

Brew

MAY 1999, VOL.5, NO.5

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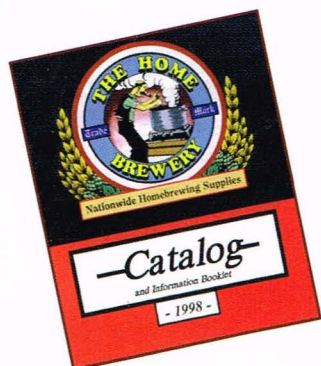
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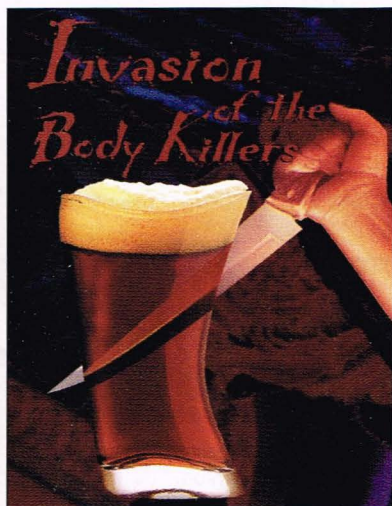


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Cover photo: Kent Lacin

A Taxing Decision

Sometimes the sun, the moon, and the stars align. A warm breeze blows from the north. Dolphins frolic with sharks. Ripe tomatoes go on sale in mid-winter.

I have entered that zone where, for a brief time at least, the earth seems to spin the opposite way. For the first time in 13 years, I'm getting a tax refund. The last time this happened was the year before I got married. Now, let me say that I wouldn't trade my lovely, smart, and charming wife, Heidi, for a tax refund (or even 12 of them). After all, it is actually our money we're getting back.

But anyone who's ever paid taxes with a credit-card check will understand where I'm coming from. April is, without a doubt, the cruelest month. May, on the other hand, is the month of spring, of rebirth, of blooming flowers and singing birds. May is the month tax-refund checks arrive.

A matter like this can't be taken lightly. It must be considered and reconsidered, the possibilities weighed. Research is in order. When you get a tax refund, you don't invest it or put it in the bank to earn interest. It must be spent. Immediately.

My first thought was a three-tier brewing system. Haven't I brewed with half a dozen mismatched pieces for long enough? But then, maybe I shouldn't blow it all — and then some — on one thing, even though it would be one great thing.

Summer's going to come eventually, and that means scorching heat. What I need is my own temperature-controlled fermentation room — a brew fridge. While I'm at it, I could get a new kegging system to go along with my used fridge. Of course somebody would have to clean the garage to clear a space for it all. I wonder how much those commercial cleaning services cost.

I'd really like one of those great

10-gallon pots with the built-in thermometer and the spigot and ball valve near the bottom. Of course that would mean I'd be brewing more, so I'd need more carboys, more bottles (or kegs!), and maybe one of those super-fast outdoor burners that brings the wort to a boil in 37 seconds or so.

My friend Carl thinks I should forego all the fancy equipment and invest in the sensory analysis of beer. He, of course, volunteered to help. But we've been through sensory analysis together before. By the end there's little analysis, the senses are gone, and there's no beer left either.

Heidi has her own ideas for the money. Since we file jointly, I won't be making any unilateral decisions. The good thing is, Heidi loves to brew. She's my brewing partner, and almost every batch I've ever made we brewed together. She's in favor of sensory analysis, too — just not including Carl (sorry, buddy). She'd like do a little empirical research on the beers of Hawaii.

I admit that's appealing, but I'm leaning toward the three-tier system. That's why this month's BYO looks at the homebrewers of Hawaii. I figured we could all read about sun, surf, sand, and brewing beers on a perfect day. Live vicariously, then get back to the business at hand, brewing at home. Then again, maybe this isn't going to work the way I had originally planned...

What would you do? Start by checking out the story, page 21.

Craig Bystrynski

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Brew Your Own (ISSN 1081-826X) is published monthly for \$44.95 per year by Niche Publications, 216 F St., Suite 160, Davis, CA 95616; tel. (530) 758-4596; fax (530) 758-7477. E-mail address: BYO@byo.com. Periodicals postage rate paid at Davis, CA and additional mailing offices. Canada Post International Publications Mail Product Sales Agreement No. 1250469. Canadian Mail Distributor information: Express Messenger International, P.O. Box 25058, London BC, Ontario, Canada N6C6A8. POSTMASTER: Send address changes to *Brew Your Own*, P.O. Box 1504, Martinez, CA 94553-0504. Customer Service: For subscription orders call 1-800-900-7594. For subscription inquiries or address changes, write *Brew Your Own*, P.O. Box 1504, Martinez, CA 94553-0504. Tel (510) 372-6002. Fax (510) 372-8582. Foreign and Canadian orders must be payable in U.S. dollars plus postage. The subscription rate to Canada and Mexico is \$55; for all other countries the subscription rate is \$70.

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Dry Hopping

Dear Brew Your Own,
I've noticed at least three references to dry hopping in the primary fermenter in the March issue. What's up with that?

Gary Muehe
Bridgeview, Ill.

There are instances of dry hopping in the fermenter. If you are doing primary and secondary conditioning in the same vessel, it's your only chance to get them in. However, most homebrewers don't suffer from this condition. The downside of dry hopping in the fermenter is you lose a lot of the hop aromatics. They get blown out of the fermenter with everything else the carbon dioxide takes out with it.

Classic Conditioning

Dear BYO,
"Four Classic Beers and How to Make Them" (March '99 BYO) says to make the first batch of the Newcastle clone two weeks before the second. Then, ferment both another week. Do you ferment the first batch three weeks and no secondary before blending the two?

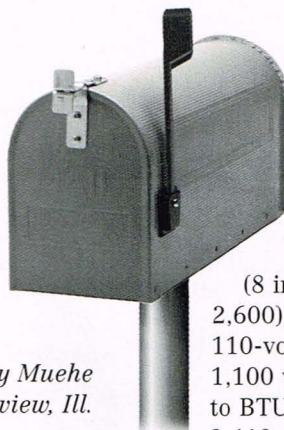
Murray Hanway
via e-mail

Yes, the secondary conditioning occurs with the blended batches.

Brew Stove

Dear BYO,
I read with interest "Build Your Own Electric Brew Stove" (March '99 BYO). I too built such a stove and also used the triangular three-burner design but with 110-volt hot plate burners. I will upgrade to a system similar to the author's and found many of his ideas useful.

However, I feel I should comment on the calculations (or those of the author's local used-appliance expert) of the heat produced by such a system. Standard 6-inch



electric burners on a 220-volt stove (including GE) produce about 2,100 watts (8 inches produce about 2,600) compared with various 110-volt hot plates at 750 to 1,100 watts. To change watts to BTU/hour multiply by 3.413. So a 6-inch burner produces 7,167 BTU compared with a small gas burner on a stove, which is 9,000 BTU (large standard burners are 11,000 BTU, "Max" burners are 12,000 or 13,000 BTU, "Commercial Stove" big burners produce 17,000 to 22,500 BTU).

The three-burner stove in the article probably produces more like 21,500 BTU than the 65,000 to 90,000 BTU claimed. And 21,500 BTU is still a respectable power output, and I would imagine the author's figures of 40 minutes for a five-gallon boil are accurate.

So 35,000 BTU gas burners advertise a 40- to 45-minute boil. It seems to be accepted fact that electric burners transfer heat more efficiently than gas, but I have not been able to find a reliable source for this. If so, it is probably due to greater convection losses with gas. I wonder, though, if placing the burners three-quarters inch to 1 inch away from the pot would increase the convection loss with his electric system.

Scott Patterson
Rocky River, Ohio

Placing the electric burners farther away would decrease convection, whereas with gas burners, correct distance positioning would maximize convection. There are many other factors that could affect the utilization of the heat — such as brewpot material.

Force Carbonating Soda

Dear BYO,

I brew all-grain beers and force carbonate them and have a great time at it. Have you ever done an article on force carbonating for

anything else such as cola, root beer, cream soda, or ginger ale? I have tried making these concoctions several times using the recipes given on the box of extract, but they always turn out bland. What am I missing here?

I've heard from others to add molassass, honey, lemon juice, or some other ingredients, but which ones for which

flavors and how much?

*Rick Lewis
Torrance, Calif.*

Making soda is much harder than making beer. With beer, so many of the factors — pH, body — take care of themselves if you do the process right. With soda you have to add everything.

The soda's pH is critical to

flavor and mouthfeel. A full-grain mash has its own buffering capacity, but you must create your own pH when making soda. Therefore, the type and amount of added acid is critical, whether you use citric acid, phosphoric acid, or lemon juice, among other possibilities.

The best flavor and body seems to come from cane sugar. Most megasodas use liquid, high-fructose corn syrup because it's cheap. Force carbonation should follow exactly the same lines as beer, being mostly dependent on time, temperature, and pressure. The other ingredients you mention will add dimension to your soda, but your choice of extract (and the age and general quality of that extract) is crucial.

The Color of Molasses

Dear BYO,

What is the SRM for blackstrap molasses? A rough estimate is fine.

*Jason Alstrom
via e-mail*

After an exhaustive search of brewing literature, professional and amateur, it seems that the color calculation (SRM) for molasses is not readily available. Large breweries that measure that sort of thing don't use molasses and most micros that might use molasses don't bother with SRM calculations.

Treat it as a dark extract, but if you are making black beers with molasses, don't worry about it. Color calculations are next to impossible to determine from those beers — other than theoretical.

A word of caution: Blackstrap molasses is great on biscuits, but if it has been "sulfured," it may cause problems with sulfite-type aromas in the finished beer. Check the label; it's best to use an "unsulfured" brand.

Correction

In the response to a letter about the carbonation of Reichelbrau eisbock (Mail, March '99 BYO), two numbers were transposed in the specific gravity. The correct gravity corresponding to 3° Plato is 1.012.



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CIRCLE 4 ON READER SERVICE CARD

Brad Thompson and C.W. Hamilton Colby, Kan.

We have been brewing for four years now and find it very disappointing when the summer heat comes, although the Cascade hop vines enjoy it. It sure can deplete a person's stockpile, as if it needs any outside help. So with that, we decided to start our summer brew days at 4 a.m. At least the boiling part of the brew will be a little more tolerable. Nothing like boiling 10 gallons of wort in 105° F daytime temperatures. But the darkness of the pre-dawn hours brings the bugs out. Well, we figure that a little protein from the bugs would not be all that bad. Besides, we are brewing a *crude* (as in black oil) porter. The real name of the finished beer is Mor-ish Porter. With the first glassful it always leaves you wanting more.

Mor-ish Porter (5 gallons, extract with specialty grain)

This stout porter is designed to be enjoyed after a good meal or on a cold winter's night with the fire-place going.

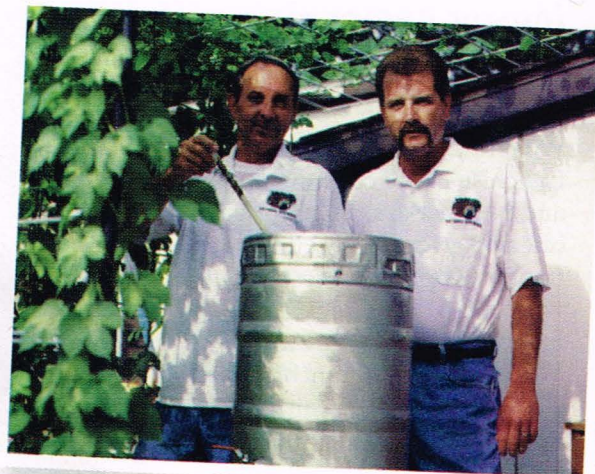
Ingredients:

- 7.5 lbs. pale malt extract

- 0.5 lbs. chocolate malt
- 0.5 lbs. black patent malt
- 1.25 lbs. crystal malt, 20° Lovibond
- 0.5 lbs. wheat malt
- 0.5 lbs. flaked oats
- 4 oz. Cascade hops (4.3% alpha acid): 1.25 oz. for 60 min., 1.25 oz. for 20 min., 1.5 oz. at end of boil
- 11 g. Edme ale yeast
- 2/3 cup corn sugar for priming

Step by Step:

Add crushed grains and oats into nylon mesh bag and steep in 4 gal. of water at 160° F for 20 min. Meanwhile, heat 1 gal. of water separately to 160° F. Remove grain bag, place in strainer over kettle, and pour the 1 gal. of heated water over grain bag. Stir in extract while heating kettle to boil. Total boil is 60 min. As soon as boiling begins, add 1.25 oz. Cascade hops. Boil 40 min. and add second 1.25 oz. Cascades. Boil 20 min. more, turn heat off, and add last 1.5 oz. Cascades. Chill to 68° F and aerate wort. Add to



C.W. Hamilton and Brad Thompson fire up Hay-Seeds Brewing at 4 a.m. to beat the summer heat.

