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BREWING UP HISTORY WITH BALLANTINE ALE

HOMEBREW BOTTLING BASICS

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THE HOW-TO HOMEBREW BEER MAGAZINE

MAY-JUNE 2010, VOL.16, NO.3

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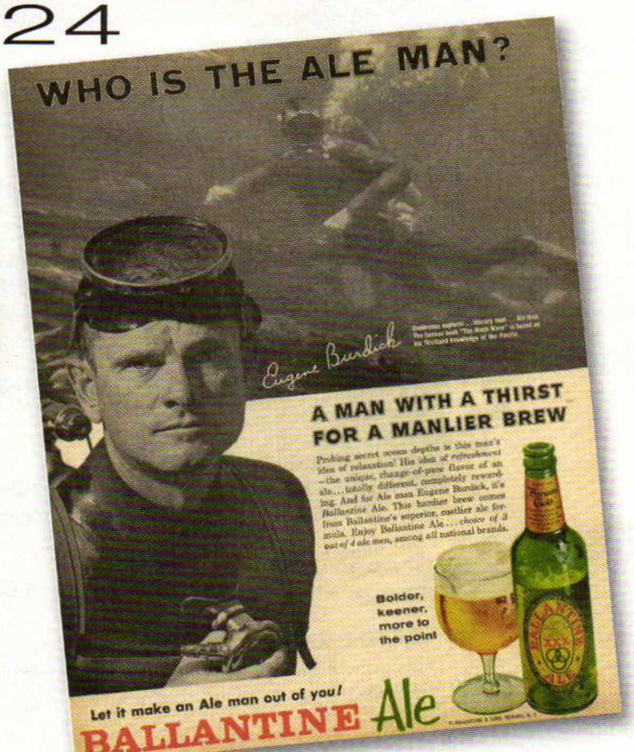

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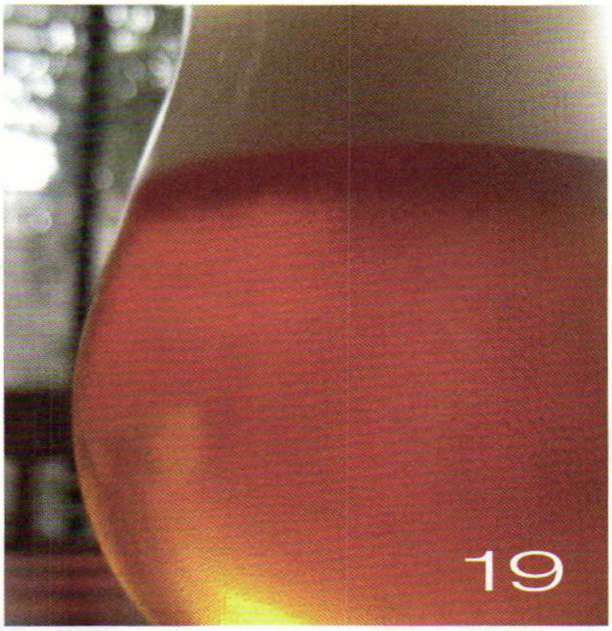

departments

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.

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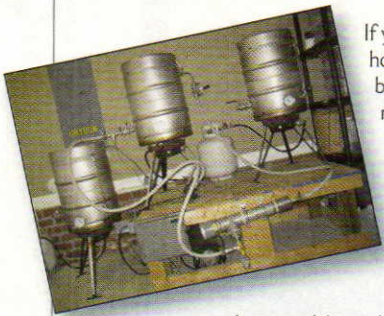
Super Systems



If you like to look at home-built home-brew setups as much as we do, take a look at our online gallery of amazing setups.

www.byo.com/photos/category/4

Going to Brew School

Follow along with new byo.com blogger Justin Burnsed as he navigates through the UC-Davis Master Brewer's Program this spring.

www.byo.com/blogs

Cover Photo: **Charles A. Parker**

Brew THE HOW-TO HOMEBREW BEER MAGAZINE YOUR OWN

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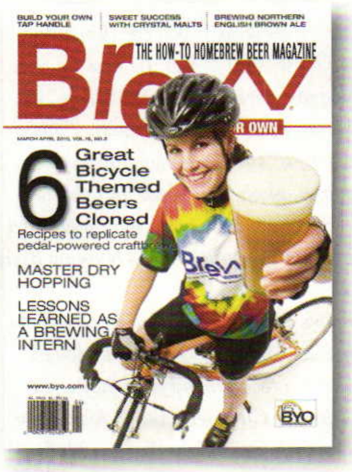


Mildly mad meadmakers

I was a little disappointed in the advice provided in "Your First Mead" by Betsy Parks in the November 2009 issue of *BYO*.

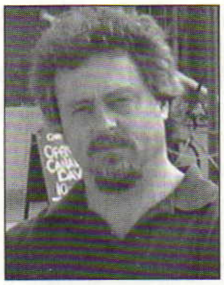
Speaking for four of the five most recent AHA Mead Makers of the Year (Curt Stock, 2005; Steve Fletty, 2007; Steve Piatz, 2008 and Thomas Eibner, 2009) we don't use sulfites (or Campden tablets) in our meads though we may use some sulfites to treat fresh fruit. From a nutrient perspective, we all use the staggered nutrient addition (SNA) process pioneered by Ken Schramm. For roughly 5 gallons (19 L) of mead, the SNA process calls for:

2 teaspoons of diammonium phosphate
1 teaspoon of Fermaid K

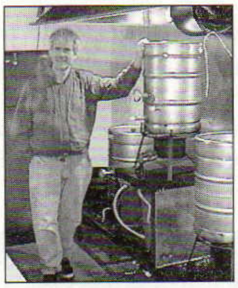
One quarter (0.75 teaspoons) of the SNA mixture is added initially. An additional quarter is added on each of the next two days and the final quarter when 30% of the initial sugar has been depleted (that typically comes around the fourth day). When making the nutrient addition, you want to stir the must a lot to drive out the carbon dioxide (CO_2). Once you stir the must and drive all the CO_2 out, you can add the nutrients and mix them in. If using a dry yeast, we will rehydrate the yeast using GoFerm. As for heating the must, just don't do that! None of us heat our musts. We will use a cup or so of warm tap water to dissolve the residual honey that might be left in a jug, but that is the limit to the heat we use.

A mead should not take two to three months in primary, that is a sign that the fermentation is not going well. We typically do our primary in a bucket to make the stirring easier. Our meads are virtually always finished with primary well before a month passes. We don't leave the mead in the bucket for more than four weeks. The whole idea of six or more months in secondary is more nonsense. A mead might stay in a carboy for that long when we get too lazy to keg/bottle the mead right away, but it is not part of the plan or required. For examples of how quickly a mead can be ready to consume; Curt Stock made a melomel on May 1, 2009 that was served during the mead making panel at the AHA NHC in Oakland when it was seven weeks old and it was very good. Curt's mead went on to win the BOS at the Minnesota State Fair in August. I made a melomel on August 9, 2009 that took a gold medal at

contributors



Former frequent contributor Scott Russell returns in this issue of *BYO*. Scott is the manager of the Home Brew Department at the South Royalton Market, South Royalton, Vermont. He was formerly the manager of the Home Brew Shop at the Seven Barrel Brewery, West Lebanon, New Hampshire. An award-winning homebrewer and BJCP National Beer Judge, Scott is the author of "North American Clone Brews" (2000, Storey) and is co-author, with the late Greg Noonan, of "The Seven Barrel Brewery Brewers' Handbook" (1996, GW Kent). In *Brew Your Own's* early years, he wrote the "Recipe Exchange" and "Replicator" columns, as well as penning many feature articles. Visit Scott's website, www.vthomebrewguru.com and check out his article, on page 38 of this issue, on brewing with maple syrup.



Former "Advanced Brewing" columnist Bill Pierce also returns in this issue. After tasting some inexpertly made homebrew in the 1970s, Bill didn't get into brewing his own until 1994, when he brewed a brown ale and was hooked. Bill was briefly a professional brewpub brewer and has completed the Craft Brewer's Certification Program from the Siebel Institute in Chicago, Illinois. "Professional craft brewing was a real eye opener," he says, "It's a true labor of love for those who do it." On the homebrew side, Bill is a BJCP judge and longtime participant in the online brewing forum Home Brew Digest (hbd.org). On page 24 of this issue, Bill takes homebrewers back to a time when there was only one American ale brewer of any significance — Ballantine.

James Spencer is the host of *Basic Brewing Radio* and *Basic Brewing Video*, podcasts which can be found at www.basicbrewing.com. James started brewing in 1996 and in 1998 he won the first homebrew contest he entered, the 3rd Annual Ozark Homebrew Contest. He immediately retired from competition, to preserve his unblemished record.

Recently, James has teamed with *Brew Your Own* magazine, and inquisitive homebrewers from all over, to perform and present a series of experiments in our BYO/BBR Collaborative Experiment series.

In this issue, on page 40 — in our "Breakfast Served Anytime" package, a collection of articles focusing on breakfast food ingredients used in beer — James discusses brewing with breakfast cereals and presents his monster cereal beer, Frankenberry Weiss.

the Hoppy Halloween Competition on October 24 or about 11 weeks later.

A good reference on mead making would be Curt Stock's "Melomel (Fruit Mead)" article published in your July-August 2008 issue.

Steve Piatz, Curtis Stock, Steve Fletty and Thomas Eibner
various cities in Minnesota

We are familiar with Curt's BYO *article on mead. In it, he outlines a method of meadmaking that — as you guys attest — makes great mead.*

However, many homebrewers still use the "old school" procedure outlined in our "Beginner's Block" on mead, and many award-winning meads have been made this way. Although fermentation takes longer when this method is used, it is very straightforward and doesn't require any intervention during the fermentation process — a plus for brewers who are only casual meadmakers and just want to "set it and forget it."

We agree that heating the honey (holding it at 160 °F/71 °C for 15 minutes) or adding metabisulfite (for example, from Campden tablets) isn't necessary, but "dump and stir" methods that don't include any means of sanitizing the must (unfermented mead) make some brewers nervous.

For meadmakers who are willing to tend to their fermentations by adding staggered nutrient additions, we do recommend the method you outline in your letter. Likewise, if you can feel secure making mead from unsanitized must, that is also the best route to take. (All of our most recent meads were made this way, and we haven't encountered any problems. Plus, making a batch of mead takes almost no time this way — just stir the honey into some water, make your nutrient additon, pitch your yeast and you are done. It can be hard, though, for a homebrewer — who spends so much time focusing on cleaning and sanitation when brewing beers — to take that leap.)

We hope that our "Beginner's Block" article will inspire some brewers to try their hand at mead. And for those who discover that they enjoy meadmaking, we do recommend that they check out the more advanced methods that Curt describes in his article, "Melomel (Fruit Mead)" (Brew Your Own *July-August 2008).*

Seal the secondary?

I just finished reading an article in one of your back issues (December 2005) on secondary fermentation. And the article agreed with everything I have read that it is for clarity purposes. The article even stated that no fermentation will be occurring. Then why oh why do all instruction books and articles that refer to this process all require or state a fermentation lock needs to be used?

Rich Jeriha
Phoenix, Arizona

So-called secondary fermentation is really a conditioning or clarifying stage. With some yeast strains, racking the beer off the yeast in the primary fermenter will help it clear faster. (With other yeast strains, you can save a step and just let the beer clarify in the primary fermenter.) Unless you rack prematurely, or add fermentables at this stage, the beer will not be fermenting. However, there is still a very good reason to keep a fermentation lock on your secondary fermenter.

Exposure to oxygen after fermentation will cause a beer to rapidly go stale. For this reason, brewers go to many lengths to shield their beer from air. At a minimum, beer is stored in sealed kegs or bottles. Beyond this, the vessels may have been purged with carbon dioxide (CO_2) before the beer was added. And, after racking, we recommend homebrewers purge the headspace in their kegs before sealing them. When bottling, oxygen absorbing caps can be used and, when counter-pressure bottling, it is recommended that the brewer cap over foam.

Container-grown hops in California

I am looking into planting hops in some containers and I came across your article in *BYO* (March-April 2009). I am wondering what kind of height I can expect to see the hop bines climb. I will be planting them against a wall and I want to train them to grow up a trellis (12 feet or so), and once they reach the top of that I was hoping to train them to grow across the top of a pergola. Do hops strictly grow upwards, or can they be trained to grow along the top of something? I'll be growing in sunny and warm Southern California, and planting in pots most likely larger than the 20" diameter ones you recommend (I currently have a large, deep rectangular planter along the wall where I'll be planting).

Ryan Greene
via email

Hops will grow up to 30 feet (9 meters) if they get enough sun and nutrition. They prefer to grow upwards, but will sprawl outwards if they have no other choice. You may have to occasionally get on a ladder and train the vines if you expect them to grow horizontally for a long distance.

As for your containers, bigger is definitely better. The more room the roots have to spread out, the less you will need to fertilize the plants. If you are growing the hops in Southern California, you may want to consider planting the hops where they get morning sun, but shade in the hottest part of the day. You may also want to consider pruning the hops so that they mature after the hottest part of the summer has passed. In warm, southern locations, hops sprout early in the spring and can bear cones by late July or early August, resulting in overly grassy hops. Pruning the plants in mid-April forces them to "start over," flower later and lets the cones finish maturing in September, when temperatures are lower.

homebrew nation

BREWER PROFILE

Brewer: Steven Jacobsen

Hometown/State: Evanston, Illinois (via Washington DC; via Bayreuth, Germany; via Denver, Colorado . . . originally). Yes, Evanston is commonly known as where Prohibition started, but we have a growing Evanston Hombrew Club, led by President Ted Perez.

Years Brewing: 15

Type of brewer: All-grain

Homebrew Setup (volume, style, efficiency): 5-gallon (19-L), mostly brewing IPAs.

Currently fermenting: Maerzen-style (see recipe to the right)

What's on tap/in the fridge: Great Lakes Brewing Commodore Perry IPA

How I started brewing:

I started homebrewing in the early 1990s because I was living in Boulder, Colorado at the time and surrounded by a burgeoning craft-brewing culture. My local favorite, Avery Brewing Co, which had just started, was a common source of inspiration and vibrant yeast for my first batches. Ironically, the nearly four years that I lived in Germany were the only years I didn't homebrew, but those years were filled with weekend walking tours in Franconia to small breweries for Landbier and Vollbier, with Hetzelsdorfer and Brauerei Meister, both near Bayreuth, among my favorites.

PROFILE RECIPE

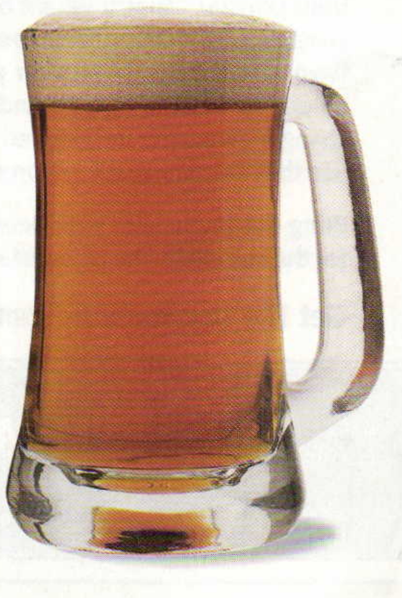
Maerzen-style
(5 gallons/ 19 L, all-grain)
OG = 1.080 FG = 1.020
IBU = 47 SRM = 26 ABV = 7.8%

Ingredients

12 lbs. (5.4 kg) Rahr 2-row malt
2 lbs. (0.9 kg) Munich malt
2 lbs. (0.9 kg) Vienna malt
0.5 lb. (0.23 kg) cara malt
0.25 lb. (0.11) black patent malt
1 oz. Hallertau Tradition hops (7.1%) (60 min)
1 oz. Hallertau Tradition hops (7.1%) (30 min)
1 oz. Hallertau Tradition hops (7.1%) (10 min)
1 oz. Tettenang hops (dry hop)
Wyeast 2206 (Bavarian Lager) yeast (use a big starter)

Step by Step

I use a single infusion mash, 150 °F (66 °C). Total boil time is 60 minutes. Follow the hopping schedule as per the ingredients list, chill the wort to 50 °C and pitch the yeast. Ferment for one to two months at 50–52 °F (10–11 °C). Condition for two weeks in the refrigerator prior to carbonation and packaging.



byo.com brew polls

have you ever brewed with coffee?

No, but I plan to 43%
Yes, I've tried it 30%
No, I'm not interested 23%
Yes, frequently 4%

new products

Blichmann Engineering AutoSparge

This new design from Blichmann automatically sets the hot liquor flow rate and liquid level in your mash / lauter tun. As you change the sparge rate into your boil kettle, the AutoSparge™ automatically responds by increasing or decreasing your hot liquor flow to compensate and keeps a constant level in your tun. Wort gently rotates on top of grain bed to reduce channeling, oxygen pick-up and to increase extraction efficiency. Fits any pot larger than 12" in diameter, including converted kegs. Adaptable to coolers.

www.blichmannengineering.com/AutoSparge/auto_sparge.html

MoreBeer! Brewing Refractometer with Specific Gravity Scale

This MoreBeer! refractometer is the first and only model to feature both a Brix Scale and a Specific Gravity Scale so there is no need to convert the reading from Brix (what winemaker's use) to Specific Gravity. Easily used pre-ferment, a refractometer can now easily be used for readings during fermentation with the help of our spreadsheet that includes a video on how to use.

http://morebeer.com/view_product/18739//Brewing_Refractometer_With_Brix_Scale

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http://backyardbarkeep.com/

calendar

May 8
Eugene, Oregon
Sasquatch Brew Festival Homebrew Competition

The annual competition made possible with the sponsorship of NW Legends and the Cascade Brewers Society. Judging will take place on May 8. Entries must be received by Eugene City Brewery by May 1. For more information, winners list for 2009 and entry forms, please go to www.sasquatchbrewfest.org.

May 15
Charlotte, North Carolina
Carolina Brewmasters US Open Homebrew Competition

The Carolina Brewmasters homebrew club will hold their 20th annual competition this year. This is an AHA sanctioned event and points are awarded towards the Carolina Brewer of the Year (CBOY). The competition is being held in the tasting room of the Olde Mecklenburg Brewery in Charlotte. Details for entry are available at www.carolinabrewmasters.com at the "US Open" tab.

June 2–6
Montreal, Quebec
Mondial de la Bière

The 17th annual Mondial de la Bière will feature hundreds of beers from Wednesday to Saturday, 11:00 a.m. to 10:00 p.m. and Sunday from 11:00 a.m. to 8:00 p.m. Admission is free. Tasting coupons are $1 each. More information is available at http://festivalmondialbiere.qc.ca/.

June 5
Milwaukee, Wisconsin
World of Beer Festival

An opportunity to taste over 100 different beers hand picked by the beer geeks from the Beer Barons of Milwaukee homebrew club. Admission is $40 advance purchase includes a commemorative glass ($45 after May 9). Proceeds go to the Museum of Beer and Brewing. More info at http://worldofbeerfestival.com/.

homebrew drool systems

Three-Tier System

doug dozark • gulfport, florida

Doug's unique three-tier system utilizes Blichmann Engineering stainless steel components, which are known for their non-welded fittings that are threaded through the valves. Imagined by Doug (top) and built by welder Jay Lesher (of Clearwater, Florida) (left), this brew tree boasts an impressive 1-barrel capacity. It all started when Doug was dreaming up a brewing system that would be big enough to hopefully brew commercially at his restaurant, Peg's, in Gulfport, Florida. He saw some photos of Jay's welding work on brewing systems and reached out for some help.

To build the sculpture, the two hit some local scrap yards and found lots of stainless steel. Top to bottom it is about 9 feet (2.7 m) tall, and features steps and landings on the back so that Doug can access the hot liquor tank at the top.

"I was going to put a ladder against it, but Jay built a platform that can hold two people or me and a few bags of grain," said Doug.

Once Jay figured out the specifications of the tanks, he designed the burners with a flame shroud - which works like a heat shield - so that the tanks could receive enough heat.

“To build the sculpture, the two hit some local scrap yards . . . ”

He built the mechanism so that the shroud doesn't let the flame get into the valve. The design also helps in the wind when brewing outside.

grain profile

WHEAT MALT

Wheat malt, whether American or European-based, is the malt used to brew many beers in the German hefeweizen, weizenbier, weissbier and dunkelweiss styles, as well as Lambics, Belgian-style witbier and American wheat. Wheat malt typically produces beers with a creamy head and light flavors. Wheat malt has no outer husk like barley and therefore produces fewer tannins. Wheat malts are generally 2 to 3 °Lovibond.

we WANT you

Share your tips, recipes, gadgets and stories with *Brew Your Own* readers! Email our editors at **edit@byo.com**

beginner's block

BOTTLING BASICS

by betsy parks

Once your first batch of beer is finished fermenting, it's time to bottle. Take a minute to go over the basics to make sure your beer is as good coming out of the bottle as it was going in.

Illustration by Don Martin

Equipment

To bottle, you will of course need a quantity of clean, sanitized bottles. If you're planning to bottle a 5-gallon (19-L) batch, that's 640 ounces, so you will need to be sure to have enough bottles on hand. For example, if you plan to use standard 12-ounce bottles, you will need about 50 to 55 bottles. In addition to the bottles, you will also need enough bottle caps to cap all the bottles, a bottle capper, a racking cane and siphon hose, (a bottling wand makes the process easier), a sanitizable spoon (metal or food-grade plastic) and a bottling bucket with a spigot that is large enough to hold your batch of beer. You will also need priming sugar for carbonating. Check out www.byo.com/resources/carbonation for more information about carbonation and priming.

Cleanliness

Clean and sanitize all of your bottles and equipment before you start. Dirty bottles can hide mold, yeast and other unwanted microorganisms, so be sure to scrub them thoroughly with a bottle brush and cleanser before soaking them in sanitizing solution. If you use bleach to sanitize your bottles, be sure to thoroughly rinse them with boiled water. Never rinse anything you've already sanitized with tap water as this can spoil your beer. A good way to clean your bottles is to wash your bottles in a dishwasher that can produce enough heat to sanitize — and add a little bleach to the wash for good measure. It is also smart to sanitize your bottle caps before you cap the bottles.

When to bottle

It is generally best to wait for a week or two after your fermentation stops before you bottle, and actually many homebrew recipes will give you some kind of conditioning guideline to follow. This waiting period is important because if you bottle too soon there is a chance that there is some yeast remaining in the beer that hasn't yet fermented. If this yeast is bottled and becomes active again, it can cause too much pressure inside the bottle (especially if you have primed your beer for carbonation) and the bottles can explode. Many *BYO* recipes recommend waiting two weeks.

From carboy to bottle

Once you have all of your equipment ready, rack your beer to the bottling bucket, being careful to keep the racking cane below the beer's surface level to prevent aeration. Next, add your priming solution (see link above) and stir with a sanitized spoon.

