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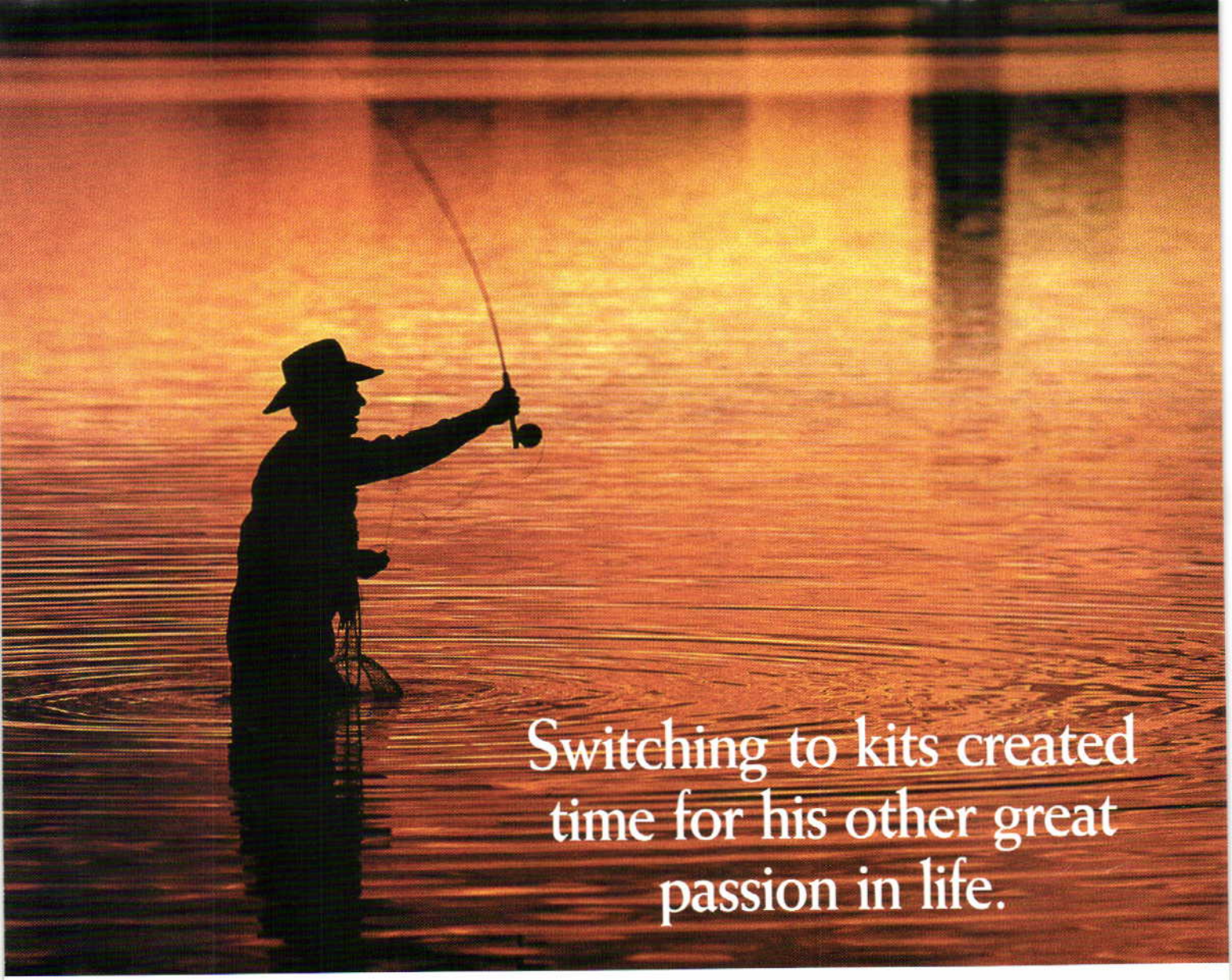

"It tasted just as good - if not better - than many a pint I've drunk in London pubs."

Richard Neill
'Weekend Telegraph' (April 99)

"I wouldn't have believed that a kit beer could be so good"

Roy Bailey - Beer Correspondent
CAMRA's 'What's Brewing' magazine (April 2000)

"It resulted in as good a home-made beer as I have ever tasted"

Maximum 5-point rating in kit review
'Bizarre' magazine (September 99)

This man is passionate about brewing. And he loves to fish.

He was finding more and more that his brewing was keeping him at home when he wanted to be down at the lake. Then he discovered Smugglers Special Premium Ale, Old Conkerwood Black Ale and Midas Touch Golden Ale - the Premium Gold range of brewkits from Muntons.

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If you've been a slave to full grain mashing, don't be! Try Premium Gold and get hooked on the taste of Muntons.

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Summertime and the brewing is easy...

Brewing a wide range of authentic beers needn't be a labor of love. Especially when there's better things to do outdoors. Beer lover Roger Bacon explains...

I love everything about beer! I love the way it looks. I love the way it tastes. I love the way it smells. I love the way it makes me feel. I love the whole history behind beer and beermaking. However, I don't necessarily *love* making the darn stuff.

The reason is that life is just too short to be stuck in a room steamier than a Chinese laundry grappling with a full grain mash boil. Every time I do it I have to gee myself up with the belief that I am creating a masterpiece. In the back of my mind I'm telling myself that the brew I am making will be something very very special. I liken myself to an 11th century monk as I stir the mash - all very evocative - but it doesn't get the lawn cut!

And that's the point. All the time I'm couped up in that room preparing and boiling, I'm wasting valuable time. Fine if the resulting brew was going to change the course of brewing history! But, dare I say, it is *only* beer I'm making. Sometimes I think we've all become far too obsessed with creating something unique. We get too involved in creating a real specialty. By adding this and that we ultimately lose sight of what should be a simple, pleasurable pastime. I'm sure those monks just chucked in all the ingredients and got on with their lives! I bet they hated being stuck inside brewing when outside the birds were singing...

So what is my point? Call me a philistine (I am a beer drinker after all) but I just don't need all the grief of full grain mash brewing, especially when I can get the beer I want from a simple, no-boil kit. I've drunk a lot of beer in my time! I've sampled brews the world over. I've drunk beers in pubs, clubs, sheds, tents, front rooms, cellars, basements, garages, motels... I've drunk light beers, dark beers, warm beers, cold beers, strong beers, weak beers, fruit beers, herb beers... But the truth is the beers I like best are the the simple beers, prepared from fundamental ingredients - quality malt, hops, yeast and water. And that's exactly what you get with a Muntons kit. There is actually no difference between what you do when you mash to what Muntons do on a larger scale. Depending on the beer style, they select the appropriate malt (from over 90 different kinds) and they mash just as you would. The only difference is they then evaporate off the surplus water and seal the mix in a can!

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The common mistake brewers make when they use a kit is to believe they have to add extra ingredients. That may be true of inferior barley syrup kits but with the premium Muntons all you do is add water and yeast and get on with your life!

The Woodfordes range is based on the original brewery recipes

The range of beer styles that Muntons offer is amazing. Everything from pilseners, India pale ales, traditional English bitter and Irish stout in the Connoisseurs range through to dark, strong ales such as Old Conkerwood in the Premium Gold range. Muntons have also worked closely with real-life breweries to produce accurate kit equivalents to English pub beers such as the award winning Woodfordes range.

Muntons Premium Gold Range

Next time you're in your brew store ask about Muntons. If you're still convinced that full mash is the only way why not put your theory to the test? Buy a Muntons kit and try for yourself. Compare your grain mash brew against an equivalent Muntons brew made as Muntons recommend. Be honest. If the grain mash brew tastes better than the Muntons kit you'll know you're doing it right. It's more likely you won't be able to tell them apart (after all, they amount to the same thing). Think of all the time and effort you could save by using a Muntons kit. All the time you could be doing other things. All the grass you could cut. All the odd jobs you could do around the house. All the grocery shopping you could do...

Second thoughts... Let's all stick to full grain mashing!!

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Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

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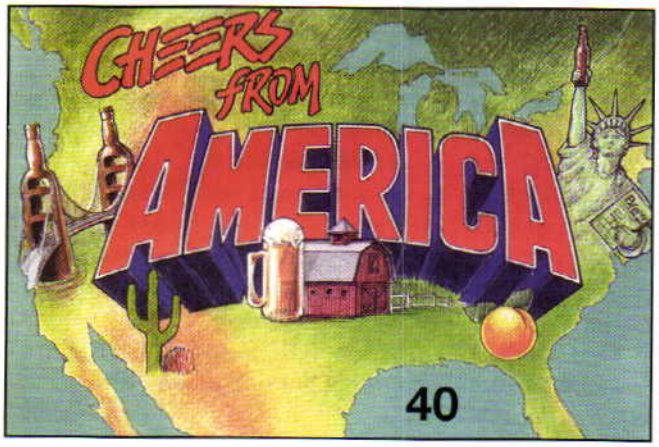

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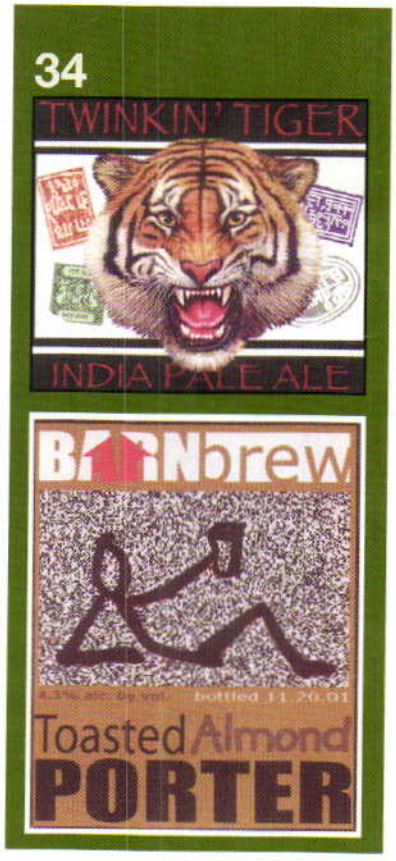

COVER PHOTOGRAPHY: *Charles A. Parker*

RECIPE INDEX

Mail

Fruit Handling

I enjoy porters and recently found the Blackberry Porter recipe in your October 2001 issue. If I use fresh blackberries, do I need to make any special considerations for sanitation? Or will a basic wash be sufficient?

Tim Graham
Orlando, Florida

You don't have to do anything aside from washing the fresh fruit. If you add the berries in the secondary, the beer will already contain alcohol and the pH will be in the 4.0–4.6 range. Under these conditions, wild yeasts or bacteria generally don't become a problem. (For more on using fruit, see "Techniques" on page 47.)

Why LME and DME?

I often see ale recipes, including some in *Brew Your Own*, that call for an amount of malt extract syrup and an additional amount of dried malt extract. Often, both extracts called for are the same type (light, amber or somesuch). Why both types of extract?

Bob Conlin
via email

Many brewers do not want to store partially full cans of liquid malt extract (LME) until their next brewing session. So they only add LME to their beers in 3.3-pound increments, the size of a standard can. Then they use dried malt extract (DME) — which is easy to store — to fill out their recipes.

Hefeweizen Yeast

I am just beginning to keg my homebrews and have a question about wheat beers. I like a hefeweizen-style wheat beer better than the American-style wheat beers, but am concerned that all the yeast will be sucked out of the keg in the first couple of glasses. Is there something that must be done when dispensing to prevent this? Is it something I need to worry about?

Kyle Karraker
Normal, Illinois

Most weizen yeast strains are not very flocculent, meaning they tend to stay in suspension. So you should get some yeast in every glass without having to do anything special. Some breweries store their kegs of hefeweizen upside-down until the keg is tapped. This prevents the yeast from settling to the bottom of the keg during storage.

Fast Ferment

I've followed instructions to the letter on my first and second brew. But still, after three days, my ferment just stops. My fermenter is located in an area that averages 75° F. I've tried yeast energizers and doubling up on the yeast, but so far no luck. Help!

David Hankins
Anchorage, Alaska

Worries about fermentations ending prematurely are common among new homebrewers. In your case, your beers may have completely fermented over the three days. At 75° F, fermentation can go fairly quickly. You mention "doubling up on the yeast," so you may have pitched enough yeast. If you don't already do so, you should make a yeast starter every time you brew. (See the March-April issue of BYO for how to make a yeast starter.) You also mentioned yeast nutrients. Yeast nutrients are rarely the solution to fermentation problems because most worts are not lacking in nutrients.

If you pitch enough yeast, aerate your wort adequately and maintain recommended fermentation temperatures (68–72° F for most ale strains), your fermentations will be fine.

Just say "No" to NO_2

In the March-April issue, one of Mr. Wizard's supplicants claimed he kegged his stout with a mixture of CO_2 and NO_2. Shouldn't that be N_2?

Tim "ChemBoy" Stewart
Highlands Ranch, Colorado

Yes, it should have been N_2. Nitrogen gas (N_2) is a gas used along with CO_2 in beer taps. NO_2, also known as nitrogen dioxide, is a poisonous gas (and definitely should not be used to push beer). BYO regrets the typo. ■

brewer profile

The Trail to Oregon • Michael Neuman • Crooked River Ranch, Oregon

PHOTOS COURTESY OF MICHAEL NEUMAN

Michael beside his three-tier brewing system that he and his neighbor built.

In December 2001, I moved to central Oregon from California. I soon found a homebrew store in Redmond, The Beer Neccessities. Through the folks at the supply shop, I met a fellow brewer and neighbor, Ward Monroe. I was impressed with his home brewery, which he calls Rowdy Dog Brewery, after his yellow Lab. Ward has built a three-tier brewing system and has a bar and a draft system in his brewery.

Ward and I have just finished building my own three-tier brew system, which Ward designed and I helped fabricate. It cost just under $800. With the kegs in place it is eight feet, two inches tall. I ordered a lot of the hardware from Beer, Beer and More Beer, including the burners, heat shields, sight gauge, gas valves and stainless-steel couplings for the brewpots. Most of the rest of the supplies — such as the copper tubing and gas pipe — were purchased from the local hardware store.

The kegs were purchased from a distributor and we had the fun and pleasure of cleaning them up, cutting the tops off and drilling the holes in them for the couplings. This took a couple of days. We had a local weld shop do the welding on the kegs. Ward welded the stand himself. It took us about 4 days — and I don't remember how many homebrews (after the job, of course) — to complete the three-tier system, once we had all the material. We used just under 60 feet of angle iron and 20 feet of flat one-inch iron.

I cut most of the angles. When it was all done, the second tier ended up being too small, and the bottom of the keg wouldn't fit. Ward creatively welded a couple of pieces of angle iron into the second-tier shelf, making it a flat shelf. Now the keg slides on and off the shelf, with no extra lifting involved. This turns out to be one of the best mistakes I've ever made, since that is the heaviest pot when it's filled with wet grains. We also learned that putting the soft gas hose along the metal frame, way too close to the heat, is not too hot of an idea.

My first brew on the system got named the Crooked River Stuck Mash Pale Ale. It helps to put a few slits in the copper tubing on the pick-up valve assembly under the stainless-steel screen. I had the pleasure of taking the whole mash out and cutting the slits.

I brew at least once a month, sometimes more. I love to brew something different every time I brew and ferment the batches with two different kinds of yeast, so I get a different flavor profile in each batch I brew. I tend to do lagers in the winter and ales during the spring and summer. My favorite brew would have to be my dunkel, though I like them all. Another reward of living in Oregon is having my own juniper trees. Sometime soon I plan to make some sahti, the "mighty Finn beer" featured in the December 2001 issue of *BYO*, using juniper twigs and berries.

My next major project will be converting my shop into a home brewery with a bar. I plan on calling it the Crooked River Brewery, after the river and ranch development where I live. In the meantime, my reward is enjoying good brewing company, creating new recipes and brewing Crooked River Ale on my new three-tier system.

reader recipe

Historic Homebrew

I started brewing again about two years ago. I say "again" because I "brewed my own" back in the mid-Fifties while I was in the Army, stationed in Kansas. I don't think it was legal to brew then, so I won't sign my real name to this letter, just in case the Feds want to come after me, some 50 years later.

The local grocery stores used to sell Blue Ribbon malt extract in large cans. I think you could make bread, cakes or cookies with it. While home on leave, a neighbor gave me a recipe for homebrew. I bought a can of the extract and gave it a try. The recipe that follows will make the modern day homebrewer cringe. It uses table sugar, bread yeast, no hydrometer and not much else.

With a private's pay at $72 a month, homebrewing made having a few beers affordable. The beer tasted pretty good, but not as good as the beer that's made these days. The price was right, however.

Humble Homebrew Soldier
Muskego, Wisconsin

Blue Ribbon Home Brew

(5 gallons, extract only)

Ingredients

1 can Blue Ribbon malt extract
1 handful of raisins or apricots
3 lbs. sugar
2 medium spuds or 1 cup rice
1/2 cake baking yeast

Step by Step

Mix malt with 1-1/2 gallons of hot water, add sugar and dissolve. (Blue Ribbon malt extract isn't sold anymore, so substitute unhopped pale malt extract syrup.) Finish filling crock with lukewarm water, dissolve yeast, put in rice or raisins. Cover with a dish towel and let set for 72 hours or until the "wort" quits. Use 1/4 tsp. of sugar for each quart when bottled.

homebrew club

A Blue Ribbon Brew Club • Pasadena, California

Football fans know Pasadena as the site of the Rose Bowl. But to chefs and gourmands, the city is better known for the California School of Culinary Arts. The school proudly teaches the skills of Le Cordon Bleu to eager students from all over the world — and it now includes brewing in its wide-ranging culinary arts curriculum.

Originally, Le Cordon Bleu (the Blue Ribbon) was bestowed and worn by only the highest members of knighthood, L'Ordre de Chevaliers du Saint-Esprit. This group was instituted by King Henri III of France in 1578. In the mid-1800s, the term Le Cordon Bleu was associated with the highest accolades that a culinary artist could achieve. Since 1895, when it began as a culinary magazine and subsequently expanded to be a cooking institution, Le Cordon Bleu has taught its long-celebrated culinary traditions while adapting to modern styles and influences. Now, with schools on five continents, Le Cordon Bleu continues to teach the chefs of tomorrow its time-tested French culinary techniques.

At the Pasadena institution, Le Cordon Bleu students are offered a rare opportunity to delve deeper into the culinary arts and explore an ancient technique beyond that of its own 206-year-old cooking traditions. At this school, students also can learn the art of brewing.

Chef Jeff Zahniser — or "Chef Z," as he is known to students and associates — heads Le Cordon Brew Society, a voluntary club for interested students. "I have been brewing for about 10 years," says Chef Z, "and I love to pass along my knowledge to eager students willing to take the time to learn a new concept in modern cuisine."

According to Chef Z, learning the ancient art of brewing is "a valuable tool that can be used in many ways by students in the new world of the culinary arts. With the revolution of the microbrewery, combined with a fine French cuisine education, the student can add a new diversity beyond that of the old boundaries."

The art of brewing is just now, over the last 10 years, enjoying a renaissance in the culinary world. Students are eager to learn how to make beer sauces, batters or marinades, as well as how to appreciate beer as an accompanying beverage with any meal. Knowing the appropriate beer to match given any dish is a skill that can be as important in the restaurants of today as being a fine wine connoisseur.

In the club, students learn to appreciate the fine qualities of a hand-crafted beer. "I take the club very seriously, and am sure to teach more than just proper brewing technique," says Chef Z. "I also discuss the illustrious history of this extraordinary invention, as well as industry trends and how the new flavors can be marketed today. We brew every kind of beer, from ales and lagers to Pilsners, porters and stouts. I let the students get hands-on experience in how to have a successful yield of homebrew."

Le Cordon Brew Club meets once a month. At each gathering, a new recipe, either ancient or modern, is tested. All results and procedures are well-documented by student brewer Andy Larsen, and the previous month's brew is bottled and labeled. At a recent meeting, the students began the process of making a gruit, an ancient medicinal brew that required delicate procedures and the addition of herbs throughout the process.

Chef Z also arranges for the club to go on behind-the-scenes tours of some of Southern California's leading breweries. Recently, a past Cordon Brew student landed a top-notch position as a brewer's apprentice at Bayhawk Brewery in Irvine, California. This proves that a fine French culinary education, blended with a bit of brewing skill, can be the key to success in the new culinary world. ■

— Chris Allen

reader tip

Wort Chiller Water Conservation

When using an immersion chiller for wort cooling, you generate a lot of hot water. Commercial brewers direct this water to their hot liquor tank, but most homebrewers just send it down the drain. Instead of letting it all go to waste, you can put the hot water to good use cleaning dirty brewing equipment. Fill two containers with the hot water runoff, one for soapy water and one for clean rinse water. The containers can be picnic coolers, brewing buckets, empty mash tuns or kettles, or the two sides of utility sink. The stream of water exiting from a chiller can also be used for a final rinse.

Paul Manzo
Beverly, Massachusetts

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Try Rye

A spicy grain for zesty, malty beers

by Thomas J. Miller

Rye adds a distinctive character to beer, often described as crisp, refreshing, slightly spicy and subtle. Its primary downfall is its reputation for causing stuck mashes. Even many advanced brewers can share stories about rye brews that ended in catastrophe. Homebrewers should remain undaunted, however, for this issue's professionals offer great ideas and tips on successfully brewing with rye.

Real Ale Brewing Company
Blanco, Texas

Brewer: Erik Ogershok joined the Real Ale Brewing Company in Blanco, Texas in April 2001. Prior to this position, he was the assistant brewer at the Commonwealth Brewing Company in New York City in 1996 and later at Poor Henry's Brewing Company in Philadelphia in 1997. In 1998, he served as a brewer at the Victory Brewing Company in Downingtown, Pennsylvania.

While we use rye to make a hoppy pale ale, rye works and tastes just as good in a malt-accented beer. Rye adds a fullness or richness to the malt character and imparts a nice spicy zest to a beer. Rye malt also complements the citrusy hop character and adds silkiness to the body. It's not quite as snappy as wheat, though.

A pale rye ale would contain something like 80% pale ale malt, 15% rye malt and 5% crystal malt (40–60° Lovibond). The small amount of crystal malt adds color, flavor and texture.

A step mash works well with rye beer. This is because the enzymes that break down the beta-glucans — and hence reduce the gumminess of your mash — are active in the lower temperature range (98–113° F). You can take your choice of mash schedules.

Many types of hops can be used to make a rye pale ale. We recommend the spicier varieties, to complement the spiciness that rye adds to the beer.

It's a good idea to make your first few batches with a clean yeast, one that doesn't impart too much yeasty flavor to the beer. This helps accentuate the rye and brings out the hops as well. You can always try different yeasts later and experiment with how they change the flavor of your beer. Wyeast 1056 American Ale yeast is a good strain to start with.

Homebrewers may want to use rice or barley hulls in their grist, to prevent a stuck mash. Between 1.5–3% of the total malt bill should do the trick.