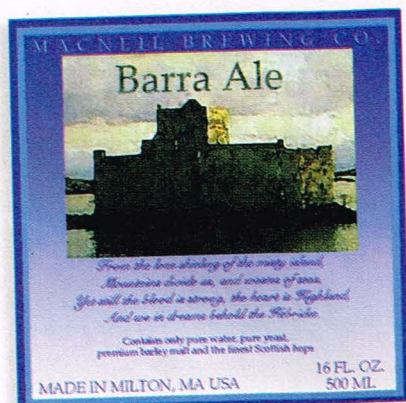
fermenter and pitch yeast.

Ferment at 68° F for four days. Rack to secondary and hold for 10 days at 68° F. Package as you wish and try to hide it from yourself for at least two months. Enjoy.

OG = 1.074

FG = 1.020

32 IBUs



A Fine Scottish Tradition

I've been brewing for about three years and stick to extract kits. My standard brew is a well-hopped brown ale that is, I think, fairly palatable. I've given samples to neighbors and have always received a positive response.

This past holiday season I thought I'd make a special batch to distribute to the neighborhood. I realized that my motley collection of Fat Weasel and Jumping Cow bottles wouldn't do, so I purchased some unblemished, Grolsch-style bottles and thought about a label.

Being of Scottish ancestry, I thought a tribute to my clan would be in order. The castle is called Kisimul and is on Barra Island in the Outer Hebrides of Scotland. The

passage is from the Canadian boat song and the "finest Scottish hops" is, of course, my literary invention.

*Ian MacNeil
Milton, Mass.*

STRANGE BREWPOTS!

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Patiently Brewing an Old-Fashioned Drink

by Scott R. Russell

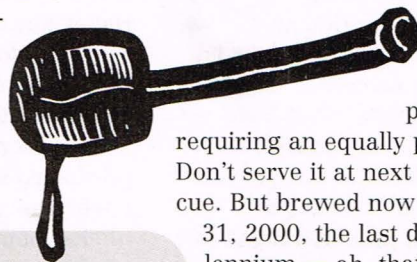
My friend Dan is getting married next summer, and he and his fiancée are planning a Renaissance wedding. Costumes, music, setting, food — everything will look and sound like 15th-century Europe. Instead of Champagne, they'll toast with mead, which I might be making for them if they can't find just what they want commercially. So I've been thinking a lot recently about mead, about the different flavors and textures that mead can have. I've been sampling different honeys, combinations of honey and other flavors, even to the point of (absentmindedly?)

putting honey on things I've never eaten with honey before. I have even eaten raw spoonfuls of honey, plain. It's become like an obsession. I'm not ashamed of it; I always own up to my manias.

Braggot is a beverage that exists, in one form or another, in virtually all the traditional brewing regions of the world. It was probably brewed in full summer, using the fresh honey right out of the

hive along with malted grain. As such, it would have to be done as an ale, with a warm fermentation pattern over several weeks. Honey ferments more slowly than malt and thus takes longer. Most versions of this brew are quite strong and rich and require long-term aging.

This is a patient brew, requiring an equally patient brewer. Don't serve it at next month's barbecue. But brewed now for December 31, 2000, the last day of the millennium — ah, that would work.



Braggot (5 gallons, honey, extract, and grains)

Golden colored, full-bodied, smooth, and rich. An ale to be aged well, saved for special occasions, and even then to be savored slowly.

Ingredients:

- 0.5 lb. toasted carapils malt (toast 15 min. at 350° F on a cookie sheet)
- 2 lbs. two-row pale malt
- 0.5 lb. crystal malt, 20° Lovibond
- 4 lbs. unhopped light malt extract syrup
- 6 lbs. wildflower honey
- 1 oz. Willamette hops (4% alpha acid) for 60 min.
- 1 oz. Kent Goldings hops (5% alpha acid) for steeping
- 1/4 tsp. yeast nutrient
- 1 tsp. Irish moss
- 10 to 14 g. dry ale yeast
- 6 to 10 g. dry champagne yeast
- 1 cup unhopped light dry malt extract for priming

Step by Step:

Let toasted carapils malt cool before crushing it.

Heat 3 gal. water to 150° F,

place cracked grains in a mesh grain bag, place in water, and cover. Steep at 150° F for 30 min., then remove grains. Add malt extract and honey, and bring to a boil. Total boil is 60 min. Add Willamette hops and boil 50 min. Add Irish moss and boil 10 min. more. Remove from heat and add the Goldings hops, steep 30 min., and strain out the hops if you can. Add yeast nutrient, cool, and add to fermenter along with enough chilled, pre-boiled water to make 5.25 gal. When wort cools to 70° F, pitch both yeast strains.

Ferment warm (68° to 72° F) for four weeks, then rack to secondary. Age in a cool (50° to 55° F) and dark corner for six to eight weeks until clarified. Prime with dry malt, bottle, and put it away where no one can find it. Give it at least a year. Trust me.

OG = 1.086

FG = 1.026

20 IBUs

Notes:

Yeast: I use dry yeasts on this

brew because I don't want to emphasize any particular yeast character. The ale yeast gets it going and allows the malty sweetness to establish itself, and the wine yeast completes the fermentation of this high-alcohol brew after the ale yeast gives up.

Gravity: Play with the recipe to make it weaker or stronger. Honey is about the same as malt extract in terms of sugar density; figure a pound of either adds about seven points to your gravity. If you make a bigger version, be prepared to be that much more patient, especially if you increase the amount of honey. You should also increase the yeast nutrient slightly if you use more honey.

Hops: Be careful not to over-hop this brew. The emphasis here should be on rich, malty, and sweet flavor; the hops are merely to balance and contrast a little.

Toasted malt: Even in this small a quantity, toasted malt adds a very pleasant biscuity/bready aroma to the brew (toast on which to spread the honey, right?).

Reader Recipes

The Red Hawk

(5 gallons, extract with specialty grains)

Unlike ordinary, cheap red beer, this is rich, hoppy, and strong.

*Bob Bates
Reno, Nev.*

Ingredients:

- 6 lbs. plain amber extract syrup
- 1 lb. caramel malt, 60° Lovibond
- 1 lb. light dry malt extract
- 2 oz. Willamette hops (5% alpha acid) for 60 min.
- 2 oz. Cascade hops (5% alpha acid) steeped for 10 min.
- London dry yeast or Wyeast 1056 (American ale)
- 4 oz. corn sugar for priming

Step by Step:

Steep crystal malt in 4.5 gal. of water while heating. Remove when temperature reaches 168° F. Rinse grain with enough 168° F water to make 5.5 gal. Bring water to a boil. Add malt extract, dry malt extract, and Willamette hops. Boil one hour. Turn off heat and add Cascade hops. Steep for 10 min. Whirlpool and strain into fermenter. Cool and pitch yeast at 69° F.

Ferment at 69° F until fermentation is complete. Prime, bottle, and wait two weeks.

OG = 1.058
FG = 1.015
45 IBUs

Osoyoos Ordinary Beer

(5 gallons, extract with specialty grains)

Don't let the name fool you — there is nothing ordinary about this hop lover's beer. With its sweet aroma, luscious mouthful of hops and malt, and lingering bittersweet finish, this is a brew you'll savor.

*Sean Sanders
Spagnol's Wine and Beer Making Ltd.
Vancouver, British Columbia*

Ingredients:

- 10 lbs. pale malt extract
- 1 lb. crystal malt, 60° Lovibond
- 1 lb. carapils malt
- 3.5 oz. Northern Brewer hops (8.5% alpha acid): 2.5 oz. for

60 min., 1 oz. for 10 min.

- 1 oz. Hallertauer hops (3.5% alpha acid) for 60 min.
- 2 oz. Cascade hops (6% alpha acid): 1 oz. for 2 min., 1 oz. dry hop
- 0.5 oz. Centennial hops, dry hop
- Wyeast 2007 (Pilsen lager) or 2 pkgs. Nottingham dry yeast
- 3/4 cup corn sugar for priming

Step by Step:

Steep crystal and carapils in 2 gal. of water at 150° F for 30 min. Remove. Add extract, bring to a boil. Total boil is 60 min. Add 2.5 oz. Northern Brewer and 1 oz. Hallertauer hops and boil 50 min. Add 1 oz. Cascade, boil 10 min. more. Add Centennial hops and the rest of the Cascade hops in the fermenter along with enough chilled, pre-boiled water to make 5 gal. Pitch yeast at 65° F.

Ferment at 60° to 64° F until complete. Transfer to secondary for one week. Prime and bottle.

OG = 1.078
FG = 1.018
90 IBUs

Mike's India Pale Ale

(5 gallons, all-grain)

This IPA has a strong West Coast hoppiness with a nice rich malt character.

*Mike Mulhern
Camarillo, Calif.*

Ingredients:

- 8 lbs. English pale malt
- 1.5 lbs. Scottish crystal malt, 90° Lovibond
- 1 lb. English crystal malt, 37° Lovibond
- 8 oz. flaked barley
- 8 oz. carapils malt
- 4 oz. chocolate malt
- 6 oz. Cascade hop pellets (5.5% alpha acid): 2 oz. for 60 min., 2 oz. for 30 min., 1 oz. for 8 min., 1 oz. for 1 min.
- 1/2 tsp. gypsum
- Dry Edme ale yeast
- 3/4 cup dry malt extract to prime

Step by Step:

Mash grains at 156° F for 80 min. Sparge with 4 gal. of 170° F water.

Bring to a boil and add 2 oz. Cascade. Total boil is 60 min. Boil 30 min., add 2 oz. more Cascade. Boil 22 min., and add 1 oz. Cascade. Boil 6 min. more, add last 1 oz. Cascade, and boil 2 min. more. Remove from heat. Chill and pitch yeast at 69° F. Ferment at 69° F until finished (about one week). Transfer to secondary for one week. Bottle condition for a minimum of four to six weeks.

OG = 1.070
FG = 1.020
80 IBUs

A Hoppy Amber

(5 gallons, extract and specialty)

I made this recipe four times with different Wyeast strains. American ale II, 1272, worked best.

*Fred Goeldi
Warren, Mich.*

Ingredients:

- 1 lb. crystal malt, 60° Lovibond
- 0.25 lb. chocolate malt
- 0.25 lb. carapils malt
- 4 lbs. Alexander's pale malt extract
- 2 lbs. Muntons amber dry malt extract
- 2 oz. Northern Brewer hops (8.5% alpha acid) for 60 min.
- 2 oz. Hallertauer hops (3.5% alpha acid): 1 oz. for 15 min., 1 oz. for 2 min.
- 1 to 2 tsp. gypsum
- 1 tsp. Irish moss
- 22-oz. starter Wyeast 1272 (American ale II)
- 3/4 cup corn sugar for priming

Step by Step:

Add grain to 2 gal. of cold water. Bring to a boil, removing grains at 170° F. Add extracts and Northern Brewer hops. Total boil is 60 min. Boil 45 min. and add Hallertauer hops and Irish moss. Boil 13 min. and add 1 oz. Hallertauer hops. Boil 2 min. more. Cool wort, strain to fermenter, and top off to 5 gal. Pitch yeast.

After fermenting for eight days in primary at 64° F, rack to secondary and ferment for 10 days at 62° F. Prime, bottle, and condition for three weeks.

OG = 1.048 to 1.050
FG = 1.012 to 1.013 ■

The Secrets of Whirlpooling

Mr. Wizard

Recently, I have read references to "whirlpooling" to help separate the trub from the wort. Can you elaborate on how this is done? My brew kettle is a keg with the top cut off and a drain tube welded in the side about an inch from the bottom.

Dick Santoro
Keno, Ore.

Whirlpooling is a common method used in commercial breweries to separate hop pellets and trub from wort after the wort boil. Essentially the wort is pumped into the whirlpool vessel at rapid velocity, usually about 15 feet per second, to cause the wort to start spinning like a whirlpool. Sometimes the kettle doubles as the whirlpool vessel and the wort is recirculated to the kettle.

In commercial breweries this pumping process lasts for 10 to 20 minutes. Then the wort is allowed to stand for an additional 20 minutes or so to allow the hops and trub to form a compact trub/hop pile in the center of the vessel. The wort is easily separated from the pile by pumping it out of an outlet located on the side of the vessel. Although whirlpooling was originally developed to separate pelletized hops from wort, breweries that use whole hops, such as Anheuser-Busch, use whirlpools to remove trub after their whole hops have been strained from the wort.

Homebrewers can use whirlpools just like the big guys. Instead of pumping the wort after boiling, use a big spoon to stir persistently in a circular motion in one direction. This will generate a

mini-whirlpool. Stir the wort at a good clip for one to two minutes and allow it to rest for 10 to 20 minutes before draining the wort into your wort cooler. Watch as the wort level gets low. If you really want to separate as much hops and trub as possible, stop the flow when the trub pile starts to suck into your wort chiller.

The whirlpool is a simple device, but there are many variations on its basic design used in commercial breweries. The most common design is a flat-bottomed vessel with a slight pitch toward the drain. This gives a great trub pile but also allows the trub to slide toward the outlet if the pile is loose. Some designs have a low point in the center and an outlet drain that is a little higher than the low point. This prevents trub from leaving with the wort. Your keg/kettle will behave

like this system.