Depending on your siphoning equipment, start a siphon with your siphoning tube and racking cane (or bottling wand). (For more information about starting a siphon, read "Beginners Block" in the May-June 2009 issue of *BYO*). Put the racking cane or bottling wand end of the siphon tube in the first bottle to be filled and fill the bottle until it is about ¾ of an inch (~2 cm) from the top. Pinch off the siphon or close the valve on your bottling wand and move on to the next bottle. When you're finished, cap each bottle and let them sit for a week or so to carbonate.

by marc martin

DEAR REPLICATOR,

There is a brewpub in Bellaire, Michigan, Short's Brewing Company, that consistently brews some wildly different and wonderfully delicious award winning brews. The one beer that keeps me coming back time after time is a beer called The Magician. Joe Short is a great guy but I have always been embarrassed to ask him for this recipe. Could the Replicator please help me with this request?

GLENN FIELDER
MADISON HEIGHTS, MICHIGAN

I am always amazed at the large percentage of professional brewers and brewery owners that have found themselves with a hobby that grew into an obsession. This was definitely the case with Joe Short. In fact, I was fortunate enough to have Joe handle my inquiry about this beer.

Joe's homebrewing hobby started while attending college at Western Michigan University majoring in industrial arts education. His first few batches were average extract pale ales but he was hooked and dropped out of college to pursue brewing as an occupation. He developed his brewing skills while working at three different Michigan breweries but longed for more latitude and creativity so he decided to open a brewery. After eighteen months of hard work, a 100-year-old building, a former hardware store, was restored and converted to a brewpub. He combined a used seven-barrel Pub Brewing Company system with five fermenters and some modified dairy tanks to make up the first brewhouse. The first beers were served in April of 2004.

The beers became so popular that soon demand dictated increased capacity. With no room to expand, a dilapidated manufacturing building was located in Elk Rapids. The first production run was made in January of 2009. This is now a dedicated, production-only operation with a 28-barrel system. In order to get his beers into the bottled market, Joe purchased a small four-head filler. His crew has now been cranking out six packs for a year with this very limited system.

Head brewer, Tony Hansen, also has homebrewing roots that run deep. Tony, a member of the local homebrewers club, was attending a meeting hosted by Short's in late 2006 when he met Joe. Joe offered him a part-time job brewing and he eventually worked his way up to lead brewer. In 2009 Tony moved over to the new production facility and now manages all of the production, bottling and new beer research.

The Magician Ale was named for Scott Newman Bale who helped Joe on several occasions when it seemed that economic struggles may doom the brewery. He now holds the title of CFO and the moniker of "Magician" seems permanent.

This beer is a beautiful dark copper red color with garnet and ruby highlights. It is topped with a thick, dense, light tan head that holds firm to the bottom of the glass. The aroma exhibits caramel overtones with a slight toffee background. The flavor is definitely malt forward with bread and biscuit notes and a somewhat dry finish. Hop bitterness is evident but low and is just enough to offset the mild residual sweetness.

Joe says that since it does not really match the specifications of any particular style he has entered it in competitions as "other strong beers."

Now Glenn, you'll be able to better analyze those great flavors because you can "Brew Your Own." For further information about Short's and their other fine beers visit the website www.shortsbrewing.com or call them at 231-533-6622. BYO

Short's Brewing Company Magician Ale
(5 gallons/19 L, extract with grains)

OG = 1.058 FG = 1.012
IBUs = 22 SRM = 17 ABV = 5.8 %

Ingredients

6.6 lbs. (3 kg) Briess light, unhopped, liquid malt extract
6 oz. (170 g) cara-pils malt
12 oz. (0.34 kg) Munich malt
4 oz. (113 g) crystal malt (60 °L)
12 oz. (0.34 kg) crystal malt (80 °L)
2 oz. (57 g) roast barley (450 °L)
3.9 AAU Cascade hop pellets (60 min.) (0.75 oz./21 g of 5.25% alpha acid)
2.6 AAU Cascade hop pellets (30 min.) (0.5 oz./14 g of 5.25% alpha acid)
1.3 AAU Cascade hop pellets (5 min.) (0.25 oz./7 g of 5.25% alpha acid)
½ tsp. yeast nutrient (last 15 min.)
½ tsp. Irish moss (last 30 min.)
White Labs WLP 013 (London Ale) or Wyeast 1028 (London Ale) yeast
0.75 cup (150 g) corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 2 gallons (7.6 L) of water at 150 °F (66 °C) for 30 min. Remove grains and rinse with 2 quarts (1.8 L) of hot water. Add the malt extract and boil for 60 min. Add the hops, Irish moss and yeast nutrient as per the recipe. Add the wort to 2 gallons (7.6 L) of cold water and top off with cold water up to 5 gallons (19 L). Cool the wort to 75 °F (24 °C). Pitch the yeast and aerate heavily. Ferment at 68 °F (20 °C). Transfer to a carboy, avoiding any splashing. Condition for one week and then bottle or keg. Carbonate and age for two weeks.

All-grain option:

This is a single step infusion mash using 8.5 lbs. (3.85 kg) 2-row pale malt to replace the malt extract. Mix the crushed grains with 3.75 gallons (14 L) of 168 °F (76 °C) water to stabilize at 150 °F (66 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (27.3 L) of wort runoff to boil for 60 minutes. Reduce the 60-minute hop addition to 0.65 oz. (18 g) Cascade hop pellets (3.4 AAU). Follow the remainder of the extract with grain recipe.

Oatmeal Stout

Packed with proteins

by Betsy Parks

WHILE A GLASS OF OATMEAL STOUT MAY OR MAY NOT LOWER YOUR CHOLESTEROL, IT'S STILL PRETTY TASTY. THAT'S BECAUSE OATMEAL BRINGS A SILKY TEXTURE AND VANILLA-ESQUE OAT FLAVORS TO THE PARTY. IN THIS ISSUE, WE FOUND THREE BREWERS WITH ADVICE FOR ADDING SOME OATS TO YOUR NEXT BREAKFAST BEER.

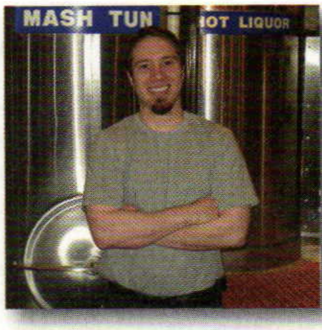
The main reason we use oatmeal in our stout is that it can bring a smooth creamy finish to the mouthfeel, creates a nice viscosity and imparts other oat-y flavors.

We use Simpsons Golden Naked Oats, which are huskless and malted for a few different reasons. The most important of course is that they easily pass through our grain mill. In the past we used flaked oats, but they didn't work so well. Plus, because of the way we mash in, the flaked oats affected our liquor-to mash ratio. I like that they impart a subtle nutty flavor and aroma.

In our oatmeal stout, I prefer to use them at about 3 to 5% of the grist. This gives me what I want from the oats without causing any lautering issues. A brewer can always control those qualities by adding more or less to the grist.

One of the issues brewers can run into when working with oats is that they have a large beta-glucan content. Too much oats in the grist can lead to difficulty with wort separation, so start small and work your way up.

If you're already successfully brewing with oats, definitely experiment because that's the fun part about brewing. I've seen some stouts with up to 20% oats in their grain bill, and you can definitely work your way up if you're comfortable with the lautering issues that can come up. However, I would also be careful that you're not adding too much. I wouldn't try more than 25% — that's going to be a lot of oats. Don't overdo it.



Justin Hamilton, Head Brewer, Chama River Brewing Co., Albuquerque, New Mexico. Justin started his career delivering kegs for the Blue Corn Café and Brewery in Santa Fe and worked his way up. He is currently enrolled at the American Brewers Guild and plans to graduate this summer.

We primarily use rolled oats at New Holland as opposed to malted oats. By using a non-malted grain you're going to get a much longer protein chain, which will result in extra head retention and a creaminess that you wouldn't get from a standard malted grain. They also have an oat-y flavor.

One of the things you have to be careful about when you use rolled oats is that they can create an oiliness in the beer that can be counterproductive.

We use oats at about 5 to 6% of the grist and then also augment it with some flaked barley. We like to use the barley to add a little more mouthfeel to the beer without going overboard in the oat flavor.

I don't know that there's any real precautions to take when using oats, but if you're making an oatmeal stout you will have a bigger mash. In the case of rolled oats, you don't want to and don't need to mill it. Throw it right in the mash tun and it will keep the mash bed open.

If you're making a stout with oats watch the pH. Dark malts tend to really acidify the mash pH, and when that happens you start to support roasty and bitter flavors. You want those flavors in the stout, but part of the reason for making an oatmeal stout is to bring up the creamy, vanilla qualities, so you're going to want a higher pH of around 5.5 to 5.6.

Brewing with oats is just like everything else in brewing — you have to play with it and find your own sense of balance, flavor intensity, head formation and head retention. As you experiment, find ways to push and pull those different factors.

John Haggerty, Brewmaster, New Holland Brewing Co., Holland, Michigan. John is a 2002 graduate of the Versuchs- und Lehranstalt für Brauerei (VLB) in Berlin, Germany where he received his brewmaster's diploma.

Damian McConn, Production and Project Brewer, Summit Brewing Company, Saint Paul, Minnesota.
Born and Raised in Kildare, Ireland, Damian graduated from Heriot Watt University in Edinburgh, Scotland, with an Honours Bachelor's Degree in Brewing and Distilling Science.

Oats are traditionally utilized in brewing for their impact on flavor and mouthfeel. In general they help to increase body, and add a soft, slightly silky smoothness to the overall profile of a beer. These attributes may help to temper the flavor contribution of other ingredients to the beer, such as the astringency provided by roast malts or high hopping rates.

The two main forms of oats used at Summit are golden oats, which are malted, and flaked oats, which are passed through heated rollers after an increase in moisture content. Malted oats have a unique nutty flavor in addition to their mouthfeel-enhancing qualities. Flaked oats are added directly to the mash tun.

Typical amounts in the grist range from 5 to 15%, although 8 to 10% is about standard in UK-style beers, a little less in Belgian beers. This is a sufficient level at which the benefits of the oats become obvious, but low enough to prevent brewhouse processing issues.

Oats contain very high levels of crude fiber, beta glucan and lipids (they were originally often used as feed for draught horses in Scotland). A thorough beta-glucanase rest during mashing (typically around 113 °F/45 °C) is highly recommended, as is the use of well-modified malts and possibly malt containing higher levels of beta glucanase than normal. Higher viscosities during lautering, and possible gum formation in the mash can impede run-off. This problem may contribute to decreased filtration through-put if the beer is filtered. Additional husk material in the form of rice hulls may help increase run-off rates.

Lipid oxidation, in both the raw material itself and the final beer may reduce shelf life and stability. Always use the freshest raw materials available and discard beers containing oats at the first signs of lipid oxidation (the beer may have a rancid-butter off-flavor and aroma). Lipids can also have a detrimental effect on foam retention; this can be offset by adding a small amount of torrified wheat to the grist.

Finely-ground oats can give a cement-like consistency to mashes, so milling-gaps should be adjusted to compensate if a malted product is used. Oats also contain lower extract and higher protein levels than standard UK 2-row pale malts, so consideration of these differences should be made during recipe calculations. BYO

Mash Mixing

Over evaporation, carboy size

by Ashton Lewis

Q I was doing a little research the other day and came across the Sabco RIMS-WIZARD. Their website claims that stirring of the mash is not recommended. What is your opinion on stirring of the mash? Is there much information available ?

FRANK UHI
BROCKAY, PENNSYLVANIA

A There is indeed much information about mash stirring and the use of agitated mash mixers is the norm in modern commercial breweries. The primary reason for stirring the mash is to provide uniformity when heating the mash. Brewers who employ step mashing, sometimes referred to as upward infusion mashing, double mashing and decoction mashing all use mash mixers. I think that the history of brewing clearly shows that mash mixers were first developed to deal with the challenge of uniform heating.

A side benefit to stirring the mash is improved yield. In large mash mixers another consequence to mixing can be shear damage from aggressive mixer designs and/or the use of baffles in mash mixers. Companies that design and build equipment for breweries have addressed the problem of shear damage by using low shear mash agitators designed to pump the mash down to the center of the mash mixer bottom. The mash then flows across the bottom and up the sides; since the mash mixer bottom and side walls are typically steam heated this flow pattern is ideal for heat transfer. Although many mixer designs are touted by equipment manufacturers, they all work on similar design premises.

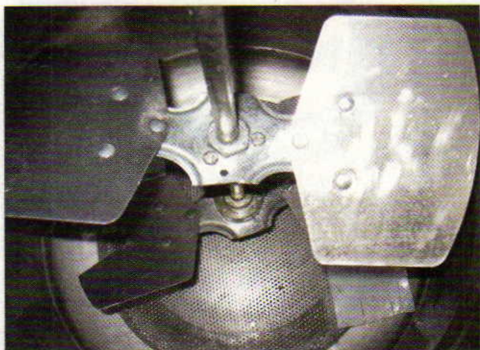
When mash mixers are used during mashing there is always a separate wort separation device, be it a lauter tun, mash filter or the now obsolete Strainmaster once used in many of the Anheuser-Busch breweries. All of the devices are designed to separate clear wort from the grain bed. A common feature of all of these devices is that the mash is not stirred during wort separation. Despite the appearance of a lauter tun raking machine, it does not stir the mash when properly designed and used, rather it gently cuts and lifts the grain bed while very, very slowly rotating.

The traditional infusion mash system is totally different than the mashing systems I just mentioned. In an infusion mash tun the malt and water are mixed during mash in, the mash is distributed by the brewer using a mash paddle (or mechanical device in larger mash tuns) and the mash is held without heating during enzymatic conversion. After conversion is complete, the false bottom of the mash tun allows wort separation to occur in the same vessel. Infusion mash beds are not disturbed during the mash rest and there is no raking machine in the traditional mash tun.

The RIMS (Recirculated Infusion Mash System) method of mashing is based on infusion mashing in that the mash is not stirred during mashing and that the mash vessel is also used during wort separation. The thing that distinguishes RIMS from traditional infusion mashing is mash heating, and with RIMS mashing the heating is made possible by the use of a wort recirculation pump and external wort heater. My guess is that mash stirring is not recommended because excessive stirring could lead to problems with wort separation after the mash is complete.

In the 5-gallon (19-L) pilot brewery at UC-Davis where my fellow graduate students and I brewed as much as we possibly could, we had a "lauter tun" located

> "I think that the history of brewing clearly shows that mash mixers were first developed to deal with the challenge of uniform heating."



below the mash mixer. When doing stirred mashes, the mash was gravity transferred from the mixer to the "lauter tun" (no raking machine). When we did infusion mashes we would simply mash into the "lauter tun" and contrary to what is often written about infusion mashes we would periodically give the mash a gentle stir and we never had any problems with a stuck bed or wort turbidity issues that extended beyond the recirculation of wort prior to wort collection.

For the last 13 years I have formulated numerous styles of ales and lagers at Springfield Brewing Company and all of these beers have been brewed using a mash mixer and a lauter tun. So stirred mashing is what I know best. What I can attest to is very good extract yield, excellent repeatability and freedom to brew just about anything we can dream up.

Q I'm currently all-grain brewing, and I've been getting a rather high evaporation rate. In fact, I have learned not to go by percentage any more but with my equipment. I seem to boil off about 7–8 liters (~2 gal.) in an hour. That makes my SG of the wort very high. I was aiming for 1.055 but am getting about 1.062 after cooling down. Is it okay to add water to bring it to 1.055 levels or nearer to 5 gallons?

JOHN WEIHT
SINGAPORE

A Knowing the evaporation rate of your equipment is important when trying to brew beer to a target original gravity. There a few things that you can consider to solve the problem you are having. Beginning with more water is one way that you can compensate for your high rate of evaporation. If you choose to do this I would collect wort from the mash bed until the gravity falls to about 2 °Plato or a specific gravity of 1.008. Collecting low gravity wort leads to grainy, astringent flavors in the finished beer. So if you want more volume before the onset of boiling I would simply add water to the kettle instead of running extra sparge water through the grain bed.

Another option is to add water to the hot wort following boiling. At Springfield Brewing Company we actually use this method as our standard method of brewing so that we can adjust our wort gravity to specification for our brews. This also allows us to produce more wort since we can brew slightly higher gravity wort and dilute after boiling. Since kettles can only boil so much wort, adding water after boiling is one way to boost wort volume.

Adding water after the boil is a way of brewing more beer and may make sense depending on the size of your kettle. Adding extra water to the wort before the boil, however, may not be required if you

> "Another option is to add water to the hot wort following boiling."

can regulate the heat that you are applying to the wort during boiling. In fact, if this problem occurs in a commercial brewery it is really a problem of energy waste. Most beers these days have a total evaporation during boiling between 4-8%. The trend is moving more toward 4% or less in new kettles, but for some beers this evaporation rate is too low unless the kettle is really designed to strip DMS during or after boiling using some type of stripper.

From what you describe you are removing more than 20% of the volume during boiling. This is really excessive and for most beers you are not gaining anything with this high rate of evaporation. In fact, if you like brewing some of the lighter styles this amount of evaporation is probably leading to higher colors and is likely lending some flavors that would be good to not have. I would turn down the heat during boiling to bring your total evaporation down closer to 10-12%. If you have flavors like DMS in the finished beer you could boil a bit harder, but I do not think this will be the case.

All the methods described above can be used to hit your target gravity. I would choose the method that makes the most sense for your needs. "Most sense" can also be interpreted as best tasting beer. Good luck!

Q My wife bought me a homebrew kit for Christmas with a 6.5-gallon (25-L) bottling bucket and a 6-gallon (23-L) glass carboy. I have come to the realization that I would like to rack to a secondary to clear my brew. From what I read, if people are using a glass carboy for a primary they are using a 6.5-gallon (25-L) carboy. Is my 6-gallon (25-L) carboy big enough to use as a primary fermenter?

JAMIE DICKSON
VIA EMAIL

A Excessive headspace in a secondary fermenter can lead to oxidation if you are not careful. The primary fermenter ideally should be sized so that foam and beer do not foam out of the fermenter during fermentation. The main reason for wanting to either avoid or minimize foaming during fermentation is that you lose beer with foam and you can experience unacceptably high losses if the fermenter is too small. I like having about 25% extra volume in a primary fermenter; this extra volume is more or less standard in commercial fermentation vessels.

So for a 5-gallon (19-L) batch of beer a 6- or 6.5-gallon (23- or 25-L) fermenter fits within this design rule. When you rack beer from a primary to a secondary you really don't need any room for foaming as long as you rack after primary fermentation has stopped. Since there is still some fermentable extract contained in beer at the end of primary fermentation there is carbon dioxide generated during secondary and this carbon dioxide will flush the air from the headspace. This is why it is good to rack soon after active fermentation stops. If you wait too long to rack there may be no more carbon dioxide generated, which is when oxidation can be a problem.

I don't think that using a plastic fermenter is a bad decision for primary fermentation since the ingress of oxygen across the plastic barrier occurs at a relatively slow rate and yeast will absorb this oxygen when fermentation is active. Secondary fermentation is another issue all together and I strongly suggest using either glass or stainless steel vessels because you can oxidize beer stored in plastic containers. Purchase a couple of 5–6 gallon (19–23 L) glass carboys to use as secondary fermenters. You can certainly use a 6 gallon (23 L) carboy as your primary since this gives you 20% headspace, but you should use a blow off hose that is large enough not to become clogged if the fermenter foams over. BYO

Belgian Tripel

Golden goodness

by Jamil Zainasheff

With the popularity and availability of Westmalle Tripel in the United States over the years, it seems hard to believe that my first real taste of Westmalle Tripel was while wandering around Belgium not so long ago. Sitting outdoors at a small café, the warmth of the sun perfectly balanced by a delicate breeze, the waiter brought me a beautiful, golden-hued glass of Westmalle Tripel. I marveled at the rocky white head that sat atop the effervescent beer, creating a "Belgian lace" with each sip. The freshness of the malt flavors made it seem much crisper than samples I found back in the United States.

Belgian tripel ranges from 7.5 to 9.5% ABV with spicy, fruity and subtle alcohol flavors supported by a grainy Pilsner malt character. While there might be a little upfront sweetness, good examples always finish dry with a moderately bitter balance. Carbonation is high and the body exhibits a medium fullness. While the malt flavors are full of Pilsner goodness, fermentation character is really the centerpiece in this style. Tripel is a complex mix of fruity esters (lemon, orange, grapefruit, pear), phenolic spiciness (pepper, clove) and alcohols. These characteristic flavors and aromas come from fermentation, not from the addition of fruits and spices, although there are some brewers that do use spices. If you go down that road, keep the spice additions to a bare minimum. You might try fresh orange peel, lemongrass, coriander or black peppercorns.

One thing to keep in mind, while tripel has a higher than average alcohol concentration, that does not mean it should be hot or solvent-like. Hot or solvent is never an appropriate beer character regardless of its alcoholic strength. The alcohol should be subtle and warming. In the best examples, the alcohol sneaks up on you only after it has reached your stomach. Many poor examples of this style have a hot alcohol character and finish far too sweet.

The base malt for this style is continental Pilsner malt. Pilsner malt lends a slightly sweet, grainy malt character to the beer. If you can source it, Belgian Pilsner malt is ideal. If you cannot, do not worry, even the Belgian brewers use other continental Pilsner malts. If you are an extract brewer, try to use an extract made from Pilsner malt. While it may seem like it isn't worth the trouble, a beer like this does not have a lot of specialty malts to hide behind, so it is important to use a good quality Pilsner malt extract. Pilsner malt and some table sugar is really all you need, although some brewers add other grains to help differentiate or enhance their beer. Oats, wheat, CaraPils, aromatic, Vienna, Munich and more show up in various recipes.

I prefer to keep it simple, with no more than one additional malt. Avoid caramel malts, especially those of higher color. Caramel flavor isn't an appropriate character in tripel. If you are going to experiment, focus on the grainy/bready malt flavors instead (such as biscuit, aromatic, Vienna or Munich) and do not add more than 3%. You can experiment with other character grains, but remember this beer is more about the clean Pilsner malt character and fermentation flavors so don't overwhelm them with specialty malts.

Belgian tripel has a medium to medium-light body. Since this is a bigger beer with high starting gravities, all-grain brewers should target a mash temperature around 149 °F (65 °C), which strikes a nice balance between fermentable and non-fermentable sugars. For extract brewers, most light colored extracts are not fermentable enough on their own, but with a portion of simple sugar (table sugar), it should attenuate enough. You will still want to buy an extract that attenuates well or you will need to make your extract-based wort more fermentable by replacing more of the extract with table or corn sugar. You can use up to 20% table sugar with good results. There is no need to use special sugars. The cheapest grocery store brand is perfect. Beet sugar or cane sugar, it does not matter.