Brewer: R. James Ray, shown here (at left) standing next to Michael Jackson, began homebrewing in 1991. He has brewed for Treaty Grounds Brewpub in Moscow, Idaho and the Hammerheads Sharkbite Brewery in Key West, Florida. From 1996 to 1998 he brewed for The Clevelander Hotel Brewery in Miami Beach, Florida. Since 1999, he has been the brewer at Titanic Brewery and Restaurant in Miami.

My version of an American rye beer is brewed in a way that is similar to a German altbier. I like it to be a full-bodied beer that accentuates the unique malt character of the rye. I like a firm hop bitterness that accentuates the rye flavor. I have found that any form of finishing hop detracts from the character of the rye, as well as the caramel flavors of crystal malt. So I don't use late-addition hops.

I think a rye beer needs to have a significant rye flavor. Rye has a sharp, spicy character. I make mine to be a full-bodied amber ale that is dry and refreshing, but not hoppy.

I like to use malted rye. It is nearly, if not fully, modified and I do not have to worry about conversion. There are other choices available, including flaked rye (which is probably the easiest for homebrewers) and whole rye (which requires cooking and gelatinization). Malted rye falls somewhere in between and adds a very distinctive flavor. Since rye has no hull, I feel that the type of crush is not that important, although it is a smaller grain and will require readjusting a roller mill to prevent the grains from passing through whole. A basic Corona mill is probably the easiest way for homebrewers to crush the rye malt.

Rice or oat hulls in the mash are a big help. For a five-gallon batch, try about eight ounces. I have done many batches with no hulls, but have always had problems with stuck mashes.

I have used both ale and lager malt in my rye beers. I think a lager malt base accentuates and adds sharpness to the rye flavor, while pale malt rounds out the flavor. Lager malt has better results if the amount of rye is small. Either will work well if rye makes up over 10% of the grain bill.

My yeast of choice is German ale yeast because it brings out the rye flavor the most. A lager yeast would also do very nicely. I have also done very well with American ale yeast. I would avoid any yeast that is very fruity because it may hide the rye flavor.

I use German Perle and Spalt hops for my rye. I calculate for 40 IBUs and do not use any hops in the last 15 minutes, so I don't cover up the rye.

Brewer: Michael Altman spent 12 years as a professional chef. He got involved in the brewing scene in the late 1980s and then spent eight years brewing for McMenamin's at the company's locations in Portland and the surrounding area. He joined Mountain Sun Pub and Brewery in Boulder, Colorado as head brewer in September 1997. The company is working to open a second brewpub with a 10-barrel brew house in South Boulder.

My approach to brewing rye ale is to make a beer that is well-balanced and delicate on the palate. I feel the beer should taste just as good on your third or fourth pint as it does on the first.

Our Chazz Cat Rye is made from a single-infusion mash with a strike temperature of 152° F. We start with a bed of rice or barley hulls to prevent the mash from sticking, due to the high percentage of rye that we use. We use 55% Crisp Maris Otter pale malt, 32% Briess rye malt, 5% Munich malt, 3% crystal malt and 5% CaraPils. The OG of this beer is 1.060. The FG is 1.008. We do a standard 90-minute boil with three hop additions.

On the homebrewing side, making rye beer should be no different than producing it on a commercial level. Use a small amount of rice or barley hulls to cover the bottom of your lauter tun. This will improve the sparge. If you are concerned that you might have sparging problems, a lower percentage of rye is warranted. When you add the rye to the mash, do so only after you have mashed-in all the other malts, as this also will help prevent the mash from getting gummed up.

Although it has a lighter flavor, homebrewers may find flaked rye easier to use. For this reason I would recommend experimenting with Briess flaked rye, if only to see if it works well in your homebrewing system and to find out if you get the desired flavor from it.

We have received lots of great feedback from customers when the rye beer is poured from a nitrogen tap. This is probably because nitro, with its smaller bubbles, makes the beer more creamy and improves the taste. It also makes the head look better, which improves the beer's appearance. ■

Wood Chip Tips

Plus: Adjusting your gravity and putrid old yeast

Aging with Wood Chips

If I wanted to use oak or beechwood chips in brewing a 5.5 gallon batch of beer, how would I go about it? How many ounces would I use and how would they be handled in the mash or fermentation containers? How long would they be left there? I realize that they would have to be steamed for 15 minutes before using.

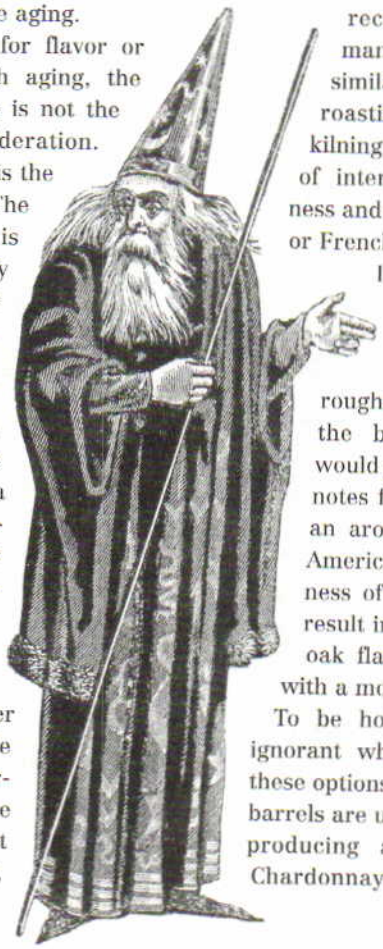
Paul A. Borowski
via email

You have really asked two different questions here: How to add oak for flavor and how to add beechwood for aging. Beechwood does not not add flavor. Adding oak chips — which is done in the fermenter, not the mash tun — can add some interesting flavors to your homebrew as well as acting as a surface area to accelerate aging.

Whether using oak for flavor or beechwood to help with aging, the weight of the wood chip is not the most important consideration. Rather, the surface area is the key factor to consider. The flavor from the chip is released into the beer only where the beer and the chip are in contact. You could have a bag of thin oak chips and a bag of thick oak chips that both weigh the same, but the thin chips would have a greater surface-area-to-weight ratio. So the thin chips would add more flavor than the same weight of thick chips.

I recently made some oak-aged hard cider and got an incredible aroma from the wood during the aging process. The barrels I used are about three feet in diameter, four feet long and contain 50 gallons of liquid. To put this in beer-geek terms, the barrels have about 149 square inches of oak area per gallon of contents. This statistic is the barrel's surface-to-volume ratio. That's a good number to keep in mind, since most barrels used for aging wine are in this size range. As the capacity of a barrel increases, its surface-to-volume ratio decreases and the time required for the oak to flavor the contents of the barrel increases.

When I decided to do an oak-aged cider, I had to make a few decisions. To begin with, I had to choose between new and used barrels. I wanted to flavor my cider with oak and nothing more, so I chose new barrels. I then had to choose among several different levels of "toast." Toast refers to the firing the inside of the barrel receives during the manufacturing process, similar to the toasting or roasting of malt during kilning. I also had an option of interior surface roughness and could buy American or French oak.



I chose American oak, with a medium toast and a "normal" surface roughness. According to the barrel maker, this would give me nice vanilla notes from the toast level, an aroma consistent with American oak. The roughness of the interior would result in a faster release of oak flavors than a barrel with a more polished finish.

To be honest, I felt pretty ignorant when faced with all these options. So I asked, "What barrels are used by winemakers producing aggressively-oaked Chardonnays?" "Most of our customers use American oak with medium-plus toast with a normal roughness," was the reply. "Very well," I said, "I'll buy two of those!"

Most of these same options are available when buying oak chips that are added to the aging vessel. You may also choose used barrels because used barrels may add more than oak flavors. There are many stouts available these days, for example, that have been aged in used bourbon barrels. As a result, these bourbon stouts have complex bourbon flavors. Sam Adams uses port and sherry barrels to age their triple bock family of beers. Used barrels open up a whole world of options that can be explored to create new and interesting beers. If the barrel contained whiskey, most brewers don't worry about sanitation. Used wine barrels, however, can pose problems and must be sanitized prior to use.

Right now it's summer, a good time to brew a big beer for the winter. Imagine a strong ale with assertive bitterness, low hop aroma and a full and clean malt backbone. This beer has just finished primary fermentation and the plan is to age it on oak to add further complexity to its flavor. A bag of oak chips with the desired toast has been purchased and the question is how much to add. If the chips are two inches wide, four inches long and 0.25 inches thick they will each provide 19 square inches of surface area (two sides at eight square inches, two edges at one square inch and two edges at 0.5 square inch). Eight of these chips per gallon of beer will give about the same surface-to-volume ratio (149) as an oak barrel. So set aside 43 of these chips for the 5.5-gallon batch of beer.

Chips will float and it is important to keep the entire surface of the chip in contact with the beer during aging. A hop bag weighted with some stainless steel bolts (or some other inert weight) will do the trick. Sterilize the bag, chips

and weight with either steam or hot water. I chose to fill my barrels with 195° F water and let the barrels sit for several hours prior to use. Either method will work for sterilization. Some sanitizing solutions will damage the wood and perhaps flavor the beer. Burning sulfur is one method of sanitizing barrels used by winemakers, while using a dilute solution of KMS or Campden tablets is another. I like hot water because there is nothing added to the barrel other than water.

The next step is to place the chip bag into a vessel for the aging process. This poses a dilemma since the chip bag won't fit into a carboy and a plastic secondary allows oxygen into the beer. The ideal container is a five-gallon Cornelius keg. Place the chips in the keg and rack the beer from the primary into the keg for aging. Try to minimize the amount of yeast carried into the secondary as excessive yeast will impart autolyzed flavors from yeast death over the aging period. The beer can be primed at this time or you can wait until later. Priming at this stage will be easy since the yeast viability is still excellent. If primed later, more yeast will most likely need to be added.

Now it's time to wait. This is the most important step to oak aging. It is tempting to place the keg in a cool corner and to forget about it for several months. After all, if you pay attention to the beer during aging, the temptation to drink it early may get to you and you will have no beer left after nipping on it for several months. However, if you store the keg where it is too cool, the flavor takes longer to extract. Too warm and the beer suffers because of yeast autolysis. Cellar temperature (55° F) works well for the aging step.

Vigilance and restraint are required during aging. Sample the beer on a regular basis — say once every three weeks — to keep tabs on its progression. The purpose is to prevent the beer from becoming excessively oaky. The oak should add complexity to the beer, but not dominate its flavor. Once the flavor reaches the intensity you desire, you can rack the beer into a second keg or bottle it.

Another variation is to not worry about the oak intensity during aging and to blend the oak-aged beer with a batch of non-oaked beer to produce the desired oak intensity. This is how I treated my cider, which became so oaky after three months in a new barrel that it was hard to smell or taste anything else but oak!

You also mentioned beechwood in your question. Beechwood aging has absolutely nothing to do with wood flavor. The wood gives the yeast more surface area to cling to and helps the beer age. The one brewery I know that still uses beechwood aging goes to a lot of effort to cook all the wood flavor out of the chips prior to use. This process also renders the chips non-buoyant so that they lay on the bottom of the chip tanks during the lagering process. These long, curly chips add a tremen-

dous amount of surface area that yeast settles on during lagering. Diacetyl and acetaldehyde reduction during aging requires yeast and beer to interact, and that is precisely what the beechwood chips do for the brewer. This reactive surface area is similar to the enormous surface area in the human intestine across which we absorb nutrients from food. If the intestine were smooth it would have a much lower surface area than it does with its microscopic convolusions. Beechwood chips give yeast a large surface area where they can hang around and interact with the aging beer.

Although I have no data to support my opinion, I bet any benefit to this practice would be very hard to quantify in a 5-gallon batch of beer. Most chip tanks in the United States are horizontal tanks containing about 60,000 gallons of beer. That's a lot of beer!

A Question of Gravity

In the January-February issue, there was a question from John "Mick" Barns concerning mashing efficiency and undershooting the target gravity given in the recipe. I have also experienced this same problem and have adjusted the specific gravity using the ProMash software. I am now ending up close to the OG I want by adjusting the amount of base malt in my recipes. The question I have is, should I also increase the amounts of crystal and other non-base malts? It seems that I am getting the colors and flavors I desire from the crystal and dextrin malts, but I would like some advice.

James Stewart
Riverside, California

This is one of those questions that raise issues extending much further than simply hitting the target original gravity. In your case, you like the color and flavor intensity of the special malts, but you have had problems hitting the target gravity. Increasing the weight of the base malt is certainly the most direct way to deal with the issue and is the method that most commercial brewers use to hit their specified original gravity. If you are not too far off target, then this is the way to go.

Base malts are used for a number of reasons, yet the most important feature of base malts is their contribution to fermentable extract. If wort did not contain fermentable extract, there would be no beer. For this reason, one could argue that base malt is the single most important ingredient in beer. The point here is that, if you need more extract, adding more base malt is the most logical response. In doing so, however, questions arise about the similarity of the wort produced and the wort described by the recipe.

I have always figured that if I am not getting what I want from the base malt, I may be missing something from the specialty malts as well. Base malts change because of seasonal fluctuations in the barley crop and in the specifications used amongst maltsters. If the malt used has a lower laboratory

yield than the base malt originally used in the recipe, then the weight of base malt should be increased to adjust for the difference. On the other hand, if the lab yields are the same, but the wort gravities are not, the difference most likely has to do with something in the brewing process. That could be milling, mashing, lautering or a combination of these steps. If this is the case, then it's likely that the special malt color and flavor intensity is different from the original recipe as well. If I'm not getting all I am supposed to out of my base malt, I may not be getting it from my specialty malts, either.

Some brewers find this all very esoteric and only care about the qualities of the beer in their glass. If the color, flavor and alcohol level are satisfactory, they are happy with that particular batch of beer and this question is a moot point. Other brewers want to produce that same glass of beer indefinitely and the question becomes much more pertinent. These brewers will not only chart original gravity, but also wort/beer color and special malt-related beer flavors using highly trained taste panels. This data can then be used to determine which malt weights need to be adjusted to keep the beer within the defined specifications.

Most homebrewers or small craftbrewers do not go that far with fine-tuning their recipes. When I think of recipes in this manner, it reminds me of what a recipe really is to most brewers and cooks. A recipe is simply a way of describing something that was previously made. I routinely brew an American-style unfiltered wheat that contains three pounds pale malt, 2.5 pounds wheat malt and 0.75 pounds unmalted wheat per five-gallon batch to give an original gravity of 11.25° Plato (1.045 SG). I hop this beer with Perle hops to about 18 bittering units and use Liberty hops for aroma. This is my recipe and it merely defines the ingredients used in the beer. That's all any recipe does. I would be surprised if another brewer used this recipe and made a beer that tasted just like mine.

In my opinion, if a brewer or a cook uses another person's recipe, they should think of the recipe as a general description. The most important quality of the finished product to most homebrewers is how good the beer tastes, not how similar the beer is to that described by the recipe. Unless you have tasted the beer the recipe is based on, you have no idea how close you have gotten to the target. If you are more challenged by hitting your target than just making a great glass of beer, then you will need to invest in some lab equipment and recruit your friends and family to participate in your numerous taste panels.

Like all brewers, I grapple with this same issue. I personally prefer to "tweak" the weight of base malt if I am trying to stay focused on my target specific gravity. After all, that's what the base malt primarily contributes to the wort. If, on the other hand, my color is off target or the flavor of the beer lacks

the intensity of a particular malt, I change my focus. Color and flavor variances are best addressed by fine-tuning the specialty malt portion of the recipe. It is most important to remember that the brewer is not the only person faced with the challenge of consistency. Specialty malts are typically described with rather large ranges. For example, I use a crystal malt called "Crystal 135-165° Lovibond." That's one heck of a range of color. If I brew a beer today and the malt is on the lower end of that range, and the same beer is brewed later and the malt falls toward the upper range, then the finished beers will not be the same color unless the recipe is tweaked.

This is one doozy of a question. In my own opinion, you can't really fine-tune the special malts unless you know what the target is. For these grains, I would view recipes as the historic log that they are. Specific gravity is a target, however, and I do adjust my base malts to hone in on that variable.

Putrid Pilsner

The other day I brewed an all-grain Pilsner beer and everything went fine. I hit my OG right on the nose and fermented with Wyeast 2565 (Kolsch yeast) at a steady 62° F for two weeks. When it came time to keg, I noticed that my FG was still high (1.030) and the beer was darker than the day I brewed it. I also noticed a funky smell; my beer smelled rancid! I went back to the pitchable yeast tube I had saved and read the date . . . it was dated seven months ago. I am currently lagering it at 40° F in the hopes it will improve. What do you think went wrong? What about the darker color?

Dan Martich
Fairfield, Connecticut

This is a question I get tired of seeing, but never getting tired of answering. The most important thing a brewer can do to increase his chances of brewing really great beer is to use healthy yeast. The converse of this statement is, the easiest way to waste a lot of time and energy while brewing is to ignore your yeast. Yeast are needy little guys and they become angry when they are ignored!

Your description sounds like a classic case in which an old yeast tube was added and you ended up with wild yeast or bacteria in your wort. Yeast labs are not perfect and, at times, their starters contain bacteria and the bacteria really set to sail when yeast begin to die. Alternately, if one pitches a bunch of dead or dying yeast, bacteria coming from your equipment can take hold of the fermentation. These unwanted guests are very hard to completely exclude from a batch of beer even with excellent sanitation practices. The change in wort appearance is a tell-tale sign of wild yeast and bacteria. Wort color does not actually increase, but the concentration of non-flocculent organisms in the beer increases turbidity. This appears as an apparent increase in color.

Aging this beer will do nothing but prolong the inevitable. Your spoiled beer will taste as bad as it does today in a month; there is no good reason to wait to dump it if it is indeed contaminated. Some young beers have aromas that mellow in time, such as hydrogen sulfide (rotten egg), diacetyl (butter) and acetaldehyde (green apple). Yeasty aromas will fade when yeast cells settle out. However, when a beer fails to ferment and the turbidity increases, there is no hope. In your case, your final gravity reading indicates you fermented only 20 percent of the wort extract, only a quarter of the norm for this type of beer.

I always make a starter with my yeast two to three days prior to brew day. If the starter does not behave normally, I will not use it and will reschedule my brewing. To use abnormal yeast is almost to guarantee failure. A normal starter should show signs of active fermentation, should smell normal for the strain being propagated and should look normal. If it acts like bad yeast, smells like bad yeast and looks like bad yeast . . . it's bad yeast!

Yeast will lose viability during storage. Eventually, the entire starter will die and there is no point in trying to revive it. The bad thing about partially dead yeast (say 50% dead) is that they decay and spill their guts into the test tube. Bacteria do very well in the presence of decaying yeast because the concentration of amino acids in the bulk slurry increases, and most beer-spoilage bacteria have a high demand for amino acids. In other words, a decaying yeast culture is a great propagation medium for growing bacteria. Although the yeast sold by yeast labs are usually very clean, it only takes one or two bacterial cells per starter to cause problems during prolonged storage. This may seem exaggerated, but — given sufficient time — a bottle of beer can spoil if only a couple dozen lactic-acid bacteria are present when it is bottled.

In the future, use fresh yeast, make a starter and thoroughly sanitize everything coming into contact with wort after cooling. A poorly-sanitized wort chiller can cause the same sorts of problems as you have described. However, given the age of your yeast and the poor fermentation, I think the yeast was the culprit in this brew. ■

Do you have a question for Mister Wizard? Write to him c/o Brew Your Own, 5053 Main Street, Suite A, Manchester Center, VT 05255 or send your e-mail to wiz@byo.com. If you submit your question by e-mail, please include your full name and hometown. In every issue, the Wizard will select a few questions for publication. Unfortunately, he can't respond to questions personally. Sorry!

Beers Cloned

Vanilla Creme Ale and Sprecher Special

by Steve Bader

Dear Replicator,

A couple of years ago I was in Nashville and had the good fortune to tip a few brews at the Market Street Pub downtown. While I was there, I fell in love with their Vanilla Creme Ale. Now that I am into homebrewing, I wondered if you could come up with a clone of the beer?

Gary Heyden
Kenosha, Wisconsin

Summertime has finally arrived, and this beer sounds perfect for those lazy days on a hammock listening to a baseball game.

Creme ales are a light-alcohol beer, between three and 3.5 percent alcohol by volume. They are medium in body, with no dark-malt flavors or colors, and a low level of hop bitterness (around 12 to 18 IBUs).

To make this beer, you should start off with a low specific gravity, around 1.040. In order to achieve adequate body in a beer with an original gravity this low, you will need to use some non-fermentable malt sugars. Market Street uses some light-colored crystal malt in their malt bill to achieve this.

Since "smooth" is the predominant flavor in this kind of beer, you'll also want to keep the hop level low. You want to allow the vanilla flavor to creep through, and a high hop level would overpower the vanilla flavors.

Since the vanilla flavoring is a "trade secret" that is locked in the Market Street vault, I asked brewer Jeff Kennard how a homebrewer might come close to their vanilla flavor. Jeff suggested using two vanilla beans for a five-gallon batch of beer. Cut the beans into one-inch long pieces and boil them for the last 15 minutes of your boil.

You can get more information about the Market Street Pub at http://marketstreetbrewery.com or by calling (615) 259-9611.

Vanilla Creme Ale

(5 gallons, extract with grains)

OG = 1.040 FG = 1.012 IBUs = 14–16 ABV = 3.5%

Ingredients

3.3 lbs. Muntons light malt extract syrup
1.0 lb. Muntons light dry malt powder
0.5 lb. wheat malt
1.0 lb. crystal malt (10° L)
3.25 AAU Nugget hops (bittering) (0.25 oz. of 13.0% alpha acid)
2.0 AAU Mt. Hood hops (aroma) (0.5 oz. of 4.0% alpha acid)
2 vanilla beans
1 tsp. Irish moss
White Labs WLP001 (California Ale) yeast or Wyeast 1056 (American Ale) yeast
0.75 cup corn sugar (for priming)

Step by step

Steep the crushed malts in three gallons of water at 150° F for 30 minutes. Remove the grains from the wort, add malt extracts and bring to a boil. Add Nugget (bittering) hops, Irish moss and boil for 60 minutes. Add chopped vanilla beans for the last 15 minutes of the boil. Add Mt. Hood (aroma) hops for the last two minutes of the boil.

When you are done boiling the wort, strain out the hops and add the wort to two gallons of cool water in a sanitary fermenter. Top off with cool water to 5.5 gallons. Cool the wort to 80° F, aerate the beer and pitch your yeast. Allow the beer to cool over the next few hours to 68–70° F and ferment for 10–14 days. Bottle your beer, age for two to three weeks and enjoy!

All-grain option

Replace the light syrup and powder with 5.5 lbs. Great Western two-row pale malt. Mash all your grains at 155° F for 45 minutes. Collect enough wort to boil for 90 minutes and still have a 5.5-gallon yield.

Since the IBUs are low, it is difficult to decrease the quantity of hops to account for increased hop extraction efficiency in a full boil. Instead, use the same amount of bittering hops, but simply reduce the total boiling time of the bittering hops from 60 minutes to 50 minutes. The remainder of the recipe is the same as the extract.