Whirlpool trivia: Some tea drinkers who use loose tea and no tea ball separate the tea leaves by stirring their tea after the leaves sink to the bottom of the cup to cause the leaves to migrate to the center of the cup. Albert Einstein thought this phenomenon was pretty nifty. He developed a general explanation, called the Teacup Effect, of why pressure changes cause solids to migrate to the center instead of to the perimeter, where it seems like they should migrate.

Molson Breweries in Canada is credited with first using the whirlpool in commercial brewing.

It makes me wonder if the "Red Tick Ale" featured in "The Simpsons" used the whirlpool effect created from the dogs trotting in the wort to separate the ticks!

Mr. Wizard

I am basically a beginner and still use sugar in my wort. The batch usually has a slight "wine" taste. An experienced friend suggested that I try honey in place of sugar. I use four cups of sugar. What is the equivalent when I use honey?

Henry Wix
via e-mail

Cane sugar is well known to give beer a cidery or winey flavor. If you want to get rid of this flavor, using honey in place of sugar is one of several solutions. When substituting brewing ingredients in recipes it is much easier to base your conversion on weight, not on volumetric measurements such as cups, because ingredient densities, especially those of malt, vary quite a bit. To substitute honey for sugar, you should use about 1.25 pounds of honey for every pound of sugar in the original recipe. This conversion is approximate because the solids content of honey has a large range, but most honeys are around 80 percent solids.

According to the label on a commercial brand of honey, three-quarters cup of sugar is equivalent to one cup of honey. This honey has a solids content of 81 percent.

Consider substituting malt for sugar if you want to make beer that tastes like beer. Although honey will take care of the odd flavors associated with cane sugar, honey beers have their own distinct flavor notes that make them taste different than all-malt beers. You can substitute



dry malt extract for cane sugar on a pound-for-pound basis and can substitute malt extract for cane sugar at the rate of 1.25 pounds malt extract per pound of sugar. If you want to brew a beer with a lighter flavor but don't want a honey beer, try using rice syrup. Rice is used in many commercial beers, including Budweiser and Coors, and has its own special flavor contribution.

The thing to remember when brewing beer is that you can use different techniques and buy all types of fancy gizmos to improve the brewing process, but at the end of the day, beer flavor is a product of the starting ingredients. Be an explorer and try out as many different brewing ingredients as you can. Cane sugar, brown sugar, candy sugar, pineapple sugar, corn syrup, rice, wheat, barley, oats, rye, potatoes — the list goes on for the variety of carbohydrate sources used in brewing. Add to the list the variety of flavors found in different

hop varieties, yeast strains, brewing spices, and water. You will discover through exploration that ingredients hold the keys to flavor!

Mr. Wizard

We just had our well tested and it came back positive for coliform bacteria. We were warned not to drink the water until we cleared up the problem, which we did by dumping a little bleach down the well. Now here is my problem: I have six cases of really tasty homebrew in my basement that I don't know whether I should drink. The thought of dumping it all down the drain brings a tear to my eye! Is coliform tolerant to alcohol? Should I dump my brew?

*Steve Ethier
Chepachet, R.I.*

First it should be noted that beer itself can't sustain pathogenic bacteria — the pH is too

low for pathogens. (Wort can become contaminated, though.)

Coliform bacteria, also known as enteric bacteria, are associated with fecal matter. In drinking-water tests, the presence of coliform bacteria indicates fecal contamination of the water. Such tests are called presumptive tests (they presume) and the coliform bacteria are referred to as indicator organisms. By regulation, municipal water may not test positive for coliform bacteria, period.

The most well known coliform is *Escherichia coli* or *E. coli*. This bug has gotten a lot of press in recent years because of its presence in hamburger meat and unpasteurized fruit juice. Certain strains of *E. coli* can cause severe sickness and even death if ingested. The good news is that cooking your hamburger thoroughly or pasteurizing your fruit juice will kill the organism, thus preventing sickness.

If your brewing water tested positive only for coliform bacteria and

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Congratulations to Bruce Hammell and Kent Brehm, winners of the gold medal for Robust Porter at the AHA National Homebrew Competition. According to Mr. Hammell, "There is a substantial difference between floor malted barley and the mass produced product. Flavor and yields are worlds better and I believe that it helped us produce a world class beer." We thank them for choosing Warminster Maltings traditionally floor malted Maris Otter barley to brew their award winning beer. The best Malting barely is carefully processed by hand at Warminster to provide the finest malt for your handcrafted beer. Ask your retailer or call us today. Wholesale inquiries invited.

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you used a 60-minute wort boil, you don't have anything to worry about. Drinking water is often contaminated during floods and the standard advice given by the government is to boil water before drinking to kill contaminating microorganisms. During the Industrial Revolution, contaminated drinking water was commonplace and people knew that beer was a safer beverage than water.

If I were you, I would not dump my beer, but I would want more information before drinking it. Where did the coliforms come from? Have you ever gotten sick from drinking your well water? If you're comfortable drinking your well water, then I would feel very comfortable drinking the beer.

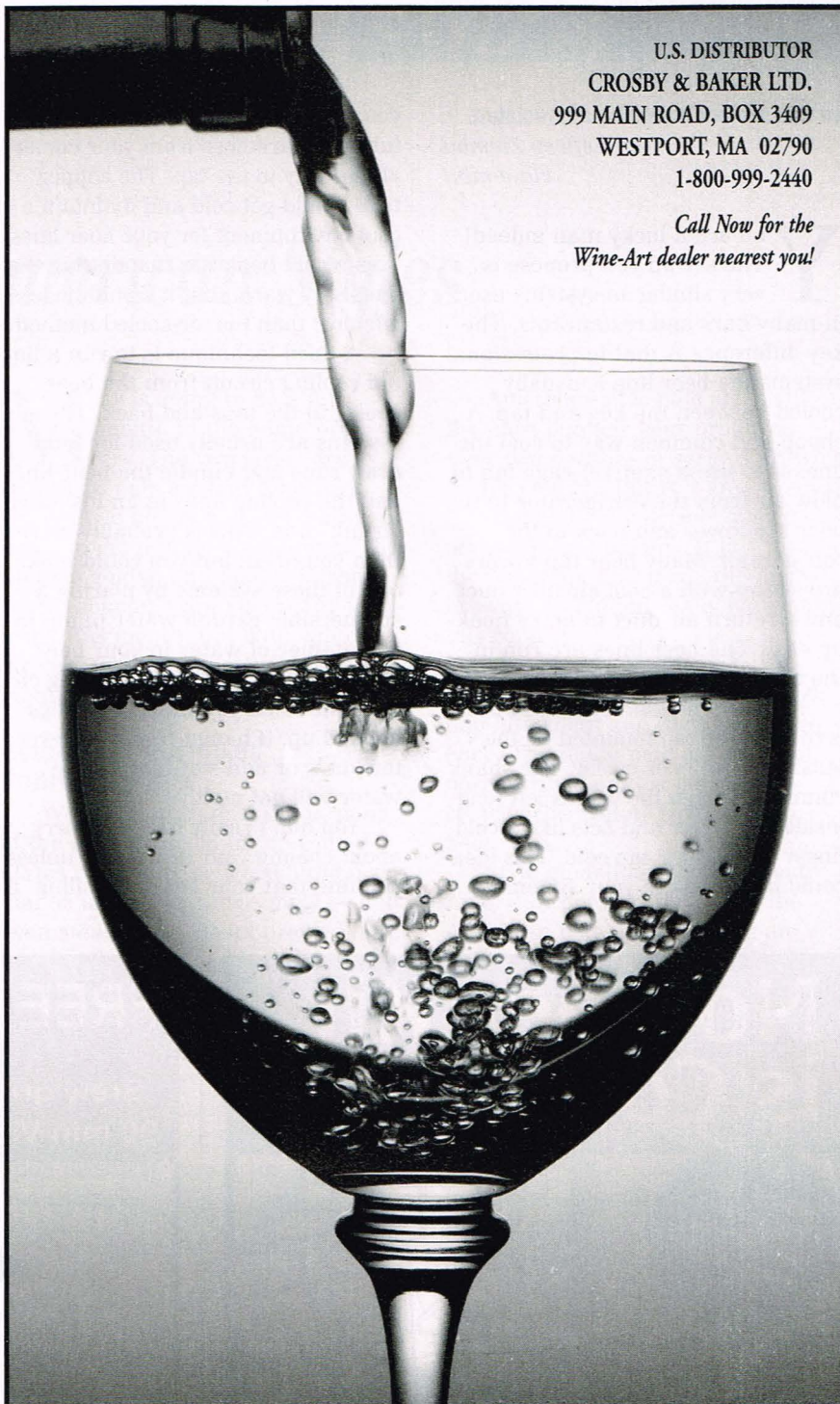
On a separate note, dumping bleach in your well may have killed the bacteria for a short time, but bleach doesn't last forever, especially when you remove it from the well with the water. Most people only worry about coliforms because of the fecal matter issue (yuck!), but some coliform bacteria also spoil wort. One such organism is *Obesumbacterium proteus*. This fat little bug spoils wort and causes the finished beer to have a foul vegetable, phenolic, parsnip odor. If you're using your water for rinsing your brewery equipment, you should probably be as concerned with the beer spoilage issue as the potential for sickness from drinking the beer. My advice is to have your water tested periodically to confirm you have your problem licked!

Mr. Wizard

I am lucky enough to have a dedicated bar in my house and a wife who will let me use it as such. Can I run a tap system through the wall without compromising beer quality? The plan is to have a spare refrigerator against the wall and run about four taps through the wall. The expected length of beer line will be no longer than two feet from outside of the fridge to tap. I was initially told you could not run any beer lines outside of the confines of the fridge itself as this would cause the beer to spoil. Any help you could offer

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on this project would be appreciated.

Jeffrey Ziemba
via e-mail

You are a lucky man indeed! The set-up you propose is very similar to systems used in many bars and restaurants. The key difference is that in professional systems the beer line is usually cooled between the keg and tap. A cheap and common way to cool the lines is to use a squirrel-cage fan to blow air from the refrigerator to the beer tap tower and back to the refrigerator. Many beer tap towers are set up with a cool air inlet duct and a return air duct to make hook-up easy. The beer lines are run in the cool air supply.

Another common system in bars is to have the tap mounted on the outside of the beer cooler. The shank running through the wall is left long inside the cooler and acts like a cold finger to keep the tap cold. This idea could be applied to your system if

you ran your beer lines in a copper tube that stretches from your cooler all the way to the tap. The copper tube would get cold and maintain a cool environment for your beer lines. This would be better than letting the lines stay warm, but it would be less effective than the air-cooled method.

A third technique is to run a liquid cooling circuit from the beer cooler to the taps and back. These systems are usually used for long draft runs and bundle the beer lines and the cooling lines in an insulated "trunk" line. This is probably more than you need, but you could make one of these systems by placing a submersible garden water pump in a container of water in your beer cooler and let this water-cooling circuit run when you have your kegs hooked up. (Change the water every few days or add sanitizer or the water will get moldy.)

You don't really have to worry about cooling your draft lines unless you find that your beer is spoiling. If

you have problems, you could simply hook the kegs up to the taps only when you want a beer. Whatever you decide to do, clean beer lines are a must. Beer lines should be cleaned with a line cleaner at least once every two weeks. With unfiltered beer more frequent cleaning is often required. If beer lines are left dirty for too long, replacement is usually the best solution. ■

Mr. Wizard's Address

Do you have a question for Mr. Wizard? Write to him c/o *Brew Your Own*, 216 F St., #160, Davis, CA 95616. Or send e-mail to wiz@byo.com.

Mr. Wizard, BYO's resident expert, is a leading authority in homebrewing whose identity, like the identity of all superheroes, must be kept confidential.

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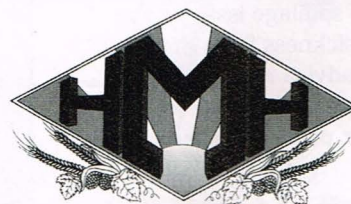
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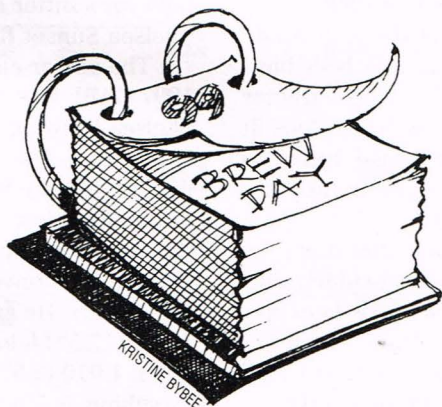
In Search of American Styles

by Mikoli Weaver

May is going to be a fun month in the home brewery. The two styles are American pale ale and American amber, two hoppy and refreshing beers to get a jump on summer. The Belgian golden and maibock from April's schedule are also ready to drink this month, but both will cellar very well for the next couple of months — if you have the patience.