Tripel hop character is usually restrained, with a low to moderate spicy or slightly floral hop aroma and flavor. I prefer to stick with noble hops such as Saaz, Hallertau or Tettnang. Traditionally,

Continued on page 21

belgian tripel by the numbers

OG:	1.075–1.085 (18.2–20.5 °P)
FG:	1.008–1.014 (2.0–3.6 °P)
SRM:	4.5–7
IBU:	20–40
ABV:	7.5–9.5%

Strict Observance Tripel
(5 gallons/19 L, all-grain)
OG = 1.081 (19.5 °P)
FG = 1.012 (3.0 °P)
IBU = 34 SRM = 5 ABV = 9.2%

Ingredients
12.4 lb. (5.6 kg) Durst continental Pilsner malt or similar (~1.6 °L)
2.2 lb. (1 kg) cane or beet sugar (0 °L)
3.5 oz. (100 g) Castle or Dingemans aromatic malt (20 °L)
7.6 AAU Tettnang pellet hops, (1.9 oz./54 g of 4% alpha acid (60 min.)
1.4 AAU Czech Saaz pellet hops (0.4 oz./12 g) 3.5% alpha acid (10 min.)
White Labs WLP530 (Abbey Ale) or Wyeast 3787 (Trappist High Gravity) yeast

Step by Step
Belgian Pilsner malt would be the natural choice for the base malt, but I use what I have on hand, which is Durst Pilsner. Feel free to substitute any high quality malt of a similar flavor and color from a different supplier. The sugar I use is the cheapest grocery store table sugar I can find.

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 149 °F (65 °C). Hold the mash at 149 °F (65 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (24.4 L) and the gravity is 1.063 (15.4 °P).

The total wort boil time is 90 minutes, which helps reduce the S-Methyl Methionine (SMM) present in the lightly kilned Pilsner malt and results in less Dimethyl sulfide (DMS) in the finished beer. Add the bittering hops with 60 minutes remaining in the boil. Add the sugar and Irish moss or other kettle finings with 15 minutes left in the boil. Add the last hop addition 10 minutes before shutting off the burner. Chill the wort rapidly to 64 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

You will need three packages of liquid yeast or you can make a 4-L starter from one package. Pitch yeast at 64 °F (18 °C), aerate or oxygenate, and let the temperature rise slowly to 70 °F (21 °C) over the course of one week. Ferment until the yeast drops clear. With healthy yeast, fermentation should be complete in a week, but do not rush it. Rack the beer to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Carbonate the beer to approximately three to four volumes and allow it to lager for one month at 45 to 50 °F (7 to 10 °C).

Strict Observance Tripel
(5 gallons/19 L, extract with grains or extract only)
OG = 1.081 (19.5 °P)
FG = 1.012 (3.0 °P)
IBU = 34 SRM = 5 ABV = 9.2%

Ingredients
8.5 lb. (3.9 kg) Pilsner liquid malt extract (~2.3 °L)
2.2 lb. (1 kg) cane or beet sugar (0 °L)
3.5 oz. (100 g) Castle or Dingemans aromatic malt (20 °L)
7.6 AAU Tettnang pellet hops, (1.9 oz./54 g of 4% alpha acid (60 min.)
1.4 AAU Czech Saaz pellet hops (0.4 oz./12 g) 3.5% alpha acid (10 min.)
White Labs WLP530 (Abbey Ale) or Wyeast 3787 (Trappist High Gravity)

Step by Step
Feel free to substitute any high quality malt extract of a similar flavor and color from a different supplier. Always choose the freshest extract that fits the beer style. If you cannot get fresh liquid malt extract, it is better to use an appropriate amount of dried malt extract (DME) instead, since it does not oxidize nearly as fast and tends to be fresher.

You can consider the aromatic malt optional. You can omit it completely or replace it with a few ounces of Munich malt extract. If you do use the aromatic malt, it is best to try and get it to convert in a very simple mini mash. Mill or coarsely crack the aromatic malt and add it to 6 oz. (177 mL) of 158 °F (70 °C) water. Mix the grains until completely moist, and then do your best to keep the temperature between 150 and 160 °F (66–71 °C) for 30 minutes to one hour. You can do this by setting the container in a larger pot of hot water or wrapping it in a heating pad set on high. The warmer the temperature, the less time it will take to convert the starches, but don't exceed 160 °F (71 °C) to avoid accidentally denaturing the enzymes in the malt. When done the liquid will taste slightly sweet.

Strain out the grains and rinse with warm water. Add the liquid from the mini mash along with enough water and malt extract to make a pre-boil volume of 5.9 gallons (22.3 L) and a gravity of 1.069 (16.8 °P). Stir thoroughly to help dissolve the extract and bring to a boil.

Once the wort is boiling, add the bittering hops. The total wort boil time is one hour after adding the bittering hops. Add the sugar and Irish moss or other kettle finings with 15 minutes left in the boil. Add the last hop addition just before shutting off the burner. Chill the wort rapidly to 64 °F (18 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

You will need three packages of liquid yeast or you can make a 4-L starter from one package. Pitch yeast at 64 °F (18 °C), aerate or oxygenate, and let the temperature rise slowly to 70 °F (21 °C) over the course of one week. Ferment until the yeast drops clear. Follow the carbonation, conditioning and packaging instructions for the all-grain recipe above.

breweries also use Styrian Goldings and I think in a pinch other varieties such as Mount Hood, Liberty or Kent Goldings are fine as well. A single, small addition near the end of the boil is about all you can add and still consider the beer a "traditional" example. Plenty of brewers are experimenting with increased aroma and flavor additions, but do not count on those experiments doing well in competition when entered as a classic example.

A good tripel finishes dry, with a firm bitter character. That dryness and bittering comes from alcohols, phenols, carbonation and hops. You can use any of the same hops for bittering and you should strive to balance any residual malt sweetness. The bitterness-to-starting gravity ratio (IBU divided by OG) ranges between 0.25 and 0.5, although most brewers will want to shoot for 0.4 — unless you are getting a very dry finish from fermentation.

There are many great yeast strains for brewing this style, but two of my favorites are White Labs WLP530 Abbey Ale and Wyeast 3787 Trappist High Gravity. Other excellent choices are White Labs WLP500 Trappist Ale, WLP540 Abbey IV Ale Yeast, WLP550 Belgian Ale Yeast and Wyeast 1762 Abbey II or 1214 Belgian Ale Yeast. You cannot go wrong with any of these yeast strains. When selecting yeast, keep in mind that the yeast provide a great deal of the character for this style. The spicy, peppery notes are from yeast-produced phenols and the fruity notes are from yeast-produced esters. 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. Getting the right settings is your job as a brewer.

Fermenter height also plays a role in flavor development, with very tall fermenters (like big commercial cylindroconical types) suppressing ester and fusel alcohol production. While you might think this does not apply to your brewing, it does in a roundabout way. Often homebrewers will say, "Brewery X ferments their classic tripel at 88 °F/31 °C, so that is the fermentation temperature I use." The problem is that the shape of the brewery's fermenters may be suppressing the production of esters and fusel alcohols. When you use the same fermentation profile in your relatively short fermenter, you end up with fruit salad dissolved in paint thinner. Well, maybe not that bad, but pretty darn close. Do not let "how the brewery does it" determine your process unless you are using the same equipment and methods.

With most of these yeasts I recommend pitching at a rate of 0.75 million cells per milliliter per degree Plato (see the pitching rate calculator at www.mrmalty.com for help in calculating this for your beer). Pitch the yeast at a cool temperature and allow 12 to 36 hours for the majority of yeast growth, then ramp up the temperature for the rest of fermentation to ensure good attenuation. For example, pitch the yeast at 64 °F (18 °C) and raise the temperature to 70 °F (21 °C) on the second day or slowly let it rise over the course of one week. You may find a higher or lower temperature gives you the ideal result, so do not be afraid to tweak the parameters until you get it right.

One concern when brewing this style is getting enough attenuation. Many brewers go with lower and lower mash temperatures in an attempt to achieve this, but that is not usually the problem. It isn't that you need to get rid of all the long chain dextrins to make a dry beer. Those dextrins are not sweet and you can have plenty of them present in a nice, dry beer. The important thing is to make sure you ferment out all the simpler sugars completely. If you leave a lot of maltose behind unfermented, then the beer is going to taste sweet, even though it might attenuate well. Starting with a healthy pitch of yeast, aerating or oxygenating, and controlling temperatures is key to getting a dry finish.

If you are having trouble getting a dry beer, one trick that seems to help is waiting until the fermentation is nearly done before adding the simple sugars. Wait until fermentation has started to slow and then add the sugar. Adding the sugar after the yeast have consumed the maltose is like telling your kids to finish their dinner before they can have dessert. If you don't do that, sometimes they will fill up on dessert first and have little desire to eat their dinner afterwards. If all else fails, you can pitch an actively fermenting lager yeast, which will consume some sugars that the ale yeast will not. Do not add the yeast if they are not in an active fermentation state, because they will just settle out. Make a small starter and wait until the yeast are at high kräusen before you add it to the beer. The lager yeast won't add any real flavor at this late stage, but they will consume some additional sugar.

Oxygen is important to yeast health and is necessary for fermentation to reach terminal gravity in a reasonable amount of time. However, too much or too little oxygen can have unintended consequences, so adding the right amount of oxygen is important. That is difficult for many homebrewers, but at least you should try to measure the amount of oxygen you are adding by timing and flow rate. The amount of oxygen needed is a balancing act. Initially adding oxygen reduces the amount of esters yeast produce, but high levels of oxygen also increase the amount of fusel alcohols, which are also a substrate for ester production. So playing around with the amount of oxygen you add makes a difference in your beer. If you are using air, there is no chance of over-aerating your wort, but there is a chance of under-aerating. If you are using oxygen with a sintered stone, a good starting point for 5 gallons (19 L) is a flow of 1 L per minute for 1 minute. You might go up or down from there, as experience shows you what is right for your brewing. If you find yourself getting stuck fermentations when brewing high gravity beers, you can add a second dose of oxygen between 12 and 18 hours after pitching. The second dose should be about ½ to ¾ the normal amount of oxygen. This will give the yeast the ability to rebuild their cell membranes after having replicated. They will better tolerate the high alcohol environment ahead with this additional oxygen. BYO

Jamil Zainasheff writes "Style Profile" in every issue of Brew Your Own.

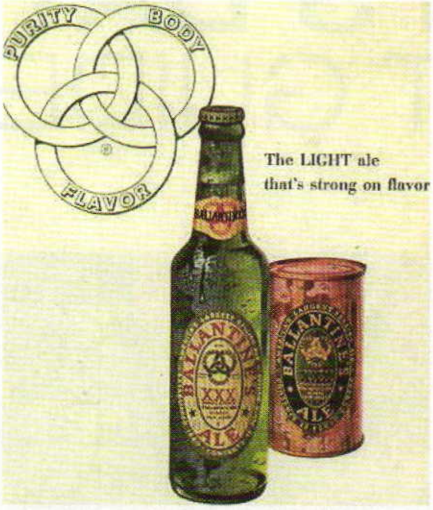
FATHER'S DAY GIFT GUIDE

This Father's Day Give Him Something He'll Really Use!

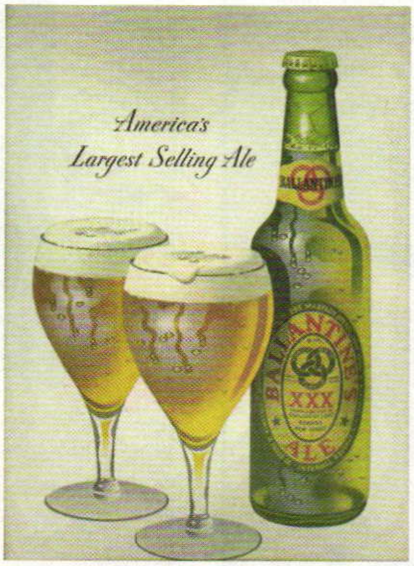
Check out these businesses for great gift ideas for your dad or your own Father's Day wishlist.

SPECIAL ADVERTISING SECTION

Story by **BILL PIERCE**



MAKE MINE BALLANTINE



BREW A HISTORIC AMERICAN ALE

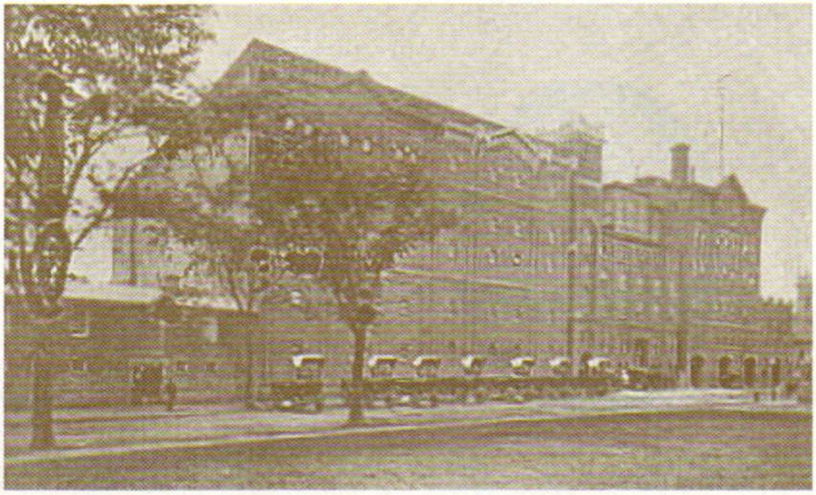
During the late 1960s and 1970s, when I was young and did a fair amount of traveling, one beer I was fond of was Ballantine XXX Ale. It was an ale rather than a lager, and it had a very noticeable hop character and presence. At a time when other American beers were becoming increasingly bland and less distinguishable from each other, here was one that was distinctive, with a lingering hop finish.

Mention the name Ballantine to others old enough to appreciate beers from that era, and you will receive smiles and knowing looks that evoke admiration and glowing tributes. As longtime craft beer enthusiast, elder statesman and writer Fred Eckhardt wrote in 2000, "Ballantine IPA would be a good choice for the greatest and most enduring American brewing triumph of the early and mid-20th century."

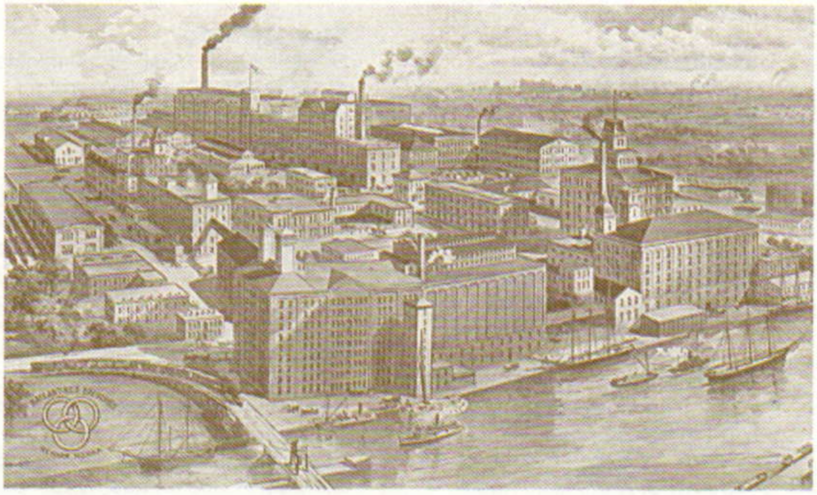
And if that is not enough to pique a beer lover's interest, there was Ballantine Burton Ale, one of the rarest and most illustrious American beers ever brewed. A beer that, after 60 years or more, is cause today for celebration when a bottle comes to light and is opened by beer connoisseurs.

The Pride of Newark

The long history of these beers goes back to 1820, when 29-year-old Peter Ballantine emigrated from Scotland to America and found a brewing job in Albany, New York. After some years, the enterprising young brewer started his own brewery, which in 1840 he moved to Newark, New Jersey, in



~1915
Ballantine Delivery Truck
Photo from Glenn G. Geisheimer



BALLANTINE ALE recipes

Ballantine XXX (original recipe) clone
(5 gallons/19 L, all-grain)
OG = 1.055 FG = 1.011
IBU = 39 SRM = 9 ABV = 5.7%

Ingredients
8.0 lbs. (3.6 kg) six-row pale malt
2.5 lbs. (1.1 kg) flaked maize (corn)
1.0 lb. (0.45 kg) light Munich malt
8.0 oz. (0.23 kg) crystal malt (20 °L)
1 tsp. Irish moss (15 mins)
7.0 AAU Cluster hops (60 mins)
(1.0 oz./28 g at 7% alpha acids)
4.0 AAU Brewers Gold hops
(25 mins)
(0.5 oz./14 g of 8% alpha acids)
0.75 oz. (21 g) Brewers Gold hops
(5 mins)
1.0 oz. (28 g) Cascade hops
(dry hops)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast
(1.5 qt./1.4 L yeast starter)

Step by Step
Single infusion mash, 60 minutes at 150 °F (66 °C). Boil wort for 90 minutes. Ferment at 68 °F (20 °C).

Ballantine XXX (original recipe) clone
(5 gallons/19 L, extract with grains)
OG = 1.055 FG = 1.014
IBU = 39 SRM = 9 ABV = 5.3%

Ingredients
7.25 lbs. (3.3 kg) American light lager liquid malt extract
1.0 lb. (0.45 kg) Munich liquid malt extract
8.0 oz. (0.23 kg) crystal malt (20 °L)
1 tsp. Irish moss (15 mins)
7.0 AAU Cluster hops (60 mins)
(1 oz./28 g at 7% alpha acids)
4.0 AAU Brewers Gold hops
(25 mins)
(0.5 oz./14 g of 8% alpha acids)
0.75 oz. (21 g) Brewers Gold hops
(5 mins)
1.0 oz. (28 g) Cascade hops
(dry hops)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast
(1.5 qt./1.4 L yeast starter)

Step by Step
Place crushed specialty grains in a coarse bag and steep in 0.5 gallon (2 L) 140–150 °F (60–66 °C) water for 30 minutes. Add the steeping water to the kettle with the malt extract at the beginning of the boil. Boil 90 minutes. Ferment at 68 °F (20 °C).

Ballantine IPA clone
(5 gallons/19 L, all-grain)
OG = 1.074 FG = 1.016
IBU = 62 SRM = 14 ABV = 7.4%

Ingredients
11.5 lbs. (5.2 kg) six-row pale malt
2 lb. 6 oz. (1.1 kg) flaked maize
1.75 lb. (0.79 kg) light Munich malt
8.0 oz. (0.23 kg) crystal malt (60 °L)
1 tsp. Irish moss (15 mins)
13 AAU Cluster hops (60 mins)
(1.9 oz./53 g at 7% alpha acids)
8.0 AAU Brewers Gold hops
(25 mins)
(1.0 oz./28 g at 8 alpha acids)
1.0 oz. (28 g) East Kent Golding hops (3 mins)
1.0 oz. (28 g) East Kent Golding hops (dry hop)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast
(1.8 qt./1.7 L yeast starter)

Step by Step
Single infusion mash for 60 minutes at 150 °F (66 °C). Boiling wort for 90 minutes. Ferment at 68 °F (20 °C).

Extract option:
Replace the grain bill with 9.25 lbs. (4.2 kg) American light lager liquid malt extract, 1.5 lb. (0.68 kg) Munich liquid malt extract and 8.0 oz. (0.23 kg) crystal malt (60 °L). Place crushed specialty grains in a coarse bag and steep in 0.5 gallon (2 L) 140–150 °F (60–66 °C) water for 30 minutes. Add the steeping water to the kettle with the malt extract at the beginning of the boil. Boil for 60 minutes. Ferment at 68 °F (20 °C).

order to be closer to the growing New York City market. His family followed him and, by the 1870s, P. Ballantine and Sons was the fifth largest brewer in the US. Peter Ballantine remained active in the business until his death in 1883 at age 91. His heirs continued to do well until the untimely arrival of Prohibition in 1919, during which time they produced malt syrup and diversified into other fields.

With the Twenty-First Amendment and Prohibition's repeal in 1933 came a major change. The company was purchased from the founding family by German-American brewing equipment salesman Carl Badenhausen and his brother Otto. They grew the business quickly to again become a major player in the East Coast beer market. By the early 1950s, Ballantine was brewing more than 5 million barrels per year as the third largest American brewer behind Schlitz and Anheuser-Busch.

Ballantine was an early sponsor of TV programs and major league sports broadcasts. Both Yankee Stadium in New York and Shibe Park in Philadelphia (former home of the Phillies) featured large Ballantine signs. Ballantine also had a connection with American writers. John Steinbeck appeared in a 1950s magazine ad for Ballantine Ale, and Ernest Hemingway made his only beverage endorsement, saying, "You have to work hard to deserve to drink it. But I would rather have a bottle of Ballantine Ale than any other drink after fighting a really big fish." Hunter S. Thompson mentioned the beer in his book, "Fear and Loathing on the Campaign Trail."

All Hail the Ale

Although the majority of their production beginning in the early 20th Century was lager, Ballantine was unique among large American breweries because they continued to brew several ales, perhaps as a nod to the founder's Scottish roots. The most popular was Ballantine XXX Ale, the ancestor of today's American pale ales. The original recipe had a starting gravity of about 1.055, an alcohol content of 5.5% by volume, and was bittered to 35–40 IBUs. There is debate about the hop varieties, which were likely Cluster for bittering and Bullion and/or Brewers Gold for flavor; later there may have been Cascade for aroma.

In the late 1970s and early 1980s, at the dawn of the American craft brewing revolution, one ale pioneering microbrewers were likely to know — and sometimes try to emulate — was Ballantine XXX. Many of the popular craft-brewed American pale ales from that period were influenced to some degree by this beer. Of the yeast strains available at the time, the Ballantine ale yeast was relatively neutral and noted for stable fermentation and high attenuation under varying temperatures and conditions. It became a fixture of early microbrewing that continues into the present.

I spoke with Sierra Nevada Brewing co-founder and president Ken Grossman about this subject. His recollection is that there were only a limited number of yeast strains available in 1979 as he and his former partner Paul Camusi made the transition from homebrewing to commercial brewing. They experimented until they achieved the desired fermentation and flavor profile for Sierra Nevada Pale Ale. "We didn't know that it was the Ballantine yeast," he said, "but it very well could have been."

While each brewery's "house yeast" strain has evolved over time, it is widely believed that the Ballantine ale yeast strain is the ancestor of today's most popular homebrewing strain, now available as Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) and as Fermentis Safale US-05.

Good, Better and Best

Even more celebrated than Ballantine XXX, both during its heyday and in memory today, was Ballantine IPA, one of the very few and by far the best-known American example of this style from the 1940s into the 1980s. For that era, it was a hop monster — bittered to 60 IBUs and possessing a distinctive hop character, enhanced by the use of hop oil for the late additions. The brewery powdered the hops, added water and then used a vacuum process to distill the essential oils with steam at low temperatures.

Ballantine IPA was a strong beer, about 18 °Plato (SG 1.074) original gravity and 7.5% alcohol by volume. Additionally, it was aged for a year in tanks lined with American oak, which gave it a noticeable oak flavor. The historical English IPAs were shipped in oak casks for their long voyage to India, but the interior of the casks was coated with pitch that largely prevented the wood from influencing the beer.

