg) CaraPils® malt
0.25 lbs. (0.11 kg) honey malt
1.5 lbs. (0.68 kg) orange blossom honey
5 AAU Amarillo hops (50 mins) (0.5 oz./14 g of 10% alpha acids)
0.21 oz. (6.0 g) Chamomile (0 mins) (optional)
Wyeast 1056 (American Ale) yeast, plus the dregs from 2–3 unpasteurized sour beers (such as New Belgium La Folie and Russian River Temptation)

Step by Step

Use your usual technique to produce the wort, mashing at 156 °F (69 °C) for 60 minutes. Boil wort 80 minutes. Chill to below 70 °F (21 °C), pitch the yeast and bottle dregs, or a commercial sour blend. While some people advocate doing a primary fermentation with just Saccharomyces, I have never been able to get enough acidity for my tastes using this method.

Stir the honey into the primary fermenter after fermentation appears complete, about 10–14 days. Transfer the beer to secondary after the honey is fermented and most of the yeast has settled out, 1–2 weeks more. After 6–9 months in secondary rack onto 2.0 lbs. of ripe white peaches (sliced, skin on, pits removed) per gallon (240 g/L) for a strong peach flavor, or 1 lb. per gallon (120 g/L) for a milder fruit flavor. Age on the fruit until the desired flavor and terminal gravity are reached, 3–4 months. Bottle condition with 1.25 oz of sugar per gallon (9.4 g/L) of finished beer for spritzy carbonation.

Honey Peach Wheat Sour

(5 gallons/19 L, extract with grains)

OG = 1.056 FG = 1.005
IBU = 16 SRM = 5 ABV = 6.7%

Ingredients

4 lb. 10 oz. (2.1 kg) wheat dried malt extract
0.50 lbs. (0.23 kg) crystal malt

(10 °L)
0.25 lbs. (0.11 kg) CaraPils® malt
0.25 lbs. (0.11 kg) honey malt
1.5 lbs. (0.68 kg) orange blossom honey
5 AAU Amarillo hops (50 mins) (0.5 oz./14 g of 10% alpha acids)
0.21 oz. (6.0 g) Chamomile (0 mins) (optional)
Wyeast 1056 (American Ale) yeast, plus the dregs from 2–3 unpasteurized sour beers (such as New Belgium La Folie and Russian River Temptation)

Step by Step

Steep crushed grains at 156 °F (69 °C) for 45 minutes. Boil at least 2.5 gallons (9.5 L) of wort for 80 minutes, adding roughly half of the dried wheat malt extract at the beginning of the boil. Add remaining malt extract during final 15 minutes of the boil. Chill to below 70 °F (21 °C), pitch the yeast and bottle dregs, or a commercial sour blend. Stir the honey into the primary fermenter after fermentation appears complete. Transfer the beer to secondary after the honey is fermented and most of the yeast has settled out. After 6–9 months in secondary, rack onto 10 lbs. (4.5 kg) of ripe white peaches (sliced, skin on, pits removed) for a strong peach flavor, or 5.0 lbs. (2.3 kg) for a milder fruit flavor. Age on the fruit until the desired flavor and terminal gravity are reached, 3–4 months. Bottle condition with 6.25 oz. (170 g) of sugar.

Cabernet Berliner Weisse

(5 gallon/19 L, all-grain)

OG = 1.033 FG = 1.002
IBU = Insignificant
SRM = 3 ABV = 4.0%

This is a variant of my award winning "no-boil" Berliner weisse infused with some cheap Cabernet juice I picked up at a local supermarket.

Ingredients

4.0 lbs. (1.8 kg) German Pilsner malt
2.75 lbs. (1.2 kg) wheat malt
1.0 oz. (28 g) Hallertau Hersbrucker hops (mash hop)
Safale US-05 yeast and Wyeast 5335 *(Lactobacillus)* bacterial slurry *(in primary)*
Optional: Additional bottle dregs from unpasteurized sour beers in secondary (such as Cantillon Vigneronne)

Step by Step

Infuse all of the malt with enough hot water to bring the mash up to 125 °F (52 °C). Pull about ⅓ of the grain into a separate pot after 5 minutes. Add the hops to the decoction.

Heat the decoction to 155 °F (68 °C), stirring constantly. Rest at that temperature for 15 minutes. Heat to a boil and hold there for 10 minutes. Add the decoction back to the mash to raise it to 145 °F (63 °C), rest for 60 minutes.

Sparge, collecting just slightly more than 5.0 gallons (19 L) of wort. Heat the wort until the first few bubbles of the boil break the surface. Turn off the heat, chill the wort to 70 °F (21 °C), and pitch the yeast and *Lactobacillus*. Using this method you will end up with around 10% lower brewhouse efficiency than usual because of the lower volume of wort collected. Not only does this technique make for a short brew day but also a beer that retains a fresh grainy aroma. Skipping the boil also avoids the risk of having an IBU level above the tolerance of *Lactobacillus*.

Having a healthy culture of *Lactobacillus* is very important to get a tart Berliner weisse. I used a slurry from a friend's batch, but if you are unsure of the freshness of yours. Make a starter with a cup of apple juice a few days before brewing. Unlike yeast, *Lactobacillus* does not need oxygen to reproduce. You can pitch additional microbes in secondary for more sourness and complexity if desired.

After two weeks, I racked to secondary adding 14 fl. oz. of Cabernet grape juice per gallon (110 mL/L) of beer. That level worked well giving a background grape character. If you want a grape forward beer, you could increase the amount of juice, but I would highly recommend going with crushed wine grapes (if you can get them) or a bottle of good quality red wine. Bottle condition with 1.375 oz of table sugar per gallon (10 g/L) of finished beer for a high carbonation.

Extract option:

Replace both malts in all-grain recipe with 2.75 lbs. (1.25 kg) dried wheat malt extract, 1.0 lb. (0.45 kg) German Pilsner malt and 11 oz. wheat malt. Steep crushed grains and mash hops in 2.3 qts. (2.2 L) of water at 150 °F (66 °C). Stir in malt extract, add water to make 3.0 gallons (11 L) and heat wort until boil just starts. Cool wort and top up to 5.0 gallons (19 L). Pitch yeast and bacteria. Follow remaining all-grain instructions for details on fermenting, adding grape juice and bottle conditioning. BYO

Fun With Numbers

Calculating gravity, yield and alcohol content

by Terry Foster

Perhaps the two most useful brewing instruments are the thermometer and the hydrometer. We have a tendency to think of these as simple pieces of equipment, but their introduction into the brewery was a big step in the development of brewing science. Without them it was impossible to brew beer of consistent quality, as the brewer had no control over mashing and no idea as to what was the strength of his beer. In particular the introduction of the hydrometer enabled the brewer not only to get a handle on wort "strength," but also to determine extract yield, the potential of various types of malt, and their true cost. Let's take advantage of this legacy from the 18th century, and use hydrometer results to enable us to consistently brew good beer.