Dear Replicator,

I would like to see a clone of Sprecher Special Amber Lager. This amber beer is brewed here in Milwaukee, the birthplace of great American beer. I have enjoyed this brew for many years. If you could clone this, and maybe even feature Randy Sprecher, it would be greatly appreciated. He not only brews great ales and lagers, but — as a good citizen — also supports public television and many local events.

The brewery's description of this beer says that "a delicate balance of toasted malt and fresh hops give this medium-bodied German-style lager an intriguing, complex flavor. A creamy head, deep golden color and an impressive hop bouquet make this a very special beer." I can enjoy this beer fresh from the brewery here in Milwaukee, but it deserves to be made by homebrewers everywhere. In my opinion, it is a fine lager.

Glenn Gavin
Milwaukee, Wisconsin

Special Amber is the flagship beer for Sprecher Brewery, and no wonder: The brewers at Sprecher make this beer with great care. I talked to Craig Burge — who has been making beer since 1990 at Sprecher Brewery — to find out how they craft this beer.

Craig tells me this is a true lager beer, fermented with lager yeast at cool lager temperatures. The cool temperatures and lager yeast enhance the maltiness and minimize the fruitiness that you might get if you used an ale yeast and fermented at higher temperatures. Craig said they ferment this beer around 50° F. When the beer has finished fermenting, they drop the temperature to about 33° F for about five weeks. This period of aging gives this beer the smooth, malty flavors for which it is known.

Hopheads should love this beer, since Sprecher Special Amber has a rather aggressive hop level, with the IBUs in the mid 30s. This is higher than normal for a German or Bavarian lager, which would usually have about 20 to 28 IBUs. By hopping to a higher IBU level, they balance this beer nicely to match the high malt level from the lagering process.

The hard part for all you homebrewers is going to be lagering this beer for five weeks or so. But hold steady and don't succumb to the temptation of sampling it before it is done. It will be well worth the wait!

For more information about Sprecher Brewery and their beers, go to http://www.sprecherbrewery.com/ or call them at (414) 964-2739. ■

Sprecher Special Amber Lager

(5 gallons, extract with grains)

OG = 1.054 FG = 1.015 IBUs = 34–37 ABV = 4.7%

Ingredients

4.0 lbs. Alexander's pale malt extract syrup
2.0 lbs. Briess Light dry malt powder
0.5 lb. dark Munich malt (20° L)
0.5 lb. crystal malt (120° L)
0.5 lb. Belgian CaraVienna malt
8.5 AAU Cascade hops (bittering) (1.7 oz. of 5.0% alpha acid)
4.0 AAU Mt. Hood hops (aroma) (1.0 oz. of 4.0% alpha acid)
1 tsp. Irish moss
Wyeast 2206 (Bavarian Lager) or White Labs WLP830 (German Lager) yeast
0.75 cup corn sugar (for priming)

Step by step

Steep the crushed malts in three gallons of water at 150° F for 30 minutes. Remove the grains from the wort, add malt syrup and powder, and bring this mixture to a boil. Add the Cascade hops and Irish moss and boil for 60 minutes. Add the Mt. Hood hops for the last two minutes of the boil. When done boiling, strain out the hops, add the wort to two gallons cool water in a sanitary fermenter and top off with cool water to 5.5 gallons. Cool the wort to 70° F, aerate the beer and pitch your yeast. After the beer has started fermenting (about 12-18 hours), move the fermenter to a 50° F location and let the beer cool and ferment until fermentation is complete, about 14 days. Then, cool the beer to 33° F and lager for an additional three to five weeks. Bottle your beer, carbonate and enjoy!

All-grain option

Replace the light syrup and powder with 8.5 lbs. Pilsner malt. The Sprecher brewery does a two-step mash. Mash all your grains at 122° F for 30 minutes, then raise the temperature to 155° F for 45 minutes. Collect enough wort to boil for 90 minutes and have a 5.5-gallon yield. Lower the amount of boiling hops to 0.9 of an ounce to account for higher extraction rate of hop bitterness in a full boil.

Bavarian Helles

An elegant beer style from Munich

by Horst D. Dornbusch

HELLES by the numbers

OG . . . . .usually 1.045–1.051 (11.2–12.7 °P)
FG . . . . .usually 1.010–1.012 (2.5–3 °P)
SRM . . .usually 2.5–2.9
IBU . . . .18–25 (occasionally less, rarely more)
ABV . . . .4.7–5.4% (rarely less)

Helles is among the few beer styles with a definite birthday. The Spaten Brewery of Munich shipped the first cask of it on March 21, 1894. Interestingly, the destination was not a local beerhall, as you might have suspected. Rather, it was the far-away port city of Hamburg, in Prussian territory, on the North Sea. The Bavarians and the Prussians have never been too fond of each other. So Spaten did what we would now call test marketing. If the beer flopped among the Prussians near the ocean, none of its regular brown-lager drinkers at home, near the foothills of the Bavarian Alps, would take notice.

Spaten was completely aware of the magnitude of its undertaking, which was no less than the introduction of a German blond lager to compete with the successful Pilsner blond lager from neighboring Bohemia. And as the Munich brewers watched their new creation gain a foothold among the old salts in the taverns of Hamburg, they knew they had a winner on their hands. They also knew that it was time to let the new brew loose in their own backyard, where it counted. So Munich residents got their first taste of Helles, in casks and bottles, on June 20, 1895. And with this act, a new Bavarian beer style was put firmly on the map.

Delicate and Full-Bodied: A Unity of Opposites

Hell or Helles is the German word for "light." However, unlike in North America, this designation refers to color only. It does not refer to the beer's calories or alcoholic strength, which measure a substantial 4.7 to 5.4 percent alcohol by volume. The higher-alcohol versions (above 5% ABV) are often referred to as Export Helles, probably because their high alcohol level allowed them to be "exported" over long distances without spoiling. If a Helles carries the designation Urhell or Urtyp-Helles, the brewery is trying to emphasize the authenticity of its beverage (ur means "original" and urtyp means "original type"). A Spezial Helles is just what you suspect it is: a seasonal brew or one that is considered especially good by the brewery. If a brewery designates its Helles as Edel-Hell (noble Helles), it is trying to remind us of the lofty, noble rank of the beer's hops (edel means "noble" in German).

A Helles is one of life's great gastronomic pleasures. In a Helles — as in such culinary delights as a mousse au chocolat or a soufflé — delicacy and richness are not necessarily opposites. It relies on its incredible subtlety to dazzle our senses. Because it is straw-blond and sparkling-light, it is pleasing to the eye. Because it is technically a full-bodied brew, in spite of its brilliant clarity, it is satisfying on the palate. It has almost no nose or up-front bitterness, but — as with most typical Bavarian beers — it is mildly malt-accented. In the finish, it is well attenuated and dry, but never harsh. There must be a lingering note of hops, which is at once less aromatic than that of the "Saazy" Bohemian Pilsner and less aggressive than that of the northern German Pilsner.

Helles is still the staple beer of today's average Bavarian, who consumes about 27 gallons annually of just this one beer style. (Compare this to the average American, who drinks "only" about 22 gallons per year of all beer styles combined.) It is also the beer most tourists know from the beer

Munich Beerhall Helles

(5-gallon, all-extract)
OG = 1.048 FG = 1.010
SRM = approximately 2.7
IBU = 18 ABV = 4.8%

Ingredients

6.6 lbs. pale Pils malt extract (such as Weyermann, Bierkeller or Ireks; unhopped)
3.2 AAU Hallertauer Mittelfrüh, Mt. Hood, Tettnanger, Spalt, Perle or Northern Brewer hops (bittering) (0.8 oz. of 4% alpha acid)
0.3 oz. Hallertauer Mittelfrüh, Mt. Hood or Tettnanger hops (flavor)
0.6 oz. Hallertauer Mittelfrüh, Mt. Hood or Tettnanger hops (aroma)
Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager), White Labs WLP838 (Southern German Lager) or White Labs WLP920 (Old Bavarian Lager)
1/2 cup light DME or corn sugar (for bottling)

Step by Step

Mix the malt extract with your brewing water in the kettle. For a light-colored beer such as a Helles, the closer you approach a full-wort boil, the better. So boil as close to five gallons as you can manage. The boiling time for extract Helles is about one hour. Add the bittering hops at the beginning of the boil, the flavor hops about 20 minutes before the end of the boil and the aroma hops a few minutes after the boil.

Chill the wort to between 50 and 59° F. Aerate the wort well and pitch the yeast. For primary fermentation, ferment the beer at 48° F for two weeks. When primary fermentation has finished, rack the beer to secondary and cool the beer by 2° F a day until you reach 33° F. Lager the Helles for four weeks to three months at 33° F. Package the brew with DME, condition and serve cold.

Munich Beerhall Helles

(5-gallon, all grain)

OG = 1.048 FG = 1.010
SRM = approximately 2.7
IBU = 18 ABV = 4.8%

Ingredients

8.5 lbs. pale Pils malt (1–1.5 °L)
3.2 AAU Hallertauer Mittelfrüh, Mt. Hood, Tettnanger, Spalt, Perle or Northern Brewer hops (bittering)
(0.8 oz. of 4% alpha acid)
0.3 oz. Hallertauer Mittelfrüh, Mt. Hood or Tettnanger (flavor)
0.6 oz. Hallertauer Mittelfrüh, Mt. Hood or Tettnanger (aroma)
Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager), White Labs WLP838 (Southern German Lager) or White Labs WLP920 (Old Bavarian Lager)
3/4 cup light DME (for bottling)

Step by Step

Start your mash with a 15-minute rest at 100° F (38° C). Start with a thick mash. Next, go to the proteolytic conversion temperature of 122° F (50° C). Keep the mash at this stage for about 30 minutes, then raise the mash temperature to 146° F (63° C). As you go up in temperature, you should also thin out the mash by infusing it with hot water. Use direct heat if you need to, but stir the mash constantly to avoid hot spots. Leave the mash at 146° F (63° C) for about 15 minutes. Next use hot-water infusion or direct heat to reach the alpha saccharification temperature of about 156° F (69° C). This rest, too, should take about 15 minutes. Then use more hot-water infusion or direct heat to reach the mash-out temperature of exactly 170° F (77° C), and start sparging. The sparge should last about 90 minutes.

Boil your Helles wort for about 90 minutes and add bittering hops 15 to 30 minutes into the boil and flavor hops about 20 minutes before the end of the boil. Add the final dose of hops a few minutes after the end of the boil.

Heat-exchange your wort to at least 50-59 °F (10-15 °C), aerate the wort and pitch the yeast. The best fermentation temperature is within a narrow band around 48 °F (9 °C). Primary fermentation might last as long as two weeks. When it's finished, rack the beer into a clean conditioning vessel.

By this time, the brew should approach its terminal gravity of about 2.5–3° P (SG 1.010–1.012). Now pull the temperature down gradually, by 2° F (1° C) a day. This may take another week to 10 days. Don't drop temperature quickly because this could shock the yeast into dormancy and prevent all subsequent lagering activity.

Now you can rack the brew again for lagering. The lagering temperature for Helles should never be higher than 37° F (3° C). The lower the temperature, the better will be the beer. Helles is usually lagered between four weeks to three months at about 28° F (-2° C). Do not skip this maturation, because this greatly benefits the beer. While in the cooler, the Helles develops its mellow smoothness. The yeast also absorbs suspended oxygen, which improves the brew's shelf life.

If you are careful at the final transfer into a keg or into bottles, you will not pick up much sediment, because the beer has cleared well during the long lagering period. Also, if you use a priming agent rather than CO_2 to condition your Helles, you should not filter it, because you need live yeast cells to metabolize the priming agent. It is always best to prime a delicate Helles with light dried malt extract (DME) instead of cane or corn sugar to avoid any cidery notes.

After priming and bottling or kegging your Helles, let it rest at about 40° F (4° C) for about a month. After this final aging period has ended, chill your Helles to serving temperature and serve cold.

tents of the Munich Oktoberfest. At the world's biggest party, the Helles has long since replaced the traditional, stronger Märzen/Oktoberfest beer as the generic crowd pleaser.

I maintain that Helles is arguably the evolutionary epitome of Germany's more than three-thousand-year-old brewing tradition. In terms of sheer brewing artistry, it caps everything that has gone before it. And nothing that has followed it has ever equaled it. The raw materials for Helles could not be simpler, yet the brewing process could not be more demanding.

In my book, there is great brewing — of which there is plenty in Germany, especially in Bavaria — and then there is Helles brewing. Nothing short of perfection is the goal of making this Bavarian lager. The brewer must strive for the most sublime balance of subtle, rich, elegant maltiness and lingering, noble hoppiness. Making a Helles is a challenge not just for the adventurous homebrewer; it is a tough assignment even for the trained professional. Helles is a gentle beer, so you must brew it with a gentle, but sure, touch.

Serve a Helles at a temperature in the lower 40s (around 5° C). When you pour a properly brewed and matured Helles into your glass, a tall, firm, creamy-white head rises above its straw-blond brilliance and the beer will appeal to you with mouthwatering allure. Prost!

Base Malts for All-Grain

Helles is often brewed with just one type of pale Pils malt and one type of hops. With this simplicity, all your ingredients must be fresh and of the highest quality. Complex, robust beers, such as a stout, are generally more forgiving if you make a mistake. But if you make a mistake as you brew a Helles, you can taste it.

The Helles — just as its German ale cousin, the blond Kölsch from Cologne — is a product of the Industrial Revolution. Pale beers could emerge only in the first half of the nineteenth century, after man had acquired the kilning technology needed to produce pale malt. The pale Pils malt for Helles has an incredibly low color rating of

about 1–1.5 °L. So you should not use pale ale malts, which can have as much as twice the color rating of a typical Pils malt. Also, perhaps surprisingly to some, there is no Munich malt in this signature Munich beer.

Hops for Helles

Helles must be brewed with so-called noble hops varieties only. These hops have a relatively low cohumulone (an alpha acid) and a relatively high humulene (a flavorful oil) content. It is perfectly acceptable to use any of the hop varieties listed in the recipes for bittering, flavor or aroma. But subjectively, I find German-grown Hallertauer (Mittelfrüh) or Tettnanger best for Munich lagers. I find Spalt, Northern Brewer and Perle generally better suited for German ales, such as Alt and Kölsch. Also, I would stay away from Saaz, that otherwise so-wonderful Czech noble hop, because it is too aromatic for the Helles style. You can also use U.S. hops, if you are so inclined. For example, Mt. Hood — from the American Pacific Northwest — gives good results, especially as a bittering hop. American-grown Tettnanger tends to be too grassy for my taste. But these suggestions are strictly personal. If your taste buds lead you into a totally different direction, that's fine too!

Water Treatment

The water around Munich has a medium carbonate hardness of about 250–300 ppm. Yet other areas — including those along the Danube, some 100 miles north of Munich — still make excellent local versions of Helles, even though the water there is barely half as hard as Munich's water. The optimum pH values for Helles are just about the same as those for the average pale ale. The mash pH should be 5.2–5.4 and the wort should have a pH below 6 at the beginning of the boil. The wort should drop to a pH of 5.6 by the end of the boil and the finished beer should have a pH of 4.2–4.4. As with any beer you brew, keep your pH strips handy and make your standard adjustments with gypsum or lactic acid, if those additions are appropriate for your local water.

Yeast Strains

As for Helles yeast, the choice among the strains recommended in the recipes is much less important than is the meticulous maintenance of the correct fermentation and lagering temperatures. Proper temperature management is the key variable for the ultimate flavor and authenticity of the brew. It contributes to keeping such fermentation byproducts as diacetyl and higher (fusel) alcohols to a minimum, which is crucial for a beer with the delicacy of a Helles.

Fermentation

The best fermentation temperature is within a narrow band around 48° F (9° C), and it should remain constant throughout the primary fermentation period. At the end of primary fermentation, which might last as long as two weeks, rack the beer into a clean conditioning vessel and put it back into the lagering refrigerator. By this time, the brew should approach its terminal gravity of about 2.5–3° P (SG 1.010–1.012). Now pull the temperature down gradually, by 2° F (1° C) a day, to as low as your refrigerator will let you. This may take another week to 10 days, during which time the brew undergoes a slow, secondary fermentation as well as additional sedimentation. Never "crash" the temperature because this could shock the yeast into dormancy and prevent all subsequent lagering activity.

Now you can rack the brew again for lagering. The lagering temperature for Helles should never be higher than 37° F (3° C). The lower the temperature, the better will be the beer. In a commercial brewery, Helles is usually lagered for four weeks to even three months at about 28° F (-2° C). Do not skip this maturation, because it is clearly worth it! While in the cooler, the Helles develops its mellow smoothness. The yeast also absorbs suspended oxygen, which greatly improves the brew's shelf life.

Helles Brewing Theory

You should use a multi-step mashing procedure to create an authentic taste and mouthfeel, as you would with

just about any German-style beer. Because you are not working, say, with crystal or black patent malt, much of the substance of the delicate Helles must come from the proteins in the grain. The protein content of a Helles is about one-half percent. For comparison, proteins make up only about a quarter of a percent in a typical North American Pilsner lager. To achieve such a high level of dissolved protein in the finished beer, you must minimize the amount of protein lost in the trub during the boil. This means you must degrade as many large-molecular proteins in the mash tun as possible.

Purists will insist that you can make a proper Helles only after endless hours of decoction mashing. Yet other perfectly competent brewers will argue that modern grains have eliminated the need for a protein rest altogether. Having tasted a great variety of both commercial and homemade Helles, I personally come down somewhere in the middle in this argument. My taste buds tell me that the enhancement in flavor that comes from a decoction mash bears no true relationship to the additional time, labor and clean-up mess that is inevitably associated with a decoction process.

Decoction mashing used to be *de rigeur* at a time when brewing grains were of uncertain enzymatic quality. Nowadays, however, it is difficult to purchase grain that is not of high enzymatic strength. Grains that are advertised as "undermodified" are perhaps the closest we can come to the old-style grains of the nineteenth century. However, brewing with such grains is probably more a matter of paying homage to tradition than it is a requirement to brew an authentic Helles.

On the other hand, my taste buds also tell me that a Helles made from just a single-step infusion mash suffers from a lack of mouthfeel. Treating a Helles like a pale ale in the mash tun just doesn't give the beer enough substance and character to be authentic. The result is more akin to a thinner American light lager than to the original Munich brew.

You can start your mash at an optional 15-minute rest at 100° F (38°

C) or you can go straight for the proteolytic conversion temperature of 122° F (50° C). Keep the mash at the protein rest stage for about half an hour. In either case, start with as thick a mash as you can, because proteolytic enzymes are more thorough in thick mashes. Then raise the mash temperature to 146° F (63° C) for beta saccharification. As you go up in temperature, you should also thin out the mash by infusing it with hot water, because diastatic enzymes are more efficient in thinner mashes. Use direct heat, if you need to, but stir the mash constantly to avoid hot spots. Leave the mash at the beta saccharification temperature for about 15 minutes. Next use hot-water infusion and/or direct heat to reach the alpha saccharification temperature of about 156° F (69° C). This rest, too, should take about 15 minutes. Then use more hot-water infusion and/or direct heat to reach the mash-out temperature of exactly 170° F (77° C), and start sparging. The sparge should last about an hour and a half.

Extract Tips

There are perfectly good extracts on the market that let you make a mighty fine Helles without any fuss in the brew kettle. I have brewed many a Helles from nothing but plain Weyermann and Bierkeller malts (unhopped).

There are no specialty malts to steep with this style, so extract brewing is very straightforward. Most extract brewers choose extract brewing because of convenience. And Helles is one beer style where the extract advantage really pays off, because the amount of pre-boil hassle that you are avoiding by just opening a can is so much greater with a Helles than it is with most other beers.

If you would like to perform a partial mash, substitute 1.2 pounds of Pils malt for every pound of extract you subtract. ■

Horst Dornbusch is the author of "Bavarian Helles" (2000, Brewers Publications), a Classic Beer Style book. He writes "Style Profile" in every issue of Brew Your Own.

how clear is YOUR BEER?

by Colin Kaminski

Is your homebrew hazy instead of sparkling bright? A guide to clarity for homebrewers who prefer to see through their pints.

A few years back, when I was just learning to brew, I handed a friend a pint of my finest ale. She held the beer up to the light and said, "Who made this?" I knew right away that I needed to solve some haze problems.

Why does it matter if your beer is clear? Sometimes it doesn't matter at all: *Hefeweizen*, for example, is an outstanding German wheat beer that's supposed to be cloudy; its haze is due to the high protein content of the wheat and the poorly-flocculating yeast that *hefe* brewers traditionally use. But another thing that can make beer hazy is organic contamination. Haze can also indicate an old beer. Without any other visual cues, someone might judge your beer strictly on its clarity. Many other people probably prefer clear beer because that's what they're used to. As the saying goes, "the first taste is with the eye."

Evaluating Beer Clarity

The first step to making your beer clear is to learn how to judge clarity. You don't need to rush out and buy a turbidity meter (unless your wife will let you!). One simple test is simply to hold the beer up to an outside window. What can you see? If all you see is a golden glow, you probably have hazy beer. If you can read the sign across the street, you probably have very clear beer. Another method is to look up at the underside of the foam. Can you see the details of the bubbles on the far side of the glass? Or can you only see the bubbles on the near side? Your eye is the final judge.

If you need a reference, open a Bud and pour it into a glass. Bud is as bright as it gets. Like most other big breweries, Anheuser-Busch has scrutinized every operation in its breweries with an eye to clarity and shelf life.

If you want your beer to be bright, you have to focus on clarity during every step of the brewing process. This article will show you how.