The most legendary and strongest of all the Ballantine offerings was Ballantine Burton Ale. This dark ruby red prototype for American barley wine was reportedly more than 10% alcohol by volume, and only brewed very occasionally — possibly only twice. It was patiently aged for ten years or more in similar oak-lined tanks as the IPA. Never offered for sale to the public, the potent elixir was instead bottled individually each year prior to the Christmas holidays and presented as gifts to brewery employees, distributors, VIPs and celebrities. Last released in 1971, the label for each bottle bore the brewing and bottling dates, the name of the recipient and the signatures of brewery owners Carl and Otto Badenhausen. The late British beer writer Michael Jackson speculated that Ballantine Burton Ale was the inspiration for microbrewery pioneer Fritz Maytag's recipe for what is now called Anchor Old Foghorn Barleywine Style Ale.

During the ensuing years, bottles of the Burton Ale have been discovered that were intended for the likes of Yankees and Mets manager Casey Stengel, New York's Francis Cardinal Spellman, real estate developer Del Webb and entertainer Milton Berle. After well over half a century, they have been opened and tasted with great fanfare. While time has contributed sherry-like notes, the beer is said to have stood up well, still displaying considerable aroma and flavor complexity. Bottles appear sporadically for sale on eBay at prices in line with their scarcity.

Among those who have been fortunate enough to sample this renowned brew are avid homebrewer and former craft beer entrepreneur Bob Girolamo, now of Chico, California. He purchased three bottles of Ballantine Burton Ale, and shared one of them on July 4, 2005 with Denny Conn of Noti, Oregon, a popular contributor to many Internet homebrewing forums. According to the label, it was brewed on May 12, 1934, and bottled more than 14 years later in December 1948, where it had remained for more than half a century longer. They very carefully decanted the bottle of 71-year-old ale into a pitcher, sniffing the aroma and sipping judiciously during the course of an hour as they took careful notes. Conn wrote, "The aroma (of cherry and plum) was simply amazing, constantly evolving over that time."

The (Less) Bitter End

The great wave of mergers and consolidation that swept American brewing beginning about 1960 was not kind to Ballantine. They had purchased a rival Newark brewery in 1943, but did not buy or build breweries in other cities in order to expand their regular distribution west of Chicago. By 1965, production had fallen to ninth place among American brewers and the company began to lose money. Finally, in 1969, Ballantine was sold to a group of outside investors, who less than three years later again sold the beers, but not the Newark brewery location, to Falstaff Brewing for $4.3 million and a 50-cent royalty per barrel produced, considered a bargain at the time. Falstaff had excess capacity at other breweries, and production of the Ballantine beers was moved to Cranston, Rhode

Island. Some of the brewery equipment came with them, and at first an attempt was made to preserve the original recipes and brewing methods.

However, the Burton Ale was neither brewed nor bottled again, and the gravity and bittering of both the XXX Ale and the IPA were gradually reduced, as was the aging time. The distilled hop oil was replaced by dry hopping. Falstaff did not fare well in those turbulent times for American brewers, and in 1979 Ballantine production moved again to Ft. Wayne, Indiana, where it remained until 1990 after a merger with Pabst Brewing in 1985. The Ballantine beers were next brewed in Milwaukee from 1990 to 1996, at which time the flagship Pabst brewery was closed. The closure also marked the demise of Ballantine IPA. The oak-lined tanks had survived the various moves from Newark to Cranston to Ft. Wayne to Milwaukee, where they are now said to sit empty in the idle former Pabst location.

During the years from 1996 to 2001, Ballantine XXX Ale was brewed intermittently at Pabst-owned operations in Tumwater, Washington, San Antonio, Texas, and Lehigh Valley, Pennsylvania. Finally, in 2001, Pabst closed the last of its breweries and became strictly a marketing company, contracting the brewing to Miller (now MillerCoors). At first they brewed Ballantine XXX in Eden, North Carolina; today it is brewed at the MillerCoors facility in Trenton, Ohio.

The current Ballantine XXX Ale is a shadow of its former self, more of an American malt liquor than a true ale, with a somewhat higher alcohol content (5.1 percent by volume) and more bittering (reportedly 21 IBUs) than standard American lagers, which gives it more flavor than its competitors for that segment of the market. And though among its popular current packages is the decidedly down-market 40 oz. (1.2 L) plastic bottle, it continues to enjoy some status among those who know it as a token of a time when it was a proud symbol of some of the best beer American brewers had to offer. Homebrewers can savor something similar to the original Ballantine beers by brewing the clone recipes on page 26. BYO

Bill Pierce is a frequent contributor to Brew Your Own *magazine.*

Breakfast
Served Anytime

MENU

by **Chris Colby**

wake up & smell the coffee

......................$1.50/free refills

Many brewers start their morning with a cup of coffee and end their evening with a glass of beer. It was only a matter of time before someone thought to combine the two. Back in 1995, Redhook introduced their Double Black Stout — a big, roasty stout with Starbucks coffee added. These days, many breweries and brewpubs produce coffee beers. There is even a coffee beer category at the GABF.

Perhaps the most interesting coffee beer in the world is Beer Geek Breakfast — Weasel. This beer, produced by the Danish brewery Mikkeller (but brewed at the Nøgne Ø brewery in Norway), is made with *kopi luwak*, an Indonesian coffee made from coffee "beans" that are eaten by the Asian Palm Civit (*Paradoxurus hermaphroditus*) — a housecat-sized mammal from the Order Carnivora. *Kopi luwak* producers collect the beans from the feces of these animals, clean and roast them.

Brewing a coffee beer — whether a straightforward espresso stout or something more exotic — is not difficult, but knowing a little bit about coffee can guide you toward making better decisions in your recipe formulation and brewing techniques.

Growing Coffee

Coffee beans typically come from one of two tropical trees, native to Africa — *Coffea arabica* and *Coffea canephora*. Other flavoring agents, especially chicory, have been used as a substitute for, or blended with, coffee.

C. arabica yields the beans used to make "arabica" coffee, while *C. canephra* produces "robusta" beans. Arabica coffee is preferred by coffee experts over robusta for being less bitter and more aromatic. *C. canephra* is, however, more resistant to disease and produces higher yields. As such, it is cheaper to produce and often ends up in coffee blends. Robusta beans also contain roughly twice the caffeine as arabica.

Coffea trees produce small red fruits, similar to cherries, with two large seeds inside. These seeds are called coffee beans, even though coffee is not a legume. Prior to roasting, the seeds are called green beans.

Coffee is grown in an equatorial belt around the world extending from 25 degrees north latitude to 30 degrees south latitude, with most arabica grown at altitudes between 3,000 and 8,000 feet. Brazil is the world's top coffee producer, producing about 25% of the world's coffee. Other famous coffee growing regions include Guatemala, Costa Rica, Colombia, Ethiopia, Kenya, Yemen, Indonesia (including Java, whose name is sometimes used as a synonym for coffee) and Hawaii. Coffees from different regions have different characteristics, which may result from the botanical variety of coffee being grown, the environmental conditions the plants experience, the way the green beans are processed or a combination of these.

Green beans are prepared for roasting in a variety of ways, but they fall into two categories — dry and wet. The dry method basically involves picking the coffee cherries, then spreading them out in the sun to dry. The fruit pulp is removed mechanically after the fruits are dried. In the wet method, cherries are fermented to soften the flesh of the fruit before removing it and then drying the beans. There is a lot of variation in how coffee is processed. The main thing to remember is that in dry processing, the beans are dried, then the fruit pulp is removed. In the wet method, the fruit pulp is removed, and then the beans are dried. The wet method is used for most arabica coffees grown outside of Brazil. Almost all robusta coffees are dry processed. Once the green beans are ready, they are shipped to roasters.

Roasting Coffee Beans

The flavors and aroma of coffee are primarily developed during roasting, and are refined in the 24 hours after roasting. Coffee beans are generally roasted at 380–540 °F (193–282 °C) for up to 15 minutes. The internal temperature of the beans rises from their storage temperature to 375–425 °F (190–220 °C), with darker roasts finishing at higher temperatures. After roasting, the beans are cooled and allowed to rest for at least 24 hours before coffee is brewed from them. During this time period, referred to as degassing, carbon dioxide (CO_2) formed during roasting is slowly released. There are a number of descriptive terms for the levels of roast and those most frequently encountered are summarized in Table 1. See the sidebar on page 35 for how to roast coffee at home.

Darker roasts feature the roasty and bitter flavors of the dark melanoidins developed during roasting while lighter roasts retain more of the varietal and location-specific aspects of the green beans. Many times, a particular kind of coffee is preferentially roasted to a specific level. For example, Hawaiian Kona coffee is generally lightly roasted. When you buy roasted beans, the region they were grown in and the level of roast is usually specified. For example, your coffee may be Sumatran Mandheling, Full City Roast.

Making a Cup of Coffee

There are many methods to making a cup of coffee. Basically, roasted coffee beans are ground and hot water is passed through them, but different methods utilize different water temperatures, grind fineness and contact times. Higher temperatures, finer grinds and longer extraction times favor more extraction, but also bring out excessive bitterness. In contrast, underextracted coffee is acidic and lacks body and sufficient roast character. Making a good cup of coffee requires the brewer to balance all of the variables to get just the right amount of extraction from the grounds.

Grinding — Most coffee sold in the United States is ground. However, many supermarkets or coffee specialty stores also sell roasted whole beans. There are a variety of appliances or gadgets for grinding coffee beans. The cheapest grinders utilize spinning blades to reduce the size of the beans. Burr grinders give the coffee brewer more control over the particle size of the grounds, but are more expensive. How finely the beans should be ground depends on the brewing method.

Extracting — The "recipe" for coffee is 15 parts water to every part coffee, by weight (approximately 2 tablespoons of medium ground coffee per 6.0 oz./180 mL of water). For a "regular" cup of coffee, about 1.3% of the liquid is coffee solids. The best coffee is made when just over 20% of the solids are extracted from the beans. Most coffee experts agree that the best coffee is made with a water temperature of 190–200 °F (85–93 °C) and a contact time of 1–3 minutes for finely ground beans or 6–8 minutes for coarsely ground beans.

Espresso is a strong coffee made by pushing pressurized (~9 PSI) hot water quickly through finely ground coffee beans; it contains about 5% solids. The key variables of different methods of coffee brewing are summarized in Table 2.

Old fashioned percolator coffee makers are not used much anymore, because the boiling water extracts too many coffee solids (up to 30% of the dry weight of the bean), drives off aromatic compounds and delivers an overly bitter cup.

Automatic drip coffee makers are popular, but vary widely in how close they come to the ideal brewing time and temperature. The Dutch company Technivorm specializes in producing coffee makers that deliver water at the right temperature and for the correct amount of time, and are approved by the Specialty Coffee Association of America. For manual drip coffee making, the all-glass Chemex coffee makers are a favorite of many coffee fans.

The French press method involves placing the ground coffee in a "plunger pot" and letting it steep in hot water. When the coffee is ready, the brewer pushes down on the plunger, forcing all the grounds to the bottom of the pot. The finished coffee is then poured from the pot. The French press method lets the coffee brewer control the time and temperature accurately, but leaves small bits of coffee solids behind in the beverage. Bitterness will continue to be extracted from these solids and can lead to excessive bitterness, but this generally isn't a problem if the coffee is drank quickly. French presses are inexpensive and homebrewers can also use them to make hot water extracts from hops.

Machines that make espresso correctly (via pushing pressurized water through the grounds) are very expensive. Cheaper espresso machines use steam (at ambient pressure) to extract the coffee and —

Table 1
LEVELS OF ROAST

Degree	Other names	bean	color
Light	Cinnamon, New England, Half City	dry	cinnamon
Medium	American, Breakfast, City	dry	brown
Dark/Full	Vienna, Full City	lightly oily	dark brown
Double	French, Italian	oily	black

Table 2
COFFEE BREWING METHODS

	Filter Machine	Percolator	French Press	Espresso
Grind	medium to coarse	coarse	coarse	fine
Temperature	180–185 °F (82–85 °C)	212 °F (100 °C)	190–195°F (87–93 °C)	200 °F (93 °C)
Time	5–12 mins	3–5 mins	4–6 minutes	20–30 seconds
Results	fair to good	poor	good	good

although they put a nice, frothy head on the cup — do not get the same results with regards to flavor.

As with beer, there are many variables to brewing good coffee and one cannot explain all the nuances of brewing coffee in a handful of paragraphs. Hopefully, however, understanding the basics of how a good cup of coffee is made will guide you in deciding how to incorporate coffee into your beer.

Coffee Flavor in Beer

Coffee has a complex flavor and aroma. We know that our taste buds only respond to five stimuli — sweet, sour, salty, bitter and umami ("brothy"). And we know that coffee is bitter and acidic. So, the bulk of what we think of as coffee flavor is really due to the vast number of volatile, aromatic oils in the cup. You can verify this for yourself with a simple experiment. Brew some coffee, pour a small amount in a cup (so it cools quickly), then go outside for a minute or two — or anywhere beyond the reach of the coffee's aroma — and smell something strongly scented. Then, pinch your nose and quickly return and take a sip of the coffee. Don't swish the coffee around in your mouth or sip so that you are pulling air across the surface of the brew and into your mouth. Just take a quick sip and swallow immediately. Next, quit pinching your nose, inhale the aroma of the coffee and take another sip. The first sip will likely taste bitter and acidic, but mono-dimensional. It may even be unpleasant. The second sip should taste like coffee; the bitterness and acidity will be present, but it will seem more complex. As beer brewers, this should tell us that, if we want the complex character of coffee in our beer — and not just "blank" bitterness and acidity — we should strive to preserve the aromatic compounds in the coffee.

Coffee in Beer

There are a variety of ways to add coffee to beer. These include adding ground beans (in a steeping sack) for the final few minutes of the boil or placing the grounds (again, in a steeping sack) in the post-boil wort prior to cooling. You can also add brewed coffee to the beer after primary fermentation or try "dry beaning" — adding whole beans to the secondary fermenter or keg and letting them steep in a manner analogous to dry hopping.

If you want to maximize the amount of coffee character you achieve with respect to the amount of coffee beans you use, adding brewed coffee after fermentation is the way to go. Using this method, you begin with coffee made with the right amount of extraction, and you don't lose aromatics in the boil or fermentation. As an added benefit, you can make a small test blend before adding the coffee to the full batch of beer.

Making a small amount of coffee in a French press lets you control the temperature and contact time when brewing the coffee. You can also control the ratio of coffee to water in the mix. To keep the dilution of the beer to a minimum, making doubly or

Continued on page 36

by Dave Green

Home Coffee Roasting

Roast coffee at home . . . why? I would answer for the same reason we brew beer at home. It's mainly about the enjoyment of taking a raw product and trying to produce a high quality finished version using your own tools. Or you could also justify it by saying you would be saving money, since raw coffee beans cost roughly half their roasted version. Either way, if you'd like to start home roasting coffee, you will need two things to start with — the raw coffee beans (also known as green beans) and some form of roasting device.

Before roasting, green coffee beans look like the pile to the left. On the right, roasted beans turn a dark brown, depending on the level of the roast.

Green beans can be found at some of the better natural food stores, co-ops, homebrew shops or specialty coffee vendors, many of which can be found online. (See, for example, morecoffee.com or www.sweetmarias.com) As the name implies, the beans will arrive the color green. They will also be much smaller than roasted beans and, of course, smelling nothing like the roasted product. There is a huge variety of green beans to explore from Tanzanian Peaberry to Mexican High Grown Chiapas to Sumatran Mandheling, just to name a few. Each coffee growing region lends its own distinctive characteristics and acidity to the mix.

Now that you have the green beans, you need to figure out how to roast them. You can go for the simple approach by utilizing a wok or skillet on a stovetop range and constantly stir the beans until a proper roast is gained. The next step up is to find an old air popcorn popper. The rotating roasting drum will provide a more even and consistent roast for the beans. (However, not all air popcorn poppers can be used to roast coffee beans). The ultimate tool for roasting beans at home is a home roaster. A coffee roaster will provide the consistent roast like the air popcorn popper, but will also permit the roaster to achieve different temperatures, adding an additional level of control over the finished product. Just as an all-grain brewer will mash grains at a range of temperatures to produce a different beer, the temperature profile of the roast will alter the final flavor of your home roasted coffee beans.

The actual roasting of the green beans can be done in as little as 4 minutes, but can take up to 30 minutes, depending on several factors. (Most commercially roasted beans are roasted in 9–14 minutes.) Typically, roasting occurs between roughly 400–500 °F (204–260 °C), so if you are planning a stovetop roast, you'll probably want to have an oven or laser thermometer on hand to assure the proper temperature. Once you have achieved the proper temperature in the pan, you will want to stabilize the temperature while keeping the beans in constant motion to avoid scorching and keeping your ears open for the first crack of the beans. The sound of the first crack is something akin to a quiet pop of popcorn and you will see that the bean will start to yellow and expand as moisture trapped inside the bean looks for a way to escape. As the first crack ends, your beans will have reached a city roast, which is a medium roast. There is usually a short lull between cracks, but soon after the first crack finishes, you will start to hear the sharper cracks indicating that second crack has commenced; your beans have now reached a full city roast. The second crack indicates that the cellular matrix of the coffee is starting to break down. Chemical reactions inside the beans (including Maillard reactions and the caramelization of sugars) will begin to occur rapidly at this point, so it is important to be vigilant if you continue to roast past the start of the second crack. The beans can proceed through Vienna roast, into French roast and beyond fairly quickly. Smoke will start pouring out of the roast until finally the beans will start to ash or burn, so special attention is required through this phase.

Once you have reached the desired level of roast, you need to let the beans cool down. A colander is a good kitchen tool to utilize to help cool the beans fairly rapidly as the air flow will help dissipate heat faster. At this point, it is best to let the beans rest (degass) for about 24 hours to allow any trapped carbon dioxide (CO_2) to escape from the bean. Store the beans in an airtight container out of direct sunlight. Roasted beans stay at peak freshness for roughly one week before the flavors and aromas begin to diminish.

One word of warning, roasting coffee beans produces copious amounts of smoke. Even if you have a smoke suppression system in your coffee roaster, you should still roast under a vent or hood, otherwise your smoke detector will go off. Outside roasting is preferred among many home coffee roasters.

Now that you know the basics, it's time to give home coffee roasting a try. If you're planning on adding coffee to your next batch of stout or porter, a nice full city roast is my preference. A full city roasted bean has nicely caramelized sugars, with a lot of the oils and soluble solids still intact to produce a flavorful complement to your homebrew.

Coffee Beer Recipes

Wolaver's Alta Gracia Coffee Porter clone

(5 gallons/19 L, all-grain with coffee and vanilla)

OG = 1.068 FG = 1.020
IBU = 27 SRM = 65 ABV = 6.2%

Ingredients

11.25 lbs. (5.1 kg) 2-row pale malt
1 lb. 3 oz. (0.54 kg) crystal malt (60 °L)
12 oz. (0.34 kg) chocolate malt (380 °L)
9.0 oz. (0.26 kg) white wheat malt
5.3 oz. (149 g) black malt (500 °L)
7.4 AAU Nugget hops (60 mins) (0.67 oz./20 g of 11% alpha acids)
2.6 oz. (73 g) freshly roasted coffee (coarsely ground)
½ vanilla bean
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Safale Fermentis US-05 yeast

Step by Step

Mash at a liquor-to-grist ratio of 1.25 qt./lb. (2.6 L/kg). Mash temperature is 154 °F (68 °C). Boil for 60 minutes. Ferment at 68 °F (20 °C). Near the end of primary fermentation, take a small amount of beer and make an overnight cold extract from the coffee. Add coffee extract — liquid, coffee grounds and all — along with the vanilla bean, to the beer. Bottle or keg when fermentation is complete.

Extract with grains option:

Replace pale malt with 6.6 lbs. (3.0 kg) of light liquid malt extract, and 1.2 lbs. (0.54 kg) light dried malt extract. Steep grains in 1.0 gallon (3.8 L) of water at 154 °F (68 °C) for 45 minutes. Add water to make 3.0 gallons (11 L) of wort, add roughly half of the malt extract and boil for 60 minutes, adding hops at times indicated. Cool wort, transfer to fermenter and top up to 5.0 gallons (19 L). Aerate and pitch yeast. Ferment at 68 °F (20 °C). See all-grain recipe for how to add coffee and vanilla.

Duncan Hills Brutal Coffee Porter

(5 gallons/19 L, all-grain with coffee)

OG = 1.056 FG = 1.014
IBU = 35 SRM = 56+ ABV = 5.4%

Would you like a smooth-drinking porter with subtle coffee notes layered in between the roasted grain aromas? Then don't even look at this recipe. If you like your coffee black, your porter robust and your death metal Swedish, then this your beer.

Ingredients

8.0 lbs. (3.6 kg) 2-row pale ale malt
2.0 lbs. (0.91 kg) Munich malt
14 oz. (0.40 kg) crystal malt (60 °L)
7.0 oz. (0.20 kg) chocolate malt
4.0 oz. (0.11 kg) black malt (500 °L)
4.0 oz. (0.11 kg) roasted barley (500 °L)
3.0 oz. (85 g) ground coffee (dark roast)
6.0 AAU Northern Brewer hops (60 mins) (0.67 oz./19 g of 9% alpha acids)
5.0 AAU First Gold hops (15 mins) (1.0 oz./28 g of 5% alpha acids)
0.5 oz. (14 g) First Gold hops (0 mins)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast (1.5 qts./1.4 L yeast starter)

Step by Step

Mash at 154 °F (68 °C) for 60 minutes in 16 qts. (15 L) of water. Boil wort for 90 minutes, adding hops at times indicated. Ferment at 68 °F (20 °C). When you are ready to bottle or keg, coarsely grind 3.0 oz. (85 g) of dark roast coffee beans. Place in French press and add 200 °F (93 °C) water. Let grounds steep for 8 minutes, then pour coffee into keg or bottling bucket. Rack the beer into the coffee.

Extract with grains option:

Replace pale ale malt with 3.3 lbs. (1.5 kg) of light liquid malt extract, and 1.5 lbs. (0.68 kg) light dried malt extract. Place crushed grains in a large steeping bag and steep, in your brewpot, at 154 °F (68 °C) for 45 minutes. The volume of the steeping water should be 5.25 qts. (5.0 L). After steep, rinse grains with 2.0 qts (~2 L) of 170 F (77 C) water. Add water to make 3.0 gallons (11 L) of wort, add dried malt extract and boil for 60 minutes, adding hops at times indicated. Cool wort, transfer to fermenter and top up to 5.0 gallons (19 L). Aerate and pitch yeast. Ferment at 68 °F (20 °C). When you are ready to bottle or keg, see instructions in all-grain recipe for how to add coffee.

For more coffee beer recipes, see the new Brew Your Own 250 Classic Clone Recipes special issue.

triply strong coffee is a good idea. Adding espresso would also be an excellent option. Make the coffee right before racking your beer to the keg or bottling bucket, add it to the vessel and rack the beer into it.

Boiling ground coffee or whole beans in wort is likely to lead to overextraction, even with short contact times, and many of the volatile aromas will evaporate. However, steeping coffee grounds immediately after the boil (just as many commercial brewers add hops to their whirlpool) is likely to produce good results, especially if you wait until the wort temperature drops below 200 °F (93 °C) and limit the contact time to an appropriate length, given how finely you ground the beans. Some volatiles will be lost during fermentation, but certainly not all of them. (You can still, for example, smell roasty aromas from darkly-roasted grains after a stout or porter wort has been boiled and fermented.)