Gravity points

The first step, which is often overlooked, is to measure the specific gravity of your wort and its volume before boiling. Cool the wort sample to the appropriate temperature for the hydrometer you use, which is normally 60 °F (15.6 °C). Then take the significant figures after the decimal point in your reading. That is, SG 1.048 is taken as 48; SG 1.105 is taken as 105. Call this "gravity points (GP)" then multiply by the volume of wort (in US gallons):

Total GP = GP x volume

For reasons of space I shall work only in specific gravity terms.

So what is Total GP and how can we use it? Quite simply it represents your yield of fermentables in the wort. It allows you to adjust wort volume to achieve target gravity; it can be used to formulate a recipe, to calculate yields from base malts, and to determine brewhouse efficiency. It can even tell you whether your sample of grain or malt extract is of the quality you expected, and if it is not, what adjustments you need to make to hop rates, final wort volumes and so on.

The next step is to take your Total GP and divide by your target finishing volume (V) to give the gravity at that volume (actual original gravity, OGA):

Total GP÷V = OGA

Now, is OGA significantly different from your expected OG according to the recipe? If so, you have decisions to make. If OGA is higher than OG, then you can increase the finishing volume (either by dilution or by cutting back on the boil to reduce evaporation) so that OGA = OG. That may not be possible if your equipment is of limited capacity so you just have to stay with the original target volume and accept that the beer will be of a higher gravity than you intended. In either case, your hopping rate will need to be adjusted.

Let's take an example. Your collected wort before boiling consists of 6.5 gallons at 1.054, so you have:

Total GP = 6x 54 = 351

Your target was 5 gallons so:

OGA = 351÷5 = 70

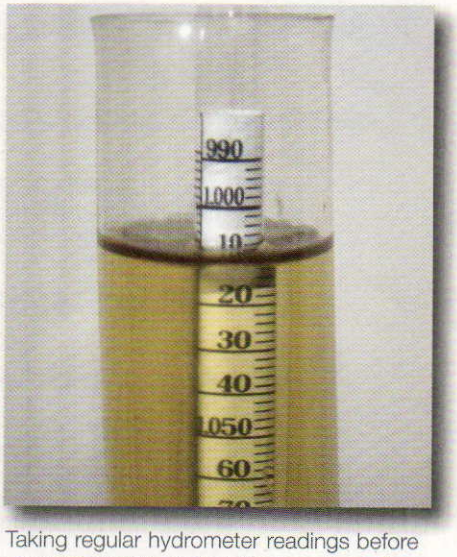
So you have 5 gallons (19 L) at 1.070, but your original target was 5 gallons at 1.060. What to do? If you want to stay with 1.070 you need to adjust for hop bitterness. To a first approximation multiply the weight of hops in the recipe by 70÷60 = 1.2. You may want to increase this factor to 1.3 (that is by about 10%), since you now have a bigger beer and may need a little more bitterness than you planned on, although that would depend on what style of beer you are brewing.

Alternatively, you decide you absolutely want the beer to be at the target gravity of 1.060, so what must your final volume be if this is the case? Quite simply:

Final volume = Total GP ÷ target OG = 351 ÷60 = 5.9 gallons

Now, to adjust back to your target bittering levels simply multiply the weight of hops given in the recipe by 5.9 ÷ 5 = 1.2. This is, not surprisingly, the same factor calculated above, but

> "Let's take advantage of this legacy from the 18th century, and use hydrometer results to enable us to consistently brew good beer."



Taking regular hydrometer readings before you pitch yeast, and all the way through bottling, will enable you to consistently make good beer in every batch.

in this case it works without further adjustment.

Of course, the above applies mainly to all-grain brewing. This should not be necessary if you are using malt extract, but do still check your wort gravity before boiling, and calculate your total gravity points. This figure should be close to that indicated from the *BYO* recipe standardization panel on page 2 of every issue. That would be as follows:

Total GP = lb. extract x extract factor

Where extract factor is 33 - 37 for LME, and 45 for DME (using the points concept of 1.033 being taken as 33 points, and so on).

Now, if the measured Total GP value is markedly different from the value indicated by *BYO* numbers on page 2, then there is something wrong with your sample of extract, or more likely with the recipe. If the latter you can calculate how much more extract you need to add, in the same way as outlined above.

Recipe formulation

This is quite straightforward if you use the *BYO* standardization numbers found on page 2. Assume we're going to make 5 gallons of a beer at an OG 1.050, using 2-row pale malt and a medium crystal malt (say about 50 °L) to make up 10% of the total extract. Then:

Total GP required = 50 x 5 = 250

Now the *BYO* figures for potential extract are 1.038 per pound per gallon for the pale malt, and 1.034 per pound per gallon for the crystal (taking the middle of the recommended range). But in practice this number will be lower - *BYO* estimates extract efficiency at 65% of the potential. So taking the points values for pale and crystal at 38 and 34 respectively we get:

Pale yield = 38 x 0.65 = 25 or 1.025 per lb. per gallon
Crystal yield = 34 x 0.65 = 22 or 1.022 per lb. per gallon

So we can calculate the recipe details as follows:

Points required from pale = 250 x 0.9 = 225

Then:

Weight of pale = 225 ÷ 25 = 9.0 lb.

And:

Points required from crystal = 250 x 0.1 = 25
Weight of crystal = 25 ÷ 22 = 1.1 lb. = 18 oz.

You can do a similar thing with malt extract; suppose we want to make a beer at OG 1.050, using amber liquid malt extract (LME). *BYO* tells us that this syrup will give us 1.035 per pound per gallon, and from the above we need a total of 250 GP. So:

Total syrup required = 250 ÷ 35 = 7.1 lb.

But suppose you only have 6 lb. of this syrup, and you want to make up the rest using dried malt extract (DME) (potential extract 1.045 per pound per gallon). Then:

Total GP from syrup = 6 x 35 = 210

GP required from DME = 250 - 210 = 40
Weight of DME = 40 ÷ 45 = 0.89 lb = 14 oz.