Something Borrowed, Something New

When it comes down to it, none of the beers brewed in the United States can really be considered original or unique to our country — not even steam beer. Beers brewed here are, for the most part, imitations of the beautiful foreign crafting of Germany, England, and a few other countries. Immigrant beers for a nation founded by immigrants. However, Americans are noted for their ingenuity and improvement upon products. American pale ale is one example.



American-style pale ale is still the most popular beer produced after two decades of serious brewing in this country. But is it any wonder? It just may be the perfect beer for all occasions and palates. It just may be the one thing that made the micro-brewing revolution really happen in this country.

Pale ale is a medium- to full-bodied beer with moderate to high hop bitterness and high hop presence. The name pale ale does not necessarily denote a color, since color varies widely from beer to beer.

Style guidelines for the Great American Beer Festival describe American pale ale as having an original gravity of 1.044 to 1.056 (11° to 14° Plato), alcohol by volume of 4.5 percent to 5.5 percent, bitterness of 20 to 40 IBUs, and color of 4° to 11° SRM.

The suggested original gravity and IBUs are too light in the opinion of some brewers. It seems old-fashioned, even for our young beer history, to brew a pale ale at the bottom end of the guidelines: 1.044 (11° Plato) and 25 IBUs. Pale ales at 1.060 to 1.064 (15° to 16° Plato) and with higher bitterness levels are hitting the market. Similarly the IPA barrier is being pushed each year by new beers of higher gravity, alcohol, and bitterness levels more than 60.

The guidelines are the same as those outlined for English-style pale ale, but are these beers the same? Absolutely not. In many cases they are not even similar, and for more reasons than just the yeast character or type of hops. American beers seem to have a little more of everything.

Commercial Examples

Of all the pales brewed today,

Sierra Nevada Pale Ale is still regarded as the one perfect reference in the category. Sierra Pale's yeast gives it a dry, crisp finish, and the beer is made with abundant Cascade flower hops that are unmistakably American. Homebrewers can use the Sierra Nevada Pale Ale yeast in the form of Wyeast 1056 (American ale).

Anderson Valley's Boont Pale has similar characteristics. Crisp, very refreshing, with citrus and floral hop flavors. Good balance and beautiful, light copper appearance.

There are, however, some distinctly American ales brewed with continental ingredients in sort of a hybrid fashion. Deschutes Mirror Pond is a perfect illustration. This pale ale uses 100 percent Cascade hops in the boil, but it is fermented with an English strain of yeast. Does this make it any less an American-style pale ale? Technically, perhaps, but it deserves consideration in this category.

Pyramid DPA (draft pale ale) is another good example of this hybrid mentality. It is the same beer as the regular pale ale produced using Pyramid's house yeast strain, which is English, but it uses 100 percent Cascade hops and North American malts like the Mirror Pond. The DPA is served under nitrogen blend, whereas the original bottled pale uses CO₂.

Both Mirror Pond and DPA are much stronger and more bitter than most of the pales in England.

Other notable pale ales include Boulevard Pale, Bridgeport Pale, Full Sail VSP (Very Special Pale), and Great Lakes Burning River Pale.

Tupper's Hop Pocket from Old Dominion is a very hoppy pale. In fact it won medals as both an American pale and an IPA. Pike Pale, Goose Island Honker's Ale, and Yards Extra Special Ale are also highly hopped pale ales.

Medal winners in 1998 included the GABF and World Beer Cup gold to Sharptail Pale from Montana Brewing Co. and the GABF silver to Addison Pale from Big Horn Brewing Co.

British Comparisons

Since the American pale is really just a version of the English pale ale style, it is interesting to compare the two. Some readily available examples include Boddington's Pale, Samuel Smith's Pale Ale, Fuller's, Young's, and Mackeson's Extra.

The GABF only awarded a gold and silver medal, no bronze. The medals went to Stoddard's Pale of Stoddard's Brewing Co. and Urban Wilderness Pale from Sleeping Lady Brewing Co., respectively. Medal winners in the World Beer Cup for English-style pale ale included Samuel Adam's Boston Ale (gold medal) and Thomas Hardy's Royal Oak (silver).

American Amber Ale

As the name suggests, American amber is made from distinctly American ingredients, just as American pale ale is. During the early years of the craft-brewing revolution, there really was no such thing as an amber, exactly. Many breweries were quite a novelty and were not immediately received by the uneducated public. In the pursuit of "the cause" so to speak, as well as capital to continue doing business, breweries created beers that were easy to understand and consumer friendly. In fact it was very common to see such titles as pale and dark describe a wide array of choices.

The famed Mendocino Brewing Co.'s Red Tail Ale is one such beer that is ill defined but broke ground as an early example. This beer has become known for its hop character somewhat like an IPA, but it does fit the profile of an American amber ale in many respects. In fact it has won medals as such.

So it is easy to see that there could be confusion, particularly on the fringes of the category. Look at MacTarnnahan's Scottish, which won a gold medal at the 1992 GABF as an amber and a bronze in the 1997 World Beer Cup in the same category. Mac's was sold as a Scottish ale for several years, then a Scottish-style amber ale, and now the tap handles and packaging

simply proclaim it as an amber.

A Portland Brewing product that closely parallels an amber is Malarkey Wild Irish Ale. Brewed as an Irish red, it uses the standard Munich and crystal malts with American Northern Brewer and Mount Hood hops. Malarkey's is recognizably a Northwest beer with its distinct light caramel finish and Yakima hops. The brewery listed the following statistics for Mac's: 1.052 (13° Plato) original gravity, 5 percent alcohol by volume, and bitterness of 30 IBUs. The color is estimated at 10° to 12° SRM.

The ambiguity of amber ale might be attributable to beers being too often categorized by color alone. Not that color is unimportant; it is a very relevant part of judging, but it is also open to rather broad interpretation. For instance Rogue American has a deep reddish hue, almost like a port. On the other end of the scale, Alaskan Amber looks more sienna or light orange, similar to John Courage Amber and other British counterparts. Yet both are medal winners.

Furthermore, the silver medal in the 1997 World Beer Cup went to a red ale named Devil's Head Red of Columbine Mill Brewing Co. in Littleton, Colo., and the gold went to Capstone ESB produced by Oasis Brewery, Boulder, Colo. Neither is sold as an amber. Confusion abounds. There were similar results in 1998 as the gold was awarded to Believer's Bitter and the silver to Chelsea Sunset Red.

The amber ale gold medal at the 1997 GABF was awarded to the Chelsea Brewing Co. for Chelsea Sunset Red. The name comes from the pier in New York City upon which the brewery is situated. Brewmaster Russel Garett helped establish and has run the brewery for the last three years. He lists Sunset Red as 1.050 (12.5° Plato) OG, finishing about 1.010 (2.5° Plato). The alcohol by volume is 5 percent, and the bitterness at a comfortable 40 IBUs. "It is a very marketable beer here in the New York area, where beer knowledge is still growing," explains Garett, who knows what it's like to

work in an emerging market. In the late '80s and early '90s he brewed at the Pacific Northwest Brewing Co. in Seattle.

The World Beer Cup gold in 1998 went to Anderson Valley's Boont Amber.

The 1998 GABF and World Beer Cup guidelines place amber at an OG of 1.044 to 1.056 (11° to 14° Plato), alcohol by volume 4.5 percent to 5.5 percent, bitterness 20 to 40 IBUs, and color 11° to 18° SRM. Essentially these parallel the American pale ale guidelines with one exception: color. And like the guidelines for pale ale, many brewers feel the amber ale guidelines are too light.

In the Northwest the primary name in amber is Full Sail Amber Ale. Full Sail's amber, with its smoky, rich, long finish, is definitely a benchmark ale. Head Brewer John Harris considers the Full Sail to be the perfect example of an American amber. "I love that beer, and I would never change it," he says. The recipe has not been changed since 1987, and Full Sail Amber remains the most consistent example on the market.

The Full Sail Amber has an

OG of 1.060 (15° Plato). Bitterness of 37 IBUs comes from Yakima, Wash.-grown Cascade and Mt. Hood hops. The grain bill is of typical North American pale malts, medium crystal malts, and a sprinkling of roasted barley for color and aroma.

Over the last few years there has been a new player in the market from the Alaska Brewing Co. Alaskan Amber, the 1995 GABF gold-medal winner, has been very popular among inexperienced beer drinkers looking for a more mild selection. The Alaskan Amber has a clean caramel flavor, low hop presence, and a slightly sweet finish. As an interesting side note, the Alaskan Frontier ale, which is more bold and hoppy, was the brewery's original American amber.

On the other hand Rogue's American Amber has assertive hops and a crisp finish. Brewer John Maier's most beautiful creation since the Red Dry Hop — or maybe even Mogul. Maier spoke about the differences between the Red and the American, saying that they essentially "have to enter the red as an amber because there is no GABF category for a red beer like the

Saint Rogue, even though the American is the one we really are trying to push as our amber."

Rogue Amber is brewed in the long-standing Maier style of big beers, with abundant Cascade and Goldings hops, an OG of 1.064 (16° Plato), 53 IBUs, and a large grain bill including crystal 95°, 115°, 135°, and 165° Lovibond.

More examples of bold amber include Lang's Tri-Motor Amber, akin to the Rogue with its generous hops and bold, estery profile; Anderson Valley Boont Amber; and Atlas Amber of Big Time Brewing. The Atlas happens to be one of the foundations upon which the Seattle beer market was based.

In this month's recipe section there are two different versions of American amber for you to try. The first is a higher gravity, hoppier beer like a Full Sail or Rogue, and the second is more subdued. It is lighter in color, flavor, and bitterness.

Another admirable, although unorthodox, version of the American amber is Thomas Kemper's Amber Lager. This beer is an excellent example of how a classic style can be manipulated to

May 1999

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
2 TASTE DAY • Belgian golden ready	3	4	5	6	7 PREP DAY • Assemble pale ale ingredients • Start pale ale yeast starter	8
9 BREW DAY • Brew pale ale • Primary fermentation starts, check original gravity and record	10	11	12	13	14 PREP DAY • Assemble amber ale ingredients • Soak equipment in sanitizer	15 TEST DAY • Test mailback for carbonation and contamination • If not ready, age seven more days
16 BREW DAY • Brew amber ale • Record original gravity • Check off-flavors	17	18	19	20	21	22 TASTE DAY • Mailback 28 days old • If not ready on the 15th, try today
23 BOTTLE DAY • Record pale ale's final gravity • Rack pale, prime, and bottle • Age seven more days	24	25	26	27	28	29
30 BOTTLE DAY • Record amber ale's final gravity • Rack amber, prime, and bottle	31					

form an American product by mixing continental and American ingredients. The grain bill consists mostly of two-row and Munich pale malts with caramel 40° Lovibond and 80° Lovibond for color and body, but is hopped with Northwest Liberty (a Hallertauer variety) and Nugget (a German Northern Brewer varietal). The Amber Lager starts at 1.052 (13° Plato).

TK's Amber was formerly called *Integrale*, but the name was changed for "packaging and salability." Creator and former Head Brewer Rande Reed comments, "I liked the *Integrale*, including the name, but it wasn't selling anywhere but in Italian restaurants. So it was fixed up and re-released in a way." He explains, "It isn't an Italian beer. It's a Seattle amber lager. Our Northwest version of a *märzen*, if you will."

The TK example brings up an interesting connection to the Old World, namely *märzen*/oktoberfest-type beers, that bear a distinct resemblance to American amber ales.

Recipe Formulation

Malt: As with any beer, the base ingredient in pale and amber ales is some sort of authentic pale malt. For bocks Munich is desired and for ESB an English pale is used, and so on.

In this country the most chosen two-row is still Harrington, with Manley and Galena (the grain) running second and third. These malting grains are mostly grown in the northwestern United States, and the Canadian provinces of Alberta, Saskatchewan, and Manitoba. Six-row varieties such as Robust and Excel are widely grown in the Midwest states where they are used predominately for feed, although malting of these grains does occur. And they are all, for the most part, considered American ingredients.

In addition to pale malt, these beers need some sort of dextrin malt (such as carapils) to provide extra body and mouthfeel. Dextrin malts contain no active enzymes for conversion due to full modification. The result is an abundance of dextrins (unfermentable long chain

carbohydrates) that add viscosity and surface tension to beer that in turn creates added body and head retention. Powdered-form maltodextrin will achieve the same result and is very popular with partial mash and extract-only homebrewers. No American styles should be lacking in body.

For specialty grains in both beers, a variety of caramel malts should form the bulk of the color, aromatic condition, and flavor. In amber ales the crystal malt is also coupled with a scant amount of roasted barley, black malt, or chocolate malt to offset the red hue and add a slightly earthy note. Two recipes are given for amber, one with roasted barley and the other with chocolate since both seem to be popular among commercial and homebrew recipes.

Hops: There are a variety of hops that will create a good American ale. Widely used bittering hops include Centennial, Chinook, Columbus, Eroica, Galena, Cluster, Nugget, and U.S. Northern Brewer.

For the middle and finishing hops, Cascade, Liberty, Crystal, Ultra, and Willamette are all good choices. Note that different hop varieties were chosen for the pale and amber recipes.