"Dry beaning" will not extract as many oils as a hot extraction, but it does have the benefit that you can remove the coffee when the flavor reaches a satisfactory level.

A final method, used when a minimal amount of coffee character is desired, is to steep coffee beans overnight in cold water. This cold water extract is then added to the beer post-fermentation. A cold water coffee extract will be thin, fairly acidic and not show the degree of aroma that a regular cup of coffee would. It will have a fair amount of roast character, but not the strong bitterness of normal coffee. Making a cold-water extract would not be the way to go if you want an "in-your-face" coffee character, but it might be appropriate if you want just a hint of coffee without adding more bitterness to your beer. If you try this, taste the cold-brewed coffee critically before adding it to your beer. Don't wreck a good beer with bad coffee.

Beer Styles, Coffee Character and Recipe Ideas

Most coffee beers combine the flavor of coffee with a beer style noted for its roasty character. Espresso stouts and coffee porters are popular types of coffee beers because the coffee adds some complexity to the roast character that is already present. If you have a stout or porter recipe you enjoy and brew regularly, you can easily make a small test blend and determine if brewing a whole batch of the coffee version would be worthwhile. Coffee adds bitterness, so you may want to dial down the hop bitterness or the amount of darkly roasted grains in a beer that is already very bitter or contains a lot of dark roast character.

Coffee can also be astringent, and it's at least possible that dark beers (which are prone to being more astringent because of tannins from the dark grains) with coffee added could get too astringent. If you make a coffee beer and it seems "harsher" than it should — given the amount of hops, dark grains and coffee in the brew — consider trying to limit your astringency the next time to you brew it. Watching your pH and not oversparging will help minimize excess tannin extraction in the beer. The use of hard water to brew your coffee can tame its astringency.

The degree to which your coffee beans are roasted will, of course, influence the flavor of your coffee beer. The roast character from the coffee should complement the roast character in the beer. If I was making a coffee beer with a brown porter base, I would first explore using a lighter roast of coffee. For a robust porter — with more hop bitterness and sharper dark grain character — I think a darker roast is needed to stand up to the existing flavors. After the base beer is brewed, you can always do a test blend with a few different coffees, displaying different levels of roast, before you decide which to use. (This assumes you plan to add the coffee after fermentation).

Dark beers pair well with many "non-beer" flavors, and you may even want to consider making a beer with both coffee and some other flavor. Some possibilities include coffee and chocolate, coffee and cracker or biscuit-like flavors (from biscuit or Victory malt), coffee and fruit (such as raspberry) or coffee and smoke (from rauchmalz). Wolaver's (the organic brand brewed by Otter Creek) makes a beer called Alta Gracia Coffee Porter — coffee porter with a hint of vanilla. Dave Green, who roasts the coffee for our Vermont office, spoke with Otter Creek's Mike Gerhart and came up with the clone of this beer found on page 36. The other recipe is a coffee beer based on a variation of my "house porter."

If you enjoy a good cup of coffee, consider adding "the other brewed beverage" to your next batch of beer.

Chris Colby is Editor of BYO.

by **Scott Russell**

brewing with maple

......................$3.75/per side order

Maple is such an intriguing flavor, both sweet and smoky at the same time. It's a natural adjunct in brewing and can add a terrific boost of flavor to almost any style.

Several varieties of maple trees, especially the Sugar Maple (*Acer saccharum*), Silver Maple (*Acer saccharinum*), Red Maple (*Acer rubrum*) and the Ash-leaf Maple (*Acer negundo*), produce a slightly sweet sap in the spring which, when boiled down to condense it, can be turned into syrup. The Striped Maple (*Acer pensylvanicum*), also known as Moosewood, has a higher density of sugar in its sap, but is rarely big enough to tap. It requires about 40 gallons of straight sap to make 1.0 gallon of syrup (or 40 L of sap to make 1 L of syrup). This figure varies from tree to tree, from season to season, and can also change from sugar maker to sugar maker. Maple sugar production is primarily limited to the northern New England states — Maine, New Hampshire and Vermont, as well as upstate New York, Ontario and Quebec. However, there is some maple syrup production in nearly every northern state from the Great Lakes eastward.

Maple sap is boiled down until it contains approximately 67% sucrose, at a temperature of 219 °F (104 °C). In the United States, syrup is graded, from lightest to darkest, as Grade A Light Amber, Grade A Medium Amber, Grade A Dark Amber, and Grade B. In Canada, there are #1, #2 and #3 grades, with Extra Light, Light and Medium as colors within Grade #1. Here in Vermont we also have our own "Vermont Fancy" grade, similar in color to Grade A Light Amber, but boiled down to be a little thicker. There exists also a US Grade C, very dark and strong-flavored, used mainly as a flavoring and sweetening adjunct for baked goods and other sweetened foods. Generally speaking, the earlier in the season the syrup is produced, the lighter it is.

When brewing, it is essential to use only real, pure maple syrup. Do not use the maple-flavored corn syrups found in the grocery store. Check the label to see if the product is maple syrup or maple-flavored, pancake, or waffle syrup. I'd like to suggest that Vermont syrup is preferable, but that may be my own prejudice showing.

At 67% sucrose, one pound of maple syrup dissolved in water to make one gallon will yield a sugar solution with a specific gravity of 1.031 or, in homebrewer's parlance, maple syrup yields 31 points per pound per gallon. (A kilogram of syrup in 10 L would yield a solution of SG 1.039.) Maple syrup can used as a kettle adjunct or to prime kegs or bottles.

In addition to syrup, you may also find crystallized maple sugar, sometimes in hard cakes, sometimes granulated. Again, be careful to use only maple sugar, not maple candy (which may contain oils, butter, and other ingredients). If you live near a sugar maker, or have your own maple trees, you may also be able to use fresh maple sap in the mash tun or in the boil kettle.

A friend of mine used to run a small micro-brewery here in my hometown of Tunbridge, Vermont. She made an annual seasonal Maple Sap Beer. She used fresh sap as her mash and sparge water, and added syrup into the boil. The maple flavor was subtle, but there, and the beer was a real refreshing treat in the early summer when it was bottled and put on the shelf. This recipe (to the right) is my adaptation of that beer.

Scott Russell wrote extensively for Brew Your Own *in the 1990s.*

Maple Beer Recipe

Vermont Maple Golden Ale

(5 gallons/19 L, all-grain with maple syrup)

OG = 1.046 FG = 1.010
IBU = 17 SRM = 7+ ABV = 4.6%

Ingredients

6.5 lbs. (3.0 kg) Maris Otter 2-row pale ale malt
1.0 lb. (0.45 kg) toasted pale malt
0.5 lb. (0.23 kg) crystal malt (20 °L)
16 fl. oz. (473 mL) maple syrup
3 AAU Cluster hops (60 mins) (0.43 oz./12 g of 7% alpha acids)
3 AAU Willamette hops (15 mins) (0.60 oz./17 g of 5% alpha acids)
1 tsp. Irish moss (15 mins)
15 g Coopers dry ale yeast
½ cup corn sugar (for priming)
¼ cup maple syrup (for priming)

Step by step

Heat 12 quarts water (or fresh maple sap) to 165 °F (74 °C). Mash in crushed pale malt, toasted malt and crystal, hold 90 minutes at 150–152 °F (66–67 °C). Runoff, sparge with 14 quarts water or sap at 170 °F (77 °C).

Add 1 pint pure maple syrup to wort, bring to a boil. Add the Cluster hops, boil 45 minutes. Add the Willamette hops, boil another 15 minutes, add the Irish moss (if desired) and remove from heat. Chill quickly, pour into your sanitized fermenter and pitch the yeast. Ferment at 70 °F (21 °C) for 7–10 days, rack to secondary and age cool for 14–20 days. Bottle, priming with the corn sugar and the maple syrup. Condition 2–3 weeks.

Extract option:

Replace the 2-row malt with 3 lb. 10 oz. (1.6 kg) Coopers Extra-light dried malt extract. Steep remaining grains for 30 minutes at 152 °F (67 °C) in 2.5 qts. (~2.5 L) of water. Boil 60 minutes, reserving roughly of half the malt extract for final 15 minutes of boil.

by **Brad Ring**

bacon beer

......................$3.00/3 strips

Oren Combs, former brewer and general manager at San Juan Brewing Co. in Friday Harbor, Washington, is not a man to back down from a challenge. When talk at his brewpub turned to food a few years ago, the conversation found its way naturally to all things pork. "Someone suggested I could make a bacon beer and people laughed at the idea, but it got me thinking," Oren remembers. So he set out to create a bacon beer that is the stuff of Homer Simpson's ultimate dream. Beer good. Bacon good. Bacon beer better.

In 2008, he first put his bacon beer on tap at the brewpub located on scenic San Juan Island and put up a pig-shaped sign in the window to announce it. "We did it as a complete novelty, I had no idea what the reaction would be to something like a bacon beer," he says. It turned out people loved the idea of bacon in their beer. People even lined up to take photos of the pig sign. "During the peak tourist season we sometimes had 100 people a day taking photos of the bacon beer sign."

So how exactly do you put some boar in your next pour? "One of the biggest challenges is getting rid of the bacon fat which you don't want in your beer," Oren says. He decided to oven bake the bacon to a super crisp first to cook off the fat and then essentially dry hop a beer in the tanks with the oven-dried bacon.

Baking in the oven should work better than cooking in a pan to remove the most bacon fat. Cook the bacon strips on parchment paper on a cookie sheet in an oven preheated to 350 °F (177 °C). Cook for at least 15 minutes until crispy, but make sure the bacon does not get burned. Remember you want that tasty bacon goodness in your beer, not burnt flavors. Drain the cooked bacon on paper towels and pat or squeeze off the excess fat with some additional paper towels.

For a 5.0-gallon (19-L) batch, cook enough bacon to end up with about 5.0 ounces (142 g) of crispy cooked bacon. Put the cooked bacon in a mesh bag and dry hop as you normally would in the secondary fermenter. By all means, start tasting your beer daily to get the right level of bacon flavor. As tough as it is to imagine, you don't want to over-bacon your beer.

San Juan Brewing went with a lower-alcohol, 3.1% ABV pale ale as the base beer when the bacon beer was first released. "I think a darker beer might go with the bacon flavors even better than the pale ale. I would want to try a porter or stout with bacon," Oren says looking back at his original choice of base beer.

While San Juan Brewing chose to dry hop (or is it dry hog?) their bacon beer, another technique you can experiment with at home is to take your crispy, cooked bacon and create a bacon extract. Add a few ounces of a neutral spirit like vodka to some crumbled bacon and let it soak for at least two days. Then strain out the bacon, taste the pork extract and experiment by adding increasing amounts of the bacon-infused vodka into your secondary fermenter until you get the taste you want.

A January flood has closed San Juan Brewing since the start of the year, and brewer Oren Combs is moving on to new ventures, but he leaves his legacy of bacon beer behind forever. Now, you can brew your own bacon beer at home. The recipe accompanying this article uses a porter as the base beer, but feel free to experiment with different beer styles as the base — after all you are adding bacon to beer!

Brad Ring is Publisher of Brew Your Own *magazine.*

Bacon Beer Recipe

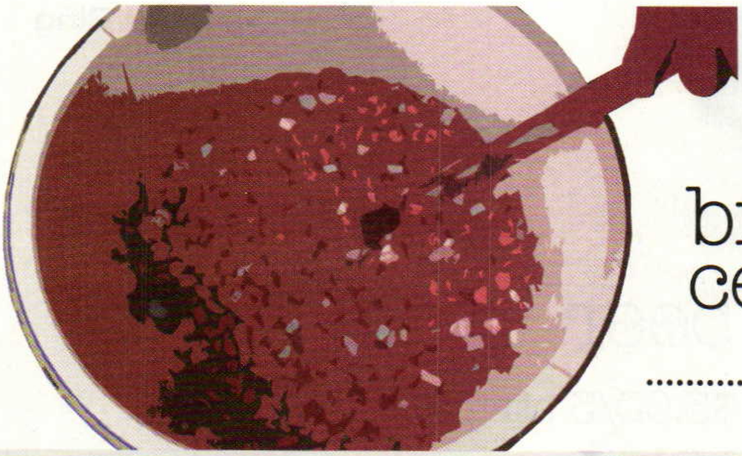
Charlotte's Some Pig Porter
(5 gallons/19 L, extract with grains and pork)
OG = 1.056 FG = 1.014
IBU = 35 SRM = 50 ABV = 5.4%

Ingredients
6.6 lbs. (3.0 kg) Muntons Light liquid malt extract
0.75 lb. (0.34 kg) Muntons Light dried malt extract
8.0 oz. (0.23 kg) crystal malt (80 °L)
8.0 oz. (0.23 kg) chocolate malt
4.0 oz. (0.11 kg) black patent malt
8.5 AAU English Fuggles hops (60 mins) (1.7 oz./48 g of 5% alpha acid)
2.5 AAU English Fuggles hops (15 mins) (0.5 oz./14 g of 5% alpha acid)
Wyeast 1098 (British Ale) yeast or White Labs WLP002) (English Ale) yeast
5.0 oz. (142 g) crispy cooked bacon (dry hog)
6.0 oz. (170 g) corn sugar (for priming)

Step by Step
Steep specialty grains in 2.0 qts. (~2 L) water at 154 °F (68 °C) for 30 minutes. Add water to make 3.0 gallons (11 L) in your brewpot, add roughly half of the malt extract and bring to a boil. Boil one hour, adding hops at times indicated. Stir in remaining malt extract during the final 15 minutes of the boil. Cool wort, transfer to fermeter and top up with cool water to 5.0 gallons (19 L). Aerate and pitch yeast. Ferment at 70 °F (21 °C). Follow the directions in the article for preparing and "dry hogging" with bacon.

All-grain option:
Replace malt extracts with 10.5 lbs. (4.8 kg) two-row pale malt. Mash at 154 °F (68 °C).

by **James Spencer**



breakfast cereal brews

......................$2.25 (includes milk)

I stood over the mash tun with the brightly colored box in my hand. As I tipped it over, a cascade of shockingly pink crunchy bits and pastel marshmallows fell onto the grain below, sending a surge of artificial strawberry aromas up into the air. As the sickeningly sweet smells reached my face, I was taken back to childhood. Memories of Strawberry Nesquik filled my head.

"My god," I thought. "I've created a monster."

My first impressions of this experimental beer were strangely appropriate. I was brewing a beer to celebrate Halloween, and thanks to inspiration from my buddy Steve Wilkes, I added a pound of Frankenberry cereal as part of the grain bill. It was to be called "Frankenberry Weiss."

It took about fifteen minutes for the cereal to saturate and dissolve enough to be stirred into the mash. This resulted in a wort the color of the neighbor girl's bike. However, a 60-minute boil tamed the artificial coloring to something more of a tan.

The resulting beer is actually very quaffable. The White Labs WLP530 (Abbey Ale) yeast lends a faintly funky note to the subtle fruity nose. The Nesquik overtones of the mash tun are long gone.

I picked the Belgian strain because, according to the nutritional label, sugar makes up about half of Frankenberry's weight. So, what better to complement sugar than a Belgian yeast?

There are more serious reasons to choose breakfast cereals as ingredients to your homebrews. Quaker Oats are ready to go into your oatmeal stout mash, as are Corn Flakes (unfrosted) into your American Pilsner. Since these have been pre-cooked, there's no need for a cereal mash to gelatinize the starches and make them available for the enzymes in the mash tun.

Are they the perfect addition? That's up for debate around the homebrew shop or club meeting, but they'll definitely work in a pinch.

Breakfast cereals played a pivotal role in the recent "Iron Brewer" competition hosted by the Garage Brewers Society homebrew club (GBS) in O'Fallon, Missouri. Club President Jeff Britton took the Iron Chef television show as his inspiration in designing the contest. In that show, a "mystery ingredient" is unveiled at the beginning, and chefs must create food dishes that feature it.

Iron Brewer pitted 16 brewers from GBS against each other tournament-style. Participants received their ingredients at one homebrew meeting and returned a month later with a brew featuring the challenging component. Breakfast cereal appeared in four of the eight first-round match-ups.

Sean Sweeney was thrilled when he found out his mystery ingredient was to be Great Value Honey Crunch (generic Honey Smacks). He had brewed with cereal before, creating a CAPtain Crunch Classic American Pils.

"Honey Smacks is essentially torrified wheat, a common brewing ingredient," says Sweeney. "So, adding it to the mash was the only logical way to use it. I used one 15.3 ounce box."

According to Sweeney, the cereal contributed eight gravity points to the 5.0-gallon (19-L) batch of wort. He says the toasty grain flavor and aroma of the cereal shone through with a background of honey and caramel sweetness.

He's since finished off his keg of the beer. "I will use breakfast cereal again," Sweeney says. "I want to make a chocolate beer using one of the chocolate cereals, such as Cocoa Puffs."

Andrew Wall had less success with the generic Honey Smacks. A stuck sparge and challenges with fermentation temperature made for a less-than-drinkable brew.

Wall says, "Everyone pretty much thought it was nasty. I did however find that it made a very tasty marinade."

Jim Yeager drew the generic version of Fruity Pebbles as his mystery ingredient. He'd never used cereal before and was a bit worried about the artificial flavors. However, he attempted to create an English Bitter with it. After tasting a finished beer with a bit of the ingredient added in, Yeager decided against a "dry cereal" approach in the keg.

"The artificial flavors along with the heavy sugar taste suggested I should go with the mash," Yeager says.

He added a full box into the tun for a five-gallon batch.

"I was really hoping that it would just be drinkable," says Yeager, "and it appeared that it might be for a while. Unfortunately, once it settled, the artificial flavors really dominated the beer and made it a drain pour."

However, after tasting the efforts of other brewers in the club, Yeager did not turn away from brewing with breakfast cereals altogether.

Bryan Clauser turned the breakfast cereal challenge into bling for his award cabinet. His task was to brew Frosted Shredded Wheat into a drinkable beer.

From the start, Clauser wasn't worried. He figured the cereal could easily fit into almost any wheat beer. He used two full boxes of the stuff for a 10-gallon (38-L) batch.

"The cereal added more gravity points than I was expecting, so I had a higher starting gravity," Clauser says. "The beer ended up finishing pretty dry, anyway. There was also a residual sweetness in the finished beer that I attributed to the cereal, due to the finishing gravity and known starting gravity."

Clauser thought the finished beer was pretty good, and others did, too. He moved into the next round of the competition. But he didn't stop there.

"I ended up splitting the base beer into two different styles," says Clauser, "Hoppy American Wheat and Raspberry Wheat. Both of which medaled in BJCP competitions."

Brewing with breakfast cereal may not be for everyone. If you're worried about the effect of the ingredients in some cereals or if you don't want to run afoul of the Reinheitsgebot, then cereal's best kept on the table and not in the tun. However, for those willing to experiment, perusing the pantry may be a way to discover some interesting beers to add to your tap list.

If you do want to try your hand at a cereal beer, keep the following things in mind. First, stick to flaked or puffed cereals if you simply want to stir the product into your mash. These have been cooked before they were rolled or puffed and should be ready for the mash tun. If you have any doubts, boil your cereal in water for 15 minutes before stirring it into your mash (i.e., cereal mash your breakfast cereal.)

Secondly, many cereals are high in sugar. This sugar will simply ferment away so your beer will not taste as sweet as the cereal does.

Finally, some breakfast cereals contain preservatives. Given the amount of cereal used in a typical beer, the preservatives should not inhibit your yeast. However, to be on the safe side, make sure to pitch a healthy yeast starter.

By weight, breakfast cereals may add as many or more gravity points to your beer as pale malt. The more sugar a cereal contains, the more extract it will add to your beer. However, as sugar is 100% fermentable, it will not contribute to the body of the beer. BYO

James Spencer is the host of the Basic Brewing Radio and Video *podcasts.*

Breakfast Cereal Beer Recipes

Frankenberry Weiss
(5 gallons/19 L, all-grain)
OG = 1.056 FG = 1.008
IBU = 23 SRM = 6 ABV = 6.3%

Ingredients
6.0 lb. (2.7 kg) 2-row pale malt
5.0 lb. (2.3 kg) wheat malt
1.0 lb. (0.45 kg) Frankenberry cereal
6.1 AAU Czech Saaz hops (60 mins) (1.8 oz./51 g of 3.5% alpha acids)
White Labs WLP530 (Abbey Ale) yeast

Step by Step
Single infusion mash for 60 minutes at 154 °F (68 °C). Cereal will need to be stirred into mash after it has softened and dissolved (about 15 minutes). Boil for 60 minutes. Ferment at 70 °F (21 °C).

Kellager 1906 Pilsner (Classic American Breakfast Pilsner)
(5 gallons/19 L, all-grain)
OG = 1.055 FG = 1.010
IBU = 32 SRM = 5 ABV = 5.8%

Ingredients
5.5 lbs. (2.5 kg) 6-row pale malt
4.0 lbs. (1.8 kg) 2-row pale malt
2 lb. 4 oz. (1.0 kg) flaked corn breakfast cereal
0.5 tsp. calcium chloride (90 mins)
1 tsp. Irish moss (15 mins)
8.0 AAU Cluster hops (75 mins)
0.5 oz. (14 g) Vanguard hops (2 mins)
Wyeast 2124 (Bohemian Pilsner) or White Labs WLP830 (German Lager) yeast

Step by Step
Mash at 149 °F (65 °C) for 45 minutes, stirring every 15 minutes. Boil for 90 minutes. Ferment at 52 °F (11 °C).

Cap'N Crunch Amber Oats Ale
(5 gallons/19 L, extract with grains and cereal)
OG = 1.053 FG = 1.011
IBU = 36 SRM = 12 ABV = 5.5%

Ingredients
2 lb. 5 oz. (1.1 kg) 6-row pale malt
16 oz. (0.45 kg) Cap'N Crunch (or similar) breakfast cereal
8.0 oz. (0.23 kg) crystal malt (40 °L)
3.0 oz. (85 g) crystal malt (60 °L)
1.0 lb. (0.45 kg) Briess Light dried malt extract
4.0 lb. (1.8 kg) Muntons Light liquid malt extract (late addition)
1 tsp. Irish moss (15 mins)
8.0 AAU Nugget hops (60 mins) (0.75 oz./21 g of 12% alpha acids)
2.5 AAU Cascade hops (10 mins) (0.5 oz./14 g of 5% alpha acids)
0.5 oz. (14 g) Cascade hops (5 mins)
0.5 oz. (14 g) Cascade hops (0 mins)
Danstar Nottingham ale yeast

Step by Step
Place crushed grains and cereal in a large steeping bag. In your brewpot, steep mixture at 152 °F (67 °C) for 50 minutes in 5.5 qts. (5.2 L) of water. Stir every 10 minutes. Heat mixture to 170 °F (77 °C), then lift bag and place in a colander over your brewpot. Rinse with 2.5 qts. (~2.5 L) of 170 °F (77 °C) water. Add dried malt extract, bring volume to 3.0 gallons and boil for 60 minutes. Add liquid malt extract in the final 15 minutes of the boil. Cool wort, transfer to fermenter and dilute to 5.0 gallons (19 L). Ferment at 68 °F (20 °C).

by **Chris Colby**

true grits

......................$3.75 (cheese extra 25¢)

grits are a staple of southern cuisine, served at breakfast or other meals. Grits is a porridge made from boiled corn (maize), and is similar to polenta. Grits can be served hot or cold and is often served buttered or with cheese

Maize (*Zea mays*), or corn as it is called in the North America, is descended from teosinte, a grass native to Mexico. The domestication of maize involved selecting for traits beneficial to humans and possibly hybridization among one or more of the species of teosinte to breed desired characteristics into the crop. By weight, more corn is harvested than any other grain. (Rice and wheat come in second and third.) Corn is used as food, a source for starch in manufacturing, for biofuel production, converted to silage and used as fodder for animals and, of course, as an adjunct in beer brewing.