Extract efficiency (E)

This is defined as the percentage of potential extract actually obtained, or:

E% = (Total GP ÷ Total potential GP) x 100

Where Total Potential GP is defined as the total of the weight of each malt times its potential extract (as given by the *BYO* figures).

Instead of giving you this as a formula, let's look at an example. Say we want to brew 5 gallons of brown porter using the following:

7 lb. 2-row pale malt (potential 1.038)
1 lb. Munich malt (potential 1.035)
1 lb. dark crystal malt (potential 1.033)
0.5 lb. chocolate malt (potential 1.034)
0.25 lb. black malt (potential 1.025)

Then:

Total potential GP = (7 x 38) + (1 x 35) + (1 x 33) + (0.5 x 34) + (0.25 x 25) = 357

OG = 357 ÷ 5 = 71 or 1.071

Let's say we actually measured our beer at OG 1.047:

Total GP = 47 x 5 = 235

Then:

Extraction efficiency = (235 ÷ 357) x 100 = 65.8%

This is pretty close to the 65% used in *BYO* recipes, and suggests an acceptable extraction rate. You will not get up to 100% because this represents the result of a fairly extreme test done under conditions which do not match those in a practicing brewery. Of course, 65% is a nominal value, and extraction efficiency can range anywhere from perhaps as low as 45% to as high as 80%. If you are around the bottom of this range, you might want to thoroughly review your procedures. Note that poor grinding of the malt is often the cause of such a problem.

You should know the number for your own set up if you want to reproduce recipes closely, or if you are formulating your own recipes. You can obviously do this by the method described above, although a better approach would be to determine it for a beer brewed from only pale malt, and to apply that efficiency in formulating recipes for beers brewed with a variety of malts. The simplest approach would be to follow a standardized recipe from these pages and to check your OG against the published value. Then the ratio of the gravities (expressed as points) multiplied by 65% gives you a reasonable approximation of your extraction efficiency:

Extraction efficiency % = (measured GP ÷ predicted GP) x 65

Alcohol content

There is a fairly simple way to determine this, without going through the more accurate, but more complicated procedures prescribed by the American Society of Brewing Chemists (ASBC). You should be measuring your finishing gravity (FG), both as a means of monitoring yeast performance, and as a safety procedure, especially if you plan on bottling the beer. Then take the difference between the two (ΔSG) and:

Alcohol by volume (abv) = ΔSG x 0.129

This is an approximation but it works well enough, except at very high alcohol levels. Note that the potential alcohol scales given on hydrometers are generally designed for wines, and do not allow for the fact that beers do not ferment out completely.

If you require a more accurate result, this can still be done simply. British brewers pay duty based on alcohol content, and H.M. Customs and Excise have made matters easy for them by providing a table relating ΔSG to abv. Its accuracy comes from the fact that the values cited have been determined by precise complex procedures similar to those recommended by the ASBC. They can be represented by the following equation:

$$ABV = 0.001(\Delta SG)2 + 0.1247(\Delta SG) - 0.0374$$

I'm sorry I had to throw that in just to make sure you're paying attention! I meant this article to put the emphasis on the simple approach, so here is an abbreviated table of the results given by that equation:

% Alcohol by Volume from OG-FG

ΔSG	ABV
30	3.87
35	4.52
40	5.20
45	5.85
50	6.55
55	7.21
60	7.92
65	8.58
70	9.31
75	9.98

Well, I set out to show you how a few straightforward measurements and calculations could tell you a lot about your beer, and about your brewing procedures. I also wanted to prove that the adoption of the hydrometer and the thermometer represented a leap forward in the development of brewing science. I hope I have done both well enough that you will use them to brew yet better beer! BYO

Terry Foster writes "Techniques" for every issue of BYO.

How a pH Meter Works

The inner workings of a useful brewing tool

by Chris Bible

pH is most commonly measured by one of three methods: litmus paper, precision test strips or a pH meter.

Litmus paper

Litmus paper contains a mixture of dyes that change color when exposed to an acid or base. At a pH of 7, the strip is purple colored. In acidic solutions (pH < 7), the paper turns red. In basic solutions, (pH >7), it turns blue. Although inexpensive and very useful for many types of chemistry (where a pH of 7 is often an endpoint in titrations), litmus paper is of little value to homebrewers, who are primarily interested in the pH of beer or wort, which (combined) is generally in the pH 4–6 range.

Precision test strips

Precision pH test strips also use pH sensitive dyes. Precision pH paper turns different colors at different pH values, and there are test strips covering nearly the whole range of pH (0–14) and those that cover a narrower range (including strips that cover the relevant brewing range). Precision test strips need to be observed in natural or tungsten ("regular light bulb") light, as fluorescent light will alter the color perception of the strip. This can be a problem if you brew late at night and have energy saving light bulbs.

pH meter

A pH meter converts the pH difference between the sample liquid and a reference liquid, which is inside a bulb at the tip of its probe, into a voltage difference that can be measured and converted into a pH reading. These instruments are able to measure pH very precisely, but this precision comes at a price. Not only are pH meters relatively expensive, their electrodes have only a limited lifetime, even when cared for well. They also require calibration and the tip of the electrode needs to be stored wet. Depending upon your intended use of pH measurement in your home brewery, the best way to measure pH in a homebrewery is likely to be with an inexpensive pH meter.

You do not need to know the details of how a pH meter works to use one in your homebrewery, but the details are likely of interest to homebrewers with some knowledge of chemistry.