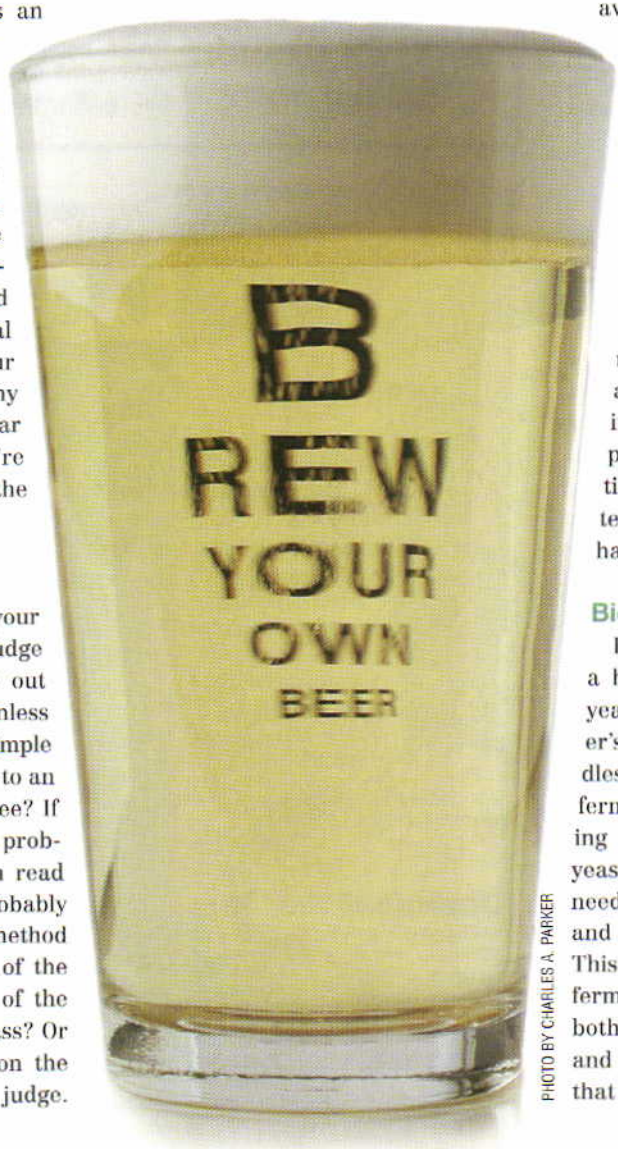


PHOTO BY CHARLES A. PARKER

Types of Beer Haze

Basically, beer haze is very small particles of stuff that are either floating or partially dissolved in your beer, depending on the temperature, with an average size about one-quarter the size of a yeast cell. Beer haze particles are generally divided into two broad categories: hazes with a biological origin and hazes with a non-biological origin. There's also a special kind of non-biological haze, called a chill haze. Chill haze is essentially a small particle comprised of proteins and polyphenols. While the ingredients are always in the beer, it is only when it gets cold that the protein and polyphenol combine to make a particle large enough to be seen (or filtered). As your beer warms up, the haze disappears.

Biological Particles

Biological particles that can throw a haze include brewer's yeast, wild yeast and bacteria. Normally, brewer's yeast flocculates into small bundles and drops to the bottom of the fermenter. What is left drops out during cold storage, leaving a naturally yeast-free beer. For this to happen, you need to pitch plenty of healthy yeast and make sure it has enough oxygen. This combination ensures a healthy fermentation, one that's unlikely to be bothered by contaminating bacteria and "wild" yeast (non-brewing strains) that may invade a weak ferment.

Brewer's Yeast

Before yeast can start to consume the sugars we have made, it must first do some preparation. This time is called the "lag" and it is a very vulnerable period. This is the time when wild yeast and bacteria can get an unwanted headstart on the brewer's yeast. That's why it is so important to pitch healthy yeast and have good oxygen levels in your wort. The best "pitches" are 10 to 14 days old for an ale yeast (meaning it has been 10 to 14 days since the last time it was pitched) and about 3 to 4 weeks for a lager yeast. When collecting the pitch, also called slurry, it is common to discard the early and late flocculators (the top and bottom layer) and collect only the center layer of the yeast. The pitch should smell and taste clean. It is traditional in English breweries to pitch one pound per barrel of active yeast, which translates to about 2.5 ounces by weight for a five-gallon batch. In large breweries it is common to perform a cell count to ensure accurate pitching rates. Homebrewers often just use a fresh culture every time they pitch.

If you are fermenting a normal-gravity beer (1.048 or so), then it is fine to use sterile air for oxygenation. Many homebrewing suppliers carry small filters to place in-line with an aquarium pump. These filter out all sources of contamination in the air. If you're using sterile air, it is practically impossible to over-oxygenate your wort. For higher-gravity beers, it is better to use pure oxygen, since O2 becomes increasingly important with increasing gravity. Medical-grade O2 can be purchased at welding supply houses or from homebrewing supply shops. You know you have used the proper amount of O2 for your beer when you harvest the next generation of yeast and the pitch has tripled or quadrupled in size. A good starting point is to add 45 seconds of O2 through an air stone. For a high-gravity brew do this twice.

Sometimes the brewer can cause "selective pressures" by changing the flocculation characteristics of a yeast strain. If we look at a population of yeast, some cells are better suited to different extremes of living conditions. Some cells will be better flocculators and some will be better attenuators. Some will perform better warm, others like it cold. "Selective pressures" (whether intentionally or accidentally caused by the brewer) can make a whole strain behave differently than the original strain.

A good example of "selective pressure" would be to ferment an ale yeast cold and have a slow fermentation. In a ferment like this, sometimes the only yeast to survive are the least-flocculating cells. After they have replicated and finished fermenting the beer, they are reluctant to flocculate, which causes a yeast haze. In this case we have created a "selective pressure" by killing the more-flocculent yeast and rewarding the less-flocculent yeast. This can happen in one generation or slowly over several generations. This is why most brewers return to a fresh culture every 10 or so generations, or after an unusual ferment. If your yeast strain becomes non-flocculating over time, it will not settle out of your beer and will need to be filtered. In a nutshell, it's important to use a strain with good flocculation properties.

Wild Yeast

Wild yeast is any yeast the brewer did not intend to pitch into the beer. Yeast and bacteria are everywhere, and on every surface, unless it has been sterilized. Since homebrewers only sanitize, not sterilize, wild yeast are always present in the brewing environment, including on your hands.

Wild yeast can have very poor flocculation characteristics, which means they will never settle out and will make your beer downright cloudy! The best way to eliminate wild yeast from your beer is to sanitize everything very carefully and ensure there are no unfermentable sugars remaining in the beer. Once you have completed the boil, everything that comes into contact with the wort or beer should be sanitized. That means every valve, line, tool and vessel. It is up to the brewer to look at every item and undertake the best sanitation method for each object.

Bacteria

Bacteria are small living cells (less than 1 micron) that would like to contaminate our wort and beer if given the chance. Bacteria are difficult to eliminate from the brewing process, because they are everywhere: drifting in the air, on every surface and on your hands. Fortunately, most bacteria are killed by the combination of the acidity of wort, the alcohol content and the hops in beer, leaving us with a short list of possible bacterial contaminates. It is important to realize that none of them are pathogenic. You cannot make anyone sick with beer. (Well, we all probably have had a hangover!)

Many species of bacteria can replicate at 36 times the rate of yeast. By the time your yeast has eaten all of the O2 and finished replicating, the bacteria can have raised 36 families and ruined your beer. Since each generation doubles the bacteria count, 36 generations is a lot of cells. Obviously this would make the beer taste incredibly off, but a milder infection can be just enough to throw a haze.

This is a good time to introduce something I call the crumb theory: Beer can get contaminated with small amounts of bacteria at any point in its lifetime. Bacteria need food to survive, so brewers try to eliminate any excess food that bacteria may use to survive. For example, when yeast gets old and dies, it decomposes (this is called autolysis) and releases its proteins into the beer. This is a potential food source for bacteria (especially lactic-acid bacteria), so most of the lactic-acid bacteria risk can easily be eliminated by properly separating the beer from the yeast after fermentation. Making sure your beer has fermented completely is another critical tool for eliminating residual food supplies.

Let's review. Brew clean and pitch healthy yeast into a wort with plenty of O2 and you will eliminate the sources for biological haze. It is important to eliminate sources of biological haze because filtering biological hazes is time-consuming and not very effective. A heavy biological haze will have too much material to filter. The result is often a clogged filter; or worse, a torn filter that lets unfiltered beer through. If your beer is in this sorry state, usually the flavor damage is permanent.

A final note: Some biological hazes

Beer Haze at a Glance

Cause of Haze	Signs of Haze	How to Treat
BIOLOGICAL		
Brewer's Yeast	Fails to flocculate	Use a healthy pitch Use a proper O_2 level Use proper fermentation temperatures
Wild Yeast	Contaminates beer and is slow to flocculate Can ferment more complex sugars than brewer's yeast	Keep wild yeast out of beer through sanitation
Bacteria	Contaminates beer and consumes sugar before yeast can replicate	Proper sanitation
NON-BIOLOGICAL		
Particulate	Is directly seen as a haze	Use re-circulation
Mineral	Iron and tin can create hazes in beer	Eliminate iron and tin from the brewhouse
Protein	Causes protein-polyphenol complexes	Use highly modified malts or use a protein rest
Polyphenol (Tannin)	Reacts with protein to make a haze	Do not over-sparge
Starch	Can directly make a haze	Make sure to mash for at least 60 minutes with quality malts
Beta-Glucan	Makes beer thicker and more difficult to filter	Use highly modified malts or use a beta-glucan rest
Lipid	Fatty acids are food for bacteria and adversely affect head retention	Make sure to separate trub from wort as early as possible and skim off hot break
Dry-Hop Haze	Dry hops can contribute to hazes	Silicate-based finings
Addition	Finings can remain behind if not used correctly	Do not over-fine Use finings as recommended by the manufacturer

slowly gain intensity in beer that has been filtered. As the beer begins to clear, "dust" slowly collects on the bottom of the bottle. Usually, the entire bottle is clear except for the bottom — when the beer is poured into a glass the "dust" stirs and the beer is hazy. The only solution is to identify the source of the contamination and remove it before your next brew. If you are lucky, you can drink some of your "dusty" brew before it begins to taste odd.

Non-Biological Haze

Non-biological hazes are not as simple to handle. Non-biological hazes fall into these categories: particulate, proteinaceous, protein-polyphenolic, carbohydrate-starch, beta-glucan, lipids or addition-related. Wow, that's a lot of causes. Which one is making my beer hazy? Good question. It may not be possible for us to tell without a lab, but by exploring the possibilities, we can learn what we do in the brewing process to "throw a haze." With experience all of the sources of non-biological haze can be eliminated from the process, but protein-polyphenol hazes require constant vigilance.

Instead of detailing every particle and its contributions to beer haze, let's review the brewing process with an eye to clarity. All throughout the brewing process particles are created and removed. It is important to remove the particles as early in the brewing process as possible.

Brewhouse Design

It is important to eliminate all tin and iron from the brewhouse. Tin and iron can cause hazes. Most homebrewers do not use tin or iron, but if you are boiling in your grandma's cast-iron kettle, I would suggest finding a stainless-steel brewpot. Water sources that are high in iron should be avoided. If you get your water from a municipal supply, you are probably okay, as they have limits on the allowable iron content.

The Mill

Next we mill the grain and create particles of starch and husks (extract brewers skip this step and go straight to the kettle). Over-milling your grain

can make this task more difficult, for two reasons: You make more husk particles to filter out, and the smaller husks compact and require more force to push the sweet wort through the grain bed. This greater force can push small particles through the mash bed or cause a stuck mash. So do not overhandle your grain. This can pulverize the husks, creating small husk particles that will be difficult to filter out during lautering. Any residual husk in the boil will be detrimental to beer clarity. When I crack grain I look for the husks to be complete and separated from the starch, with 25% of the starch as powder. This is a fine mill; it probably is safer to have less of the starch powdered and the kernels opened, but the husks not completely stripped off.

The Mash

In the mash we must cooperate with the maltster to degrade beta-glucans, protein and starch, since all of these things can cause problems later on. Most malts we use are very highly modified, which means most of the protein has been degraded for us, and a single starch rest (mash profiles are discussed below) is all that is needed. If you are using an under-modified malt, like Budvar, most homebrewers will have to "step mash" in order to further break down the beta-glucans and the proteins to avoid a haze. With most highly modified modern malts, however, a protein rest lowers head retention and really does not help clarity.

Here is a breakdown of the various mash rests and their uses.

Beta-Glucan Rest

Beta-glucans are a gum derived mostly from grain husks. The standard rest to break down beta-glucans is 100° F for 15 minutes. Excess beta-glucans can thicken our beer enough to create problems with filtration, and in extreme cases can cause a haze.

Protein Rest

Proteins are present in malted barley and some adjuncts are high in protein. Proteins can combine with phenols to cause a haze in beer. Most protein degradation is performed by the

PHOTO COURTESY OF COLIN KAMINSKI

Here is a set-up for filtering carbonated beer. Gas flows in the "gas-in" fitting on the keg to be filtered (at left). This pushes the beer out the "out" fitting, through the cartridge filter and in the "out" fitting (so the beer enters the receiving keg, at right, from the bottom). There is a pressure-relief fitting with a gauge on the "gas-in" fitting on the receiving keg. The pressure gauge on the receiving keg must read higher than the serving pressure for the beer; 30 psi in and 14 psi out works well.

maltster; homebrewers can further degrade the proteins by holding the mash at 120-130° F for 15 minutes. Another tip: If you use adjuncts to boost the alcohol content of your beer or to lower the malt content, avoid high-protein adjuncts like raw wheat. Instead, go with low-protein adjuncts like rice or corn. A healthy boil is beneficial because it helps ensure good "break" or precipitation of the protein/polyphenol trub.

Starch

The conversion of starch to sugar is accomplished by holding the wort at 142 to 158° F. It is in this temperature range that alpha and beta amylase enyzmes, which are present in malted barley, can work together to convert the barley starch to sugar. Alpha amylase works at the upper end of this range and leaves more unfermentable sugars behind, making a sweeter, malty beer. Beta amylase works at the lower end of this temperature range, and will make less unfermentable sugars, leaving us with a dryer beer. If you want to rest at the low end of this range, then the mash must be longer (about 90 minutes). Most people choose a warmer temperature for their mash, at about 154° F. This results in quicker conversion (about 60 minutes) and contributes to a "maltier" beer. A rest that's conducted at an improper temperature, or a rest that's too short, will leave residual starch in suspension and throw a haze into our beer.

To ensure you have converted all of the starch to sugar, it is useful to perform a iodine test. Take a few drops of wort and place it on a white plate. Add one drop of iodine from your local drugstore. If the solution turns blue, you still have residual starch.

The Re-Circulation

The best place to filter out husk particles is in the mash. We accomplish this by re-circulating the wort through the mash bed. As I mentioned earlier, over-milling your grain can make this task more difficult, and you may wind up with tiny husk particles in your wort. Since husks contribute to the phenol levels it is important to keep them from the boil kettle. Phenols combine with proteins and cause a haze.

A simple method is to place a bowl upside-down on top of the mash. Because we are pre-boil, it is not necessary to sanitize this bowl. Draw about a pint of sweet wort off the bottom and gently pour it over the bowl. If we hydraulically cut through the mash it ruins our filter bed, so go slowly. As my personal rule of thumb, I like to re-circulate the entire volume of the mash in about 30 minutes.

The Sparge

When we have clear sweet wort, it is time to run off into the boil kettle. This is called sparging. Sparging is simply pushing the sweet wort down with hot water and rinsing the rest of the grain free of sugar. We must be careful not to over-sparge. The last runnings of the sparge have very little sugar and increasing levels of polyphenol and lipids. Polyphenols and lipids can cause haze and instabilities in your beer so it is best to keep them out.

You should stop sparging when you can start to taste tannins in the final runnings. Tannins are the astringency in tea and taste like weak tea. Tannins are a polyphenol that indicate over-sparging. You can also use a hydrometer or a pH meter to decide when to stop sparging. If you are using a hydrometer, chill a sample and stop your sparge at 1.008. If you are using a pH meter, chill a sample and stop sparging when the run-off pH increases to 5.8. If you are like me, you have stopped the run-off before you have filled your boil kettle. To get your final boil volume just add liquor (water) from your hot-liquor tank.

The Steep

Homebrewers often will put a bag of specialty grains into the boil kettle if they are not mashing. The usual method is to place about 1.5 pounds or less (for a 5-gallon batch) of cracked crystal or dark malts into a fine mesh bag. The sweet wort is warmed up to 170° F and then the heat is switched off. The bag is placed in the sweet wort for 30 minutes. The heat of the 170° F water destroys the enzymes that break down the malt, so very little starch is converted to sugar.

Because the enzymes are inactivated and therefore are not converting the starch, steeped grains add various lev-

els of starch to the sweet wort. Crystal malt has already been "mashed" and roasted grains are so burnt that little starch remains, so these specialty grains don't contribute enough starch to worry about. The lightest specialty grains are the ones to consider; I save malts like Vienna or Munich for my mash tun. Either way, remove all grain when the sweet wort is below 178° F. The over-use of steeped grain can cause hazes, so sticking to less than 1.5 pounds for 5 gallons works well.

The Hot Break

Just before the kettle comes to a boil, the hot break starts to form on the kettle. It is formed mostly from protein. This break looks like a foamy, eggy substance. When the break is at its maximum, skim it off. If you wait until the boil begins, the break will sink back into your sweet wort and you will have to whirlpool it later.

The Boil

What makes a good boil? A boil should be as hot as you can get it (215° F is recommended, but not possible for many homebrewers), long (at least 60 minutes) and vigorous (it is recommended to boil off about 8 to 10% per hour). Simply simmering will not be enough to coagulate protein into a good hot break and will result in a cloudy wort. If you have done this correctly, the boil will contain large pieces of what looks like egg white. This is trub.

Trub is coagulated protein compounds, and it can be addressed by adding finings to the wort. There are many choices. The most common is probably Irish moss, a refined seaweed that helps precipitate protein into the hot break. Use one to three teaspoons of Irish moss flakes for 5 gallons of beer, and add the moss 15 minutes before the end of the boil. Kettle finings improve the break and reduce protein levels, which results in a clearer beer.

The Whirlpool

Once you have completed the boil, the kettle is a good place to separate out some of the larger particles. This can be accomplished by giving the wort a good stir; be sure to get the entire vol-

ume spinning in one direction. Let this settle for about 20 minutes (longer if you have a very deep kettle). Spinning the wort creates lower pressure in the center of the kettle. This starts a vertical circulation, with the wort running down the sides of the kettle and up the center, pulling the trub towards the center. Gravity drops the trub and hop matter down against the flow of wort and deposits it in the center, away from your valve, allowing for an easier rack from the boil kettle. You can alternatively run your wort through a hopback and use the whole hops to filter the trub from your wort.

The Cold Break

Cold break is the solids that begin to fall from solution as the wort drops below 140° F (by definition). It is very similar but not identical to the composition of hot break. The colder you take your wort after the boil, the more trub you will precipitate. This is because warmer wort can hold more dissolved trub than cold wort.

The Pitch

Now that we have made the best food for our yeast, it is time to give them their chance. When I learned to brew in a microbrewery, the master brewer told me that "brewers are only yeast farmers; if we are good to them, they give us beer." There is a great deal of wisdom in this sentence. Be clean, control your temperature and give your yeast oxygen. Healthy yeast are tough; in the right environment, they will out-compete the organisms that can cause haze.

The Rack

From this point on, it is extremely important to eliminate all sources of oxygen from your beer. Even the tiniest amounts of O_2 will cause stability problems. Flush everything with CO_2 before you transfer and don't splash.

The homebrewer often leaves the cold break (trub) in the vessel during fermentation. Some of it will settle before the yeast and can be seen on the bottom of the carboy. It is wise to rack off this trub after a day or so, as it is another food source for bacteria.

At the end of fermentation, transfer your beer off the yeast. Make sure to leave as much of the sediment behind as possible. If you are coming out of a carboy, place the racking cane about 1 inch from the top of the yeast. When the beer level starts to get to the end of the cane, gently tip the carboy, allowing the yeast to settle into the corner. Stop racking just as you start to take the top of the yeast.

Dry Hop?

It should be noted that dry hopping can cause a haze. If you choose to dry hop, you can fine with silica gel and then filter. Or you could use Polyclar AT to remove the tannins introduced by the hops. This is usually successful in removing dry-hop haze. If clarity is your final concern, then no hops after the hopback.

The Bright Tank

The next chance we have to "filter" our beer is by aging. Some people do this in a second carboy; others use an aging vessel that can be pressurized like a keg, so it is easier to rack off the sediment without introducing oxygen. Gravity pulls the large particles to the bottom of the aging vessel. It is best to chill this vessel — three weeks at 32° F is recommended. Cold helps the particles to precipitate.

There are three finings we can add to the bright tank, depending on what we want to remove. Isinglass, which is made from the swim bladders of certain fish, will help to settle the yeast. Polyclar AT (also called PVPP) will adsorb polyphenols. And silica gel will adsorb haze-forming proteins, leaving head-retention proteins behind. To add isinglass, hydrate one quarter to 1 gram of isinglass in one quarter to 1 pint of sterile distilled water for a 5-gallon batch. Polyclar AT and silica gel are best used together, because together you can use less than either of them alone, making it easier to filter. Add between 5 and 10 grams each of Polyclar AT and silica gel in a 5-gallon batch. Be sure to keep everything sanitized. Polyclar AT and silica gel should

be followed by filtration or the finings can remain in the beer.

The Filter

I like to sample the beer one month after brew day and evaluate it for clarity. If it is up to my standards I rack off the sediment into a keg or bottle. If it's not, I start to think about filtration. Many beers do not need filtration and will be very bright at this point.

The mega-breweries would take the beer to 29° F, centrifuge to remove all of the yeast, run it through a filter small enough to remove all of the haze particles, bottle the beer, and then pasteurize the whole package with the cap on to kill any bacteria. The craft brewers I have met can be divided into two groups: the ones who choose either no filtration or coarse filtration; and the craft brewers who bottle their beer and often filter with a small-pore filter that traps all bacteria (this is called sterile filtration). Many craft brewers use sterile filters because they can't afford pasteurization. Sterile filtration alters the chemical composition of the beer (Fix and Fix, "An Analysis of Brewing Techniques," 1997) and, in my opinion, adversely affects its flavor.

So we look at our beer and decide it looks like pea soup. Well, a filter is probably not going to help. It will make the beer clear, but we have created a problem earlier in the brewhouse, and it is likely to have affected the flavor. If we look through our beer and decide it is almost clear enough, but could use a little polishing, then a filter may be just the ticket.

What filter do we use? There are three methods in common usage.

Diatomaceous Earth Filter

In a large brewery, the economics dictate using a diatomaceous earth (DE) filter. DE is the skeletal remains of algae. It is very small and has jagged edges that lock it together. A DE filter is a vertical plate that has coarse pores. You start pumping the beer through the filter while you "dose" the beer with DE. This initial beer has a considerable amount of DE that escapes through the coarse screen and is re-circulated. After a few minutes, the DE will have bridged the holes in the screen, making a fine filter. Once the beer is clear, the output is diverted to a tank. If the transfer is interrupted, the DE falls off the screen and the process must be started over. Since the beer must re-circulate through the filter, the transfer is usually accomplished with a pump. If this sounds complicated, it is, and it's not suitable if you have less than 200 gallons.

Pad Filter

Another filter that is useful but not commonly used is a pad filter, originally designed for home winemakers. It is two plates that spread out the beer and push it through a filter pad. These are available from mail-order houses. They work just the same as the cartridge filters many homebrewers have.