Grits are made from degerminated corn and the word "grits" refers to both the dish and degerminated corn used to make it. Germ is the embryo of the corn plant, and this portion of a corn kernel is more oily than the starchy endosperm. One way of degerminating corn is to cook it in an alkaline solution. Grits produced this way are called hominy grits. Grits can also be produced by dry milling. Either type of corn grits can be used for making grits (the dish). In addition, dry-milled grits can be used in brewing. Corn grits produced expressly for brewing are called brewers grits.

Brewing with Grits

Grits are used in the mash and so can be only used with an all-grain or partial mash beer. Simply steeping or boiling the grits would extract only starches and lead to hazy and biologically unstable beer.

The gelatinization temperature of corn starch is 143–161 °F (62–72 °C). In order for the starch-degrading (amylase) enzymes to have access to the starch molecules in grits, they must be cooked so that they fully "gelatinize."

Cooking any starchy ingredient and adding it to a mash is called cereal mashing. When cereal mashing with grits, they are brought to a boil, along with a small amount (~10%) of crushed malted barley. Once the starches are gelatinized, the cooked grits are stirred into the main mash, composed of malted barley. The heat from the cooked grits raises the temperature of the main mash, usually from a initial low-temperature rest to the temperature range for starch conversion.

The maximum amount of grits you could use in a beer depends on the diastatic power of the malted barley you use. Corn grits do not contain sufficient enzymes to degrade a significant portion of their own starches. Thus, you must rely on the "excess" diastatic power of your malts. Domestic 2-row and 6-row pale malted barley has a lot of diastatic power. (Often around 120 DP for 2-row and 160 DP for 6-row, compared to around 90 for German Pilsner malt and around 50 for British pale malts.) With US 2-row, you can add up to about 30% grits to your grist and perhaps up to 40% when using 6-row.

Here's how it works on a homebrew scale. For every pound of grits in your recipe, add about a handful of crushed 6-row malt (so roughly 10% of the grits mixture is malt by weight). Add water until the grits mixture is the consistency of a thin mash — around 1.4 qts. of water for every pound (3.0 L/kg) of grits — and begin heating. Stir the grits as you cook them to avoid scorching. The enzymes from the malt will degrade some of the starch from the grits, which will reduce its viscosity. As an option, you can rest for 5 minutes at 150–154 °F (66–68 °C) to get the most from the malt enzymes (even though the bulk of the starch degradation will occur in the main mash). Bring the grits to a boil, stirring often, and boil for 15 minutes. While the grits are cooking, add strike water to your main mash and hold until the grits are ready.

The initial temperature of your main mash depends on what your target mash temperature is and the percentage of grits used. A higher percentage of grits in your recipe means the increase in mash temperature will be greater. Getting the cereal mash to raise the mash the right amount can take some practice. Some brewing software packages let you calculate this. However, in order to be accurate, you need to know the "thermal mass" of your system — essentially, how much heat it will absorb.

In practice, it is easier to simply follow the temperature suggestions of your recipe, and make adjustments as needed. If adding the cooked grits causes you to overshoot your mash temperature, simply stir in some cool water to lower the temperature. If you end up too low after adding the grits, you can add boiling water to make corrections of a couple degrees. For larger corrections, draw off about 20% of the wort, heat it to near boiling and stir it back into the mash. (A heated recirculation loop, can also be used to solve this problem.) If you mash in your kettle, you can add heat directly and I do this whenever I am doing a step mash of any sort, including cereal or decoction mashes. This makes temperature corrections easy, but does mean that you will need to scoop the mash over to your lauter tun when the mash is finished.

The first time you brew using a cereal mash, consider that missing your mash temperature by only a degree or two is not going to ruin your beer. It is possible to turn a perfectly enjoyable brew day into a nightmare by attempting to correct for small differences in temperatures. Adding water multiple times to make temperature corrections leads to overly thin mashes. Likewise, every time you open the mash tun, scoop or otherwise remove small amounts of mash or wort, you are losing heat. Take detailed notes on your first cereal mash brew day — including the weight and temperature of your grist, the volume and temperature of every water addition and the resulting mash temperatures — and your second brew day will go much more smoothly.

With a little extra fuss at mash-in, you can also do a single infusion mash. To do this, cook your cereal mash as described before, but do not mash the rest of your grains in until the cereal mash is cooked. Measure out the correct volume of strike water and dump the cereal mash into your hot liquor tank while the water is being heated. When you hit your target temperature, just use the strike water — with your grits floating in it — to mash in as you normally would. You will need to clean your hot liquor tank after mashing in if you do this.

Once your cereal mash is stirred in and the saccharification rest is complete, proceed with the rest of your brew day as you normally would.

Most homebrew shops don't carry grits, but you can often find dry-milled grits in the baking aisle of your supermarket. (I've used Bob's Red Mill Corn Grits (Polenta) before, as these are degerminated, dry-milled grits — exactly what you want.) Do not use the instant grits sold in the breakfast food aisle as these often contain other ingredients that you do not want in your beer. (If in doubt, read the label.)

If you'd like to use corn as an adjunct, but wish to avoid the hassle of a cereal mash, you can simply use flaked maize. Flaked maize can be stirred into a mash without any preparation and contributes almost no flavor to a beer while grits can lend a distinct "corny" note, most likely due to flavors developed when the cereal mash is cooked. Of course, corn can also be added in the form of corn sugar or high-fructose corn syrup, but these contribute no corn character what-so-ever.

Chris Colby is Editor of BYO.

Corn Grits Beer Recipes

Zea Mays Hayes (Creamed Corn Ale)

(5 gallons/19 L, all-grain)
OG = 1.044 FG = 1.007
IBU = 15 SRM = 6 ABV= 4.7%

Ingredients

3 lb 12 oz. (1.7 kg) 6-row pale malt
2.0 lbs. (0.91 kg) 2-row pale malt
3 lb. 6 oz. (1.5 kg) corn grits
3.0 oz. (0.08 kg) crystal malt (20 °L)
0.5 tsp. calcium chloride (80 mins)
1 tsp. Irish moss (15 mins)
4.0 AAU Vanguard hops (60 mins) (1.0 oz./28 g of 4% alpha acids)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or US-05 yeast (1.5 qt./1.5 L yeast starter)

Step by Step

Reserve corn grits and approximately 0.5 oz. (14 g) of 6-row malt. In your kettle, mash in the remaining malts with 12 qts. (11 L) of water at 138 °F (59 °C), so the grain bed comes to rest at around 127 °F (53 °C). In a large kitchen pot, combine the grits and reserved 6-row malt with 5.0 qts. (4.7 L) of water and begin heating this mixture to a boil. Stir the grits mixture frequently. (Option: when you reach 152 °F (67 °C), hold for 5 minutes before resuming heating.) Boil the grits mixture for 15 minutes, stirring frequently. Stir cooked grits into main mash. Your goal is a combined mash temperature of 150–152 °F (66–67 °C). If required, adjust temperature by directly heating the mash, or by adding cool water. Hold at this temperature for 45 minutes, then heat the mash to 170 °F (77 °C), stirring the mash frequently as you heat. Scoop or pour your mash into your lauter tun. (If you have a false bottom, add enough foundation water (at 170 °F/77 °C) to cover it.). Recirculate until the wort clears substantially (but don't recirculate for more than 20 minutes). Begin running off wort, sparging with 190 °F (88 °C) water until the grain bed temperature reaches 170 °F (77 °C); then add cool water to your hot liquor tank and continue sparging with 170 °F (77 °C) water. (Heat sparge water to a greater temperature if grain bed temperature drops below 168 °F (76 °C). Boil wort for 90 minutes. Ferment at 65 °F (18 °C).

Zea Mays Hayes (Creamed Corn Ale)

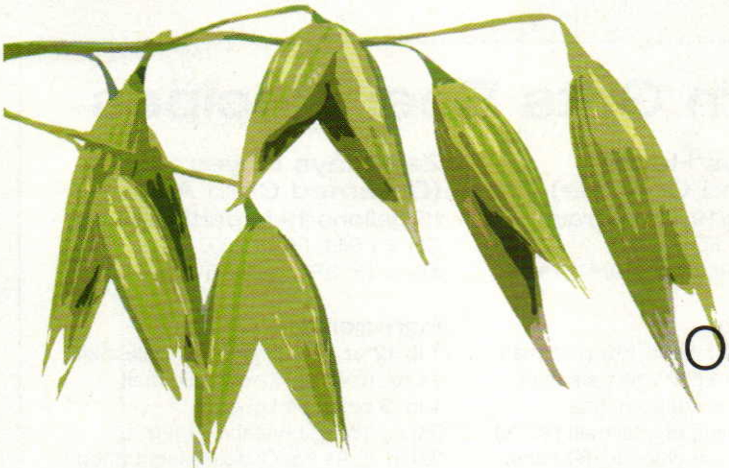
(5 gallons/19 L, partial mash)
OG = 1.044 FG = 1.007
IBU = 15 SRM = 6 ABV= 4.7%

Ingredients

1 lb 12 oz. (0.79 kg) 6-row pale malt
14 oz. (0.40 kg) 2-row pale malt
1 lb. 3 oz. (0.54 kg) grits
3.0 oz. (85 g) crystal malt (20 °L)
2.0 lb. (0.91 kg) Coopers Light dried malt extract (late addition)
1.0 lb. (0.45 kg kg) corn sugar
0.5 tsp. calcium chloride (60 mins)
1 tsp. Irish moss (15 mins)
4.0 AAU Vanguard hops (60 mins) (1.0 oz./28 g of 4% alpha acids)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) or US-05 yeast (1.5 qt./1.5 L yeast starter)

Step by Step

Review the all-grain recipe for the basic idea of cereal mashing. For the partial mash version, boil your grits and about 0.25 oz. (7.1 g) of crushed 6-row malt in a soup pot for 15 minutes. While grits are cooking, add the remaining grains to your brewpot and stir in 5.0 qts. (4.7 L) of water at 138 °F (59 °C). Hold at around 127 °F (53 °C) while grits are cooking. Add cooked grits to brewpot and stir. If temperature is outside the 150–152 °F (66–67 °C) range, add cold water or heat to adjust it. Hold at this temperature for 45 minutes, then heat mixture to 170 °F (77 °C). Scoop the contents of your brewpot to a 2.0-gallon (7.6-L) beverage cooler lined with a large steeping bag. Rinse brewpot. Recirculate, then start collecting your wort. Collect 1-2 cups of wort from the cooler, then gently pour the same volume of hot water (170 °F/77 °C) on the top of your grain bed. Repeat until you have collected 2.25 gallons (8.5 L) of wort. Add sugar and calcium chloride and bring to a boil. Add hops at times indicated. Add malt extract and Irish moss during final 15 minutes of the boil. Cool wort and transfer to fermenter. Top up with cool water to 5.0 gallons (19 L), aerate and pitch yeast. Ferment at 65 °F (18 °C). Rack to secondary to clarify beer. For bottle conditioning, prime with just over a cup of corn sugar (about 6.0 oz./170 g).



by **John Palmer**

oatmeal in beer

......................$4.50 per bowl

When you say the word, "oats" to a brewer, most often they think of oatmeal stout. But oats are also sometimes used in Belgian witbiers and American stout. In fact, you can use oats in any style you put your mind to. Oats add to the body of the beer and can add a silkiness to the mouthfeel. They take some of roast edge off the palate and are popular in stouts for that reason.

The idea of oats in other beer styles may sound odd to new brewers — they have heard of adding wheat for head retention, but oatmeal? As such, they may ask: How do I make beer with that? Do I just dump it in? What kind do I use? Oh wait, it's probably some special kind of oats from the health food store, or maybe it has to be malted oats.

The answer to this question is "E: All of the above." Oats are very similar to barley and can be processed in the same way. Oats can be malted, made into specialty malts or flaked. However, oat malts are not widely available. Thomas Fawcett and Sons in West Yorkshire, UK, and Simpson's Malts Ltd, Northumberland, UK, are the only remaining maltsters of oats, producing a lager-type base malt and a de-husked light crystal malt respectively. Flaked oats are widely available though, both as a brewer's adjunct and in the breakfast section of the grocery store.

Let's review a little bit about using cereal grains, though, before we slap down our hard-earned money on a bulk bag of rolled oats at Costco. First off, oats and oat malts need to be mashed, exactly the same as barley and barley malts. The oat crystal malt (and oat roast malts, if existent) can be steeped just like the corresponding barley malts because the starches have been gelatinized during the kilning and roasting process after malting.

Oat malt is similar to barley malt in most respects, but it has two differences — it is higher in protein, and it seems to yield a sweeter tasting wort than barley. The difference in sweetness is probably due to a difference in tannin character between the two grains. These differences work well with stouts and porters, but it can also be useful in making session beers; adding body and a little more flavor to a 1.035 light lager for instance. The higher protein content can also boost head retention, similar to wheat. Table 1 shows a comparison of oat and barley brewing properties.

Table 1 - Oat and Barley Malt Comparison

Product	Extract (L°/kg)	Extract (FGDB)	Extract (PPG max)	Protein	Modification (SRM)	Color
2-row Lager Malt	305	80%	37	12%	42	1.5–2
Oat Malt	265	—	32	13.5%	38–42	1.5–2
Oat Crystal Malt	275	—	33	No data	No data	5–10
Flaked Barley	—	70%	32	12.5%	—	1.5
Flaked Oats	—	70%	32	14%	—	2.5

You will often read that you can add rolled oats directly into the mash, i.e., that they don't need to be cooked. And it is true; the starch gelatinization temperature of oats is 127–138 °F (53–59 °C), which means that the starches will hydrate and react with the mash enzymes at mash temperature. If the starches were not water soluble, the enzymes would not be able to act on them. Rice, for example, has a gelatinization temperature of 154–172 °F (68–78 °C), which is higher than most mash temperatures. Adding crushed rice to a typical mash would result in very little of the rice starch being converted – it would just sit there. In order to make the starches water-soluble, rice needs to be heated above the gelatinization temperature range and soak up water — in essence, get cooked. The flaking operation is designed to pre-gelatinize the cereal and reduce the amount of cooking time necessary to get all of the starches fully hydrated and soluble.

The flaking process starts with whole oats that have been de-hulled (or de-husked) leaving an oat groat. The groat consists of the starchy endosperm of the oat surrounded by the bran (otherwise known as the aleurone layer and pericarp). You can get barley groats too, but more often you will find "pearl" barley in the grocery store, in which the bran has been removed from the groat as a second step. The oat groats are soaked in water to increase the moisture content and soften them. The groats are steam cooked to varying degrees, depending on the product, and then flattened between two large heated rollers set to 0.010–0.020 inch (0.25–0.50 mm) apart. The oats are dried after flaking to about 9–12% moisture.

In terms of size and ease of use, whole rolled oats are generally the largest and are the least "cooked." Quick oats are made by cutting the groats into smaller pieces. The smaller size allows more thorough cooking prior to flaking and less cooking required to make oatmeal. Instant oats have been cooked longer or cut into smaller flakes to reduce the oatmeal cooking time even further. Brewer's oat flakes are typically prepared to a slightly different process to benefit mashing. The groats are infra-red heated instead of steamed, are rolled thinner, and dried to a lower moisture content (7–8% vs. 9–12%). How much difference do these processes make to your beer? The thinner, more cooked oat is more readily mashed, and the infra-red cooking provides a more toasted flavor than steaming. Consider the difference in flavor between steamed and baked bread. For the professional brewer, the lower moisture content means better extract economy.

Oat flakes do not add much flavor unless they are toasted. Toasting can be carried out at various temperatures from 250–350 °F (121–177 °C) depending on the degree desired. The most commonly recommended temperature of 300 °F (149 °C) will develop a rich toast or cookie-like aroma and flavor. Higher temperatures cause roasting and dark toast or coffee flavors. The time necessary is 20–60 minutes depending on the degree of toast. Spread the oats out on a cookie sheet and stir them occasionally while you are toasting. Use your nose and your eyes to determine when they are done.

Let's assume you are going to brew today with the oats that you have in the cabinet at home, rather than buying brewer's flakes. You are probably wondering if you should cook them or simply add them to the mash. Cooking the oats ahead of time on the stove does take the guesswork out of mashing with store-bought rolled oats. Consider for a moment the fact that you crush your malts in a grain mill before mashing in order to make the starches more accessible. If you are going to add flaked oats to your mash, especially the larger, old-fashioned rolled oats or the high fiber (i.e., full-bran) rolled oats from the health food store, either cooking them or running them thru your grain mill will minimize the chances of ending up with oat starch in your beer. Smaller pieces means faster hydration and gelatinization, and better accessibility for the enzymes. Without pre-cooking or milling, the rest of the mash may be long done before you get full conversion of the oat starches.

The thing to remember with any adjunct or new ingredient is that discretion is the better part of flavor. Don't go overboard with oats, in fact I would not recommend over 25% as a general rule. The high protein content and oil in the oat bran can cause a greasiness to the mouthfeel and a mealy taste to the beer if used in excess. If you are using a lot of rolled oats, it may be a good idea to use some rice hulls in the mash or conduct a beta glucan rest at 95–122 °F (35–50 °C) to break up the gums that makes oatmeal so gummy. Oatmeal porridge does not lauter well.

So what sort of beer can we brew with oat malt? Oats are a versatile brewing ingredient and can be used in many beer styles — oatmeal stouts and porters, Belgian witbier, pale ales, session beers, etc. The body and sweetness of oats got me thinking about helles bock, which is known for having a rich malt body and lots of bready malt character. The thought of adding some toasted oat character to the aroma of the beer intrigued me too, and this inspired the recipe below.

John Palmer is a frequent contributor to Brew Your Own *magazine.* BYO

Oatmeal Beer Recipe

Kid Groat Bock
(5 gallons/19 L, all-grain)
OG = 1.064 FG = 1.017
IBU = 28 SRM = 12 ABV = 6.6%

Ingredient
8.0 lbs. (3.6 kg) Pilsner malt
2.0 lbs. (0.91 kg) oat malt
3.0 lbs. (1.4 kg) Munich malt
0.50 lbs. (0.23 kg) Briess Aromatic malt
1.0 lb. (0.45 kg) home toasted rolled oats
8 AAU German Magnum hops (60 mins) (0.62 oz./17 g of 13% alpha acids)
White Labs WLP833 (German Bock Lager) or Wyeast 2206 (Bavarian Lager) yeast

Step by Step
Toast the oats at 300 °F (149 °C) for 30 minutes, until they smell like cookies. Mill oats with grains and step mash at 130 °F (54 °C) for 15 minutes, and then ramp to 155 °F (68 °C) for 45 minutes. Boil for 90 minutes. Ferment at 52 °F (11 °C) .

Story by **CHRIS COLBY**

GROWING BARLEY

Many homebrewers grow their own hops. For interested homebrewers with a little space in their garden, growing your own barley is also a possibility. Last year, I grew barley in my garden and found it to be a rewarding experience.

There are a few good reasons for a homebrewer to grow their own barley. Firstly, and most obviously, you could malt it and use it in your brewing. You can also use unmalted barley as an adjunct in a variety of beers, especially Belgian-inspired beers such as saisons, farmhouse ales or similar brews. Finally, you could grow a little bit of barley simply as decoration and to get a better appreciation for one of the key ingredients in beer.

Barley Biology

Barley (*Hordeum vulgare*) is a grass and is the fourth most widely-planted cereal in the world (behind corn, rice and wheat). Over half of all barley production is used as animal feed. In the United States, about 40% of all barley is malted for use in the brewing industry and barley is also used as a human food and in the distilling industry. There are varieties of barley that are specifically bred for malting, and crops of malting barley that are acceptable to maltsters generally command higher prices than feed barley.

Barley is widely adapted and can be planted anywhere in the United States. US commercial production is dominated by North Dakota, Montana, Idaho and Washington. Some varieties of barley, called spring barley varieties, are planted in the early spring and mature about 130 days later, depending on environmental conditions. Winter varieties are planted in the late fall, sprout and grow slowly (if at all) over the winter. In spring, development is accelerated and winter barley varieties mature before spring barley. In the United States, most malting barley crops are spring barley varieties.

Brewers divide malting barley varieties into two types — 2-row and 6-row. Two-row barley generally produces plumper kernels with a lower protein content. In Germany, Belgium and England, beer is traditionally made only from two-row barley. In the United States, 6-row barley is used in conjunction with low-protein adjuncts, especially corn and rice, to produce beer with comparable protein levels.

The American Malting Barley Association (AMBA) recommends malting varieties to farmers each year and their 2010 recommendations are summarized in Table 1. The year listed next to the variety gives the first year that the variety was recommended by the AMBA. The amount of US acreage planted with these recommended varieties in 2009 is also given.

Planning and Preparation

Homebrewers looking for sources of barley seed can contact their local agricultural extension. Or, you can look for barley seed in seed catalogues for home gardeners. Barley is not a popular garden crop, however, so finding seed this way can be difficult. I have found that Johnny's Selected Seeds (www.johnnyseeds.com) carries both Conlon and Robust barley.

If you live in the northern half of the United States, or Canada, find a spring barley variety and plant it in the early spring. Barley can germinate at soil temperatures as low as 34 °F (1 °C). Barley does not tolerate heat well so, if you live in the southern United States, you will be better off planting a winter variety.

Top: Three barley plants at separate growth stages. The leftmost is in the three-leaf stage, the middle has 5 leaves and 1 tiller and the plant on the right has several tillers and the stems are just starting to elongate. **Bottom:** A "lawn" of young barley.

Your expected yield is going to depend on a lot of factors. These include the usual things that farmers have to contend with, especially the weather, plus factors unique to growing barley on a small scale. As an extremely small scale barley grower, the amount of loss you experience during harvesting, threshing and winnowing will play a large role in your overall yield. In 2009, I planted about 500 sq. ft. (46 m^2) of Robust barley and yielded 6.5 lbs. (2.9 kg) of (reasonably) cleaned barley. However, I experienced significant losses at every step.