Some brewers like to dry hop pale ales, but for the most part this is completely optional. The idea is to have a good balance in the finished product. The recipes provided do not have a dry-hop step included. If you wish to really push the bounds of the style, use any American aroma hop such as Cascade or Liberty. You can even try the bittering hop Columbus, which has great aroma properties in dry hopping. The second, stronger amber recipe can more readily accept dry hops due to the heavy use of caramel malts and high original gravity.

Yeast Selection: For these American-style ales it is most appropriate to select an American-type strain of yeast. The most common is the Wyeast 1056 (American ale). Several alternatives impart different flavors and as a result make the beer more unique.

Wyeast 1272 (American ale II) and 1087 (Wyeast ale blend) both produce good examples of these styles. The 1272 is also a bit more flocculent than the 1056 (it settles out better), which is nice for homebrewing where filtration may not be possible. Brewers interested in creating these styles as lagers can use the Wyeast 2035 (American lager) and 2112 (California lager).

Fermentation for both styles should be very complete, so a terminal gravity in the 1.008 to 1.012 (2° to 3° Plato) area is perfect for a crisp, dry finish with good balance.

Recipes

American Pale Ale (5 gallons, all-grain)

Ingredients:

- 8.5 lbs. two-row pale malt such as Gambrinus or Great Western
- 0.5 lb. carapils or dextrin-type malt
- 0.5 lb. crystal malt, 20° Lovibond
- 0.5 lb. crystal malt, 60° Lovibond
- 0.5 oz. U.S. Northern Brewer hops (3.5% alpha acid) for 90 min.
- 2.5 oz. Cascade whole hops (4.5% alpha acid): 0.75 oz. for 45 min., 0.75 oz. for 15 min., 1 oz. at end of boil
- 1 pt. starter of Wyeast 1056 (American ale)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 3.25 gal. of water at 150° F for 60 min. Sparge with 168° to 170° F water to collect 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil, add Northern Brewer hops and boil 45 min. Add 0.75 oz. Cascade hops, boil 30 min., and add 0.75 oz. Cascades. Boil remaining 15 min., at end of boil, add 1 oz. Cascades to finish. Whirlpool and cool to 69° F to pitch starter. Oxygenate/aerate well.

Ferment at 69° F for seven days, then rack to secondary fermenter. Continue fermentation for seven more days until gravity is about 1.012 (3° Plato) or fermentation stops. Let settle, rack, prime, and

bottle. Age seven more days before drinking.

OG = 1.056 (14° Plato)
40 IBUs
SRM = 12
ABV = 5.75%

American Pale Ale (5 gallons, extract with grain)

Ingredients:

- 8 lbs. pale malt extract syrup
- 0.5 lb. carapils or dextrin-type malt
- 0.5 lb. crystal malt, 20° Lovibond
- 0.5 lb. crystal malt, 60° Lovibond
- 0.75 oz. U.S. Northern Brewer hops (5.25% alpha acid) for 60 min.
- 2.5 oz. Cascade whole hops (4.5% alpha acid): 0.75 oz. for 45 min., 0.75 oz. for 15 min., 1 oz. at end of boil
- 1 pt. starter of Wyeast 1056 (American ale)
- 2/3 cup corn sugar for priming

Step by Step:

Start with 5 gal. of 150° F water. Steep crushed grain for 30 min. Sparge grains with enough 170° F water to make 5.5 gal.

Heat to boiling and add extract syrup. Total boil will be 60 min. At beginning of boil, add Northern Brewer hops and boil 15 min. Add the first Cascade addition, boil 30 min., and add second Cascade addition. Boil remaining 15 min., at end of boil, add last Cascades to finish. Whirlpool and cool to 69° F to pitch starter. Oxygenate/aerate well.

Ferment at 69° F for seven days then rack to secondary fermenter. Continue fermentation for seven more days until gravity is about 1.012 (3° Plato) or fermentation stops. Let settle, rack, prime, and bottle. Age seven more days before drinking.

OG = 1.056 (14° Plato)
40 IBUs
SRM = 12
ABV = 5.75%

American Amber I (5 gallons, all-grain)

This version is hopped fairly aggressively but balanced by a high

enough gravity to provide an even product. It also shreds the guidelines to bits. That's why it's so good. The numbers are close to the Rogue American.

Ingredients:

- 9 lbs. two-row pale malt
- 1 lb. carapils or dextrin-type malt
- 0.5 lb. carastan malt or caramel malt, 20° Lovibond
- 0.5 lb. crystal malt, 60° Lovibond

Brewing Schedule Notes

May 2, Sunday

Belgian golden ready to drink

Taste the Belgian for off-flavors and development. It should be clean, floral, and carbonated. Kept for a couple of days in the refrigerator, the beer should clear sufficiently. Date and reserve a case for the cellar.

May 7, Friday

Prep day for pale ale

Assemble all ingredients for pale ale, sanitize equipment, and start yeast culture for brewing on Sunday.

May 9, Sunday

Brew day

Brew American pale ale, record original gravity, and begin fermentation.

May 14, Friday

Prep day for amber ale

Assemble all ingredients for amber ale and sanitize equipment. Start yeast culture for brewing on Sunday if you are not going to harvest from pale ale primary.

May 15, Saturday

Mailbox 21 days old

Test for drinkability. Carbonation should be complete and off-flavors should be absent. If not, age seven more days until May 22.

May 16, Sunday

Transfer and Brew

The pale ale will be racked

- 0.5 lb. crystal malt, 120° Lovibond
- 0.25 lb. roasted barley
- 0.5 oz. Columbus hops (7% alpha acid) for 90 min.
- 1.5 oz. Cascade whole hops (3% alpha acid): 0.5 oz. for 30 min., 1 oz. at end of boil
- 0.5 oz. Liberty hops, dry hop (optional)
- 1 pt. yeast starter, Wyeast 1056 (American ale)
- 2/3 cup corn sugar for priming

over to a secondary and the gravity recorded. Check for off-flavors or contamination. If there is sufficient yeast in the bottom of the carboy and not mixed with too much settled trub, it may be used for the amber ale.

Brew amber ale. Record original gravity and begin fermentation.

May 22, Saturday

Mailbox 28 days old

If you decided not to chill and drink the mailbox on the 15th, try it now. Date and reserve a case for the cellar.

May 23, Sunday

Bottle and transfer

Pale ale should be ready for bottling. Record final gravity and bottle. Age seven more days (May 30).

The amber ale is also ready for transfer to secondary. Record gravity and check for off-flavors.

May 30, Sunday

Bottle amber, Pale ale ready to drink

The amber should be ready for bottling today. Record final gravity and bottle. Age for seven more days (June 6).

The pale should be ready to drink. It should be completely carbonated and free of off-flavors.

June Brews: Pilsner and nut brown ale

Step by Step:

Mash grain in 3.75 gal. of water for 60 min. at 150° F. Sparge with enough 168° F water to yield 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil add Columbus hops and continue for 60 min. more. Add first Cascade addition and boil for remaining 30 min. At end of boil, add last Cascade addition. Whirlpool and cool to 69° F to pitch starter.

Ferment beer at 69° F for seven days and transfer to secondary. Ferment for seven more days until the gravity has reached 1.008 to 1.012 (2° to 3° Plato) or has stopped fermenting. Let settle, rack, prime, and bottle. Dry hop in secondary if desired with 0.5 oz. Liberty pellets in a nylon hop bag.

OG = 1.064 (16° Plato)
42 IBUs
SRM = 18
ABV = 6.5%

American Amber I (5 gallons, extract with grain)

Ingredients:

- 8 lbs. light malt syrup
- 0.5 lbs. crystal malt, 80° Lovibond
- 0.5 lb. carapils or dextrin-type malt
- 0.25 lb. roasted barley
- 0.75 oz. Columbus hops (10.5% alpha acid) for 60 min.
- 1.5 oz. Cascade whole hops (3% alpha acid): 0.5 oz. for 30 min., 1 oz. at end of boil
- 0.5 oz. Liberty hops, dry hop (opt.)
- 1 pt. starter of Wyeast 1056 (American ale)
- 2/3 cup corn sugar for priming

Step by Step:

Start with 5 gal. of water in boil kettle. Steep crushed grains in a nylon bag at 150° F for 30 min. Remove bag and rinse with enough 168° F water to make 5.5 gal.

Add extract. Total boil time is 60 min. At beginning of boil add Columbus hops and continue for

30 min. Add first Cascade addition and boil for remaining 30 min. At end of boil add last Cascade addition and whirlpool. Cool to 69° F to pitch starter.

Ferment beer at 69° F for seven days and transfer to secondary. Ferment for seven more days until the gravity has reached 1.008 to 1.012 (2° to 3° Plato) or has stopped fermenting. Let settle, rack, prime, and bottle. Dry hop in secondary if desired with 0.5 oz. Liberty pellets in a nylon hop bag.

OG = 1.064 (16° Plato)
42 IBUs
SRM = 18
ABV = 6.5%

American Amber II (5 gallons, all-grain)

Here is a more subtle version of an amber ale that is good to pair with foods.

Ingredients:

- 8 lbs. two-row pale malt

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- 1 lb. carapils or dextrin-type malt
- 0.5 lbs. crystal malt, 80° Lovibond
- 0.25 lb. crystal malt, 120° Lovibond
- 0.25 lb. chocolate malt
- 0.25 oz. Centennial hops (2.75% alpha acid) for 90 min.
- 1.75 oz. Willamette hops (3.5% alpha acid): 0.75 oz. for 15 min., 1 oz. at end of boil
- 1 pt. starter of Wyeast 1056 (American ale)
- 2/3 cup corn sugar for priming

Step by Step:

Mash grain in 3.25 gal. of water for 60 min. at 150° F. Sparge with 168° F water to yield 5.75 gal. of wort.

Total boil time is 90 min. At beginning of boil add Centennial hops and continue for 75 min. more. Add first Willamette addition and boil for remaining 15 min. At end of boil, add last Willamette addition. Whirlpool and cool to 69° F to pitch starter.

Ferment beer at 69° F for seven days and transfer to secondary. Ferment for seven more days, or until the gravity has reached 1.012 (3° Plato). Let settle, rack, prime, and bottle. Age seven more days before drinking.

OG = 1.052 (13° Plato)

ABV = 5%

SRM = 16

23 IBUs

American Amber II (5 gallons, extract with grain)

Ingredients:

- 7.5 lbs. light malt syrup
- 1 lb. carapils or dextrin-type malt
- 0.5 lb. crystal malt, 80° Lovibond
- 0.25 lb. crystal malt, 120° Lovibond
- 0.25 lb. chocolate malt
- 0.25 oz. Centennial hops (2.75% alpha acid) for 60 min.
- 1.75 oz. Willamette hops (3.5% alpha acid): 0.75 oz. for 15 min., 1 oz. at end of boil
- 1 pt. starter of Wyeast 1056 (American ale)
- 2/3 cup corn sugar for priming

Step by Step:

Start with 5 gal. of water in boil kettle. Steep crushed grains at

150° F for 30 min. Remove bag and rinse with enough 168° F water to make 5.5 gal.

Add extract. Total boil time is 60 min. At beginning of boil add Centennial hops and continue for 45 min. Add first Willamette addition and boil for remaining 15 min. At end of boil, add last Willamette addition and whirlpool. Cool to 69° F to pitch starter.

Ferment beer at 69° F for seven days and transfer to secondary. Ferment for seven more days, or until the gravity has reached 1.012 (3° Plato). Let settle, rack, prime, and bottle. Age seven more days before drinking.

OG = 1.052 (13° Plato)

ABV = 5%

SRM = 16

23 IBUs ■

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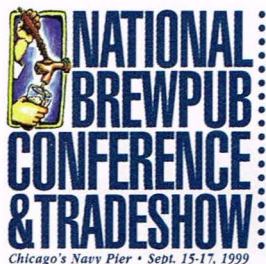
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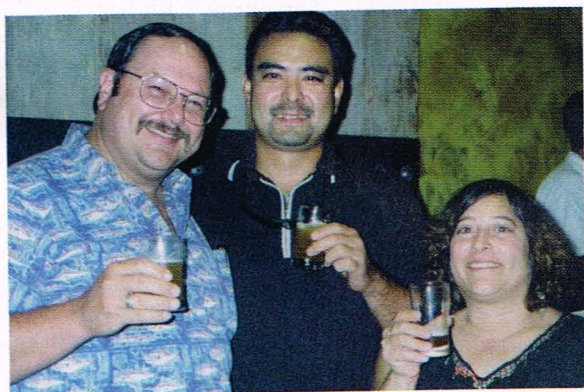
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Wort's Up! Hawaii Homebrewers

by Sal Emma



Cindy Goldstein (wearing the official club T-shirt) and Mario Serracin (top) enjoy a brew while brewing. Judging the Kona Brewfest homebrew contest (center). Alan Spitzer (bottom, left), one of the club organizers, enjoys a beer with fellow HOPS members Kevin Miyahira and Cindy Goldstein.