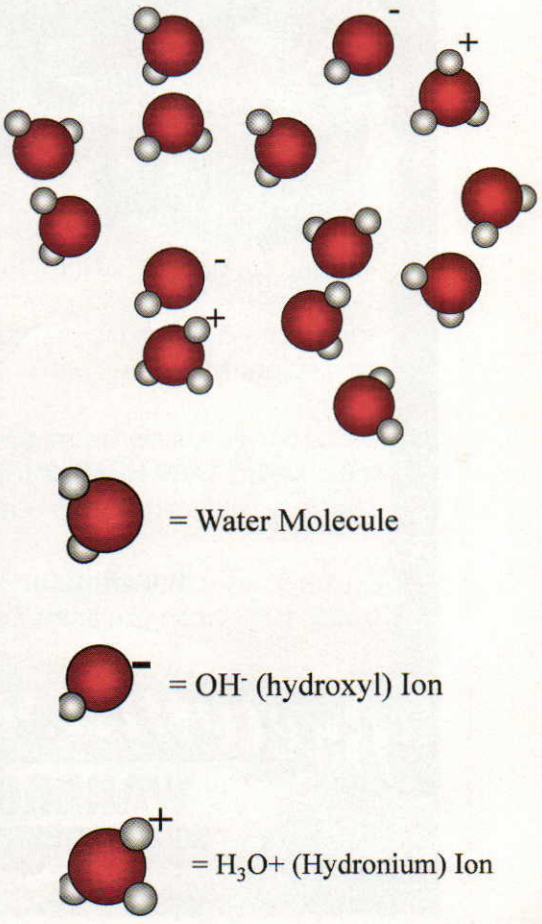
How pH meters work

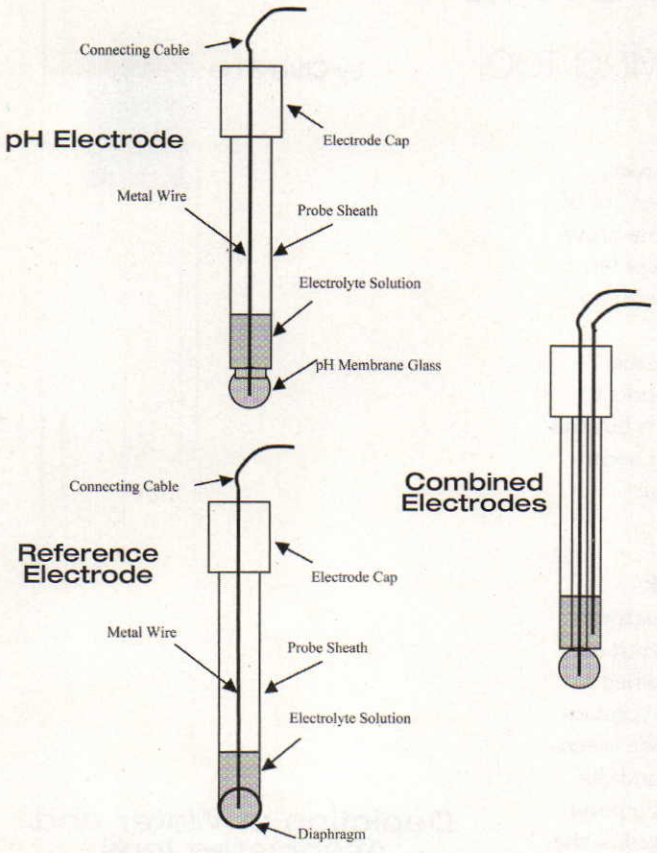
A pH meter measures the electrical potential between the pH electrode and the reference electrode when immersed into an electrically conductive solution. The pH electrode is sensitive to the hydronium ions and the reference electrode is not. The potential change is directly correlated to the concentration of hydronium ions present in the solution. The pH meter does this using two glass electrodes. One electrode is called the pH electrode, and the other electrode is called the reference electrode.

pH and reference electrode surface chemistry

The glass electrodes are primarily composed of alkali silicates which are comprised of sodium, potassium, lithium, silica, oxygen and hydrogen. All of these components are combined to form a hydrogen ion specific sensing glass. The amount of each constituent in the glass determining its pH sensing properties. When the glass is put into solution, it undergoes a chemical reaction which forms a leached layer. The leached layer is the area at the surface of the glass where an ion exchange reaction takes place. In this surface layer, hydrogen ions migrate in and replace other positively charged ions such as sodium or potassium. This causes a silica-oxygen-hydrogen bond to be set up, which is essential for sensing hydrogen ions in solution.

Depiction of Water and Associated Ions





The basic premise behind glass pH electrodes is to have the reference and the hydrogen ions sensitive glass membrane in contact with the solution being monitored.

pH, reference and combined electrodes

The electrical potential of the pH electrode changes with the $[H_3O^+]$ ion concentration in the solution. The pH electrode only senses the hydronium ions. This means that any voltage produced is the result of the presence of hydronium ions only.

The reference electrode provides a constant potential value against which the potential of the pH electrode is measured.

Although you can easily measure pH using this two-separate-electrode set-up, modern pH probes combine the electrodes into a single probe.

Since the measurement of pH using probes relies on measurement of electrical potential differences, the concentration of the hydronium ions must be interpreted using the Nernst equation:

$$U = U_0 + \frac{2.303RT}{Z_i F} \log[H_3O^+]$$

Where:
U = Potential measured between indicator and referenc electrode
U_0 = Standard potential of the electrode assembly. This depends on its construction. (Well-made electrodes give 0 mV with a pH 7 solution)
R = Universal gas constant (8.31441 J /(K · mol))
T = Absolute temperature (K)
Z_i = Charge on the hydronium ion (+1)
F = Faraday constant (96,485 coulombs/mol)

The pH meter determines the potential differences and uses the Nernst equation to determine pH.

Temperature and pH measurement

It is immediately obvious from the Nernst equation that the measured pH of a solution will depend on the temperature of the solution. To properly determine solution pH, the pH meter must know the temperature of the solution because the pH of a solution changes with its temperature. This needs to be taken into account when measuring the pH and determining pH targets (e.g. in the mash). There is a difference of 0.35 in pH between a mash pH measured at mash temperatures and the same liquid measured at room temperature. The pH measured at mash temperature is lower than the pH measured at room temperature.

Pros and Cons of pH Measurement Methods

Measurement Method	Positive	Negative
Litmus Paper	1. Least expensive method (~$4 for 100 strips) 2. No maintenance	1. Difficult to read (+/0.5 pH) 2. Dye can run
Precision Test Strips	1. Easy to read with a reasonable accuracy of +/-0.3 pH 2. No maintenance	1. More expensive than litmus paper (~$30 for 100 strips), but they can be cut in smaller strips to make the package last longer 2. May have a systematic error which leads to inaccurate pH reading
pH Meter	1. Very accurate (+/- 0.01 pH for some models) 2. Easy to read	1. Most expensive option. (about $80-$130 for a meter) 2. Replacement electrode costs about $50-$60 and may need to be replaced every 1-2 years. 3. Calibration necessary 4. Must store electrode(s) in wet storage solution

Practical tips for using a pH meter

1. When you first get your pH meter, begin by soaking the electrode in electrode storage solution. Whenever the meter is not in use, it will need to be stored in this solution. Ideally, the electrode should never be allowed to dry out.

2. When testing wort or beer, calibrate the meter according to the meter's instructions, using a pH 7.01 buffer and a pH 4.01 buffer.

3. Take your wort sample in a clean glass. If the sample is from the mash, cool it down to room temperature, even if your pH meter has automatic temperature control. Taking readings of hot samples will decrease the life of the electrode.