BREWS CLUES Answers

A	L	E	■	B	E	E	R	■	F	I	R	E	■	■
C	I	V	■	E	L	L	E	■	A	R	O	M	A	■
A	M	A	Z	A	K	E	S	■	R	I	D	E	R	S
S	E	N	O	R	■	■	T	W	O	S	■	N	I	P
■	■	E	N	D	■	L	O	O	■	■	E	D	D	Y
C	A	S	E	■	F	O	R	W	A	R	D	■	■	■
A	R	C	■	L	O	S	E	■	R	E	A	P	E	D
P	E	E	P	E	R	S	■	T	R	E	M	O	L	O
T	A	S	T	E	D	■	B	E	A	D	■	P	A	L
■	■	■	A	S	S	U	R	E	S	■	V	E	N	T
L	A	O	S	■	■	M	I	N	■	D	I	R	■	■
A	S	K	■	K	A	P	E	■	■	A	N	I	S	E
Y	E	O	M	E	N	■	F	E	R	M	E	N	T	S
■	A	L	I	G	N	■	E	R	I	E	■	G	A	P
■	■	E	L	S	E	■	D	A	D	S	■	E	R	N

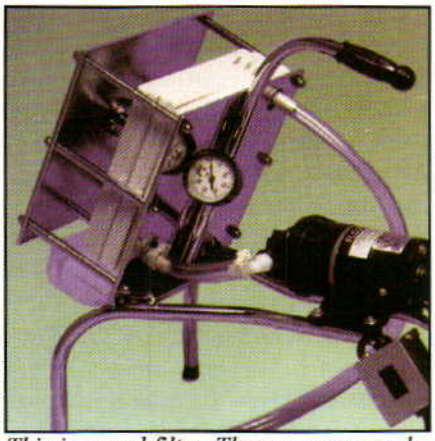


PHOTO COURTESY OF BUON VINO

This is a pad filter. They are commonly used by home winemakers and work just as well for filtering beer.

Cartridge Filter

A cartridge filter is a plastic or metal housing that is designed to hold a cartridge. There are many sizes, but 6" and 10" are the most common. There are many cartridges to choose from, and it is important not to choose one with charcoal or carbon. They will remove all of the flavor from your beer and you may end up with Zima.

A good choice for beer filtration is spun polypropylene. Spun filters come rated by the smallest particle they will let through. Common filter sizes are 10 micron, 5 micron, 1 micron and 0.5 micron. Yeast is about 7-8 microns. Bacteria ranges widely but is about 1.5 microns. One micron is .00004 inches, or much smaller than the naked eye can see. If you're thinking, "I'll just use the 0.5," not so fast. Smaller is not always better. If you were to run a really cloudy beer through a 0.5 micron filter it would likely clog before you had finished filtration. So it is common to step through a few filters. I use 10 micron, then 1 micron or 0.5 micron, depending on how cloudy the beer is and how clear I want the beer to be.

I did an informal tasting of some hoppy beers filtered to different sizes. Every taster had noticed a difference by 1 micron; they all perceived a loss of bitterness. At 0.2 micron the hop flavor was completely changed.

While it is possible to filter beer without CO2, it is best to use a keg-to-keg transfer with the filter in-between. Any time we move the beer after fermentation, we must be vigilant about eliminating O2 pickup and a keg-to-keg transfer is the easiest method. The set-up goes like this: Connect your gas to the unfiltered keg gas-in line. Connect the product out line to the filter. Connect the output side of the filter to the beverage side of the fresh keg. Connect a bleed valve to the gas-in of the fresh keg (see photo on page 28).

Make sure to sanitize all of the parts with your usual method before assembly. The filter can be used fresh out of the package. I have heard of homebrewers reusing filters by boiling them, but I have never tried. The cheap ones are not rated for 212° F.

It makes sense to flush out the filter system before using it. I like to run sterile water through all of the hoses and the housing and filter. Most cartridges have a bleed valve on the top.

On the housing I use, there is a red button. If you see a pocket of air on the top of your filter, press this button until the fluid level rises to the top. When I am sure I have gotten all of the air out, I push the water out with CO_2.

After everything is hooked up, open the valve to the CO_2 tank and crack the bleed valve. It is critical to resist the temptation to filter too quickly or at too great a differential pressure, especially with the spun poly cartridges. While it is easier to filter pre-carbonation, it is possible to filter post-carbonation if necessary. When filtering post-carbonation, it is important to control the bleed valve so the transfer goes very slowly. CO_2 is dissolved into the beer. As long as the beer after filtration is cold and under enough pressure we will not lose any carbonation. It is important to pre-chill the receiving keg to avoid carbonation loss.

If you would like to use the two- or three-step method, you can either transfer to another keg, changing cartridges before you do so, or use two or more housings in a row. If you are trying to remove a chill haze it is important to filter the beer as cold as possible. A chill haze must be visible to be filtered, because when a particle is dissolved, it is in solution and does not contribute to a haze. A common number is 29° F, but it is probably safer to try about 32° F until you know your set-up. (You don't want to freeze any water left in your system.)

Forever Bright?

So now you have a keg of bright beer. It will stay that way forever, right? Well, not really. Over time, even the clearest beer can get hazy. Package stability is a huge problem even for the mega-breweries, and they have spent considerable time devoted to keeping the beer as fresh and clear as the day it was "born." But if you've followed the recommendations above, you have a good headstart.

We were careful to control many of the precursors to aging haze. We stopped sparging just in time to prevent polyphenols from getting into our wort. We were careful not to add any oxygen after fermentation.

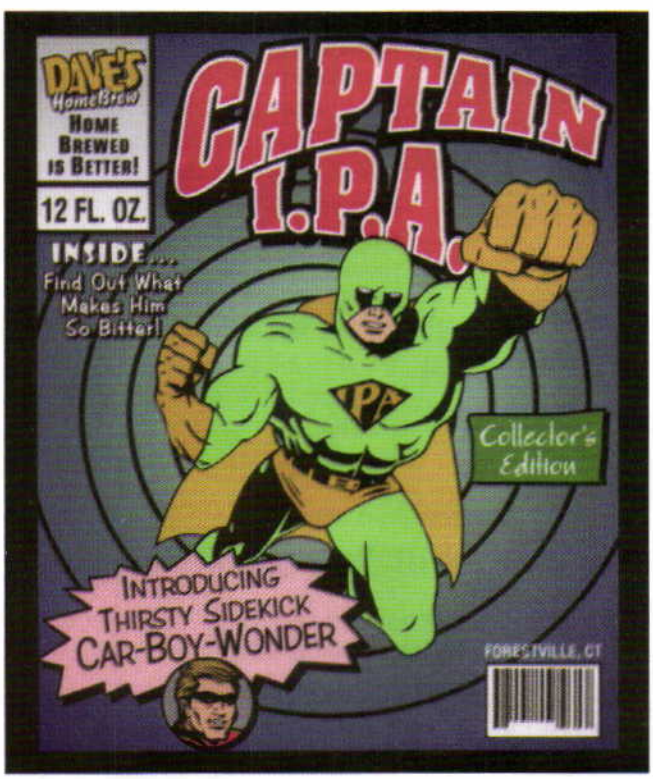
I have tasted low-gravity, lightly hopped beers after six months and found them as bright as the day they were bottled. With practice and attention to detail, you can brew crystal-clear beer! ■

Colin Kaminski is a brewer at Downtown Joe's in Napa, California. He also works as a product developer at Beer, Beer and More Beer. Colin attended a presentation by Ian Ward at the Northern California chapter of the Master Brewers Association. The presentation was based on a research paper, "The Nature, Formation and Prevention of Beer Hazes," that Ward wrote for Savilles in Aldrich, England. Savilles is a leading fining manufacturer for the beer and wine industries; Ward works for Savilles from Napa.

label 2002 contest

This year's collection of handmade homebrew labels was by far the most impressive in the seven-year history of our annual competition. We received many more labels than ever before; in the weeks leading up to the competition, more than 1,000 entries jammed our mailbox. Better yet, the labels astounded our esteemed judges — in other words, the editorial staff of Brew Your Own — with their artistic talent, kaleidoscopic creativity and oddball sense of humor, which was often twisted but always appreciated. It was a tough task to sift the winners from the also-rans, and the pile of labels that we didn't have room to include contains countless commendable candidates. As always, the selection criteria were totally subjective, utterly whimsical and completely open to interpretation. (Complaints, however, will be promptly dismissed.) A heartfelt toast to everyone who took the time to mail us a label.

GRAND PRIZE

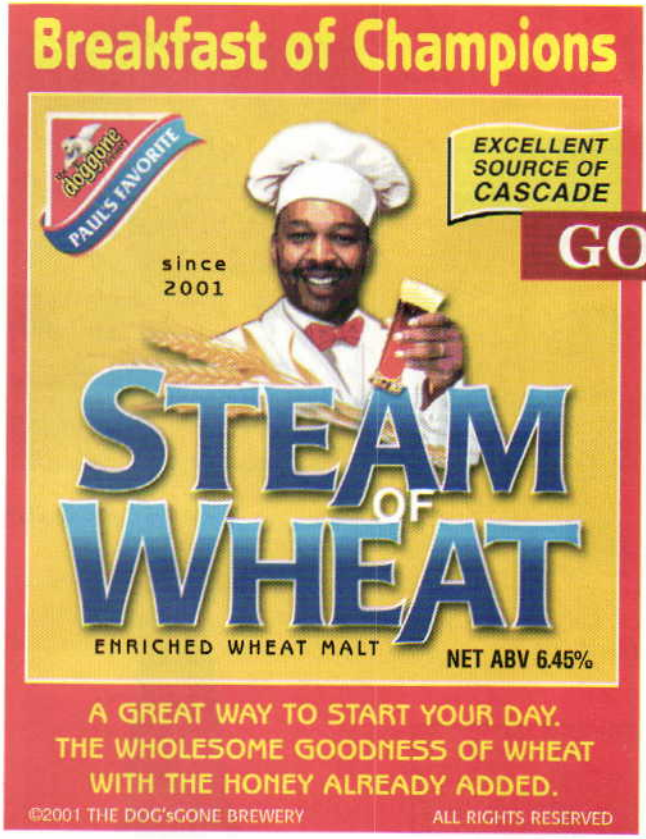


DAVID LEVESQUE
Forestville, Connecticut

Prize: Complete Cornelius Kegging System from Midwest Homebrewing Supplies

The words of the winner: "While sampling my latest India Pale Ale, I was looking through my old comic-book collection and I realized there weren't any beer-related superheroes. That's when I thought, 'Wouldn't it be great to have Captain IPA come to the rescue on those occasions when you're far away from your homebrew and crave some quality beer?' Captain IPA needed a sidekick, so we recruited thirsty Car-Boy-Wonder. The label design combines clip art that I altered and images I created in Corel Draw on my computer."

the MEDAL winners



GOLD

LARRY DURBIN & STEVE MEARS

Prior Lake, Minnesota

Prize: Gift Certificate from BrewSource

"Steam of Wheat is a wheat beer fermented with a San Francisco lager yeast. With the name as inspiration, the beer label became a parody of the famous cereal box. Our friend, Paul Laws, was photographed in our brewery with the perfect expression and graciously allowed us to make him our 'Steam of Wheat guy.' "

SILVER

CHRIS BENNETT

New Bern, North Carolina

Prize: Portuguese Floor Corker from Grape and Granary

"This image is a four-color linoleum cut. I haven't done a lino cut since I was in high school (I'm 41 now), so I had to remember the technique as I worked. I printed about 20 of these, and ten of them came out pretty well."

BRONZE

PATRICK & CHRIS MORGAN

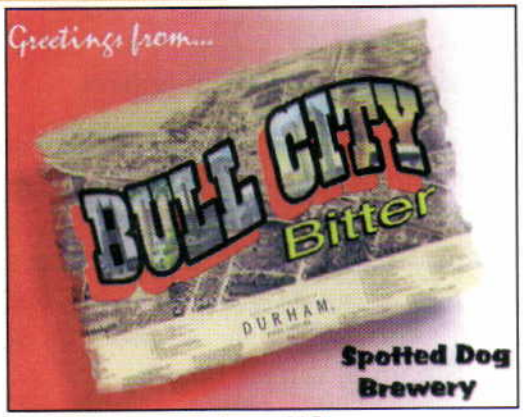
Brentwood, Tennessee

Prize: Party Pig® Set-up Package from Quoin Industrial

"In 1998 I started brewing in a shed behind my house. I have always been a dog lover and currently have two. The dogs stay outside, but they never liked their doghouse. So I added a pet door to my brew shed. I have to keep an extra-careful eye on sanitation now, but I like brewing in the doghouse and the dogs like it, too. My brother Chris did this label artwork by hand."

label 2002 contest

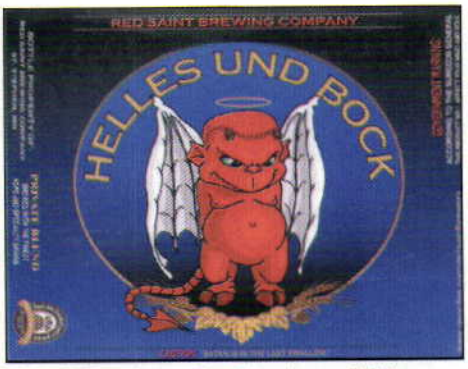
HONORABLE mention



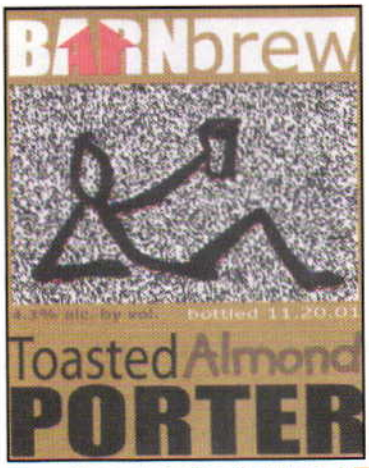
Chris Mincey, Durham, NC
Prize: CO_2 Keg Charger
from Innovations, Inc.

Geoff Ashworth, Tyringham, MA
Prize: CO_2 Keg Charger
from Innovations, Inc.

Barry Fitzgerald, Lawrence, KS
Prize: Natural Wood Oar Tap Handle
from Taphandles, Inc.



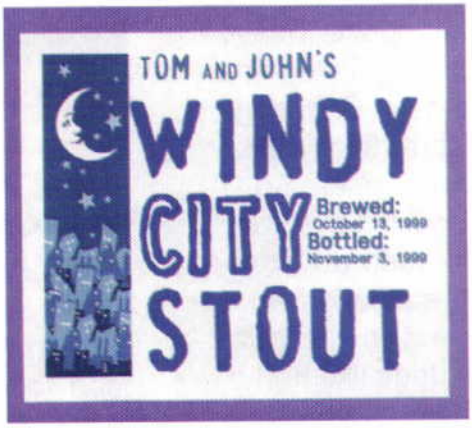
Chad Gertken, St. Stephen, MN
Prize: Five Coupons for Yeast
from White Labs, Inc.



Troy Sprenkel, South Hero, VT
Prize: CO_2 Keg Charger
from Innovations, Inc.

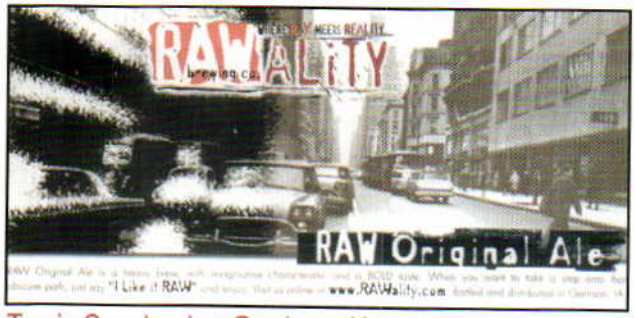
Scott & Jeff Nichols
Pleasant Prairie, WI
Prize: White Embroidered Cotton Shirt
from Muntons

Rick Brozek, Decatur, GA
Prize: Gift Certificate
from The Weekend Brewer
Home Brew Shop

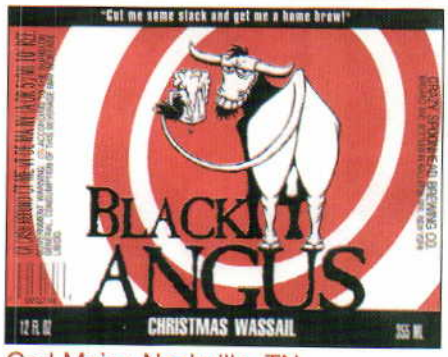


John Wyzkiewicz, Chicago, IL
Prize: T-shirt and Hat
from White Labs, Inc.

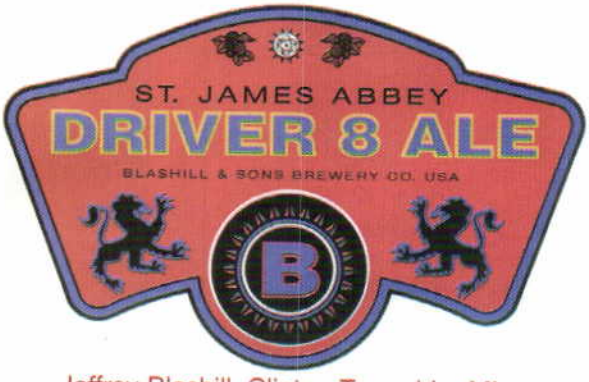
Michael Hall, Arvada, CO
Prize: Herrnbrau Millenium Half-Liter Stein
from Beerglasshopper.com



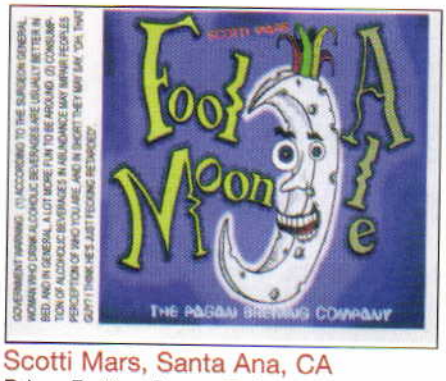
Travis Savchenko, Garrison, IA
Prize: ProMash Brewing Software
from Bader Beer and Wine Supply, Inc.



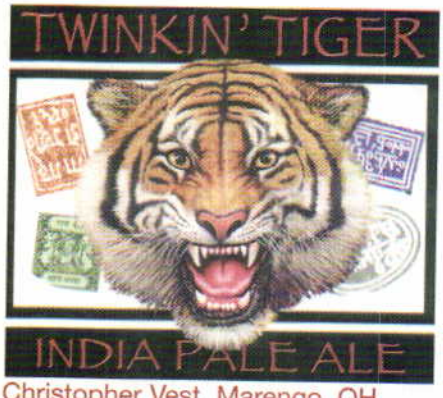
Carl Meier, Nashville, TN
Prize: Gift Certificate
from Beer and Wine Hobby



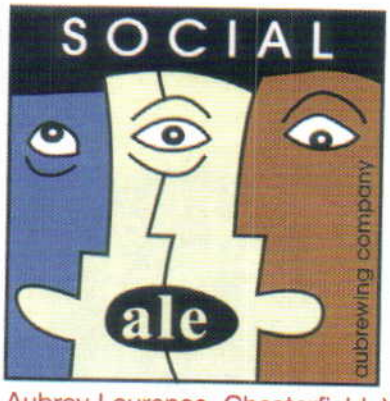
Jeffrey Blashill, Clinton Township, MI
Prize: Phil's Immersion Wort Chiller
from Brew By You



Scotti Mars, Santa Ana, CA
Prize: Button-Down Oxford
from White Labs, Inc.



Christopher Vest, Marengo, OH
Prize: Five Coupons for Yeast
from White Labs, Inc.



Aubrey Laurence, Chesterfield, VA
Prize: White Embroidered Cotton Shirt
from Muntons

Connie Hargrove, Duluth, GA
Prize: Gift Certificate
from The Weekend Brewer
Home Brew Shop

Stuart Greer, Randolph, NJ
Prize: ProMash Brewing Software
from Bader Beer and Wine Supply, Inc.

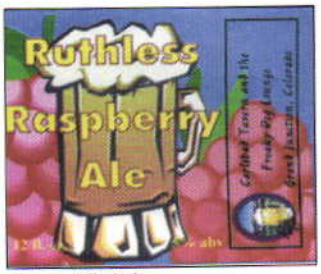
Andy Friedl, Beloit, WI
Prize: Imperial Eagle Tankard
from Beerglasshopper.com

label 2002 contest

THE BEST of the rest

Brian Janes
Sparks, NV

Steven Kordecki
Muskegon, MI

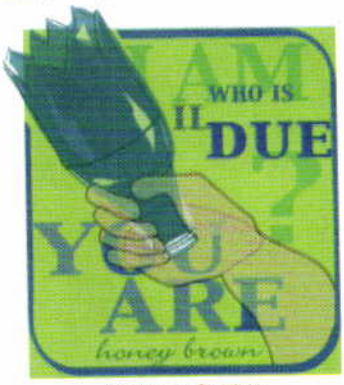


Glen Klaich
Grand Junction, CO

Alan & Connie Filippi
Petaluma, CA

Daniel Friedman
Farmingdale, NY

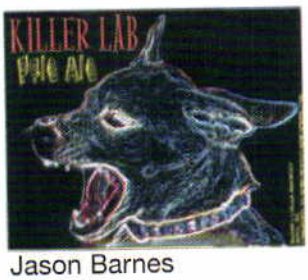
Gregg Wormley
Struthers, OH



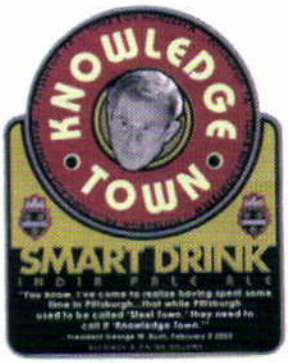
Ashley Smith
Irving, Texas

Gus Pope
Nampa, ID

Jason Jonikas
Oro Valley, AZ

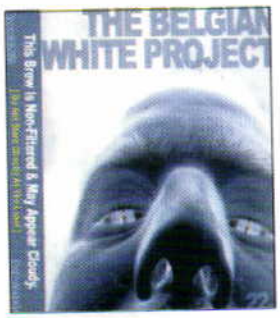


Jason Barnes
Apex, NC



Jeff Bricker
Pittsburgh, PA

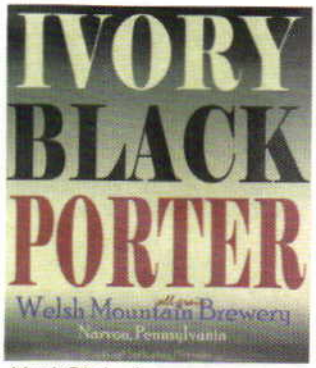
Kevin Tighe, Ajax, ON



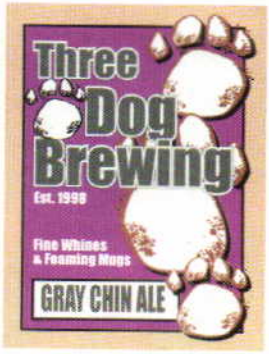
Wes Denaro
Pepperell, MA

Kevin Kuffa
Mechanicsburg, PA

Brian Kopelke, Milwaukee, WI



Karl Sickafus
Narvon, PA

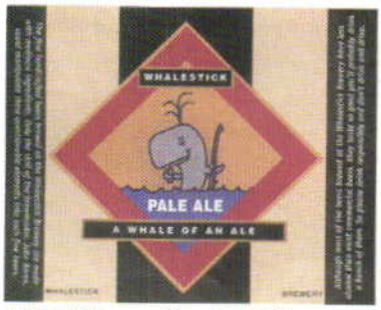


John Chlpka
Jackson Center, PA

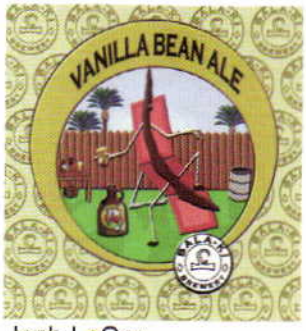
Matthew Rinker
Nazareth, PA

Walt Lewis
Huntington, WV

Randall Hunt, Jerome, AZ



John Boren, Snyder, TX

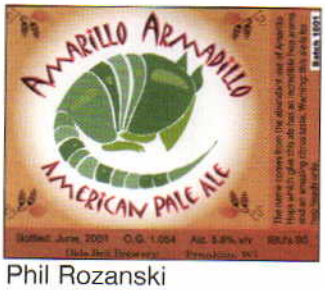


Josh LaGoy
La Quinta, CA

Tao Langston
Stamford, CT

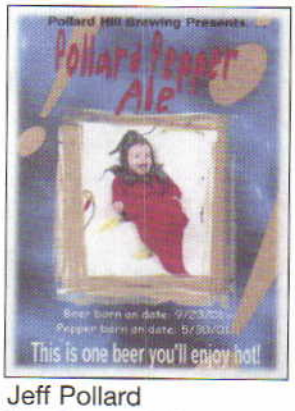
Laszlo Bodo, Middletown, DE

Matt Walker
San Francisco, CA

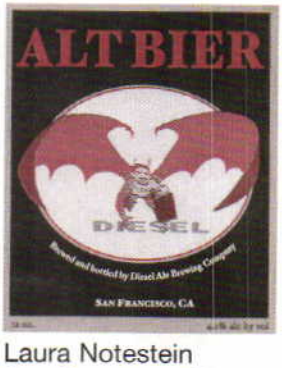


Phil Rozanski
Franklin, WI

Lou Pappalardo
Oakland, CA



Jeff Pollard
Manhattan, KS



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San Francisco, CA

Paul Rallo, Cary, IL

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Hillsboro, MO

ILLUSTRATIONS BY DON MARTIN

Old Fiddlehead Barleywine

(5 gallon, extract with grains)