Hawaii is the perfect place to hang loose with a homebrew. And the members of HOPS, the homebrew club on the island of Oahu, know how to do it right.

Its full name evokes images of swaying palms, hula skirts, red sunsets and a warm ocean breeze: Homebrewers on Pacific Shores.

Cindy Goldstein, who has been a brewer for seven years, maintains HOPS' mailing list and activity schedule. Though only a year and half old, the mailing list is 220 strong.

HOPS has some amazing venues for outdoor parties. "Alcohol is not allowed in public parks in Hawaii, but that rule does not apply to military bases. We depend on some of our military members to get us locations for events. Most are stellar ocean locations," Goldstein says.

A group of HOPS members recently gathered at Kaneohe Marine Base for a porter taste-off to accompany a humpback whale count. The whale count is a local event, similar to the Audubon Society's big annual bird count. The HOPS brewers enjoyed their porter while counting 27 humpback whales frolicking in the surf.

"One of our spots, Waimanalo beach at Bellows Air Force Base, is frequented by green sea turtles. It's always fun to go looking for

them on the beach during a club get together," Goldstein says.

As you might expect, HOPS has its share of surfers, body surfers, and boogie boarders. HOPS member Steve Wilson is a long-time Hawaii resident who is world renowned as a surfboard shaper. Steve likes to brew double- and triple-decoction German styles while he's shaping surfboards in his home shop. "Steve is probably our best brewer. I know this because at club meetings everyone wants to sit next to him. People just migrate to him, asking 'What did Steve bring today?' He's a big fan of bock and also dabbles in Belgian dubbels and trippels," she says.

The mild weather makes most Hawaii brewers ale people. And local ingredients also find their way into HOPS members' beer. Lilikoi, known commonly as passion fruit; pineapples; mangoes; macadamias; and coffee are some of the favorites.

Wilson is fond of passion fruit.

Mario Serracin's specialty is coffee stout.

Serracin is a native Panamanian whose family owns a coffee plantation in Panama. "I love brewing coffee stout. I usually use Panama coffee, but I have also made it with Kona coffee," Serracin says.

"Living in Hawaii is like living in paradise. The people are warm, honest, and relaxed. The diversity of plants, the melting cultures, and the beauty of marine life are just breathtaking.

"The biggest advantage of brewing in Hawaii is that we can control the quality of our beer at a very low price. Most specialty beers are very expensive (here) because of shipping costs.

"Hiking is the only activity that conflicts with my brewpot. I am an avid hiker and spend a lot of time in the old Hawaiian trails, looking at native plants and exotic waterfalls," Serracin says.

R.J. Manson has tamed local ingredients since his pioneer days. "When I first moved to Hawaii, I unpacked my brewing gear and was all set for some experimentation. I decided a coconut porter would be a good start. I brewed a fairly standard porter, adding some freshly grated coconut at the end of the boil," he recalls.

"Sounds great, but it was terrible. Apparently the oils in the coconut reacted badly with the yeast, and I ended up fertilizing my papaya trees rather than enjoying an island brew," he says.

Manson says things are better now. His Millennium Mead is made with local Kiawe honey and flavored with lilikoi. "It is still in the secondary, but the hydrometer samplings taste great!" he says.

Goldstein is a plant physiologist and geneticist by profession. Brewing is the perfect hobby for her, and her yeast knowledge and laboratory skills benefit other club members, too. "I've got an autoclave, flame loops, petri dishes, and a laminar flow hood at my disposal. We culture our own yeast, sometimes from bottles, and we keep a yeast bank going at the lab," she says.

She describes the end of a perfect day. "There's this little beach spot near Waikiki where I like to go to watch the sunset and share a homebrew with friends. It's just a spectacular place. Lots of locals and tourists gather there to watch sunsets amid people doing their tai chi, playing flute, or swimming. When the atmospheric conditions are just right, we can see the green flash. I've seen it probably around 25 times there," she says.

The "green flash" describes a sunset phenomenon that occurs when the last glimpse of the sun is tinged green or blue-green. "It's not really a flash but rather a short-lived burst of green color, the last color you see before the sun dips below the horizon," Goldstein explains.

Over in Hawaii, they've brought relaxing with a homebrew to fine art.

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Kona Coffee Stout Cervesa

From HOPS members Mario Serracin, Scot Nelson, Wayne Borth, and Cindy Goldstein

Ingredients:

- 10 lbs. two-row Klages pale malt
- 1 lb. roasted barley
- 1 lb. flaked barley
- 0.5 lb. crystal malt, 120° Lovibond
- 0.25 lb. black patent malt
- 1.8 oz. whole Cascade hops (6% alpha acid) for 50 min.
- 0.5 oz. Kent Golding pellet hops (5% alpha acid) at end of boil
- Wyeast 1084 (Irish ale)
- 50 g. pure Arabica coffee (Kona works well)
- 2/3 cup corn sugar for priming

Step by Step:

Bring 3.5 gal. water to 170° F. Mash in grain. Add flaked barley. Hold at 150° to 155° F for 75 min. or until conversion is complete. Sparge with about 3 gal. water at 170° F. Collect 5.5 gal. wort.

Bring to a boil and add whole Cascade hops. Boil for 50 min. Add Kent Goldings pellets for aroma at end of boil. Chill to 70° F. Brew coffee (very finely ground) into 1 cup of water. Add the coffee to the wort after chilling. Pitch the yeast.

Ferment at 64° F until complete. Keg or bottle.

OG = 1.058

FG = 1.021

Millennium Mead — Put a Little Passion in Your Life

contributed by R.J. Manson

Ingredients:

- 13 lbs. Kiawe Honey
- 1 Tbsp. gypsum
- 3 tsp. citric acid
- 3 tsp. yeast nutrient
- 1/4 tsp. Irish moss
- 12 oz. lilikoi (passion fruit) concentrate
- 15 g. (3 packets) champagne yeast
- 2/3 cup corn sugar for priming (optional)

Step by Step:

Add honey, gypsum, citric acid, yeast nutrient, and Irish moss to

2.5 gal. water and bring to boil, then simmer for 15 min. Skim coagulated foam from the surface.

Turn off heat. Add lilikoi concentrate when temperature reaches 170° F and allow it to sit for 20 to 30 min.

Transfer to fermenter and top off to 5 gal. with pre-boiled, chilled water. Pitch yeast between 70° and 80° F and continue to ferment at

that temperature.

Transfer to secondary after seven days or when specific gravity falls below 1.020, whichever comes first. Bottle when mead has cleared. That could take several months. Be patient. Prime with corn sugar for carbonation, or omit if you prefer still mead.

OG = 1.087

FG = 1.009 ■

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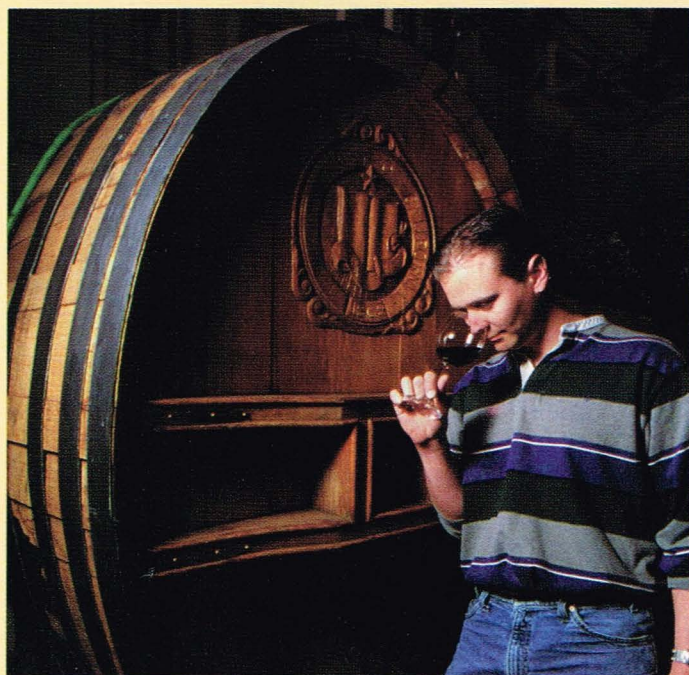
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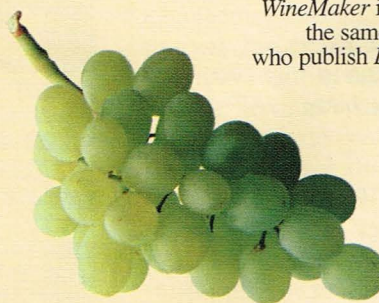
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Homebrewing With the Pros

by Julie Slama

When Matt Cole homebrews, it's no small production. A 20- or 30-gallon batch means that five or six carboys must be sanitized, along with six pots and all the utensils. Three to five burners are lit, depending on the likelihood of asphyxiation. Ingredients are gathered and, of course, beer is consumed.

Cole is head brewer at Cleveland's Rocky River Brewing Co. He homebrews with another pro, Rob Gerrity, production manager at Great Lakes Brewing Co. in Cleveland. There are always extra hands to sanitize, as several patrons of the two brewpubs take the

opportunity to brew their first all-grain batch with a couple of pros. Though they are both professional brewers, Cole and Gerrity turn to home-brewing for creativity and a love of the craft.

Cole worked hard to become a professional brewer, but he found he had to continue homebrewing to produce some of the beers he loves. Gerrity enjoys his work at Great Lakes' large production facility, but homebrewing is his chance to experiment, to have fun with beer.

The first time Cole walked into Pennsylvania Brewing Co. he knew he had to make beer. Instead of waiting tables or working in a bookstore to help him through college, he chose to sell beer for the Pittsburgh microbrewery. "I caught a whiff of that mash and from that day decided that I at least had to homebrew," he says.

"My first brew was all-grain. I bought a malt mill and got yeast from a brewer. I had a false-bottom pot and a Corona mill that pulverizes the (grain). I had a stuck mash that was horrendous. I sewered it."

He stuck with it, so to speak, and 10 all-grain brews later, he had it figured out. He started brewing mainly British ales and then lagering, getting yeast from the brewery. "I was lagering and was never satisfied with it," Cole says. He was working at Pennsylvania Brewing Co., a brewery that had mastered the German lager, and was constantly disappointed with his own attempts.

"I tried to dabble in too many styles," he says. He finally settled on pale ale and brewed at least 20 consecutive batches. "Instead of trying to tackle every style, master (one) and move on to something else. That's important, especially to



When Matt Cole homebrews, he makes mass quantities of beer. Of course 20 or 30 gallons is nothing compared with the hundreds of gallons he brews at a time in his job as head brewer at Rocky River Brewing Co.





The experience that had the most influence on Matt Cole's brewing was an extended trip touring the beer hot spots in Germany and Great Britain. It was the old German towns with their dedication to doing one style well that endeared Cole to German styles.



all-grain brewers. Pale ale is nice because you can do an English bitter, India pale ale, and then a barleywine. They are all pale ales, one bigger than the next."

After attending Siebel Institute of Technology in 1995, Cole's beer started to resemble commercial beers. "I would have five or 10 people over," he says "and we were knocking out 20 gallons at a time. We were getting results, and that's what drew people to it."

Now that he is brewing for a living, there are beers that he isn't allowed to make. Ohio state law forbids commercial production of any beer that's more than 6 percent alcohol. So he and Gerrity get together every other month and brew the beer they can't brew at work. Cole is partial to imperial stouts and barleywine, while Gerrity prefers Belgian beers.

Cole admits that part of the fun is having many of the luxuries most homebrewers only envy. These

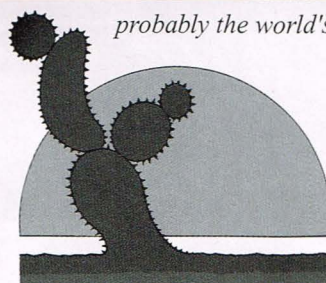
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include a 25-gallon pot with a false bottom, a half-barrel system in the basement, and a refrigeration system for lagering. Even with all the equipment, brewing is a major production — which explains the infrequency with which they do it. Each chooses two beers to brew on their typical four-beer brew day.

The day before a brew session is spent sanitizing, weighing ingredients, and crushing malt. Cole digs out all six pots that he owns and fires up the burners. "We start the first mash and once we have lautered, we start the second batch," he says.

The beers Cole makes at home sometimes become the beers he makes at work. He says he was surprised to find how accurate his homebrew recipes were after he scaled them up to fit his Rocky River system. He found himself adjusting hopping rates but leaving the grain bill as originally constructed.

That is not to imply that all the homebrew turns out well. "When we homebrew we have big aspirations, but it doesn't always turn out perfect," he says. "Sometimes we just do stupid stuff." Their most common mistake, he admits, is overhopping. Once they made a beer with a bitterness of 100 IBUs, about twice that of a standard IPA.

Brewing together is a social occasion as much as an opportunity to be creative. "It's an excuse to drink beer," Cole says. True to their schools, Cole prefers his favorite, the Rocky River's Cooper's Gold Kölsch, "a session beer at 4 percent alcohol." Gerrity prefers the Great Lakes Dortmunder; the Great Lakes Barrel Select Pils, which is really hoppy for a pilsner; and the Holy Moses Belgian wit.