4. Rinse the electrode with distilled water then dry the electrode with a tissue. Don't actually touch the electrode with the tissue, but let the tissue just touch the droplets of water and wick them away.

5. Place the electrode in the sample and give the sample a good swirl. Ensure there are no bubbles clinging to the electrode.

6. Turn on the power to the electrode. The power to the electrode should never be on unless the electrode is submerged. Applying power to an electrode when it is not submerged will decrease electrode life.

7. With the power turned on, the meter will take the reading. Note the pH reading, then turn the power to the electrode off before removing the electrode from the solution.

8. Rinse the electrode with distilled water again, dry as before, and return the electrode to the storage solution.

9. If it takes awhile for the meter to settle on a reading, or the reading jumps around even after the electrode has been in contact with the solution for more than a minute, the electrode may be old and needing replacement.

Remember that since pH changes with temperature, you will need to compensate for this change. The pH of a cooled sample at room temperature will be about 0.35 units higher than the pH at mash temperature. Thus if you get a reading of pH 5.60 for your cooled sample, the corrected reading is 5.25. BYO

Chris Bible writes the "Advanced Brewing" column in every issue of Brew Your Own.

Portable Power

How to build an electric heat stick

by Tom Bardenwerper

I've been an apartment brewer since 1987, so space has always been a problem. Then, in 2005, I purchased a 15-gallon (57-L) stainless steel conical fermenter and a 60-qt. (57-L) stainless steel brew kettle. With these two major upgrades came the inevitable step-up to brewing 10-gallon (38-L) batches. This increase created a number of problems, the first of which was heat: How was I going to boil 10 gallons (38 L) of wort in my small condo?

After surfing the Net for countless hours I came upon the solution: I saw an old "Bruheat" electric boiler on an English homebrewer's website and thought, "that's perfect, I could use an electric hot water heating element!" I did not want to permanently install a heating element into my kettle, however. Ideally, I wanted the heater to be portable, so I could apply heat where and when I needed it. The trick would be making something as safe as possible — electricity and water is a VERY DANGEROUS combination!

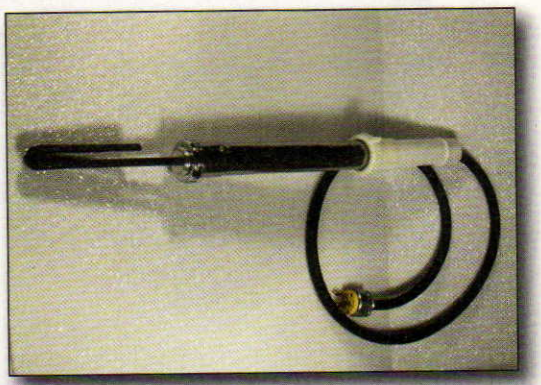
I decided to make it similar to a power tool; one with a straight handle, a short power cord, and a heating element on the other end — a "heatstick!" After seeing all my parts options, I settled on the configuration I am still using today: a hot water tank heating element attached to a kitchen sink drain pipe that's attached to a plastic handle, with a power cord running through the middle. The hot water heating element electrical contacts are sealed water-tight from the inside with epoxy. Finally, by using a GFCI (Ground Fault Circuit Interrupter) protected wall outlet and a solid ground connection, I would have two layers of protection and be as safe from electrocution as possible if the heatstick were to develop a leak.

The primary thing I've learned from building this project is that the key is a good seal around the electrical contacts of the heating element. To do that, I encapsulate or "pot" the electrical contacts in epoxy from inside the drain pipe. The sticks I have now are sealed with JB Weld epoxy, which has worked the best out of all the sealants I've tried, including: aquarium silicone, Alumalite casting resin, and high-temp automotive RTV silicone gasket maker. JB Weld can withstand temperatures up to 450 °F (232 °C) and the epoxy never comes in contact with liquid so the stick is as food-safe as we can make it.

"I've been an apartment brewer since 1987, so space has always been a problem."

parts and equipment list

- GFCI (Ground Fault Circuit Interrupter) adapter or GFCI protected wall outlet
- Screw-in hot water heating element. Choose based upon your home's electrical system and how much liquid you intend to heat. For this stick, I bought a 1500 watt, 120 volt, ultra-low-density element made by Camco. Part number 02853.
- 12-gauge, 3-wire, rubber electrical cord
- Heavy-duty, armored, 20-amp, three-prong plug
- 12" x 1-½" I. D. chrome plated, brass drain pipe
- 1-½" x 1-¼" slip joint nut
- 6" x 1-½" I. D. plastic drain pipe extension tube with compression fitting nut and gasket
- ¾" PVC coupler
- 1" PVC end cap
- Small brass bolt, nut and washer for ground connection
- J-B Weld epoxy (not the fast curing type)



By using two of these heatsticks, 6.5 gallons (25 L) of cold water can reach a hard boil in about 45 minutes.

1. HEAT STICK SAFETY

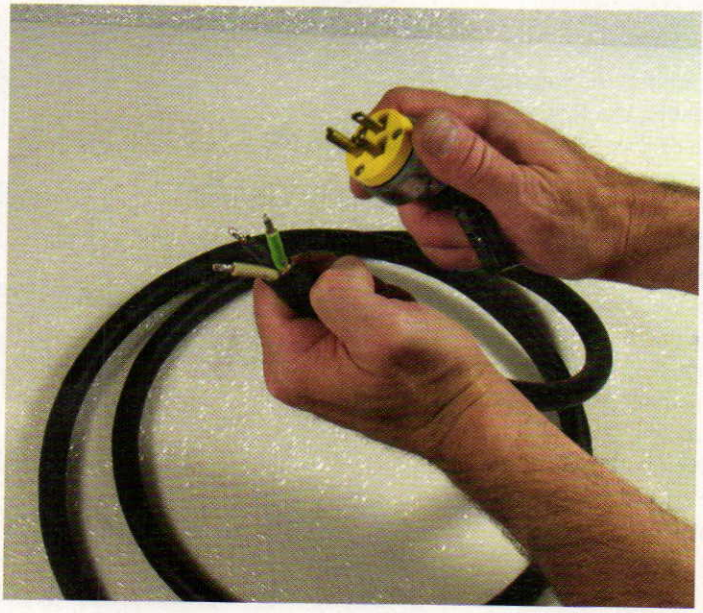
• NEVER run a heatstick dry. The element MUST be fully submerged at all times or it will overheat and burnout very quickly, possibly causing personal injury, a fire, or worse!