OG = 1.085+ FG = 1.020
SRM = 15 IBU = 51

Ingredients

8.75 lbs. of extra-light malt extract
16 oz. Vermont maple syrup (dark)
3.5 gallons of sap (fresh from the tree)
8 oz. Munich malt (10° L)
8 oz. caramel wheat (45° L)
8 oz. crystal malt (60° L)
8 oz. crystal malt (90° L)
8.2 AAU Challenger hops (60 min.)
(1.0 oz. of 8.2% alpha acid)
6 AAU Northdown hops (45 min.)
(1.0 oz. of 6% alpha acid)
2.8 AAU Kent Goldings hops (30 min.)
(0.5 oz. of 5.5% alpha acid)
2.8 AAU Bramling Cross hops
(15 min.)
(0.5 oz. of 5.5% alpha acid)
2.8 AAU Kent Goldings hops (5 min.)
(0.5 oz. of 5.5% alpha acid)
2.8 AAU Bramling Cross hops (2 min.)
(0.5 oz. of 5.5% alpha acid)
Wyeast 1968 (Special London) or
White Labs WLP002 (English Ale)
yeast (make yeast starter)
0.5 cup corn sugar (for bottling)

Step by Step

Heat sap to 160° F and steep crushed grains for 45 minutes. Remove the grains. Add the malt extract and syrup to the warm grain tea, stir well and bring to a boil. Follow the hop schedule in recipe. After the boil, chill the wort and top up fermenter with the water. Aerate well and pitch yeast starter. Ferment at 65–68° F. Transfer to secondary and age two–four weeks.

— Vermont Homebrew Supply: Winooski, Vermont

Brew your way from sea to shining sea with this great collection of regional recipes from homebrew shops across the USA.

Cranberry Wheat

(5 gallon, extract with grains)

OG = 1.042 FG = 1.011

SRM = 7 IBU = 34

Ingredients

6.6 lbs. John Bull wheat malt extract syrup
0.5 lb. Munich malt
0.5 lb. CaraPils
3 lbs. cranberries (frozen)
9.0 AAU Northern Brewer hops (bittering)
(1.2 oz. of 7.5% alpha acid)
1 pkg Whitbread Ale yeast
0.75 cup corn sugar (for bottling)

Step by Step

Several days before brewing, clean the cranberries and run them through a blender. Put the berries in a large nylon bag and put them in the freezer until they freeze solid. Thoroughly clean and sanitize all equipment.

Add 1.5 gallons of water to a stockpot. Crush the grain malts just enough to crack the husk. Put cracked grain in the muslin bag and put it in the pot. Bring the water to a boil and remove the pot from the heat. Remove grain bag and discard. Add the wheat malt syrup extract and stir well to dissolve. Return the pot to the heat and bring to a boil. Watch the pot carefully as it might boil over.

Once the wort begins to boil, add the bittering hops. From the time of adding the hops, the total boiling time is 60 minutes. Remove the pot from the heat. Pour the hot wort through a fine mesh strainer (to remove the hops) and into your fermenter, to which 2.5 gallons of cool water has already been added. Add the nylon bag of frozen cranberries. When all of the hot wort is in the fermenter, add additional cool water as necessary to make five gallons. Stir to mix hot and cold spots and aerate. When the temp is around 70° F, add yeast after shaking the package.

Ferment for one week at 68° F. When fermenting has ceased, remove bag and rack to secondary. When secondary fermention is complete (between three days and one week), bottle with 0.75 cups corn sugar.

— Stout Billy's: Portsmouth, New Hampshire

Chesapeake Pilsner

(5 gallon, extract with grains)

OG = 1.043 FG = 1.012

SRM = 2.5 IBU = 19

Ingredients

5.5 lbs. light liquid malt extract
0.75 lb. Vienna malt
1 lb. rice syrup
5.0 AAU Northern Brewer hops (bittering)
(0.67 oz. of 7.5% alpha acid)
0.5 oz. Mt. Hood hops (aroma)
1 tsp. Irish moss
1.5 tsp. Polyclar AT
Wyeast 2007 (Pilsen Lager) or White Labs WLP840 (American Lager) yeast
1.0 cup corn sugar (for bottling)

Step by Step

Add crushed Vienna malt to a nylon bag and steep in four gallons of brewing water. Heat water and remove grain bag when temperature reaches 170° F. Turn off heat. Add the malt extract and rice syrup to your brewing water and then bring it to a boil. Be sure to stir in malt extract and rice syrup thoroughly.

Boil for one hour. Add Northern Brewer hops at the beginning of the boil. Add Irish moss with 15 minutes remaining in the boil. Add Mt. Hood hops when two minutes remain in the boil. After the boil, cool the wort quickly and rack to a fermenter. Add water to make 5.25 gallons of wort, aerate and pitch yeast.

Ferment at 65° F for one week. Rack to secondary and add Polyclar. Let settle for one week. Bottle with one cup of corn sugar, condition for two weeks, then enjoy. *— Annapolis Home Brew: Severna Park, Maryland*

Pre-Prohibition Lager

(5 gallon, all-grain)

OG = 1.045 to 1.048

FG = 1.010 to 1.012

SRM = 3 IBU = 27

A pre-Pro lager brewed with a yeast strain reputed to come from Philly's old Christian Schmidt Brewery. This recipe is based on one developed by award-winning homebrewer Jeff Renner and originally published in "Brewing Techniques."

Ingredients

7.5 lbs. American six-row malt
2 lbs. flaked maize
7.5 AAU Cluster or Northern Brewer hops (bittering)
(1 oz. of 7.5% alpha acid)
0.66 oz. Hallertau hops (aroma)
Wyeast 2272 (North American Lager) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Mash in at 145° F for 30 minutes. Raise to 158° for additional 30 minutes. Mash out at 168° F if possible. Collect 6.5 gallons of wort and boil for 60 minutes. Add Cluster or Northern Brewer hops at beginning of boil. Add Hallertau at knockout. Cool wort and transfer to fermenter. Aerate and pitch yeast. Ferment at 52° F for two weeks, then lager just above freezing in secondary for six weeks. *— Brew By You: Philadelphia, Pennsylvania*

Georgia Peach Wheat

(5 gallon, extract with grains)

OG = 1.053

FG = 1.011

SRM = 2.5 IBU = 15

Ingredients

6 lbs. wheat malt extract (dry)
8 oz. wheat malt
8 oz. crystal malt (10° L)
3 lb. peach purée
5 AAU Hallertau hops (bittering)
(1.25 oz. of 4% alpha acid)
White Labs WLP320 (American Hefeweizen) or Wyeast 1010 (American Wheat) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Heat 1.5 gallons of water to 160° F, then add crushed wheat and crystal malts in nylon bag. Steep grains at 150-155° F for 30 minutes. Rinse grains with 1.5 gallons of water at 170° F. Use kitchen strainer to remove solid matter from water. Bring water to a boil and add malt extract and Hallertau hops. Boil for one hour. Cool wort and add to fermenter. Top up to five gallons, aerate and pitch yeast. Ferment for 10 days at 72° F. Rack to secondary fermenter and add peach purée. Allow to ferment a further three weeks. Bottle with 3/4 cups of corn sugar, condition and enjoy.

— Marietta Homebrew Supply: Marietta, Georgia

Southern Blonde Cream Ale

(5 gallon, extract with grains)

OG = 1.052 FG = 1.016
SRM = 2 IBU = 40

Ingredients

6 lbs. Northwestern Gold unhopped malt syrup
1 lb. Northwestern Gold dried malt extract
1 lb. Pilsen malt
10 AAU Centennial hops (bittering) (1.0 oz. of 10% alpha acid)
5 AAU Cascades hops (aroma) (1.0 oz. of 5% alpha acid)
White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Steep crushed Pilsen malt for 45 minutes in one gallon of water at 170° F. Remove grains and place in bowl to cool. Add malt extracts to water, stir to mix thoroughly and heat to a boil. Boil for 45 minutes. Add Centennial hops with 35 minutes left in boil. With 25 minutes left in boil, gently wring grain bag into boiling wort. At the end of the boil, add Cascades hops, cover pot and let sit for five minutes. Cool wort and add to fermenter. Add four gallons of cold water to fermenter, aerate and pitch yeast. Ferment for one week at 72° F. *— Asheville Brewers Supply: Asheville, North Carolina*

Kansas Sunset Red Ale

(5 gallon, extract with grains)

OG = 1.049 FG = 1.012
SRM = 13 IBU = 32

Ingredients

3.3 lbs. Coopers light unhopped malt extract
4 lbs. Alexanders pale malt extract
0.5 lb. Munich malt
0.5 lb. biscuit malt
0.5 lb. CaraMunich
0.5 lb. CaraVienna
0.5 tsp. Irish moss
7.5 AAU Northern Brewer hops (bittering) (1.0 oz. of 7.5% alpha acid)
0.5 oz. U.S. Goldings hops (aroma)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Place the crushed grains in a nylon or muslin bag and place in two gallons of water. Slowly heat the water to 170° F, then remove grains. Take at least 30 minutes to heat the water. Bring water to a boil, then turn off the heat and add malt extracts. Boil for one hour. Add Northern Brewer after wort has boiled for five minutes. With 20 minutes remaining in the boil, add Goldings hops and Irish moss. After the boil, allow wort to sit for 30 minutes, then cool it rapidly. Transfer the cool wort to a fermenter and add cold water to make 5.25 gallons of wort. Aerate wort and pitch yeast when temperature is between 70–80° F. Ferment for eight days. Rack to secondary for five to eight days. Bottle, condition and enjoy.

—Bacchus and Barleycorn: Shawnee, Kansas

Cincinnati Cream Ale

(5 gallon, extract with grains)

OG = 1.045 FG = 1.010
SRM = 2 IBU = 15

Cincinnati is one of the original homes of cream ale, and this version is reminiscent of the city's famous Hudepohl-Schoenling's Little Kings.

Ingredients

5 lbs. light dry malt extract
0.25 lb. CaraPils
1.0 lb. corn sugar
4 AAU Hallertau hops (bittering) (1.0 oz. of 4% alpha acid)
0.5 oz AAU Liberty hops (aroma)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Put the crushed grain in a grain bag and place in two gallons of water. Heat water to 170° F, reduce heat and simmer for 30 minutes. Remove bag and allow liquid to drain into pot. Do not squeeze bag. Heat water to a boil, then remove the pot from heat. Stir in malt extract and corn sugar. Add bittering hops. Resume heating and boil 55 minutes. Add the aroma hops with five minutes remaining in the boil. Cool the wort and transfer to fermenter. Aerate and pitch yeast. Ferment at 72° F for one week. Transfer to secondary for one week. Bottle, condition and enjoy. *— Listermann: Cincinnati, Ohio*

Classic American Pilsner

(5 gallon, extract with grains)

OG = 1.059 FG = 1.012
SRM = 2 IBU = 22

Ingredients

5.5 lbs. extra-light dried malt extract
1 lb. flaked maize
0.5 lb. CaraPils malt
6 AAU Tettnang hops (bittering) (1.5 oz. of 4% alpha acid)
2.5 AAU Cascades hops (aroma) (0.5 oz. of 5% alpha acid)
Wyeast 2007 (Pilsen Lager) or White Labs WLP840 (American Lager) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Steep flaked maize and crushed CaraPils in 3/4 gallon of 155° F water for 20 minutes in a four to five gallon pot. Rinse grains with 1/2 gallon of 170° F water. Take the 1.25 gallons of water and bring to a boil. Remove the pot from the heat. Slowly stir in the dried malt until dissolved. Return to heat and bring to a boil. Once the wort is boiling, add the Tettnang hops. After 50 minutes, add 1 tsp. Irish moss if desired. At 55 minutes, add the Cascade hops. At 60 minutes, remove from heat and chill the wort. Add enough cold water to bring the temperature to 55° F.

— Fermenter's Supply and Equipment: Omaha, Nebraska

Anoka Pumpkin Patch Ale

(5 gallons, extract with grains)

UPPER MIDWEST

OG = 1.058
FG = 1.020
SRM = 7
IBU = 19

This pumpkin ale commemorates the famous Halloween celebration that's held every year in Anoka, Minnesota.

Ingredients

6 lbs. Briess light malt extract
2 lbs. fresh pumpkin or
2 lbs. of canned pumpkin (no preservatives)
0.5 lb. crystal malt (10° L)
0.5 lb. CaraPils malt
1 cup brown sugar
5 AAU Mt. Hood hops (bittering) (1.0 oz. of 5% alpha acid)
0.5 tsp. cinnamon
0.5 tsp. nutmeg
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or two packets of Muntons or Nottingham yeast
0.75 cup corn sugar (for bottling)

Step by Step

If using fresh pumpkin, cut the pumpkin in half. Clean and bake for about one hour or until it gets mushy. Otherwise, empty contents of canned pumpkin into a grain bag. Steep the grains and pumpkin together in about 1.5 gallons of water at 155° F for one hour. Remove grains and pumpkin. Again, if using fresh pumpkin, place in strainer and sparge with about five quarts of water at approximately 170° F, collecting a total of about two gallons of wort. Add malt extract and brown sugar. Bring to a boil. Add Mt. Hood hop pellets and boil for one hour. Add spices in hop bag and boil just long enough to infuse the flavors into the wort, about two to three minutes. Combine wort with water to make five gallons. Pitch yeast when wort temperature is under 80° F or ideally under 75° F. Ferment in primary fermenter at 65–75° F for seven to 10 days, then rack to secondary for seven to 14 days. Prime and bottle. Bottle conditioning for at least two weeks is required but a better product may be achieved after a month of conditioning.

— Midwest Homebrewing: St. Louis Park, Minnesota

Dairyland Milk Stout

(5 gallons, extract with grains)

OG = 1.052 FG = 1.014
SRM = 35+ IBU = 45

Ingredients

6 lbs. Northwestern Amber malt extract syrup
16 oz. milk sugar (lactose)
8 oz. dark crystal malt (120° L)
4 oz. black patent malt
4 oz. roasted barley
8 oz. malto-dextrin
12 AAU Eroica hops (bittering) (1.0 oz. of 12% alpha acid)
1.0 oz. Fuggles hops (aroma)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Crack all grain and place in a sauce pan. Cover with two quarts of water. Heat to 155° F, allow to steep for 40 minutes, strain off liquid into your brew kettle. Discard spent grains. Add one gallon of water to brew kettle. Bring to a boil. Remove from heat. Add malt extract, malto-dextrin, milk sugar (lactose) and one ounce of Eroica hops to water. Return to a boil and continue to boil for 58 minutes. Toss in one ounce of Fuggles hops for last two minutes of the boil.

Cautiously pour the hot wort into 3.5 gallons of cold water in your sterilized fermenter. Top off with cold water to make five gallons. After temperature falls below 75° F, aerate by stirring vigorously and pitch yeast (follow the directions on the packet of yeast). Cover the fermenter, install fermentation lock and ferment for 10–14 days at approximately 70° F. Sanitize your bottling equipment, siphon hose, spoons, bottling bucket, bottles and caps. Siphon your beer into a bottling bucket being careful to leave behind as much sediment as possible. Boil priming sugar in 8 oz. of water for five minutes. Cast this sugar solution into the beer and gently mix. Bottle and age the beer for at least six weeks.

— BrewCitySupplies.com (The Market Basket): Brookfield, Wisconsin

Holly's Honey Lager

(5 gallons, extract)

OG = 1.045 FG = 1.008
SRM = 2 IBU = 21

Ingredients

6 lbs. light malt extract
1.5 lbs. Colorado clover honey
4 AAU Hallertau hops (bittering) (1.0 oz. of 4% alpha acid)
4 AAU Hallertau hops (flavor) (1.0 oz. of 4% alpha acid)
1.0 oz. Hallertau hops (aroma)
White Labs WLP800 (Pilsner Lager), Wyeast 2278 (Czech Pils Lager), White Labs WLP029 (Kölsch) or Wyeast 2565 (Kölsch) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Bring 1.5 gallons of water to a boil. Add malt extract and honey and stir wort to ensure it does not scorch.

When boiling resumes, add bittering hops. Boil for one hour. With 30 minutes left in the boil, add flavor hops. With 10 minutes left in the boil, add aroma hops. When the boil is complete, cool your wort and top up fermenter to five gallons. Pitch yeast and ferment. Ferment at 60–75° F for the ale yeast and below 50° F for the lager yeast. Bottle after 14 days. — *Beer at Home: Englewood, Colorado*

Chokecherry Stout

(5 gallon, extract with grains)

OG = 1.066 FG = 1.022
SRM = 35+ IBU = 45

Ingredients

3.3 lbs. John Bull dark liquid malt extract
3.3 lbs. John Bull amber liquid malt extract
1.5 lbs. Muntons dark dry malt extract
1.0 lb. Briess crystal malt (60° L)
0.25 lb. chocolate malt (350° L)
0.5 lb. Briess roasted barley (500° L)
0.5 lb. black patent (525° L)
8 lbs. chokecherries
11.25 AAU Northern Brewer hops (bittering)
(1.5. oz. of 7.5% alpha acid)
6.5 AAU Cascades hops (type)
(1.3 oz. of 5% alpha acid)
White Labs WLP004 (Irish Ale) or Wyeast 1084 (Irish Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

In two gallons of cold water, add grains and heat to 155° F. Hold for 30 minutes. Sparge with half gallon of 165° F water. At boil, add malt extract and Northern Brewer hops. Boil 75 minutes. Add Cascade hops and boil for five more minutes. Turn off heat and add chokecherries. Hold for 20 minutes to pasteurize. Cool to 67° F and transfer to wide-mouthed, sanitized fermentation bucket. Pitch yeast and attach airlock. Ferment at 65° F for six days. Then rack to secondary and keep at 65–67° F for nine more days. Bottle with 3/4 cup corn sugar. Condition for two to three weeks.

— *The Brew Haus at SKA Brewing: Durango, Colorado*

Prickly Pear Ale

(5 gallon, extract)

OG = 1.045 FG = 1.010
SRM = 3 IBU = 19

Ingredients

6 lbs. Moravian pale malt extract
3 lbs. prickly pear purée
4 AAU Hallertau hops (bittering)
(1.0 oz. of 4% alpha acid)
4 AAU Hallertau hops (finishing)
(1.0 oz. of 4% alpha acid)
Wyeast 1272 (American Ale II) or White Labs WLP051 (California V) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Heat three gallons of water to a boil. Shut off heat and stir in malt extract. Resume heating. Add bittering hops after boiling resumes. Add finishing hops with 15 minutes left in boil. Cool wort, top up to five gallons and aerate. Pitch yeast and ferment at 68° F for one week. Rack to secondary, add purée and ferment for another week. Bottle with 3/4 cup of corn sugar.

— *St. Patrick's of Texas: Austin, Texas*

Dry Heat Chili Ale

(5 gallon, extract)

OG = 1.042 FG = 1.011
SRM = 1.9 IBU = 32

Ingredients

5 lbs. extra-light dry malt extract
0.25 lb. wheat malt
52 jalapeño chili peppers (small)
7.5 AAU Northern Brewer hops (bittering)
(1.0 oz. of 7.5% alpha acid)
3 AAU Saaz hops (finishing)
(1.0 oz. of 3% alpha acid)
Wyeast 1056 (American Ale) yeast
0.66 cup corn sugar (for bottling)

Step by Step

Add two gallons of water to your pot. Put grain in steeping bag and bring water temperature to 155° F. Steep grain for 30 minutes. Remove the grain bag from the steeping water, squeeze excess water and discard bag and grain. Bring this to a boil. Remove from heat and add malt extract. Bring wort to a boil and add bittering hops. Allow the wort to boil for 45 minutes. Add the flavoring hops. Boil for an additional 15 minutes. Put three and a half gallons of cold water in your fermenter and add the hot wort. Allow the wort to cool to 75° F or below. When the temperature reaches 75° F, pitch your yeast. Ferment at 68–72° F. After five days transfer to your secondary and condition your beer for seven to 10 days. Bottle your beer with five ounces of priming sugar in one cup of water. Add a jalapeño pepper to each bottle. Condition, chill and enjoy!

—*Brew Your Own Brew: Tucson, Arizona*

San Francisco Steam Beer

(5 gallon, extract with grains)

OG = 1.052 FG = 1.014
SRM = 9 IBU = 50

Ingredients

7 lbs. extra-light or light malt extract
1 lb. crystal malt (60° L)
11.25 AAU Northern Brewer hops (bittering)
(1.5 oz. of 7.5% alpha acid)
7.5 AAU Northern Brewer hops (flavor)
(1.0 oz. of 7.5% alpha acid)
1.0 oz. Northern Brewer hops (aroma)
White Labs WLP810 (San Francisco Lager) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Place one pound of crystal malt in grain bag and steep as you are heating up your water. Remove the steeping bag when the water reaches 170° F. When water reaches a boil turn off heat and stir in malt extract. Turn heat back on and add 1.5 oz. of Northern Brewer. With 20 minutes left in the boil add one teaspoon Irish moss if desired. Add one ounce of Northern Brewer with 10 minutes left in the boil and add one ounce with two minutes left in the boil. We suggest you use a fine mesh hop bag if using pellet hops and a coarse mesh hop bag if using whole hops. After cooling to between 70–80° F add yeast and ferment for two weeks at around 60° F.