In the Beginning

Gerrity and Cole met while brewing together at Great Lakes Brewing Co., where Cole says they would pull a half-barrel system up on the loading dock and make pilot batches of beer. "There we were on the loading dock, brewing beer," he says. "It was great fun." Now he has that same system in his basement and is constantly reminded of another reason

he homebrews: "I have too much money invested in it not to."

Gerrity began homebrewing as a learning tool. When he started brewing at Great Lakes, he had never homebrewed and admittedly had a lot to learn. "I had a long way to go," he says. "This is a way to play around with different ingredients. I can become more familiar with off-beat malts, hops, and techniques."

Cole agrees that hands-on is the most valuable approach for anyone interested in learning to brew like the pros. "Do as much all-grain (brewing) as possible, dabbling in a lot of different ingredients," Cole says. "See them, taste them, notice what they contribute to the beer."

"I learned more from hands-on (brewing) than from any textbook."

At the brewery Gerrity is tied to a very regimented set of procedures designed to produce a very consistent beer. At home he can experiment. He chuckles when noting that as Great Lakes has

gotten bigger, his homebrewing has scaled down. Originally he would brew 15-gallon batches, and then 10, and five, and now, when he's not brewing with Cole, he often brews three-gallon batches. Freshness and quality are more important to him than quantity, he says.

Like Cole, some of Gerrity's homebrew recipes have found their way as commercial beers, including a stout that he formulated at home.

The Art of Homebrewing

Both brewers talk about the respect they have for the legacy of brewing. The history of beer is what got Gerrity involved with Great Lakes. He was working on a master's degree in history when he began at Great Lakes as a tour guide. Brewing is a tie to the land, he says. "At work, it's a factory environment," he says of his job as production manager of a large production facility. "It's very urban. At home I tend to gravitate toward the more rural,

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agricultural side of brewing.

"Commercial brewers have really become divorced from the hop field," he says. "Winemakers are out there with their grapes, and I try to get that in homebrewing."

The next time he and Cole brew together they will be tackling an organic beer using hops that Gerrity found at Snake Hill, an organic farm near Cleveland. Gerrity would like to create a farmhouse beer, perhaps a *bière de garde*. He has been to the same farm for maple syrup and honey, which might surface in an upcoming beer.

Cole has also learned a lot by traveling in the United Kingdom and Germany with his Real Ale handbook in hand, drinking beer. First came

a tasting at Bass, with lots of high-gravity, chewy beers. Then a malt plant, Pauls Malting, and pub after pub. He even found himself pouring beers at a CAMRA event in an old barn where he spent the night in an apple box. CAMRA, Britain's Campaign for Real Ale, is a longstanding advocacy group for fresh, hand-crafted beer.

It was the old German towns with their copper kettles and dedication to doing one style well that endeared Cole to the German styles. The history of women doing the brewing and brewing being a central part of the culture are part of what attracts Cole to the craft.

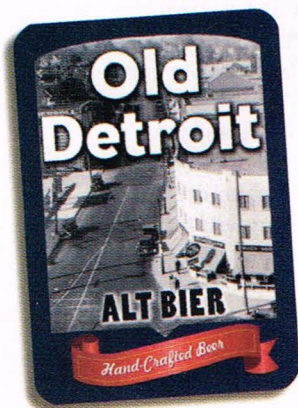
He helped a guy move kegs in a pub in Dusseldorf. He met a man who took him to eight pubs in Bamberg and then toured Erste Kulmbacher Actienbrauerei, home of high-powered beer ECU 28. "No matter what time you were there, it always smelled like wort," he says of Kulmbach.

In the Dusseldorf area he became intrigued with German ales, which he hadn't been able to find in the United States. "Until about two years ago I couldn't think of any bottled *kölsch* or *alt*."

Back to Basics

Gerrity homebrews to please himself and recommends that other homebrewers do the same. "Experiment, but don't try to emulate professional brewers," he says. "Brew to your own taste. A lot of homebrewers take it too seriously. They don't have the means to have that kind of control. Abandon that and brew what you like."

For all their serious brewing systems and technical advice Cole and Gerrity brew because it's fun. They get together, drink a bit, make a lot of high-gravity beer, and play darts on Cole's new electronic dartboard in the basement. It's all for the sake of professional development.



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Sticke Altbier (10 gallons, all-grain)

Ingredients:

- 23 lbs. German pilsner malt
- 2 lbs. Vienna malt
- 2 lbs. Munich malt
- 1.5 lbs. caramel malt, 20° Lovibond
- 3 oz. carafa malt, 600° Lovibond
- 3 oz. acidulated malt
- 3 oz. carafoam malt
- 3 oz. carahell malt
- 3.5 oz. German Spalt Select hops (8.5% alpha acid): 2.5 oz. for 90 min., 1 oz. for dry hopping
- 5 oz. Crystal hops (3.8% alpha acid): 2 oz. for 30 min., 2 oz. for 5 min., 1 oz. for dry hopping
- Wyeast 1007 (German ale)
- 1.5 cup corn sugar for priming

Step by Step:

Mash in with 7.5 gal. of water at 122° F for 25 min. Raise to 151° F for 30 min. Raise temperature to 168° F for mash out. Sparge with 170° F to collect 10.5 gal. of water.

Total boil is 100 min. Boil 10 min. and add 2.5 oz. Spalt. Boil 60 min. more and add 2 oz. Crystal hops. Boil 25 min. and add 2 oz. of Crystal. Boil 5 min. more, cool, and transfer to primary. Pitch yeast below 65° F.

Ferment at 60° F to 65° F until fermentation is complete. Transfer to secondary, dry hop with 1 oz. Spalt and 1 oz. Crystal hops. Cool to 41° F and condition for four weeks. Prime with corn sugar and bottle. Allow to carbonate at least seven days.

OG = 1.060

FG = 1.013

Baby Barrel Pils (5 gallons, all-grain)

Ingredients:

- 7 lbs. German pils malt
- 0.5 lbs. carapils malt
- 0.5 lbs. wheat malt
- 2.5 oz. Ultra hops (3% alpha acid): 0.5 oz. for 120 min., 1 oz. for 20 min., 1 oz. for 10 min.
- 1 oz. Hallertauer hops (4.2% alpha acid) for 5 min.
- 1.5 oz. Saaz in whirlpool
- Danish lager yeast
- 3/4 cup corn sugar for priming

Step by Step:

Mash in with 2.5 gal. of water at 150° F for 90 min. Sparge with 170° F water to collect 5.25 gal.

Bring to a boil and add 0.5 oz. Ultra hops. Total boil is 120 min. Boil 100 min. and add 1 oz. Ultra. Boil 10 min. more and add 1 oz. Ultra. Boil 5 min. more and add 1 oz. Hallertauer. Boil 5 min. more. Remove from heat, add Saaz, and

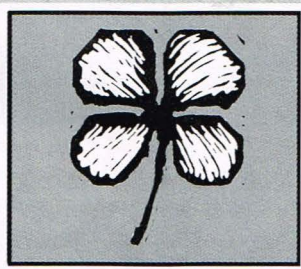
cover for 10 min. Remove hops, cool, and aerate. Pitch yeast at 48° F.

Ferment seven to 10 days. Transfer to secondary and condition at 32° F for six to eight weeks. Prime with corn sugar, bottle, and allow to carbonate at least seven days. This beer has a massive hop aroma!

OG = 1.052

FG = 1.012 ■

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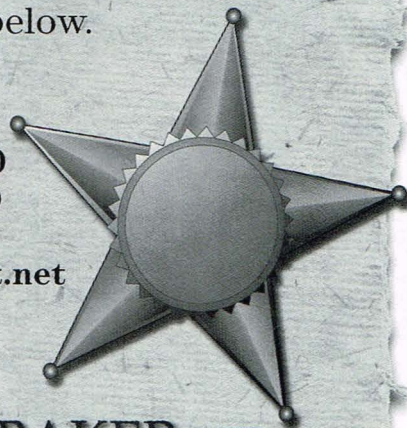
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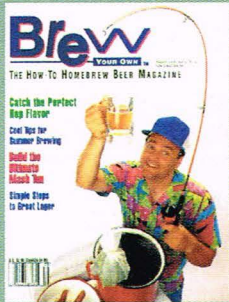


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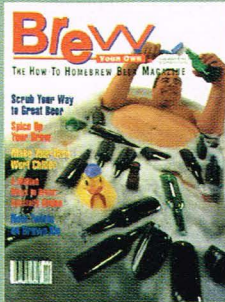
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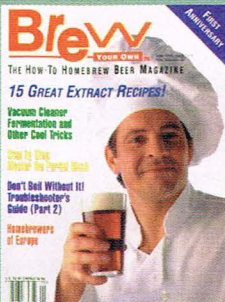
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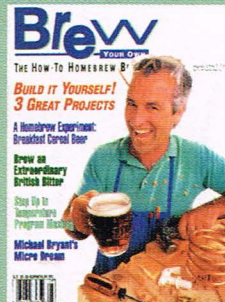
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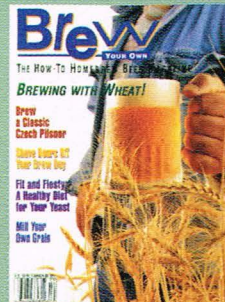
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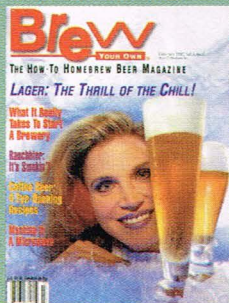
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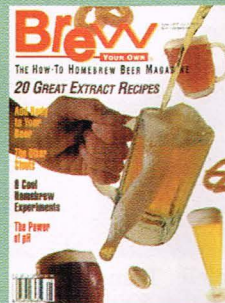
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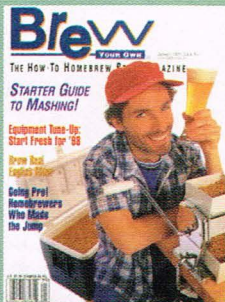
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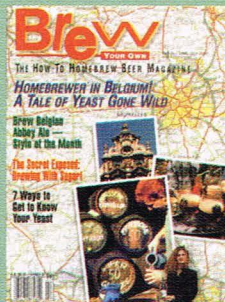
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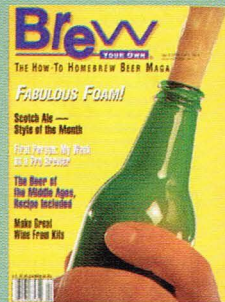
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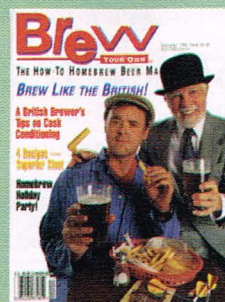
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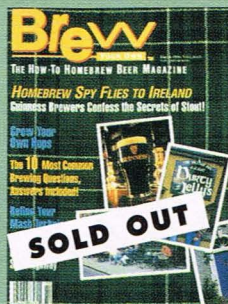


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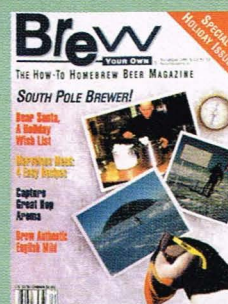
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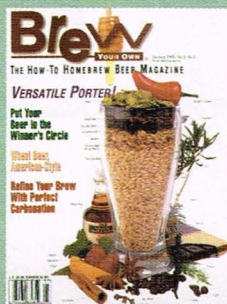
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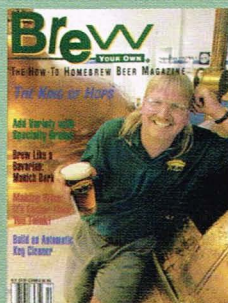
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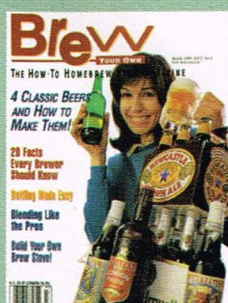
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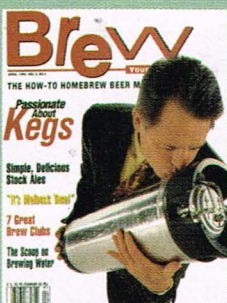
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The Nitrogen Effect

It's common for Americans, particularly those Americans who may not fully appreciate the diversity of all the world's beer styles, to say that the English "like to drink their beer warm and flat." On the other hand many a Brit when confronted with standard American commercial beer has been heard to mutter some comment about "freezing seltzer water." Both statements are over-critical and somewhat exaggerated, but both have a basis in fact.

Mainstream American commercial beers are brewed to be very light. That is, they are very short on the critical ingredients, malt and hops, that produce most of the flavor in beer. This lightness is not a defect; it is in fact the distinctive characteristic of this beer style, and there is good reason for it. These beers are crafted to be light and refreshing and, as the commercial

says, "less filling."