• ALWAYS plug your heatstick into a functioning GFCI (Ground Fault Circuit Interrupt) protected outlet. If the heatstick ever leaks, the GFCI will instantly trip, shutting off power to the outlet.

• A heatstick draws a lot of power. Each stick must be on its own circuit or you'll likely blow a circuit breaker/fuse. Do not exceed 80% of your circuit's load capacity.

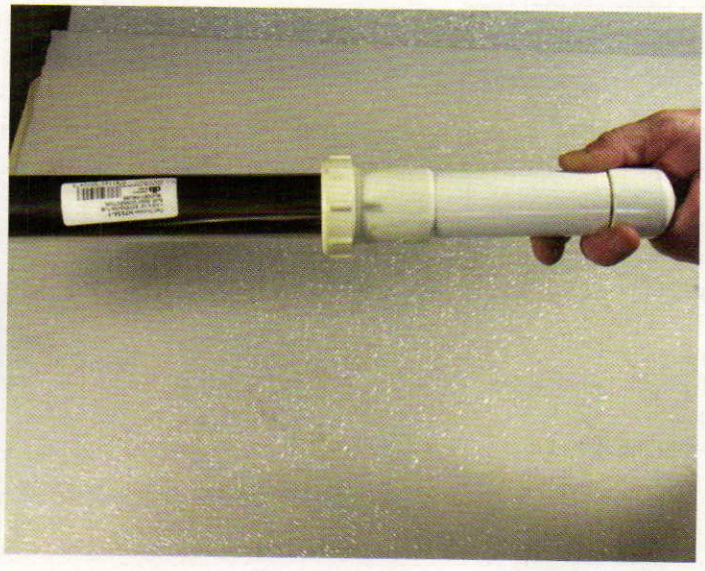
• A heatstick is a potentially VERY DANGEROUS tool! However, if built and used correctly, and you respect it as the potentially dangerous tool it is, you'll have years of safe, trouble-free brewing with it.

• Failure to follow these precautions could result in serious injury, fire or death! If in doubt about anything, stop and call a qualified electrician for assistance.



2. PLUG ASSEMBLY

Strip 1-½" of the outer wiring insulation from the cord to expose the three wires and then strip about ½" of insulation from each wire. Solder the wire tips. Next, connect the wires to the plug, making absolutely sure the GREEN wire is attached to the GROUND plug. It does not matter which plug the black and white wires are attached to. Assemble the plug housing as necessary.

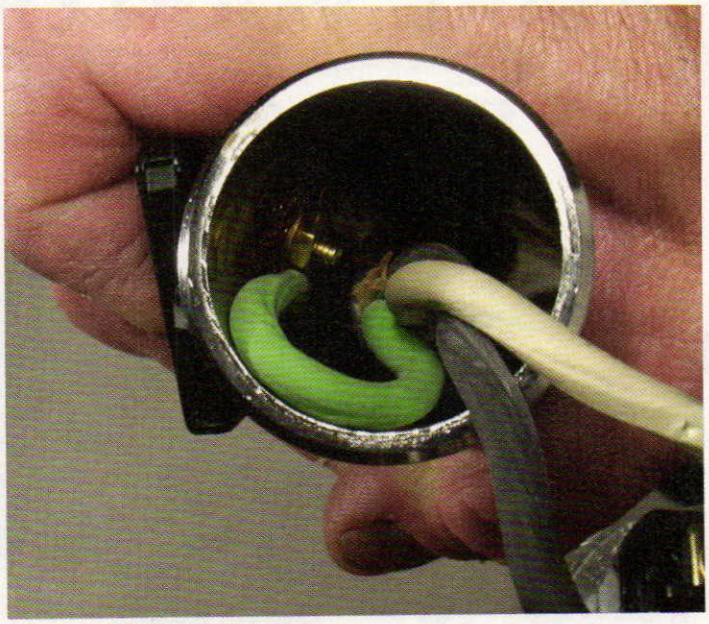


3. HANDLE ASSEMBLY

The plastic parts form the handle. Take the PVC end cap and, using a marker, mark the top-center with a dot. Using an appropriately sized drill bit for the diameter of the cord, drill a hole through the top of the PVC end cap and file the edges smooth. Attach the PVC coupler to the end cap and thread them onto the cord. Next, thread the cord through the center of the plastic drain pipe extension and slip the coupler on to the end of the pipe. Be sure the compression fitting nut and plastic gasket are screwed on to the plastic drain pipe and then run the cord through the metal drain pipe, but don't connect the pipes together yet; in the final step we need to pour epoxy inside.

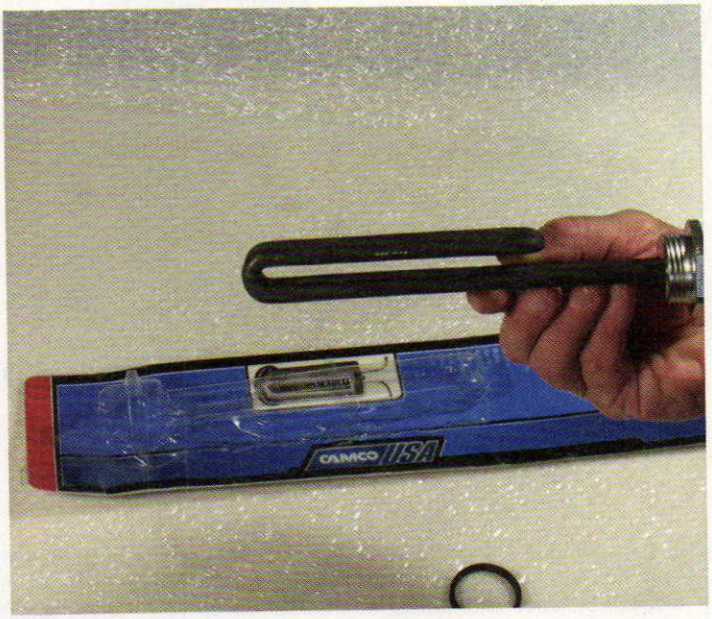
4. GROUND NUT ASSEMBLY

Next, we need to mount the green ground wire to the metal drain pipe. If your GFCI should malfunction, the ground wire will blow the circuit breaker/fuse, giving you a second layer of protection from electrocution. Strip 4 in. (10 cm) of the outer wiring insulation from the other end of the cord to expose the three wires and then strip about 1 in. (2.5 cm) of insulation from each wire. Use a marker and place a dot about 2 in. (5 cm) up from the threaded end of the metal drain pipe. Make an indentation on your mark so the drill bit will not slide around. Next, use an appropriate sized drill bit for your ground nut and drill a hole at the mark you made, file the hole smooth and thread your ground nut through. From inside the pipe, put the washer on and screw the nut on loosely. Thread the stripped cord through the metal drain pipe and carefully attach the green ground wire to the ground nut on the inside — it's a bit tricky — a pointy needle-nose pliers helps. Screw the wire down tightly.