—Beer, Beer and More Beer: Concord, California

Organic Red Ale

(5 gallon, extract with grains)

OG = 1.048 FG = 1.016
SRM = 12 IBU = 40

Grab your Birkenstocks and brew this groovy Santa Cruz ale, made with all-organic malt extract and grains.

Ingredients

7 lbs. organic pale malt extract
0.5 lb. Briess organic caramel malt (60° L)
0.25 lb. Briess organic caramel malt (120° L)
2 oz. Briess organic chocolate malt
6 AAU New Zealand Hallertauer hop pellets (bittering) (3/4 oz. of 8% alpha acid)
3 AAU German Select hop pellets (flavor) (1/2 oz. of 6% alpha acid)
0.5 oz. New Zealand Hallertauer hop pellets (aroma)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast
0.75 cup corn sugar

Step by Step

Soak the grains in 170° F water for 20 minutes. Remove grain bag and add the grain "tea" to your brew kettle along with up to 5-1/4 gallons of water. Heat the water to boiling and then turn the heat off. Add the malt extract and dissolve the extract completely. Turn the heat back on and bring to a boil. Add bittering hops and boil for 40 minutes. Add flavor hops and, if desired, add 1 tsp. Irish moss. Boil for 15 minutes more. Add aroma hops, boil five more minutes, and turn the heat off. Cool the wort to 65–75° F and transfer wort to your fermenter. Aerate and add the yeast. Ferment in a cool, dark place for three to five days at 65–70° F. Transfer the beer to secondary when fermentation activity has subsided (after four to six days). Ferment for an additional seven to 14 days, or until fermentation is complete. Bottle the beer and let condition in the bottle for one to three weeks.

— Seven Bridges Organic Homebrewing Supplies: Santa Cruz, California

West Coast IPA

(5 gallon, extract with grains)

OG = 1.073 FG = 1.018
SRM = 12.8 IBU = 60

Ingredients

6 lbs. Alexanders pale malt extract
2 lbs. light dry malt extract
1.5 lbs. of crystal (40° L)
1 lb. CaraPils malt
14 AAU Columbus hops (boiling) (1 oz. of 14% alpha acids)
7 AAU Columbus hops (flavor) (0.5 oz. of 14% alpha acids)
1 oz. Columbus hops (aroma)
1 oz. Columbus (dry hop)
0.5 tsp. Irish moss
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Steep grains for 30 minutes at 151° F. Combine tea from grain with dry and liquid malts and bring to a boil. At beginning of boil add one ounce Columbus hops and boil for 60 minutes. With 30 minutes remaining add 0.5 ounce of Columbus hops. Add Irish moss with 15 minutes remaining. At end of boil add one ounce of Columbus hops, cover and cool. Aerate wort in fermenter and pitch your yeast. Ferment at 68° F. When fermentation is complete, transfer to secondary and dry hop with one ounce of Columbus hops. Let sit one to two weeks and then prime, bottle or keg. Condition two weeks and enjoy!

— O'Shea Brewing Company: Laguna Niguel, California

Diamond Knot IPA

(5 gallon, extract with grains)

OG = 1.072 FG = 1.018
SRM = 10 IBU = 70

Ingredients

6 lbs. British light malt extract
2 lbs. Muntons light dry malt extract
0.75 lbs. German light crystal malt
0.75 lbs. dextrin malt
18 AAU Chinook hops (bittering) (1.5 oz. of 12% alpha acid)
5 AAU Willamette hops (finishing) (1.0 oz. of 5% alpha acid)
1.5 oz. Columbus leaf hops (dry hops)
Muntons dry ale yeast, Wyeast 1028 (London Ale) or White Labs WLP013 (London Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Place the crushed grains in a strainer bag. Pour 2.5 gallons of water into the kettle. Add the grain bag and bring the water to 170° F. Remove from heat and let grains steep for 10 minutes. Remove the grain bag with a large strainer and rinse grains with one quart of 170° F water. Add the malt extract and resume heating. Add boiling hops as soon as the boil starts. Add finishing hops with 5 minutes left in boil. Cover the kettle and let it cool for 20 minutes. Put 2.5 gallons of very cold water in fermenter and transfer

wort into it. Top up to just over five gallons. Aerate and pitch yeast. Ferment for one week at 68–72° F. Rack to secondary fermenter and add leaf hops. After another week, bottle, condition and enjoy. — *Cellar Homebrew: Seattle, Washington*

Blueberry Brown Ale

(5-gallon, extract)

OG = 1.065 FG = 1.020
SRM = 25 IBU = 58

Ingredients

6.6 lbs. Coopers unhopped amber malt extract
1 lb. Coopers light dry malt extract
1 can Oregon Fruit Products blueberry purée
15 AAU Magnum hops (bittering) (1 oz. of 15% alpha acids)
3 AAU Fuggle hops (bittering) (0.5 oz. of 6% alpha acids)
5 AAU Horizon hops (flavor) (0.5 oz. of 10% alpha acids)
Wyeast 1728 (Scottish Ale) or White Labs WLP028 (Edinburgh Ale) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Bring water and malt extract to boil. Boil Magnum and Fuggle hops for one hour. Add Horizon and boil 15 minutes more. Cool and add purée in primary. For a more intense flavor, add fruit to secondary. The large amount of sediment will settle dramatically.

— *Steinbart Wholesale: Portland, Oregon*

Lilikoi Wheat Ale

(5 gallon, extract with grains)

OG = 1.055 FG = 1.015
SRM = 5 IBU = 15

Ingredients

7 lbs. Alexander's wheat syrup extract
0.5 lb. wheat malt
0.5 lb. crystal malt (10° L)
32 oz. lilikoi (passion fruit) purée
4 AAU Hallertauer hops (bittering) (1.0 oz. of 4% alpha acid)
Wyeast 3068 (Weihenstephan) yeast
0.75 cup corn sugar (for bottling)

Step by Step

Steep crushed grains in 170° F water for 30 minutes. Remove grains, add malt extract and bring to a boil. Add bittering hops and boil for 1 hour. Cool wort, transfer to fermenter, aerate and ferment at 68° F for 1 week. Add fruit purée to secondary fermenter. After another week, bottle, condition and enjoy. — *Hawaiian Style Homebrew: Honolulu, Hawaii* ■

Fruit cup

How to pick the right fruit for your beer

by Chris Colby

As spring fades into summer, the produce department at my local supermarket fills with fruits and vegetables. As the summer progresses, the selection gets wider and the colors get brighter. As a homebrewer, I look at all this bounty and think, "Hmmm . . . I wonder if I could ferment any of this?"

Historically, fruit has been absent from breweries in most major brewing centers. The use of fruit in beer was banned in Germany from 1516 to 1987 when the Reinheitsgebot (the German Beer Purity law) was in effect. English brewers use adjuncts in some of their beers, but there are no traditional British fruit beers. The use of fruit does, however, have a long history in Belgian brewing. Belgian brewers flavor their lambics with cherries and raspberries to make kriek and framboise, respectively. More recently, lambics have been flavored with peaches (Peche) and black currants (Cassis).

In the U.S., neither law nor tradition has restrained the use of fruit. Most brewpubs and many microbreweries offer fruit beers, often as summer seasonals. A sampling of American fruit beers includes: Sam Adams Cherry Wheat, Pete's Strawberry Blonde, Magic Hat's #9 (apricot), Buffalo Bill's Pumpkin Ale, New Belgium's Two Cherry Ale, Cave Creek Chili Beer, Leinenkugel's Berry Weiss (loganberries, elderberries and blackberries) and Sea Dog Raspberry Wheat. Among homebrewers, raspberries and cherries are the two most popular fruits used in brewing.

Making a good fruit beer doesn't require any new equipment and the procedures for using fruit are simple. The most common fear homebrewers have when contemplating their first fruit beer is contamination of the beer with microorganisms from the fruit. In practice, this rarely happens. To make a good fruit beer, you first need to examine the flavors of fruit and how they can be used in brewing. That is the subject of this month's installment of "Techniques."

Fruit

The biological definition of a fruit is the mature ovary from a flowering plant. (The fruit may also contain some flower parts in addition to the ovary.) This definition includes most of what we think of as fruits as well as many fruits that we commonly call vegetables (such as tomatoes, peas and peppers). This definition further includes many plant structures that are not typically eaten, such as the "helicopters" from maple trees, the white fluffies on a dandelion and the sticky burrs of many plants. Hop cones, incidentally, are fruits. Interestingly, the biological definition of a fruit excludes juniper berries. These "berries," used in the manufacture of gin, come from the ovary of a non-flowering plant.

The culinary definition of fruit is a sweet, edible part of a plant, often containing seeds. I'll use this more utilitarian definition, since the only fruits of interest to brewers are the sweet, sugary fruits that can easily be used to add flavor, color and fermentable sugars to fruit beers.

Sweetness

Most fruits contain between 10 and 15 percent sugar when they are ripe. The least sugary fruits are limes, which contain less than one percent sugar. The most sugary are dates, which contain up to 60 percent sugar. Most fruits contain a mixture of fructose, glucose and sucrose. See **Table 1** for the percent sugar content of many brewing-relevant fruits.

The sugars from fruits will raise the specific gravity of your beer. For large additions of fruits, you may want to calculate how much the specific gravity will increase.

Raspberry Porter
(5 gallons, partial mash)

OG = 1.052 FG = 1.014
SRM = 30 IBU = 21

Ingredients

4.5 lbs. pale dry malt extract
1 lb. pale malt (2-row)
6 oz. chocolate malt
5 oz. roasted barley
3 oz. black patent malt
3.75 lbs. raspberries (frozen)
1 tsp. Irish moss
7.5 AAU Northern Brewer hops (1.0 oz. of 7.5% alpha acid)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast (make yeast starter)
0.75 cup corn sugar (for priming)

Step by Step

Put pale malt and dark specialty grains — both crushed — in a large grain bag. Heat three quarts of water to 165° F and submerge grain bag. Steep grains between 154 and 158° F for 30 minutes. Rinse grains with three quarts of water at 168–170° F, then set bag and grains aside. Add water to steeping water to make at least three, but preferably four, gallons and bring to a boil. Remove from heat and stir in extract. Resume heating and boil wort for 1 hour. Add hops for final 45 minutes of the boil. Add Irish moss for final 15 minutes of boil. Cool wort and transfer to sanitized fermenter. Add cold water to make 5.5 gallons. Aerate wort and add yeast starter (wort temperature 78° F or below). Ferment for one week at 68° F. After the first week, add frozen raspberries to a sanitized fermentation bucket and crush with a potato masher. Rack beer onto raspberries and let ferment for an additional week. Bottle with 3/4 cup of corn sugar. Let bottles condition at room temperature for two weeks, then refrigerate for one week. To serve, pour beer into a tall glass, such as a wheat beer glass. Examine the color by holding glass up to light, inhale the aroma and then drink.

TABLE 1: SUGAR CONTENT AND pH OF FRUITS

Fruit	% sugar	pH
Apricot	9	3.4-3.8
Banana	17	4.5-5.2
Blueberry	11	3.1-3.3
Cherry	14	3.3-3.9
Cranberry	4	2.3-2.5
Date	60	4.1-4.9
Gooseberry	11	2.8-3.1
Lime	1	2.8
Mango	11	3.4-4.6
Peach	9	3.3-4.1
Pear	10	3.5-4.6
Pineapple	13	3.2-4.0
Plum (blue)	11	2.8-3.4
Plum (red)	11	3.6-4.3
Raspberry	7	3.2-4.0
Raspberry (frozen)	7	3.2-3.3
Strawberry	7	3.0-3.9
Strawberry (frozen)	7	3.2-3.3
Watermelon	9	5.2-5.6

Data from "The Curious Cook" by Harold McGee and U.S. FDA Web site.

You can calculate how much a fruit addition will affect its specific gravity by using the following formula:

$$SG = [W_{fruit} \times (P_{sugar}/100) \times 45]/V_{beer}$$

In the equation, SG is the specific gravity increase due to fruits. It is given in "gravity points," or the decimal portion of a specific gravity number. W_{fruit} is the weight of the fruit in pounds. P_{sugar} is the percentage of sugar in the fruit. The number 45 is the extract potential — in gravity points per pound per gallon — of simple sugars (such as fructose, glucose and sucrose). V_{beer} is the volume of beer in gallons. For example, if you use 10 pounds of cherries in your five-gallon batch of cherry wheat, you would calculate the specific gravity addition like this: SG = [10 (14/100) 45]/5 = 12.6, or about 13 gravity points. If your wheat beer weighed in at 1.048 before the cherries were added, it would now have a specific gravity of 1.061.

Most fruits are sweeter than the beer they will end up in. So, when a beer drinker tastes a fruit beer, the fruit flavors are experienced in a background that is less sweet than in the fruit. This may explain why the most popular brewing fruits are low in sugar. The fruit flavor in high-sugar fruits may not taste quite right.

If you wish to add sweetness to a fruit beer, you can add a nonfermentable sugar such as lactose when you bottle or keg the beer. The amount of sugar you add will depend on how much "sweet" you want in the beer. Your best bet may be to slowly sweeten a pint of your fruit beer until you reach a level of sweetness you enjoy. From that basis, calculate how much sugar you will need to add for five gallons of beer. (There are 40 pints in five gallons of beer.) In five gallons of beer, 6.4 ounces of sugar will raise the sugar percentage by one percent. Lactose, however, is not very sweet. That's why commercial brewers sweeten their sweet beers with fermentable sugars followed by pasteurization.

The sugars in fruits come from the breakdown of starches during the ripening process. There are two main forms of plant starch, amylose and amylopectin. Fruits also contain carboxymethylcellulose, which is commonly called pectin. In cooking, pectins help jams and jellies thicken. When heated, such as when boiled in wort, pectins can be extracted from fruit and cause haze problems in beer. Fortunately, most common brewing fruits — including raspberries, cherries, strawberries, blueberries, apricots and peaches — are low in pectin. (When making jam or jellies from these fruits, cooks must add pectin to get them to gel.) Most winemaking stores sell an enzyme that degrades pectins, called pectinase. In beers in which high-pectin fruit is heated, this enzyme can be used. To do so, add pectinase at a rate of 1/4 tsp. per five gallons during primary fermentation.

Acidity

There are many types of acids found in fruits, including malic acid, citric acid and tartaric acid. Malic acid is the primary acid in apples, apricots, cherries and peaches. Raspberries and all citrus fruits are high in citric acid. Tartaric acid is found in grapes.

As fruit ripens, the acid content of the fruit declines. However, even ripe fruits have pH values well below neutral (pH 7). **Table 1** also gives the pH values of various fruits commonly used by homebrewers. These pH values do not have direct, quantitative use in brewing as the numbers for sugar content do. However, some qualitative considerations are worth discussing.

The pH of most fruits is lower than that of most beers, which usually have a pH of 4.0–4.6. So adding fruits to beer will lower the pH of the beer and may make it more tart. Conversely, the beer drinker will experience the fruit flavoring in fruit beers at a higher pH than in the native fruit. It is interesting to note that the most historically successful fruit beers — lambics — have a lower pH than most beers. The pH of fruit lambics (3.3–3.5) overlaps the pH

range of fruits used in lambics.

Some brewers attempt to make their fruit beers more acidic so that the beer pH is closer to the fruit's natural pH. You can do this by adding food-grade acid. If you make a lambic, acidity will come from lactic acid produced by bacteria. When adding acid, your best bet might be to draw off a small sample of your fruit beer and add acid to see if the flavor improves, and if so, what rate of acid addition to apply to your beer. For five gallons of beer, you will probably end up adding only a few teaspoons. Most winemaking shops sell malic acid and citric acid, so you can add the appropriate acid for your fruit if you desire.

Color

Many fruit beers exhibit the color of their added fruit. Lambics and wheat beers are light-colored beers that allow the color of the fruit to show. Fruit can also add a pleasing reddish cast to darker beers, such as stouts and porters. Few fruit beers fall in between these color extremes.

The color in fruits and other plant parts comes from three major pigment families: chlorophylls, anthocyanins and carotenoids. The green color in plants comes from chlorophyll, the molecules that absorb light energy from the sun. Chlorophyll is not, however, a major pigment in most fruits.

Anthocyanins are responsible for most of the red, purple and blue colors in plants. These molecules give cherries, raspberries and blueberries their color. Unlike chlorophyll and carotenoids, anthocyanins are water-soluble. So adding red fruit to a beer will make a reddish-colored beer. Anthocyanins are also pH sensitive; they are more reddish at low pH values and bluer at higher pH values. In beer, the pH is low enough that they will always be on the reddish end of the spectrum. As a consequence, blueberry beers will turn out red.

Carotenoids are responsible for many of the yellow and orange colors found in plants. (They are also responsible for the red color in tomatoes and bell peppers, although most red colors in plants are due to anthocyanins). Carotenoids are fat-soluble. Thus fruits rich in carotenoids will transfer relatively little color to your beer. Pumpkin beers, for example, are not bright orange in color.

If you wish to adjust the color of your fruit beer, you could add food coloring. It will take a little experimentation to find the right amount to add. In general, however, the natural color of the fruit should be sufficient to get a pleasing color. Artificial colors tend to look, well . . . artificial.

Astringency, Bitterness and Death

Fruits are edible, but any associated plant parts are likely inedible or unpalatable. The majority of plant parts are chemically defended to prevent animals (especially insects) from eating them. The leaves and stems of most plants taste bitter or astringent, depending on the plant species and plant parts. Trim off other plant parts from fruits that you use in brewing.

The pits of some fruits, including cherries and peaches, contain cyanogens. Plant cyanogens are broken down to release hydrogen cyanide (HCN) when the plant is damaged. Cyanide is a potent and deadly poison. Yet it occurs naturally in tiny doses in many food products. (Lima beans, for example, contain cyanide.) It is highly unlikely that you could add enough fruit to a beer to cause cyanide poisoning. However, many brewers remove fruit pits, just to be safe. Pits can also impart a tannic, almond-like taste to beer, so removing them will also improve the flavor.

Choosing a Beer Style

Many people's only exposure to fruit beers are the fruit beers made by many brewpubs. In these fruit beers, the brewer mixes fruit with a light ale or lager. The rationale is that the "blank" background lets the flavor and color of the fruit show through. This is perfectly true, but it's also why most beer drinkers don't like these beverages — they don't taste like beer!

The best fruit beers are, in my opinion, those in which the flavors of beer and fruit co-exist. There are many beer flavors that can successfully interact with fruit flavors, and these are outlined below in the discussion of various fruit styles. There is, however, one characteristic beer ingredient that does not mix well with fruits — hops. Hop bitterness and aroma just doesn't mix well with fruit flavors. When making a fruit beer, it's best to choose beer styles that are lightly hopped or to decrease the amount of hops used in brewing the beer. Don't eliminate the hops, but their presence should be secondary to the fruit flavor. The amount of hops a fruit beer can support is a matter of taste, but I'd recommend keeping the beer under 18 IBUs.

Lambics

Historically, the most successful fruit beers are lambics. In lambics, the flavor of the fruit is balanced by the acidity of the beer. Lambics are typically made from 65 percent pale malt and 35 percent unmalted wheat. They are lightly hopped with aged hops. Lambics are fermented with a mix of yeasts and bacteria. Lactic acid bacteria in the lambics convert sugar into lactic acid, leading to a tart flavor. The light color of base lambic allows the color of the fruit to be exhibited. Lambics are great beers, but they take a lot of time and patience to brew. In addition, many homebrewers are reluctant to purposely introduce bacteria and wild yeasts into their brewing equipment. See Jean-Xavier Guinard's book "Lambic" (1990, Brewer's Publications) for more information.

Wheat Beers

Wheat beers provide an excellent base for a fruit beer. In wheat-based fruit beers, the characteristic "tang" of the wheat blends with the fruit flavor. In addition, the characteristic yeast aroma from German wheat yeast mingles with the aroma of the fruit. (Of course, German brewers would never add fruit to a wheat beer.) American wheat beer — brewed with a "clean" yeast rather than traditional wheat yeast — can also be used as a base. However, you should use enough wheat malt (in my opinion, at least 50%) to get a good wheat flavor in the beer.

Light-colored wheat beers also provide a good background for fruit colors.

Raspberry wheat is a particular favorite of homebrewers. The tart taste and sharp aroma of raspberries mix quite well with the flavors and aroma of a traditional wheat beer. In a good raspberry wheat beer you can clearly taste the fruit and the beer. The Internet is a good source for raspberry wheat beer recipes.

Stouts and Porters

The dark, roasted grain flavor of stouts and porters can also provide an excellent complement to fruit flavors. Fruit porters and stouts can also be more highly hopped than more lightly-flavored fruit beers. However, to make a good fruit stout or porter, you need to get enough fruit flavor into the beer to compete with the dark grain flavor. This means you should only use fruits with lots of flavors, such as raspberries and cherries. How much more fruit you need is, of course, a matter of taste. But I recommend using at least 25 percent more fruit than you would in a lambic or wheat beer.

Of course, with dark beers the color of the fruit is less visible. In stouts, color from the fruit may not be seen at all. In porters, you may have to hold the beer up to the light to reveal the color contribution of the fruit. However, the deep red of a fruit porter can be very appealing. Next to kriek (cherry-flavored lambic), raspberry porter is my favorite fruit style. A good raspberry porter has a full beer flavor accentuated by the tart raspberry flavor. See the sidebar on page 47 for my recipe for raspberry porter.

High-Gravity Beers

One other beer flavor that could be matched with fruit flavor is alcohol. This is an underexplored option, but it seems to me that many milder fruit flavors — such as peaches or apricots — could complement the flavor of alcohol in a strong ale or barleywine. The elevated ester levels that accompany very strong beers would also add complexity to this beer. Since the hopping rate would have to be low, the resulting beer would be very sweet. This would not be a session beer, but might make a nice after-dinner drink to sip on.

Using fruit

Brewers have the choice of many different fruits, both in fresh and processed form and there are many ways you can add fruit to your beer. Fruit can be added at many different brewing stages. The type and amount of fruit you add, along with when you add it, will affect the extraction of sugar, flavors, aromas and color from the fruit. The risks of contamination from fruit microorganisms will also vary with the technique you use. I'll cover all these options in detail in next issue's installment of "Techniques." ■

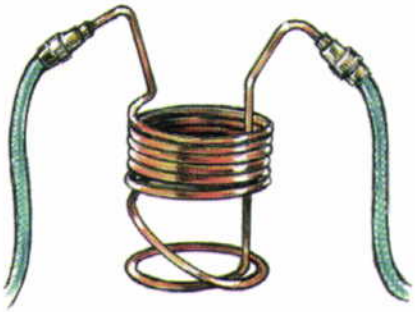
Chris Colby is the managing editor of Brew Your Own magazine.