Barley does not require excessively rich soil. In fact, too much nitrogen in your soil can lead to unacceptably high protein levels

AMBA Recommended Six-Row Malting Barley Varieties

Variety	Year	2009 Acreage
Drummond	2002	*
Lacey	2000	22.8%
Legacy	2001	7.0%
Rasmusson	2009	1.0%
Robust	1984	5.4%
Stellar-ND	2006	4.6%
Tradition	2004	59.2%

AMBA Recommended Two-Row Malting Barley Varieties

Variety	Year	2009 Acreage
AC Metcalfe	2005	25.6%
CDC Copeland	2007	*
Charles (winter)	2009	1.0%
Conlon	2000	21.3%
Conrad	2007	15.5%
Harrington	1989	17.6%
Hockett	2010	*
Merit	2000	7.6%
Merit 57	2010	0.1%
Moravian 37	2010	3.5%
Moravian 69	2010	7.9%
Scarlett	2008	*

*represents less than 0.1% of the total acreage planted in 2009 in your barley. If you have reasonably fertile garden soil, you will not need to add any fertilizer. If you are roto-tilling under a little patch of lawn to make room for a barley patch, you may want to add a small amount of balanced granular fertilizer. (Read the instructions and add about half of the recommended amount for garden soil.) Whatever you do, do not add any nitrogen after the plants have reached the three-leaf stage.

You should receive planting instructions from your seed source. These are frequently expressed in pounds per acre or other units that are not very useful on a garden scale. Do the math and reduce the numbers to weight per square foot (or square meter) and use this as a guide. For reference, one acre is 43,560 square feet (or 4,046 m^2).

Planting

When planting your barley, you want to spread the seeds out as uniformly as possible. If you have a suitable broadcast spreader, use this to evenly disperse the seed. I planted my barley by hand and came up with the following method for achieving this. To begin, I roto-tilled the garden, then raked the soil as flat as possible with a heavy-duty rake. Rake hard enough to leave little furrows in the ground.

Next, I weighed out the seed and split it into three roughly equal portions. I then walked the length of the section to be planted and broadcast the seed by hand. On the first pass, I simply tried to spread the seed as evenly as possible. On the second pass, I again tried this, but also looked for bare patches that I missed on the first pass. On the third and final pass, I basically tried to fill in any gaps. The final step was to gently rake over the furrows and collapse them, covering the seed.

When you do this, use very short back and forth motions with the rake. If you drag it across several furrows at a time, you will drag seed along with it and leave thick clumps at the end of the rake's path.

Care

Barley does not require a lot of care, compared to most garden crops. If you thoroughly roto-tilled your soil before planting, the barley should grow quickly enough that weeds will be mostly suppressed. Pull any large weeds that spring up early, but you shouldn't need to regularly weed your barley during the growing season. Unless you live near barley (or wheat) farms, barley-specific insect pests will likely not be a problem either.

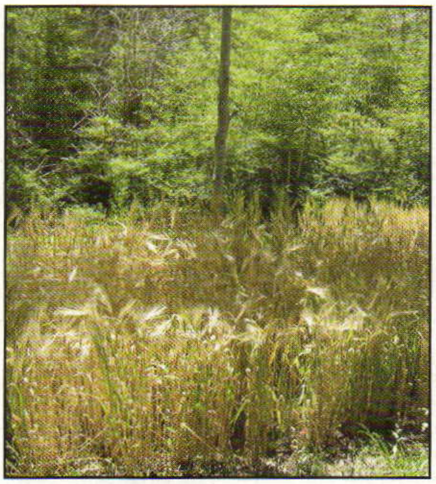
The most important factor to take care of is watering. Ideally, if you get a steady amount of rainfall throughout your growing season (between half and three quarters of an inch per week), your watering needs will be taken care of. Barley does not require a lot of water and many modern barley varieties have some degree of drought tolerance built into them. If you do need to water, it's best to water your barley thoroughly then let the soil dry out almost completely before watering again.

Maturation

Barley goes through a variety of growth stages before reaching maturity. When it sprouts, a single leaf emerges from the soil and unfurls. In early development, new leaves continue to emerge from the central stem until the plant is a compact "bush," usually with five leaves. This is sometimes called the rosette stage.

Next, tillers (secondary stems) will start emerging and all the stems will start elongating. The more densely the barley is planted, the fewer tillers will emerge. In the elongation phase, the stem "telescopes" and the distance between the leaves increases as the plant grows vertically. The leaves will also continue to broaden and grow longer during this phase.

Eventually, the head of the barley will emerge and the kernels will start developing. Barley is almost entirely self-fertilized and fertilization will be mostly complete by the time the first bit of the head emerges. Any stress on the plant, from temperatures over 90 °F (32 °C) or water stress, at this point will result in low rates of fertilization. As the kernels develop, they fill with a clear liquid (which is mostly water) that becomes more milky over the next 10 days or so. The white color in this "milk" is starch. The milky stage blends into the "soft dough" stage where the material in the kernel becomes semi-solid. The kernel continues to harden through the "hard dough" stage and eventually the into the hard, mature kernel. This generally takes about 10 days following the milk stage. Once the hard dough stage arrives, the barley begins to lose its green color and the crop quickly



Top: Barley is ready to harvest when it turns yellow and the barley heads tilt. **Bottom:** Hand-harvested barley. This barley needs to be threshed and winnowed (the kernels broken from the rachis and separated from the other plant material).

turns from a field of green grass into "amber waves of grain." Once the plants have lost all of their green color and the kernels have dried, the barley is ready to harvest. In the final stages of maturation, do not water your barley.

Harvesting

Commercially grown barley is harvested by combine. At home, you will have to develop a method on your own. What I did in 2009 was invite a friend (John "JB" Brack) over, grab a couple big kitchen knives and harvest handfuls of barley heads. Each of us grabbed a handful of stems to gather the heads together, then cut the stems. The heads were collected in small containers (I used plastic pails). It took most of the morning for both of us to harvest the 500 sq. ft. (46 m^2) I had planted, and there were still quite a few stray heads left behind.

Threshing and Winnowing

Once you've harvested the barley heads, you need to thresh and winnow the barley. Threshing is the process of breaking the kernels from the rachis and winnowing is the process of separating the unwanted plant material from the kernels.

To thresh and winnow the grain, I took two buckets of equal size — one filled with harvested barley and the other empty — and set them side by side. I donned a pair of heavy work gloves and grabbed a small handful of barley and held it over the empty, receiving bucket. Rubbing my hands together shattered the rachis and I let the kernels and other plant material fall into the receiving bucket. I repeated this until all of the barley had been processed.

To separate the kernel from the other plant material, I took the two buckets and placed the receiving bucket in front of a large fan. I slowly poured the barley from the full bucket. Since kernels are heavier and less likely to be caught by the wind, they fell into the receiving bucket whereas the stalks and broken spikes from the barley heads were blown away. I repeated this several times until the kernels were cleaned.

In each of these steps, there were significant losses. If I tried to crush too large of a handful of grain, some of the heads would remain intact and few kernels would invariably fall outside the receiving bucket. And, every time I poured barley from one bucket to the other, a few seeds would be lost. When threshing and winnowing your grain, there is a tradeoff between quick processing and lessening your losses.

Malting

Once your barley is cleaned, you are ready to malt it. If you don't plan to malt it right away, store it in a cool, dry place and check on it occasionally, looking for the sights or smell of mold. For information on how to malt at home, see the March-April 2007 issue of *BYO* (or read the story online at www.byo.com/component/resource/article/1113-malting-your-own-techniques).

In the coming years, I hope to brew some beers made with homegrown barley and hops. BYO

Chris Colby is Editor of BYO.

Making Real Ale at Home

Cask conditioning

by Terry Foster

The title of this column may have made you say something like, "Real ale? All my ale is real!" And you are right; Didn't Descartes say, "I drink it, therefore it's real?" But there is a specific meaning of the phrase "real ale." It is a term coined by the British consumer group CAMRA, the Campaign For Real Ale, when it was founded in the early 1970s. And quite simply what they meant was that it is ale which is conditioned with CO_2 by a secondary fermentation in the cask from which it is served by gravity or pump, and it must not be driven out of the cask by additional CO_2 pressure (or that of any other gas mixture). In short, the term applies not to the brewing of the beer, but to how it is processed after the primary fermentation (yes, I am deliberately using the words ale and beer interchangeably).

What this meant in practice was that the beer could not be chilled, filtered, or pasteurized. It would be kept at cellar temperature, 50–55 °F (10–13 °C), during the secondary fermentation, and be served at that temperature from the cask. One result of this is that the beer would have a relatively low CO_2 content. CAMRA generally reckoned this to be about 1 volume, although I suspect the range was more likely 1–1.5 volumes (which compares with 2–3 volumes commonly in use in US brewing. Further, air would be pulled into the cask as the beer was drawn off. Once the cask was broached, the beer would inevitably gradually lose condition, and beer left in the cask would be subject to bacterial infection if not consumed within two or three days.

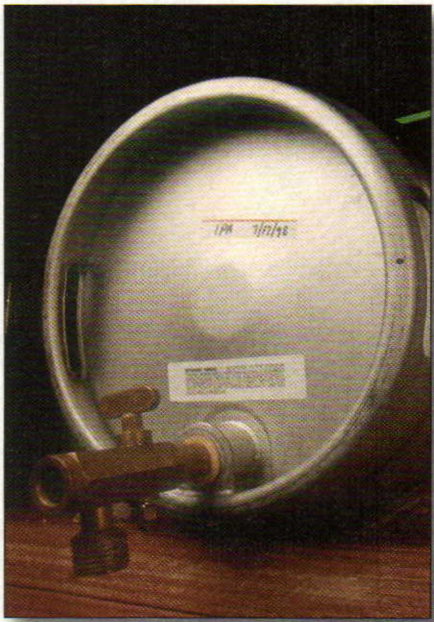
Why go to all this trouble? What is so special about real ale? Well, quite simply, many drinkers (including professional brewers) think that a good cask of it is beer at its best. Of course that's a subjective judgement but remember that the beer is at a temperature where all the nuances of flavor and aroma will be released, none of them having been removed by filtration or destroyed by pasteurization. And the CO_2 level is low enough to prevent the gas from drowning out other flavors. However, I should point out that when CAMRA came into being what it was fighting was British keg beer, which was chilled, filtered, pasteurized and served cold at two volumes CO_2 or more. Such beers in Britain then were intended for the mass market, were usually bland and more expensive than cask-conditioned beer. In the US, craft brewers usually filter their products and serve it at high CO_2 levels at temperatures as low as 40–45 °F (4.5–7.2 °C). But their recipes are designed to allow for the effects on flavor of these processes and conditions, so that the beer still has lots of flavor and complexity.

> "What this meant in practice was that the beer could not be chilled, filtered or pasteurized."

Cask-conditioned beer

This is the classical form of real ale but remember it has a short shelf-life, so you will only want to do this on a limited number of occasions. You will need a cask, and some accessories. These are available, but usually from professional brewing suppliers, rather than those catering to homebrewers. The point about the cask is that it had a bung hole at the bottom of one of the faces and a second hole in the curved side. The second, or shive, hole is sealed with a wooden (or plastic) plug, or shive, whose middle can be knocked out so that a wooden peg or spile can be inserted in it. There are two types of spile — a porous one, which is inserted to control pressure during the secondary fermentation, and a hard one, which is inserted in the shive at the end of fermentation so as to keep the beer in condition. So you will need bungs (in two sizes), hard and soft spiles, and a faucet; to be really fancy you can throw in a hand pump, or beer engine. And of course you will need a cask; stainless steel is the most common material and is better than aluminum or wood for this purpose. All these supplies will run a couple of hundred dollars or so, and much more if you opt for the hand pump.

The best approach I think is to rack the beer after primary fermentation and allow it two or three days in the secondary before racking to the sanitized cask. Do remember to bang home the bung in the bung hole first then fill through the shive hole. Now comes the tricky bit. You need



"Real ale" refers to ale that is conditioned with CO_2 by a secondary fermentation in the cask from which it was served by gravity or pump, but no additional CO_2 or other type of gas pressure.

to add enough priming sugar to reach the desired level of conditioning, which is 1–1.5 volumes CO_2. How much is the question, for your beer will already contain some of the gas, and you have no way of knowing exactly how much? Well I am going to chicken out here and not make any recommendations, partly because of reason of space, but more importantly because this question was dealt with in some detail by "Mr. Wizard" in the Jan-Feb 2010 issue of *BYO* (p. 16-18). Author Ashton Lewis points out it that it may be necessary to add fresh yeast at this point, particularly if you used a highly flocculent strain in the primary. You may also wish to add isinglass finings at this point; if so, simply follow the instructions on the packet. You can use gelatin finings, but isinglass is much superior for this purpose.

Once everything is in the cask, hammer home the shive then hold the cask at cellar temperature, if possible, but up to 60 °F (15.6 °C) is okay. After the first 1–2 days, bang out the center of the shive with a screwdriver; you should hear some release of gas when you do so. Insert the porous spile; as soon as no more gas is being evolved, replace it with a hard one. Allow 2–3 days for the beer to fall bright then place the narrow end of the faucet against the center part of the bung. Try to hammer it home with one sharp blow of the mallet; if you do so you will lose only a small amount of beer. Now remove the hard spile and serve your own real ale directly from the faucet. Or if you prefer, attach it via a line to your beer engine and pump the beer out. An advantage of the latter approach is that the pump can be adjusted so that even a relatively flat beer will have a good head of foam. Do remember to replace the hard spile between servings so that the beer does not lose condition.

"You probably have a Corny keg or two for your draft beers, and you can use one of these instead of the cask."

An alternative approach

You probably have a Corny keg or two for your draft beers, and you can use one of these instead of the cask. You won't then have to bother with a faucet, bungs and shives. You should proceed as above, but simply seal the keg with its lid during the secondary fermentation. For serving you will need an appropriately sized piece of food grade vinyl tubing; one end attaches to the beer engine inlet, and the other is fitted with a female ball- or pin-lock fitting.

When the beer is ready attach the tubing to the "beer out" post, open the pressure relief valve (or loosen the "gas in" post) and pull a pint of real ale from your hand pump.

Another variation

The problem with both the methods mentioned is that the beer has a short life once the cask or keg has been opened to the air. Is there a way round that? Of course, there is! You just use your gas cylinder to drive the beer so that air does not enter as the beer is served. A direct connection can easily raise the gas content above 1.5 volumes, taking it out of our definition of real ale. That can be solved by purchasing (from a professional supplier) a device called a cask breather. This fits into the line between the gas cylinder and the "gas in" post on the keg (it can also be attached to the spile hole in the shive of a cask). It is just a one-way "zero-demand" valve and will only let gas into the keg when beer is drawn out of it. The result is that the pressure above the beer remains the same and in the region we want. This means that you could probably run such a system without the expense of a hand pump; just use a normal picnic tap for serving, and if you are only drawing off a pint or two at a time it should work well enough. CAMRA has proscribed this device, stating that beer delivered with its help is not real ale. This is because they are paranoid that if a CO_2 cylinder is connected to the cask, with its valve left open, the beer will become over-carbonated. But I connected an opened gas cylinder, with a gauge pressure of 15 PSI, via a cask breather to a stainless keg of near-flat beer. I left this setup alone for three weeks in which time no gas passed into the beer and it was as flat as when I started!

> "A direct connection can easily raise the gas content above 1.5 volumes, taking it out of definition of real ale."

Yet another variation

From the above it is clear that CAMRA does not understand the physics of the system. If you have a beer containing 1.5 volumes of CO_2, and draw off four or five pints, the pressure above the beer is lowered and gas will come out of solution to restore equilibrium. That means that the beer will now contain less than 1.5 volumes (assuming everything is at constant temperature), so you need to apply a little pressure to bring the CO_2 level back up. In other words, a short burst of gas from the cylinder after you draw off some beer will not raise the carbonation level of the beer.

That is exactly how I handle my real ale. After secondary fermentation in the keg I connect the gas line to it as I am ready to serve. As long as I can draw off beer through a picnic tap I keep the gas cylinder valve closed; it is only opened for no more than a few minutes when beer does not flow freely from the picnic tap. I set the cylinder gauge at 5 PSI at 50 °F (10 °C); that would make the beer contain 1.5 volumes at that temperature, or 1.66 volumes at 45 °F (7.2 °C), which is my normal serving temperature. At that level the beer is not gassy, and all the flavor nuances still come through. Furthermore, I am not letting in air and the beer does not quickly deteriorate, and will remain in good condition for weeks. Note that you could also do this using mixed gases (CO_2/N_2), which might, in fact make for better control of CO_2 content, but I haven't put this to the test in my own brewery.

The final variation

This is the simplest technique of all, and one that many homebrewers are already familiar with — bottle-conditioning. It is a method approved by CAMRA, who have persuaded a number of British brewers to offer such beers for sale. I have not properly measured any of these, but would judge from the way they pour that many of these are closer to 2.0 volumes of CO_2 than to 1.5! The only point about it is that it is not as easy to achieve a reproducible level of conditioning in the bottle as many people seem to think. Once again, I refer you to Mr. Wizard's piece for a fuller discussion on this topic.

Closure

I have shown you what real ale is, and also described how you can make it at home according to the strict letter of CAMRA's law. But I am no great believer in dogma, and I hope I have also shown you that it can be produced by simple techniques, and that you can produce real ale without going to a great deal of extra expense. However, do not let me discourage you from going the whole hog and buying a cask and a beer engine, for there's something very satisfying about serving your beer exactly the way the pros do it. And to emphasize an earlier point — I give you no recipe for real ale, because the term does not apply to the way it is brewed, but to the methodology of conditioning and serving it. Finally, some questions as food for thought. Is cask-conditioned beer really better than a beer which has been artificially conditioned with CO_2 (and possibly filtered too)? Does gas from a cylinder really make the beer taste differently than gas evolved "naturally" from fermentation? Do we need the term "Real Ale" at all, when the most important question of all is not how the beer is produced, but "Does it taste good?" BYO

Terry Foster divides his time between the US and England. He holds a PhD in chemistry from the University of London. He writes "Techniques" in every issue of Brew Your Own.

Malt Drying and Kilning

Flavor and color development in malt

by Chris Bible

Malted barley is the heart and soul of beer. Malting is the process of allowing barley to begin germinating until it develops the enzymes that are needed to convert the starches within the barley to sugar. The four steps in the malting process are steeping, germination, drying and kilning. The way that the maltster performs these steps directly affects the biochemical reactions that occur within the barley and, as a result, directly impact the flavor, aroma and color characteristics of the malt.

Steeping

Steeping is the act of soaking barley in controlled water temperatures (50–59 °F /10–15 °C), air humidity (10–50%) and oxygenation conditions. Steeping is typically carried out in two or three stages of steeping the barley in water and draining the grain bed in order to induce rapid, even water uptake by the barley, while allowing sufficient air contact with the barley to ensure that the absorbed water is well oxygenated. At the end of the steeping process, which takes 40–50 hours, the barley will typically contain 45–50% water by weight.

Germination

After steeping is complete, the free water is drained away and the barley is allowed to germinate. Germination is typically carried out over 3–5 days at a temperature of between 50–68 °F (10–20 °C).

During this step in the process, the barley is allowed to sprout and the enzymes that will later be used by brewers when mashing are produced. These enzymes include α-amylase, β-amylase, β-glucanases and proteinases. Kernels of sprouted barley have the emerging stem and roots extending from them.

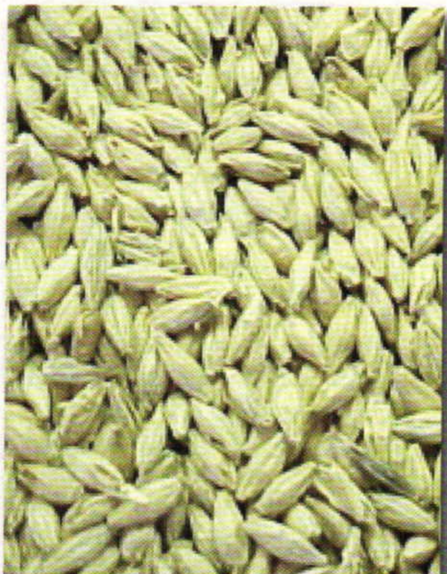
Drying

After modification has progressed to the desired extent, the malted barley is dried in order to stop the germination process, halt the biochemical reactions that are responsible for modification of the malt and make the roots extending from the kernels brittle, so they can be easily removed. Drying involves moving hot, dry air through the malt so that water is removed. Malsters can adjust the "air on" temperature of the dry air entering the kiln and the speed of the air movement. These parameters are manipulated so that the relative humidity of the "air off" — the air that has passed through the grain bed — is very high, from 90 to 95%. As drying progresses, the "air on" temperature increases (which increases the amount of water it can hold). Initial "air on" temperatures can start as low as 122 °F (50 °C). This early phase of drying is called free drying. Once the moisture content of the malt has dropped to 12%, forced drying begins and the "air on" temperature is raised to as high as 167 °F (75 °C). The malt is dried until the malt drops to about 5% moisture. Enzyme inactivation increases with the moisture content and temperature of the malt. For this reason, lower temperatures are used when the malt contains the most moisture, and the "air on" temperature only increases when required. For pale malts, the final phase of drying is called curing and the "air on" temperatures may be elevated to 176 °F (80 °C) for American pale malts to 230 °F (110 °C) for the slightly darker British pale ale malts.

Kilning

After drying, malt may be kilned further to produce darker malts or specialty malts. (Crystal malts are kilned without being dried. This process, called stewing, is not discussed in this article. Dried malt may be stored before further kilning or this further kilning can be a continuation of the drying process.) Kilning removes raw, green-malt flavors associated with dried barley and produces new flavor, aroma and color-producing compounds within the malt. The types and amounts of flavor, aroma and color-producing compounds that develop during the kilning stage are affected by the temperature and duration of the kilning process. Shorter, lower-temperature kilning produces lighter malt with less flavor intensity. Longer, high-temperature kilning pro-

"Malted barley is the heart and soul of beer."



Brewing grains are malted through the process of four steps: steeping, germination, drying and kilning.