5. ELEMENT ASSEMBLY AND SEALING

Attach the two remaining black and white wires to the end of the heating element. Screw the wires down tightly. Put the rubber gasket that came with the heating element over the base threads of the element. Take the slip joint nut (but not the gasket) and slide it over the element. The slip joint nut will slide past the element threads and screw on to the metal drain pipe end, forming a perfect fit with the heating element. While holding the element firmly so the wires inside don't twist, screw the slip joint nut down tight. Squeeze both full tubes of JB Weld into a disposable cup. Thin the epoxy with lacquer thinner or acetone to a consistency of house paint so you can pour it. With the stick standing element-end-down, pour the epoxy into the metal drain pipe so it completely covers and encapsulates the element and ground nut electrical contacts. Let the heatstick stand upright for 72 hours. When the epoxy has completely cured, couple the handle to the pipe.



6. WATER TESTING

Before brewing with your new heatstick, water test it. Fill your boil kettle to full depth and with the end cap uncoupled from the handle, immerse the stick — unplugged — into the water. Keep it submerged for at least 30 minutes. Take it out, dry off the outside and tap the stick upside down to see if any water comes out. Use a flashlight to double check for water on the inside. If you have water on the inside, you have a leak and will need to start over. When you're confident it's sealed well, reconnect the end cap, immerse the stick in the water again and plug it in to a GFCI protected outlet. If a leak is present, the GFCI should instantly trip, shutting off the outlet and heatstick. If the GFCI malfunctions, the short on the ground will blow your circuit breaker/fuse. BYO

This is Tom Bardenwerper's first article for BYO.

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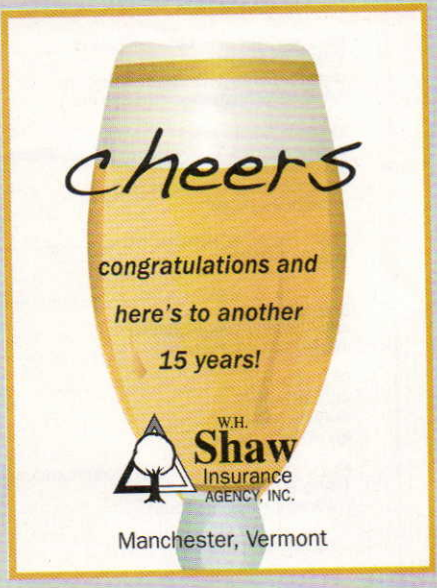

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Traveling Homebrew

A brewer and his bike

by Ilan Klages-Mundt • Appleton, Wisconsin

Imagine taking a year off of work or whatever it is that you are doing, and ask yourself, what would you do? If you had an entire year to do whatever you'd like, and I mean anything, what would it be?

As a homebrewer and avid cyclist, I can think of a few great activities, but when it comes to encompassing an entire year, I came up with an idea that I guarantee no beer lover (and bicycler) would get tired of doing.

As of July 27th, I have embarked on a year-long journey around the globe to study all aspects of brewing cultures in twelve different countries. During this year, I will of course visit breweries and pubs, but I will also try to encapsulate everything else along the way that has to do with beer, including hop/grain farms, malt houses, homebrew clubs, advocacy groups, universities, distributors and political offices. For the entire year, minus plane flights, my bicycle will be my main source of transportation, and I will use it to discover what makes each country and each region's brewing cultures and traditions unique.

I graduated in 2009 from Lawrence University's Conservatory of Music in Appleton, Wisconsin, where the cello was my main instrument. As an avid homebrewer for the past three years, beer is a great passion of mine, and although I may still pursue a musical career in the future, beer will always play an important role in my life. This trip is my chance to see the world, with my bike and a beer glass, before going on with the rest of my career.

During my year of travels, I have acquired apprenticeships at the following breweries:

Fullers Brewery: London, England
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(February 2011 - April 2011)

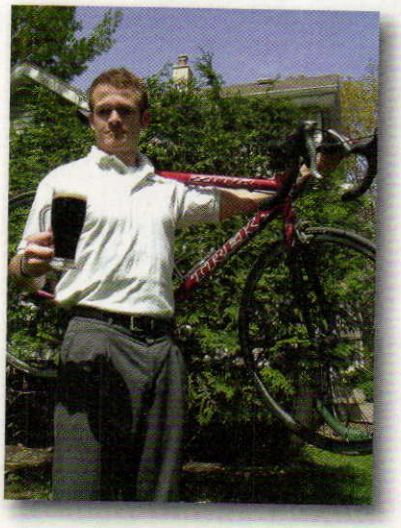
During the final three months of my trip, May through July of 2011, I ride through Belgium, the Netherlands, France, Luxembourg, Germany, Switzerland, Austria, and the Czech Republic. Without any apprenticeships taking up time during this period, I plan to focus even more on the many unique regions throughout these great brewing countries. I hope to not only learn more about many old and historical brewing traditions, but also discover the brewers that are pushing beer's "limits" to new heights!

Once I return to the US in August 2011, I plan to change the focus of my journey to share what I've learned about brewing with others. I will travel around the country to attempt to coerce students into discovering the greatness of not only craft beer, but also the history and traditions behind it. My political side will say there is no such thing as a bad beer in this world, just beers that I would chose not to drink myself.

My goal for this second leg of my travels is to inform the masses about what beer really is and what it can be, and I firmly believe that once someone learns the basics, such as the ingredients in beer and how they are grown, as well as processes used in the brewery, that they will gravitate towards the wide world of beer.

My journey still sounds like a dream to me. I'd love to take everyone along with me during my travels, but since that may be a bit tricky, I've set up a website at www.bikeforbeer.org where I will be posting updates on where I am in the world, articles, interviews and reviews every day during my travels. I hope my fellow homebrewers are as excited about my trip as I am, and I encourage you to check out the website and share your insight with me! BYO

"This trip is my chance to see the world, with my bike and a beer glass, before going on with the rest of my career."