The Big Chill

The why and how of cooling hot wort

Homebrew Science

by Steve Parkes



An immersion chiller, made of coiled copper tubing, is what many homebrewers use to cool their wort.

After your wort has been boiled, it must be cooled. The cooling process is simple, but it changes the wort in many ways. Cooling renders the wort hospitable to yeast, aids in the formation of solids that precipitate out of the wort and slows the formation of unwanted volatiles.

Hot wort clarification

Wort is full of suspended solids at the end of boil. It contains hop leaves (or, if pellets are used, ground-up hop particles) along with precipitated protein/tannin complex and coagulated protein. The hops need to be removed prior to transfer to the fermenter as they will interfere with the action of the yeast. The rest of the material that precipitated out of the wort during boiling, called hot break or hot trub, should be removed from the wort also. If a lot of trub carries over into the fermenter, it will be detrimental to the fermentation. Protein and polyphenols will coat the cell walls of yeast cells, making the uptake and release of compounds more difficult. Trub also tastes quite nasty and so will negatively influence the flavor of light-tasting beers.

Traditionally, wort was passed through a separate screened vessel to separate the solids from the liquid. In English ale breweries, a charge of hops was added to the screened vessel to act as a filter bed to trap trub and hop leaves. This also added the benefit of imparting additional hop aroma to the wort and hence the finished beer. This would be referred to in brewing books as a hopback. If you plan to use whole hop cones in the kettle, then the filtration separation method is really the only way to effectively remove them. As homebrewers, it is quite easy to replicate this vessel by using your mash tun, provided it has a screen and not a slotted separator. Simply transfer the wort to a cleaned and sterilized mash vessel immediately after boiling finishes, and cool it down from there.

Larger brewers these days tend to use hop pellets and whirlpool vessels to clarify the wort. The wort is spun in the vessel and centrifugal force sends the solid particles to the outside of the tank. The laws of physics flex their muscles and cause the solid particles to flow down the wall of the tank and across the bottom of the tank toward the middle, where they repeat the process. Once the spinning motion slows, the solid debris forms a mound in the middle of the bottom of the tank. Large brewers do this with pumps, but homebrewers can easily reproduce the effect by stirring the wort in the kettle with a spoon until it is all spinning fast at the same speed, and then allowing it to slow down.

Why Cool the Wort?

The wort must be cooled to an appropriate temperature for the yeast to do its work. Yeast is generally happiest growing at incubation temperatures of 98.6° F (37° C). However, for yeast to produce the kinds of flavors we enjoy in our beer, significantly lower temperatures are required. Yeast strains that produce lagers prefer to ferment in the range 45–57° F (7–14 C), while those that produce ales create their best beer flavors in the 59–72° F (15–22° C) range.

How the Wort is Cooled

A big brewery has a specialized device for wort cooling. Traditionally brewers would use a device called a coolship. This was just an open shallow pan that the wort sat in while it cooled down from boiling to around 140° F. It would then be transferred to a more rapid cooler. The rapid cooler consisted of a series of tubes containing flowing cold water over which the wort is gently allowed to flow. The risk of bacterial infection is obviously high using this method. However, the open arrangement does help to improve the volatilization of unpleasant aromas and the pickup of oxygen, both of which lead to better beer.

A modern brewery uses a plate heat exchanger. A plate cooler consists of a steel frame which carries a number of stainless-steel recessed plates pressed tightly together. The connections and passages are such that wort and the cooling medium pass each other in turbulent counterflow in shallow layers between the plates. The exchange can be set up so that two cooling media are used. For example, water cools wort down to 75–80° F, and then cold glycol will cool the wort the rest of the way.

Wort cooling is probably the area that presents the biggest challenge for homebrewers. Many appropriate heat sources are readily available, but suitable refrigeration devices are harder to find. Simply allowing the wort to cool over time will expose the wort to the risk of infections and make off-flavors more likely. Brewing strong wort, and then adding ice or cold water to cool the wort, can cause similar problems with wort sterility.

Usually, an immersion chiller is used. A clean, sterilized copper coil is dropped into the kettle and cold water is passed through the coil to chill the wort. The limit here is the temperature of the water used to cool the wort. If the water from the faucet is 60–80° F,

then it is impossible to cool the wort any lower. A better option is to use two coils and first chill the faucet water in a bucket of ice water to chill it below 40° F. Counterflow chillers are the preferred option. In a counterflow chiller, wort is run inside a copper tube while water flows along the outside of the copper tube in the opposite direction, usually inside a length of hose pipe. Again, the water may need to be cooled prior to running it through the hose.

Wort volume shrinkage

One thing often overlooked by brewers, although probably of little significance to homebrewers, is the fact that wort at 200° F occupies four percent more space than wort at 68° F. For those of you counting every drop of beer, that's a pint and a half for every five gallons.

Formation of solids

Once we have removed the solid and highly visible components from the hot wort with a whirlpooling method, or some kind of filter using hop leaves, we should have lovely, clear, hot wort. When we cool it down, though, it goes cloudy again. The reason? We are now forming what we know as cold break or cold trub.

Cold break is similar chemically to hot break, except that the particle size is much smaller. It consists of proteins, protein/polyphenol complexes, carbohydrates, bitter compounds and lipids. These are smaller molecules — about 0.5 micrometers in diameter — which are soluble in hot wort but are insoluble in wort once the temperature falls below 140° F (60° C). As wort is cooled, it precipitates and causes a solid deposit. The amount of potential cold break is dependent on the barley, the adjuncts, the degree of modification of the malt, the mashing regime and the degree of removal of hot break, but the amount that actually precipitates out is affected by the temperature. At ale fermentation temperatures (68° F) only 50 percent of the cold trub may precipitate out in the wort. At lager temperatures (50° F), as much as 85 percent of the potential cold break solidifies.

Throughout the world, opinion is divided on whether this cold break should be removed. On the negative side, it is responsible for "chill haze" in the beer. Chill haze is a cloudiness in the beer that appears once it is refrigerated. On the positive side, the cold break carries with it vital yeast nutrients, including lipids that are needed for healthy yeast growth.

Generally, traditional ale brewers leave it in the wort since the trub sinks to the bottom of the vessel and the brewer's yeast is reclaimed from the top of the vessel. Lager brewers traditionally remove the trub since their yeast sinks to the bottom of the tank and becomes mixed with the yeast, concentrating with each serial repitching. This is why some traditional European brewers sieve and clean their yeast.

Homebrewers generally use their yeast only once, using fresh yeast each time. If recovery of yeast is not an issue, then cold break can comfortably be left behind to settle in the bottom of the primary fermenter. Further cold conditioning of the beer causes the rest of the cold trub to precipitate out and sink to the bottom of the vessel. Complete removal of all of the cold break from the wort has been shown to cause slower fermentations, increased ester formation, poor yeast growth and poor yeast vitality.

Trub particles also operate as nucleation sites for carbon dioxide bubble formation, therefore eliminating dangerous super-saturation and increasing motion in the fermenter. If too much CO_2 dissolves in the wort, then the wort will foam uncontrollably when the CO_2 inevitably breaks out. The steady stream of bubbles being produced and rising through the liquid will increase mixing action and speed up the fermentation. These same fatty acids, along with some metal ions, are implicated in the reactions that cause beer staling. So too much is probably a bad idea. Large brewers remove cold trub by various methods: sedimentation in large shallow pans; chilling and filtering with diatomaceous earth; centrifuge; or a traditional method known as a flotation tank. This is an additional vessel added to the process between the hop heat exchanger and the fermenter where the wort is collected. Air is bubbled violently through the wort from the bottom and the cold break is carried to the surface of the vessel. Six to 12 hours later, the wort can be run from the bottom of the tank, leaving the cold break behind. In the UK, brewers traditionally collected the wort in a gauged government tank in order to assess the excise duty that was due on the beer. They would transfer the beer to the fermenter after 12 hours. The cold break would sediment and be left behind in the government tank, cleaning the beer.

Volatile removal

Dimethyl sulfide (DMS) is a volatile beer aroma producing a "corn like" aroma in beer. In some styles, such as a few American pale lagers or German pilsners, it is a pleasing part of the flavor profile. In other styles it is inappropriate. Normally it is significantly reduced during vigorous wort boiling. However, if that is not the case, then more can form while the wort is waiting to cool. So the quicker wort can be clarified and cooled into a fermenter, the better. A revived technology that is finding favor is that of wort stripping. Anheuser-Busch has, for a long time, clarified their hot wort and then run it through a cooler that blows air across a thin, falling film of wort. This allows volatile hop aromas and DMS to be significantly removed from the wort. Wort stripping is a new technology being built into modern German brewhouses, and a new design of kettle developed in Germany incorporates this into the boiling phase.

Aeration

Brewing yeast cells require molecular oxygen at the start of the fermentation. Indeed, immediately prior to fermentation is the only time during the entire brewing process when oxygen is deliberately added. Yeast cells require oxygen to produce several intermediate compounds that they require in order to grow effectively. And since it is the yeast growing in wort that creates beer flavors, then healthy yeast will ferment better.

The next question is how much oxygen is needed. The answer to this question is significantly more important to commercial brewers than it is to homebrewers. Commercial brewers need to re-use their yeast and homebrewers do not. If you use fresh yeast every time then wort aeration is far less important, unless you are using wort aeration as a technique to rescue an underpitched stuck fermentation. If you are serial-repitching your yeast at home, then it does become an issue that needs to be addressed. Different yeast have different oxygen requirements. In general, yeast need between five and 10 mg/litre of oxygen to be healthy. This allows them to grow sufficiently, and also to be in good health at the end of the fermentation, when they still have work to do maturing the flavor. If you force air into wort you can achieve an oxygen level of around eight milligrams per liter. Craft brewers tend not to measure oxygen levels as the meter is expensive. Big brewers, however, do measure it. So saturating the wort with air may not provide quite enough oxygen for all yeast. In this case, brewers use oxygen from an oxygen cylinder. Medical oxygen is best, although welder's oxygen is just as pure. (Both are filled from the same pure oxygen source; it's just that medical oxygen can only be put into cylinders that never have contained anything but oxygen.) The oxygen needs to be added to the wort in a way that allows it to dissolve and the best method is a small "sintered" stone. Traditionally these were made from pumice, hence the term "stone," but now sintered stainless-steel devices are readily available. These are dangled into the cooled wort and oxygen is allowed to flow, foaming the wort and dissolving the gas. This method will help when making very strong beers, as air and oxygen dissolve less well in strong worts and yeast really need to grow well when the wort is strong.

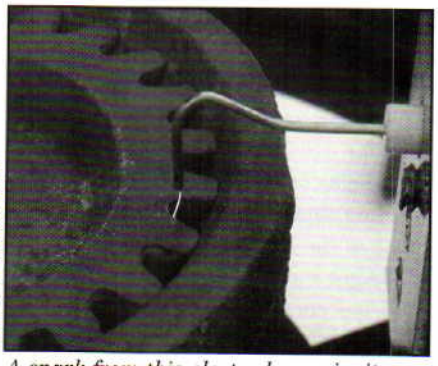
To summarize, it is important to make an effort to cool the wort down as quickly as possible. The wort will be clearer and less prone to bacterial infection. The chance of off-flavors will be reduced and the beer will be less prone to chill haze. Hot trub should be separated as completely as possible. Cold break removal is less important for homebrewers, unless you're brewing lagers and re-using the yeast. ■

Steve Parkes is the lead instructor at the American Brewers Guild.

Light My Fire!

A simple electrode to spark your burner

by Thom Cannell



PHOTOS BY THOM CANNELL

A spark from this electrode can ignite a propane burner, eliminating the need to put your hand close to the flame.

For the last two weekends, I've been fortunate enough to return to my back porch "brew house." One consequence of outdoor brewing is having the flame of my propane burner blown out by the wind. This always seems to happen when I have put the long-nosed butane match away downstairs. So I thought, why not make igniting the burner as easy as pushing a button? What brewer wouldn't want that?

A search at my local home-improvement store produced two similar products, replacements for the spark generators that come with every propane or natural gas grill. Both appeared to be a solution to having a safe and effective method of lighting my propane burner.

Charbroil (a division of the W. C. Bradley Company) responded to my inquiry with two igniters designed as universal replacements for gas grill spark igniters. They were a universal fit igniter with sideburner (#4984685) and an electronic igniter (#4984683). These electrodes have a long wire (the actual electrode) protruding from a ceramic fitting. This wire is long enough to reach across the typical "Cajun cooker" burner rings.

One igniter uses piezoelectric principles to generate sparks. Squeeze a piezoelectric crystal (usually quartz) and it generates electricity — a spark rather like static electricity. The electronic igniter uses the same kind of solid-state electronics as a gas-fired furnace, water heater or stove. Low voltage from a battery is converted to very high voltage for a spark.

Either should work well. Both are meant to be used on a grill and we all know from experience that grills are left out all year around. This should guarantee some weather proofing and water- and wort-resistance. I decided to install the electronic igniter because I like electronics. If cost is an issue, the piezo model is about eight bucks cheaper and it works just as well.

After laying out the parts, I decided to place the igniter module as far from the heat as practical. In grill installations, the igniter module is outside of the "oven" so I put my igniter low on a support leg of my burner. I used one of the replacement brackets supplied with the igniter kit; you might choose something different. The bracket fit nicely against any leg.

Step by Step

Drill two 1/8" pilot holes through the center of one leg and then through the supplied bracket. Then drill a 3/16" shank hole through both and use 3/16 x 1" #6 bolts and nuts. Your mounting holes should be half of the leg thickness or less, so as not to compromise the strength and stability of your stand.

If using the supplied bracket, fit the igniter module into its slot and secure with the provided nut. If using the piezo igniter, drill and shape the appropriate hole and then snap the igniter unit into it.

No bracket is provided for mounting the electrode, so you must build one. I chose aluminum for a variety of reasons. It is easy to bend, readily available in small pieces, has a high heat rejection and is non-rusting. The bracket is bent into a simple "U" shape with two long legs. One leg will be bolted to the burner windscreen and the other will be drilled for the electrode.

By using 1-1/2" wide stock, I hope to prevent spillage from gunking up the electrode as well as covering it from flame backwash. The design and placement should provide some cooling as air rushes up to the flame.

Cut 10–14 gauge aluminum sheet 1-1/2" wide by 6" long (14–18 gauge steel is an alternative).

Measure the length of the electrode, plus 3/8" extra for the wiring, then subtract your windscreen-to-burner distance. My result placed the end of the ceramic ferrule 1/2" from the burner ring, enclosed by a metal "U" roughly 2 x 2 x 2 inches.

Drill two 1/4" mounting holes into one leg of the bracket for mounting to the wind screen. At the other leg, drill a 5/16" hole for the electrode. (When I test-fit the assembly, the first location was incorrect, so now I have some extra holes drilled in my burner leg.) The electrode needs to be near the bottom of the "U." This will place the elec-

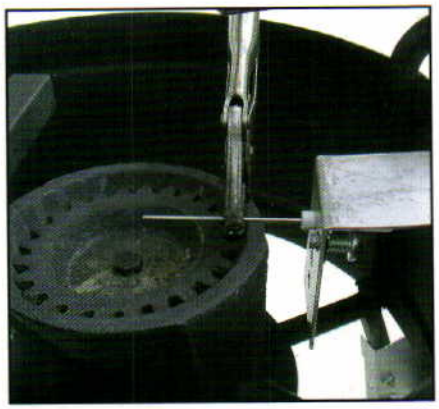
PARTS LIST:

•Universal fit igniter with sideburner (4984685)	$20
or	
• Electronic igniter (4984683)	$30
•Two 3/16" (#6) nuts and bolts	50¢
•One 1/4" nut and bolt	50¢
•6" x 1-1/2" x 16 gauge aluminum or steel	$1
•6" bare or heat resistant wire (ground)	25¢
•Two 0.125" quick connect (crimp-on) connectors	$2

Tools:

•Pliers, vise-grip, file

•1/8", 3/16", 1/4" drill bits and drill motor



The electrode is mounted in the inverted aluminum "U" (on the right). The wire can be bent to fit with vise-grip pliers.

trode near the burner while keeping it below the flame. Though the electrode body is designed to work in a hot environment, it is not meant to be directly in the flame.

To secure the electrode, you'll need to drill a second hole through the bracket and either tap it for a 1/4" bolt, or bolt in a 1/4 x 1/2" nut and bolt.

The bracket is then fitted to the windscreen. A pair of vise-grip pliers marks the location for bending the electrode, which is obviously too long (see the figure at left).

According to the directions included with either replacement, a sideburner electrode should be suspended in the air 3/8" from the burner. A friend did this and placed the electrode 3/8" from the edge of the burner ring. Guess what? There's no gas flow there! The tip of the burner must therefore be 3/8" from a gas port. Charbroil includes a plastic gauge to help position the electrode. The plastic gauge sits next to the bent electrode. I made a round bend (which can be seen in the picture on page 55) to allow some extra wire after I cut the electrode. Mark your electrode just below the top edge of gauge. Be sure to count the air space of the burner orifice in your 3/8"air gap. Then cut the wire.

Finger-tighten all your nuts and bolts. If using the electronic igniter, install the battery. Charbroil includes one wire for this kit; the ground side of the circuit is provided by the main electrode, which completes the circuit. For this installation I made my own ground wire (white wire) using 6" of high temperature 14-gauge wire and two 0.125" connectors, available at any Radio Shack. The grounding ring is supplied. Piezo models provide both wires, but may require some adaptation for use on a propane burner. After tightening all nuts and bolts, and connecting the electrode and ground, I pushed the igniter button and immediately got a spark. A bit of repositioning and it struck exactly where I wanted, making me one happy, happy brewer. Now I can spend more time brewing and less time wondering where the butane lighter is. I also no longer need to worry about sizzling my knuckle hairs when I light the burner. ■

Thom Cannell writes the "Projects" column in every issue of BYO.

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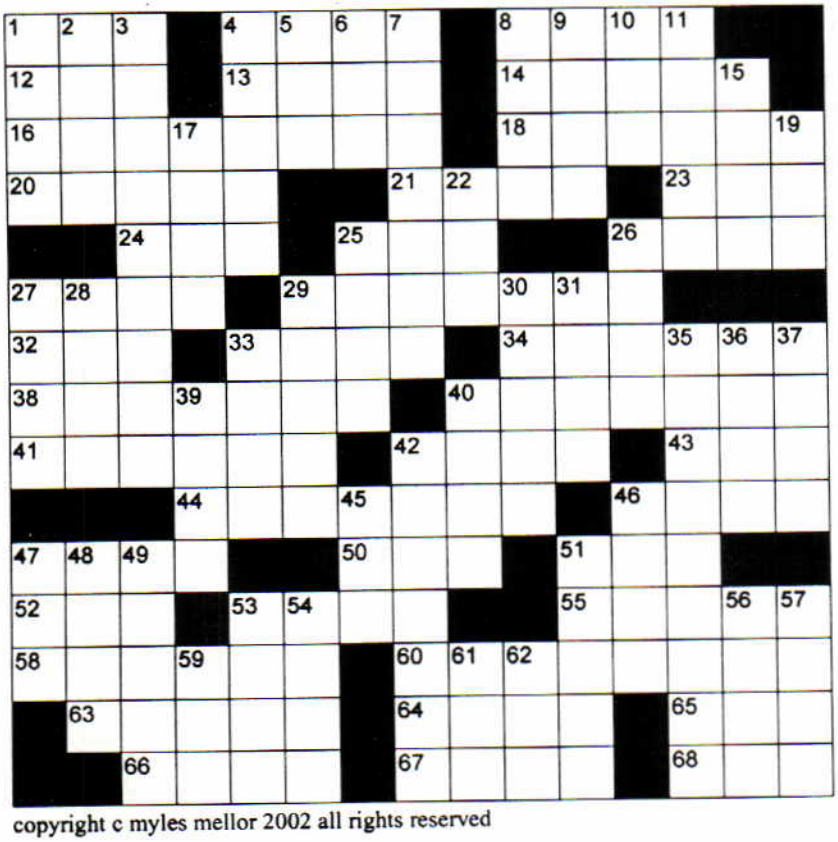
Brews Clues

Put your beer vocabulary to work

by Myles Mellor



ACROSS

1. Top-fermented beer
4. You should Brew Your Own
8. Stroh's used _____ brewing
12. Civilization (abbr.)
13. French girl
14. Final kettle hops are for _____
16. Sweet Japanese beers
18. Horseback travelers
20. Mexican restaurant scene: "_____, mas cerveza, por favor"
21. _____penny — old English beer
23. Half-pint beer bottle
24. Closing time is the_____of the evening
25. Where you go after a lot of homebrew
26. Beer moves like this sometimes as it is poured into the mug
27. 24 bottles or cans of beer
29. Homebrewing technology moves_____
32. Electric spark
33. Opposite of win
34. Harvested your hops crop
38. What you see the homebrew with
40. Musical effect produced by quivering repetition of one note
41. Checked out the homebrew
42. Bubble rising to the surface of the beer
43. Chum
44. Guarantees beer quality
46. Allow excess carbon dioxide to escape from a beer cask prior to serving
47. Country in SE Asia
50. Least amount
51. Directory (abbr.)
52. If you have a question about homebrewing, you should do this
53. Kansas Association of Public Employees
55. Herb used to flavor liqueurs
58. This old English farmer enjoyed his brew
60. Turns the sugar into carbon dioxide and alcohol
63. Ally with one side of an argument
64. Lake in northern US
65. Space in a mug with no homebrew in it
66. Other than
67. Pops
68. Sea eagle

DOWN

1. Peruvian beers
2. Fruit that makes drink
3. Vanishes during fermentation
4. Awn
5. His head appears on beer bottles!
6. Estimated life expectancy
7. Bring back to original condition
8. Special type of Belgian beer
9. Flower
10. Measuring stick
11. Make corrections to
15. Dry
17. Separate area
19. Snoop
22. What you might say when you taste your homebrew
25. What? You don't drink beer? Your_____, my gain.
26. Cheese to go with the beer
27. Captain (abbr.)
28. Location, could be for hop-growing
29. Wading areas
30. Tapestry
31. Swamp grass
33. Yeast dregs
35. Belgian beer festival town
36. Ardor felt after good homebrew?
37. Idiot
39. Parent-teacher groups
40. Adolescent
42. Was informed about homebrewing
45. Homebrew referee?
46. Wine plant
47. Repose
48. At sea
49. Ancient Hawaiian beer
51. Ladies
53. Cornelius or Sankey
54. Green Gables dweller
56. Nova
57. Sports channel
59. Milliliter
61. Epoch
62. Dispose of

Brews Clues answers on page 31

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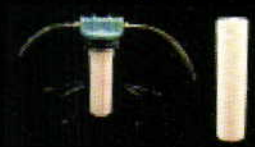

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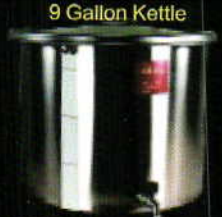

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