Table 1: Effect of Curing Temperature and Time on Formation of Color

Temp. (°F)	Kilning Time (minutes) 10	20	30	40	50	60	70
300	Pale Gold	Gold	Amber	Deep Amber	Deep Amber	Deep Amber	Deep Amber
350	Pale Gold	Amber	Deep Amber	Copper	Copper	Copper	Deep Copper
400	Gold	Deep Amber	Copper	Deep Copper	Brown	Brown	Dark Brown
440	Amber	Copper	Deep Copper	Brown	Dark Brown	Dark Brown	Dark Brown / Near Black

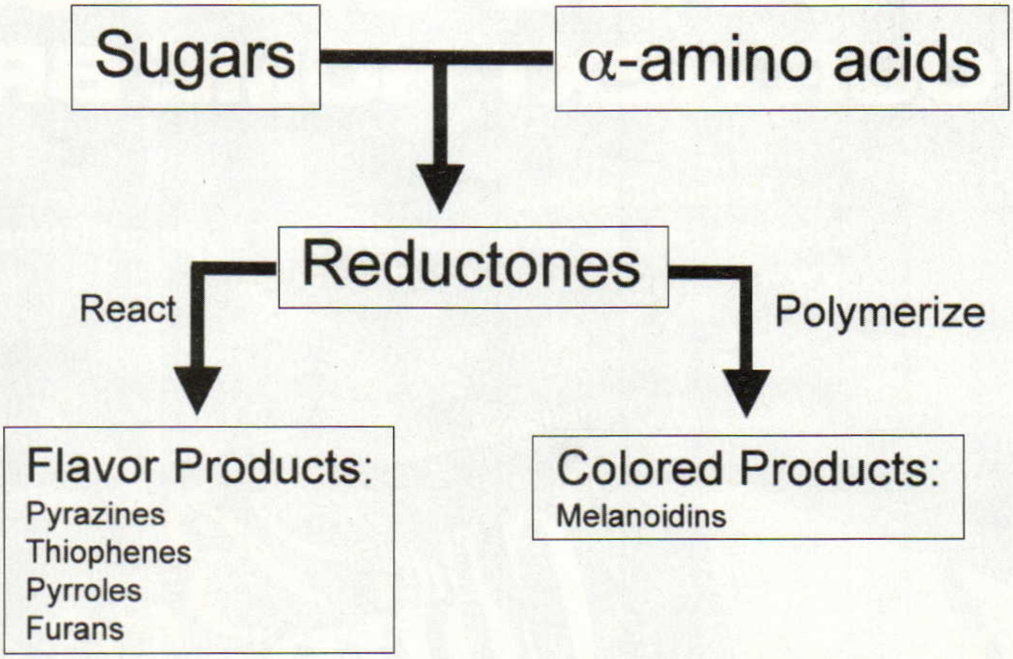
Table 2: Flavor Descriptions

Color (°Lovibond)	Flavor / Color Description
Pale Gold (10L)	Nutty & aromatic. No toasted flavor. Enzymes still active. Yellowish-gold color
Gold (20L)	Malty and caramelly rich. No toasted flavor. Partial enzyme activity. Brilliant gold color.
Amber (35L)	Nutty, rich malty and caramel flavors. Light toasted flavor. Enzymes mostly deactivated. Deep orangish color.
Deep Amber (65L)	Pronounced toasted flavor. Nutty and toffee-like. Copper-red color.
Copper (100L)	Very toasted flavor. Very nutty. Dark ruby-copper color.
Deep Copper (125L)	Roasted flavor (not toasted). Coffee-like. Ruby-brown color.
Brown (175L)	Sharply roasted flavor. Rich, coffee-like. Deep ruby-brown.
Dark Brown (300L)	Very rich, intense roasted flavor. Dark ruby-brown
Dark Brown / Near Black (400L)	Very intense, somewhat acrid, roasted/burnt flavor. Very dark, near black.

duces darker, more intensely flavored malt. During kilning, the internal temperature of the kernels rises from its initial temperatures to the desired temperature for that type of malt. The final temperature achieved is called the curing temperature. Table 1 shows the curing temperature and the amount of time the malt is held there for a variety of malts. (The amount of time it takes to reach the curing temperature depends on a variety of things and is not shown.) Table 2 provides flavor and color descriptions for these malts.

Pale malts have a more subdued flavor and tend to be high in the diastatic enzymes α-amylase and β-amylase (high temperatures deactivate these enzymes). During kilning, compounds are formed via the Maillard reaction that have very intense flavor, aroma and color characteristics. These flavor, aroma and color compounds include brown and flavorful melanoidins, volatile aldehydes such as furfural, and other compounds such as pyrazines, thiophenes, pyrroles and furans. Figure 1 shows a schematic representation of the Maillard reaction. If the malt is kilned at a high-enough temperature for a long-enough time, roasted malts such as chocolate malt and black patent malt are produced. These malts contain the highest concentrations of the flavor, aroma and color compounds and represent the most extreme results of kilning.

Figure 1: Schematic of Maillard Reaction



Conclusions

It is important for a brewer to have an understanding of how the variables within the malting process can impact the malted barley. By understanding the science of the malting process, a brewer can make better decisions regarding the selection of malts, and also appreciate the work that goes into producing quality malt. BYO

Chris Bible writes "Advanced Brewing" in every issue of BYO.

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Keg and Carboy Cleaner

Build a bucket-based sprayer

by Bill-John Neidrich

here's a project that was inspired by Doc at The Brewing Network (check it out at www.thebrewingnetwork.com). In one of their first episodes Justin gushed about one of Doc's time and energy saving brewing gadgets. Doc kindly gave an explanation about how he used a submersible pump to recirculate cleaning solution through an overturned keg or carboy. He used a main spray head to clean the body of the vessel and also used auxiliary lines to feed cleaning solution through the gas in and beverage out dip tubes.

Here are the basic items you'll need:

- A submersible pump
- A bucket to put the pump and cleaning solution in
- A bucket lid or other type of support for on top of the bucket
- Various pipe fittings and adapters
- A ball valve
- Two hose barbs
- 3 feet (~1 m) of tubing

Just like any project, the equipment and materials you use can be swapped out based on availability, your preference or your budget. Find and re-purpose materials you have lying around the house to save some cash. With that being said, the parts and equipment list below is what I used from bottom to top. I built this project using imperial copper pipe fittings. If you are interested in building this project in a country where metric pipe fittings are the norm, you will need to modify the parts list and build accordingly. Stainless steel tube and Swagelok-type fittings will resist erosion from strong alkaline and acidic cleaners, so using stainless is another good alternative to copper. Plus, if you use Swagelok you don't have to do any welding or soldering. Also, you can use PVC pipe if you don't want to solder.

Since the initial build four years ago I've added a heat stick so I can heat the cleaning solution right in the pump bucket and I've added a rotating spray head to perform a more thorough cleaning job. The cleaner could also be used for boil kettles and mash tuns (provided that they are rinsed of grain and other large particles).

Important: Water and electricity can cause serious electrical shock. The pump (and heater if you modify) should be plugged into an outlet with GFI protection.

> "Find and re-purpose materials you have lying around the house to save some cash."

parts and equipment list

- A large saucer
- A 5-gallon (19-L) bucket with lid
- A pump. The pump is really the heart of this beast. I used a ⅙ HP WaterAce R6S Utility Pump with a max flow of 25 GPM. I then wandered around with the pump in hand at the hardware store for what seemed like hours to find the right fittings to adapt it down to the ½" copper pipe.
- I used a monster copper female threaded fitting x 1" sweat
- One copper 1" to ¾" reducer bushing
- One short section of copper ¾" pipe
- One copper ¾" x ½ x ½ tee
- One copper ½" sweat to ½" mpt
- One brass ½" fpt ball valve
- One brass ½" mpt close nipple
- One brass ½" fpt tee
- Two nylon ½" mpt x ⅜" barb fittings
- Two sections of ⅜" vinyl tubing each 16" long
- Four small hose clamps
- Two 5/16" barb x ¼" flare swivel nuts
- One gas in keg quick disconnect (QD)
- One beverage out keg QD
- Some ½" copper pipe
- One bulbus copper "water hammer air chamber" for the spray wand

Note: You don't need to have the QDs dedicated to this cleaner but you probably want to have an extra set so you don't need to remove them from your draft system just to clean a keg.

This pumped up bucket project cleans and sanitizes carboys and kegs with ease.

1. THE BUILD

You'll want to dry fit everything together before any parts are soldered so you're sure to get the correct heights and lengths. You'll also want to find the location of any screwed in fittings when they are tight. Take your main threaded fitting and screw it into the pump. Then mark the direction that the ball valve needs to go. This mark will be used to align the fittings when they are soldered. Also make sure you design your cleaner so the ball valve is a few inches below the rim of the bucket.

2. THE BALL VALVE

Solder your parts up again making sure that your ball valve will be pointing in the correct direction when the unit is connected to the pump. Do not solder the pipe going up to the main spray head you will want to leave it free so you can add different length pipes for your various cleaning applications.

3. PUT IT TOGETHER

Assemble all of the pieces that get attached to the pump. Thread on the ball valve, the nipple, the tee, and the hose barbs. Press one end of each section of tubing over the nylon hose barbs and clamp them in place with two hose clamps. Press the two $\frac{5}{16}$" barb by $\frac{1}{4}$" flare fittings into the open ends of the tubing and then clamp them in place with the two remaining hose clamps.

Web extra:

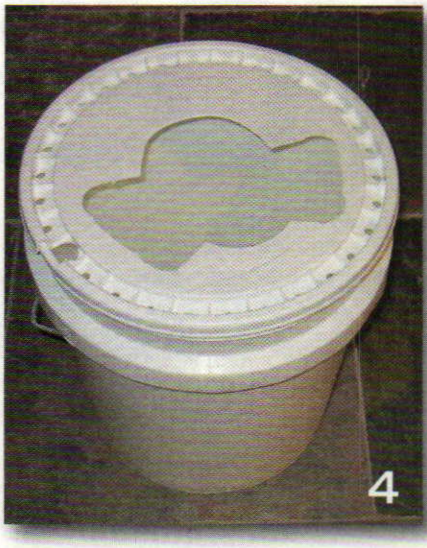
For details about modifying this project for heat and a rotating spray head, visit:

http://byo.com/component/resource/article/2051

4. MODIFY THE BUCKET

You will need to modify your bucket lid by cutting a hole for the keg opening and the QDs. My cutout is an odd shape to accommodate both ball and pin lock kegs. You'll also need to cut a slot in the edge for the cord. I had to drill holes around the edge of the lid to allow liquid trapped in cavities to drain back into the bucket.

To support the weight of a carboy on top, I used a hole saw to cut a large hole capable of fitting the carboy's neck in a scrap piece of 2 x 6 (see figure 6). It adequately held the carboy but was awfully unstable so I used a jig saw to create a chamfer around the hole. This improved carboy stability tremendously. I have also seen people use milk crates and the like to hold the carboy.



5. MEASURE THE RISERS

You will want to solder the union on to the water hammer bulb. Once that's done you can start measuring out the lengths of copper pipe (risers) you need to get the spray head 4 to 6 inches (10 to 15 cm) from the top of your vessels. I use a shorter riser while cleaning carboys and a longer one when cleaning kegs. I put a slight bend in my risers in order to center the pipe in my bucket. Using a pair of pliers slightly deform each end of the riser so that it fits snugly into the fittings on the pump and the spray bulb. This will prevent the riser or bulb from separating due to water pressure. Using a 3/32" drill bit, drill as many holes as you can into the top of your spray head. You may need a number of bits, and use a vice or drill press if you can. Don't hold it while you're drilling. You may want to add dimples to the bulb with a punch prior to drilling to help keep the bit from wandering. To specifically target that stubborn kräusen line in your carboys, you can add a few holes along the sides of the bulb or your riser.

6. USING THE CLEANER

To clean carboys I shut the ball valve, place the wooden cradle over the spray head, and then slide the carboy over the spray bulb. When cleaning kegs I install the QDs on the lines, open the ball valve half way, and put the lid on the bucket. Then I place the keg over the spray bulb and connect the QDs. The keg rests right on the bucket lid (I may end up needing to reinforce the lid with something as I have cracked it). Everything should be good to go. I highly recommend using Powdered Brewery Wash (PBW), it foams far less than OxiClean and does not foam at all when heated over 100 °F (38 °C). If it's needed, foam control can also be used to prevent a foamy mess. Solution for cleaning carboys should not be heated over 100 °F (38 °C) to prevent the thermal shock from cracking the glass. Kegs can be cleaned with 150 °F (66 °C) solution, which will clean more effectively. BYO

Bill-John Neidrich is a Process Engineer by profession and a professed brew gadget freak. He is a member of the Ithaca Practitioners of Alemaking (I.P.A.) homebrew club in Ithaca, New York. More of Bill-John's projects can be seen at www.flickr.com/photos/billjohnn.

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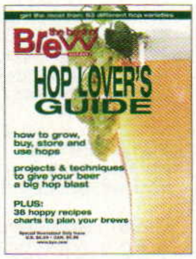

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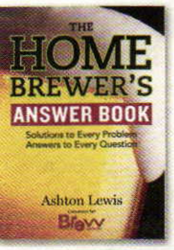

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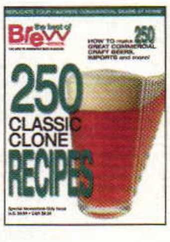

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Brew School

Follow a new brewer at UC-Davis

Justin Burnsed • Walnut Creek, California

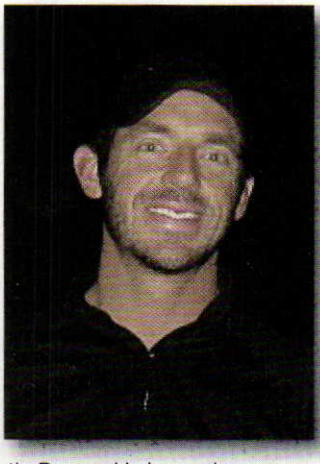
In 1999, I moved to Chico, California. While I was attending college there, I discovered something that would change my expectations of beer, the Sierra Nevada Brewery. Not only could you get every style that they made in that town, but also it was ridiculously fresh and only $4 a pitcher, what a bargain! It was then that I decided that quality beer was something that I wanted to explore.

After graduation, I moved to San Diego and shortly after purchased my first homebrew kit. It was the basic no frills liquid extract with a plastic fermentation bucket and a 3-gallon (11-L) stockpot setup. As a homage to my favorite "little" brewery back in Chico, I used whole cone hops in my first batch, which at the time I thought was impressive for a first go at it.

With basic instructions in hand from the guy at the brew shop, I learned my first lesson quickly. I soon figured out that scorched wort made for a not so tasty brew. Over the next few years, I was an on-again/off-again homebrewer, mostly reserving my creations for special occasions like the annual cabin trip with my friends up to the mountains every 4th of July. At the time I was working in the finance industry and was enjoying what seemed like a very stable and lucrative corporate existence.

In 2008 when the financial markets took a nosedive, my company had to close its doors and I was out of a job. While searching for a new career path I stumbled across an advertisement in a magazine for the UC-Davis Master Brewers Program. This was one of those moments where if I were in a cartoon, the light bulb would have turned on over my head. I had no idea programs like this even existed.

> "This was one of those moments where if I were in a cartoon, the light bulb would have turned on over my head."



Justin Burnsed is becoming a professional brewer as a second career.

The next day I picked up the phone and called up the program representative to ask what this was all about and see what I needed to do, if this was to be something I decided to pursue. After our conversation I felt enlightened and a bit apprehensive at the same time. I found out that I would have to take courses in both biology and chemistry as prerequisites before I could even apply. Suffice it to say that I hadn't even touched those subject areas in 16 years!

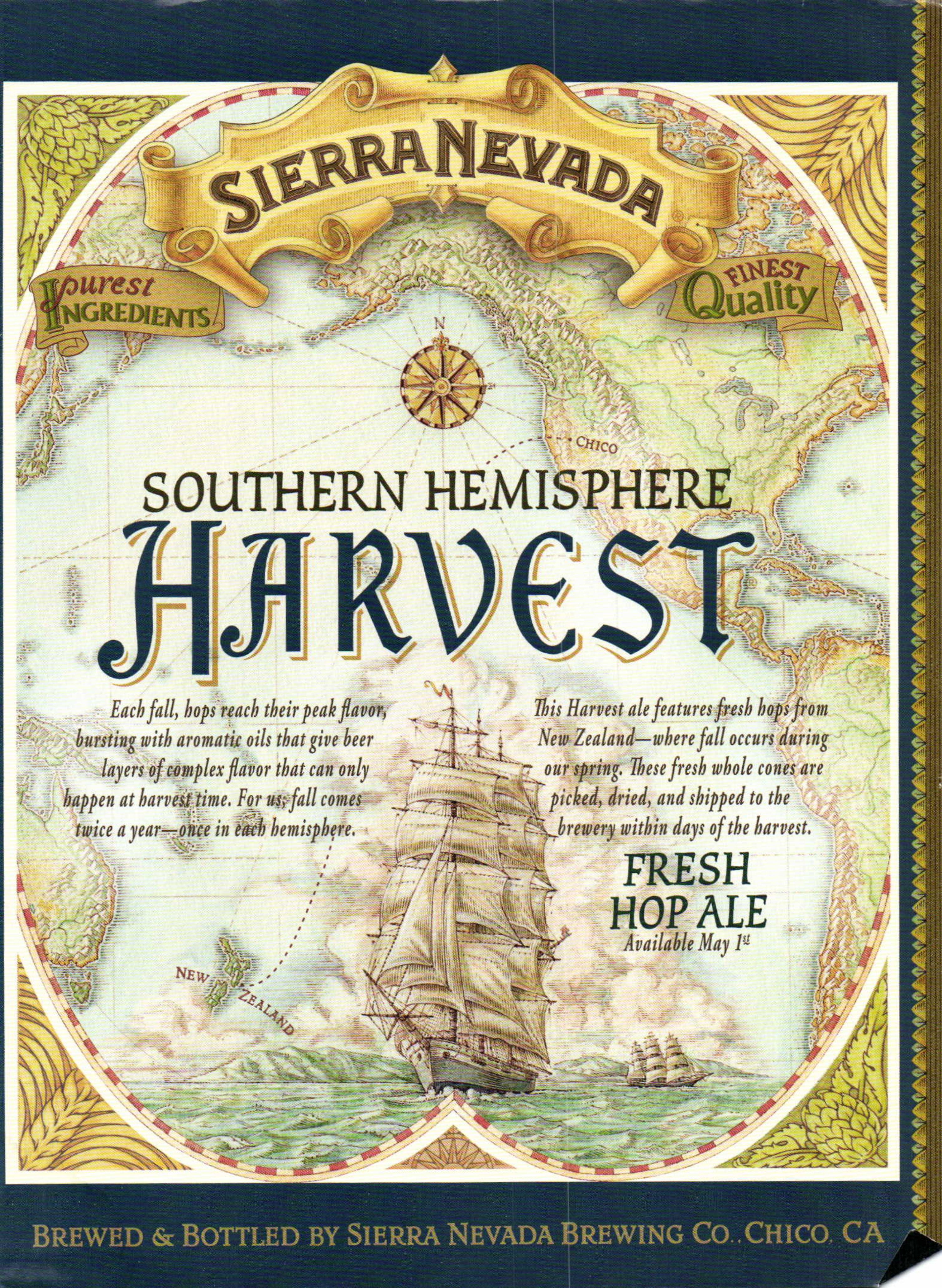
Despite my reservations, I enrolled in the necessary classes at the local community college and went for it. At the same time, I also made the decision that I would need to understand brewing a whole heck of a lot better than I did at that point. I bought every brewing and beer related book I could get my hands on. I also decided that an equipment upgrade was absolutely necessary if I were to maximize my potential as a homebrewer.

I purchased a few glass carboys, two keg shells that I would use as a mash tun and a kettle, a kegerator complete with external thermostat, an immersion chiller and everything else needed to make the move to all-grain brewing. My first batch was a Scotch Ale that I thought was pretty good, so I entered it into a local contest that was being judged by the guys from The Bruery (in Placentia, Californa). Well, I didn't win, but I did get 3rd place overall out of 106 entries. The winner was a beer called Liquid Sex. How can you compete with a name like that?

I continued to brew throughout the year, entered some more local contests, all while trucking through my classes. When I finished, I got on the waiting list at UC-Davis for 2010 with the likelihood that I would have to wait until the following year to attend. Less than two weeks before the program was set to begin, I got the call that some people had backed out and that I was in. I packed my bags and headed up to Northern California.

Now, on the eve of this chapter in my brewing journey, I find myself with many questions. Who are the people that will be alongside me? Will this be the foot in the door that I am looking for? The answers to everything will come soon enough in the weeks to come. BYO

Editor's note: Justin will chronicle his experiences at UC-Davis's Master Brewer's Program in a new blog available at www.byo.com/blogs.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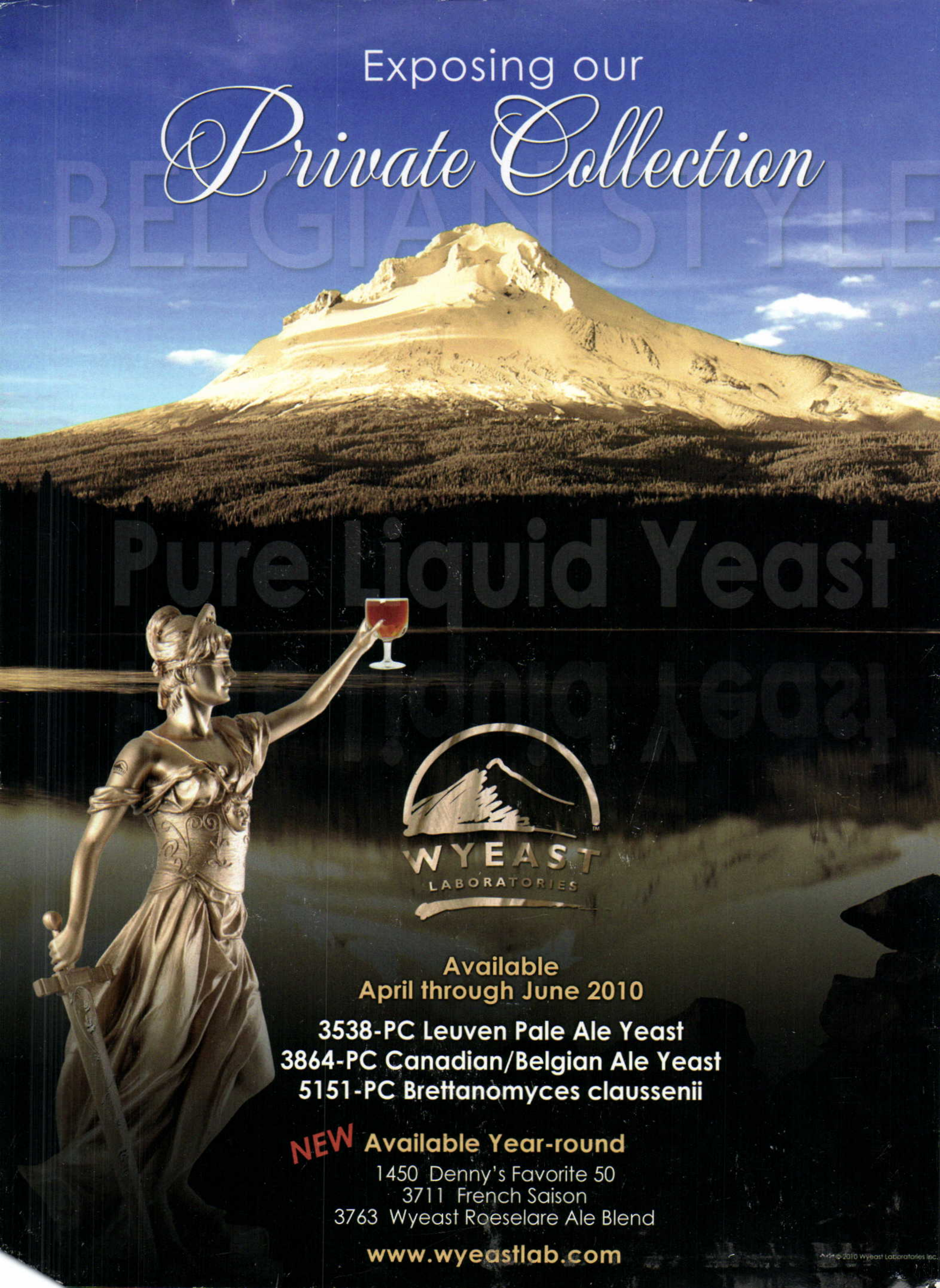
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