Ilan Klages-Mundt is taking a brewing-related world journey on his bike

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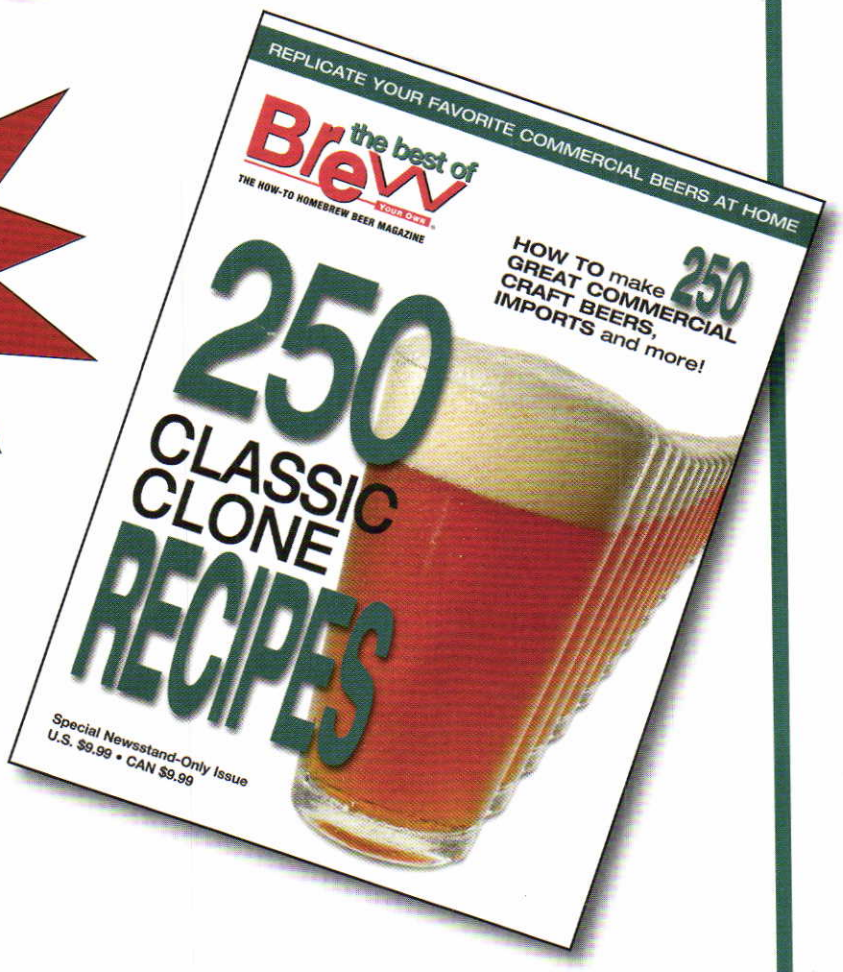

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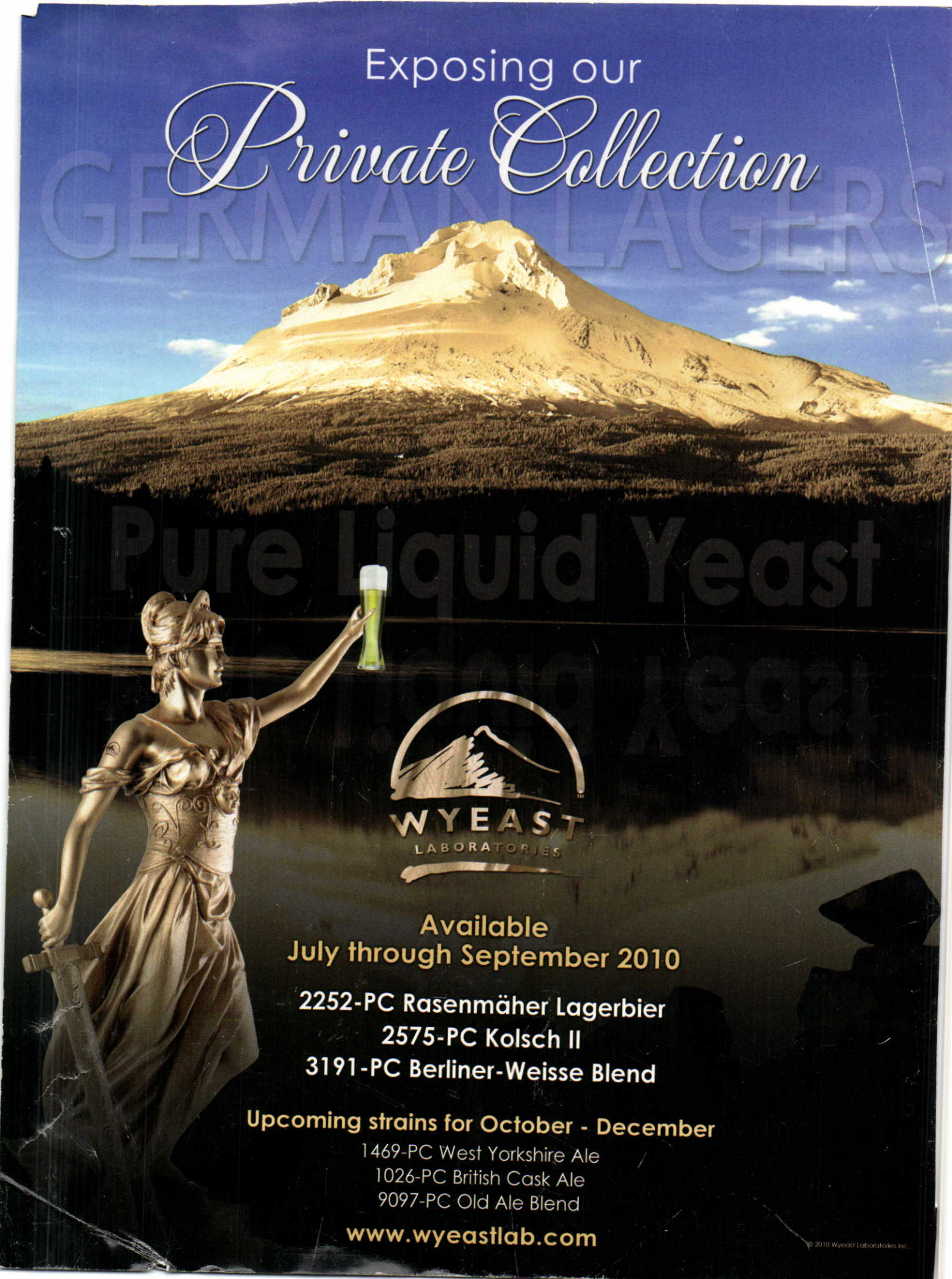
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