Because of the composition of these American beers, they are meant to be consumed very cold (below 42° F) and with a high level of carbonation. The CO₂ bubbles enhance the refreshing characteristic, and a hefty level of carbonation particularly brings out what hop bitterness and flavor there is. As we all know, mainstream American commercial beers are not very pleasant if they are allowed to go "warm and flat."

English ales, served as they should be, are the opposite. These beer styles were developed long before the invention of refrigeration and forced carbonation, so they are brewed for the conditions of that time. Traditional stouts, porters, milds, bitters, and other ales have a lot of flavor from both malt and hops. They are made to be

by Sam Wammack



cask-conditioned, originally in wooden barrels. Wooden casks obviously wouldn't hold much CO₂ pressure, so these beers are crafted to be very low in carbonation. They are served at cellar temperatures, about 55° F.

Far from being just "warm and flat," traditional English ales are rich and creamy. The higher temperature and lower carbonation showcase the full flavor of the malts. Homebrewers can replicate the taste and feel of these traditional styles.

Introducing Nitrogen

Traditionally, cask-conditioned English ales were served with a hand pump, or "beer engine." The barrels in the cellar of the pub were connected to the tap faucets on the bar upstairs, and the beer was drawn up by pumping air into the barrel. These hand pumps delivered about 25 to 30 pounds per square inch (psi) — and at one time you could tell an English barmaid by her

well-developed arm and shoulder muscles!

Air is 78 percent nitrogen, so they were pumping beer that had a low level of carbonation with something that was mostly nitrogen.

The trouble with using air to pump beer is that the remaining 21 percent of air is mostly oxygen. If a keg is going to be consumed quickly, using air is okay. But if the beer is consumed over a period of more than one day, it quickly becomes oxidized. To avoid oxidation but duplicate the effects of traditional cask ale, modern pubs pump their low-carbonation draft ales with a mixture of 75 percent nitrogen and 25 percent carbon dioxide at high pressure, about 28 to 30 psi. Homebrewers can do this too, but using nitrogen is not as easy as CO₂.

It's important to understand some basics. Nitrogen doesn't behave like CO₂. Nitrogen doesn't have the affinity for going into solution like carbon dioxide does.

Professional breweries "nitrogenate" their beer by chilling the beer to 32° F and forcing nitrogen into it under extremely high pressure. Nitrogenation helps brewers re-create the smooth feel and thick head of cask ales. If you tried brewing a batch of homebrew, moving it into a keg, then pressurizing with nitrogen for a number of days, the only result would be a tap delivering very flat, high-pressure homebrew. As a safety note, most homebrew equipment is not designed to handle the pressure needed to force nitrogen into beer.

In the pubs nitrogen is also used as a pusher to deliver the beer to the taps. The benefit of nitrogen-tapped beers that homebrewers want to emulate are those delicious, tiny, creamy bubbles. And yes, you can do that.

The Nitrogen Effect

A good example of the nitrogen-as-a-pusher idea is those great Draught Guinness cans, also used now to package and distribute Murphy's Irish Stout, Boddington's Ale, and others. In the bottom of those cans is a hollow plastic disk pierced with a tiny laser-cut pinhole.

The 16.9-ounce cans are filled with 14.9 ounces of beer and a minute amount of liquid nitrogen. Then the can lid is quickly attached. As the liquid nitrogen warms, it turns to gas, raising the pressure inside the can and forcing about 1 percent of the beer into the hollow plastic disk. When the can is opened, the pressure is released. That small amount of beer streams out through the tiny hole, creating a geyser effect inside the can. This agitation causes carbon dioxide to be physically knocked out of solution, creating the little creamy bubbles. It's just like a draft beer in a traditional English pub — high pressure, low carbonation.

It's actually more difficult for pubs and bars to achieve an authentic cask-conditioned effect in dispensing their beers than it is for homebrewers. In a pub, especially

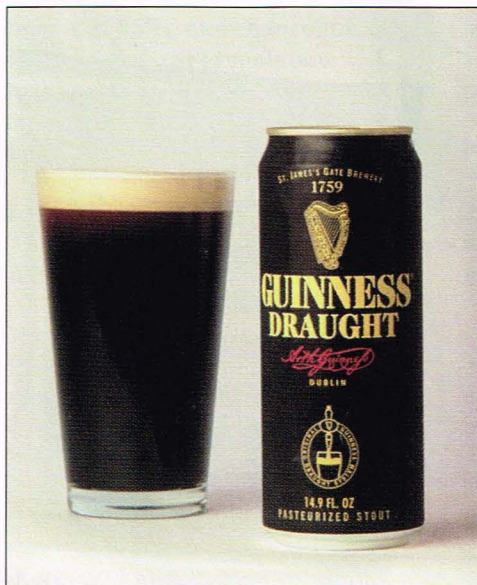
Nitrogen vs. Carbon Dioxide	
Nitrogen	Carbon Dioxide
High-pressure gas	Low-pressure gas
Constitutes 78 percent of air	Constitutes less than 1 percent of air
Used to serve traditional stouts, porters, milds, bitters, and other English ales	Used to pressurize most beer styles
Higher serving temperature (55° F) and lower carbonation brings out the full, rich flavor from both malt and hops	Beers with a high level of CO ₂ are meant to be consumed very cool (below 42° F) and fairly quickly — before the high level of carbonation dissipates and beer becomes warm and flat
Makes thicker, more stable foams than CO ₂	CO ₂ bubbles enhance the refreshing characteristic of American light beers
Palate-smoothing	Carbonation particularly brings out hop bitterness and flavor

in a brewpub, the beer often has to be moved a great distance under pressure to get it to the taps. It's quite common for the brewhouse to be in another room or in a cellar, and sometimes it's even in another building.

Kegged beer has to be kept under serving pressure in the delivery line 24 hours a day until the keg is empty, and since the line may be quite long, the pressure has to be high. Obviously, if CO₂ pressure were used for this (as it is for American beer styles), the effect would be to put a high level of carbonation into the beer. This is not wanted in traditional English cask ales, and it is rather difficult for the pub to avoid doing it.

The most simple solution for a brewpub is to pressurize these beers with "G-mix" gas, a mixture of 75 percent nitrogen and 25 percent carbon dioxide.

Some of the larger brewpubs mix their own gas, but this is a very



Liquid nitrogen is added to "widges" in beer cans. The nitrogen warms, turns to gas, and creates a geyser effect inside the can. This causes carbon dioxide to be physically knocked out of solution, producing tiny, creamy bubbles.

Toby's Irish Stout (5 gallons, extract)

Here's an extract recipe that has proven to be very good for traditional (low carbonation, high pressure) serving.

Serve this beer at 55° F to bring out the rich malt flavor.

Ingredients:

- 6 lbs. dark dry malt extract
- 4 oz. malto-dextrin
- 1/4 lb. black barley (crushed)
- 1/4 lb. black patent malt (crushed)
- 1/4 lb. roasted barley (crushed)
- 1.5 oz. Kent Goldings hop pellets (6.4% alpha acid) for 60 min.
- 1 oz. Fuggle hop pellets (5.1% alpha acid) for 15 min.
- 1 oz. Willamette hop pellets (4.8% alpha acid) at end of boil
- 1/2 tsp. Irish moss
- 2 packs Doric dry ale yeast or starter of Wyeast 1028 (London ale)

Step by Step:

Put 5 gal. of water in the brewpot and apply heat. Add a cheesecloth bag containing the crushed specialty grains. Use the grain bag like a teabag while the water is heating, and remove the grains and the bag when the water reaches 170° F.

When the pot reaches a boil, turn off the heat and add the dry malt extract, malto-dextrin, and Kent Goldings pellets. Total boil is 60 min. Stir until these ingredients are completely dissolved, then resume heating. During the boil, add small amounts of water to keep the pot topped up to the 5-gal. mark. After 45 min. stir in the Fuggle hops and Irish moss. Boil 15 min. more, turn off the heat, and stir in the Willamette hops. Use a wort chiller to cool as rapidly as

possible to 70° F, then siphon from the brewpot into the primary fermenter, carefully leaving the protein trub and spent hops behind in the brewpot. Let the outflow of the siphon splash into the fermenter to gain oxygen, and pitch the yeast directly into the stream.

Ferment in the primary fermenter until the foam drops, then siphon into a glass secondary fermenter, leaving the sediment behind. Keep the beer in the secondary until it is still, flat, and clearing. Siphon into a keg and apply CO₂ until the beer has a low level of carbonation. Tap with high (25 pounds per square inch) CO₂ pressure, applied only while serving.

OG = 1.060

FG = 1.022

technical and expensive method. By doing so, they can use bottles of pure nitrogen and pure CO₂ in combination, running the hoses through a "blender box" that precisely controls the mix.

Nitrogen for Homebrewers

After overcoming some minor technical problems and some expense, any homebrewer can follow brewpubs and pressurize his kegged beer with G-mix gas. Instead of using CO₂, hook up the G-mix and apply it at about 25 psi. The nitrogen supplies the push while the CO₂ maintains the low carbonation of the beer.

G-mix gas is not always easy to find. If you live in a rural area or small city, you may be out of luck for nitrogen experiments.

There are some minor technical problems and some expense involved any time bottled nitrogen gas or "G-mix" is used. For one thing, sellers of compressed gases

won't put nitrogen in a CO₂ bottle. CO₂ bottles are only rated at 1,800 psi, though they are tested at about 3,000 psi. When a small CO₂ bottle of the kind usually used by homebrewers is filled, it is filled by weight. The CO₂ inside the bottle is actually a liquid, and a five-pound

bottle is filled with five pounds of liquid CO₂, which delivers a pressure of about 900 psi.

Five pounds of liquid CO₂ goes a long way, because the liquid inside the tank keeps generating more CO₂ gas as the pressure drops. When the pressure gauge says the tank is half full, about 450 psi, the tank is almost empty because all the liquid has been changed into compressed gas at that point.

Nitrogen is just a compressed gas. It won't liquefy at normal pressures and temperatures, so the only way to put a supply into a tank is to compress it as a gas and just pump as much as possible in there. Nitrogen (or G-mix) tanks have to be much larger than CO₂ tanks to hold any usable amount of gas, and they have to be much thicker. Nitrogen and G-mix tanks are usually filled to 2,250 psi, so the construction and expense of the tank is much greater than that of a CO₂ bottle.

Because it remains a gas in the tank, a large bottle of nitrogen or G-mix holds much less than a smaller bottle of CO₂. Since the pressure is so much higher, a different pressure gauge is usually required as well. CO₂ gauges often won't go high enough for nitrogen. And in any case, an adapter is required to fit a CO₂ gauge to a nitrogen bottle, because the neck sizes and threads are different.

An Authentic Alternative

Fortunately, homebrewers don't have many of the problems that pubs and brewpubs do in dispensing authentic cask-conditioned English ales. Because you are dealing with smaller volumes, have shorter delivery lines, and don't have to maintain a constant serving pressure, you can re-create the nitrogen-pushed authentic English ale effect easily and cheaply, without nitrogen.

First, make sure the beer recipes you want to dispense will be good at 55° F with low carbonation. Some beers are great when served in this way and others are not. Many brewpubs and microbreweries have been

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the nitrogen-pushed
authentic English
ale effect easily
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disappointed to find that some of their best beers became one-dimensional and bland when served with low carbonation. The best candidates for this treatment are traditional stouts, porters, milds, and bitters.

Good hop flavor and aroma and the flavors from specialty grains are important in beers with low carbonation. If you have some of your favorite beer bottled, open one and let it sit for a couple of hours before drinking it. If it seems better that way, that recipe is a good candidate for a traditional English draft beer.

To be prepared for traditional serving, a beer must have a low level of carbonation. If you are adding priming sugar when kegging, cut the amount to one-third cup of corn sugar in five gallons of beer. If you are artificially carbonating, put the keg in the refrigerator, apply 20 psi CO₂ pressure and give it a shake. The next day, take the keg out of the refrigerator, let it

warm up to 55° F, and draw off some beer to check; there should be some carbonation, but not much. Stir the beer with a spoon and see if some CO₂ bubbles are knocked out of solution.

When you feel that the beer has the proper low level of carbonation, keep it at 55° F and reduce the CO₂ pressure to 5 psi to maintain it. A stick-on strip thermometer on the keg is very helpful for checking the liquid temperature.

To get the proper head you need a restrictor on your tap. Restrictor tap faucets can be ordered specially for you by your homebrew supplier, but they cost more than \$100. The Guinness tap system in pubs uses a disk about the size of a penny that is inserted into the tap faucet. The disk has five tiny holes drilled in it. High-pressure nitrogen forces the beer through those five holes, creating the "creamy" effect by knocking the low-pressure CO₂ out of solution and creating those tiny

bubbles.

Try drilling five holes in a food-grade plastic disk the size of a penny. The disk should just fit the inside diameter of your tap faucet. Here's the place to do a little experimenting and to be inventive.

Then comes the time to serve the beer, and nothing could be easier. With the keg at 55° F, increase CO₂ pressure to 25 psi, but keep it there only while you are drawing the beer! Pressure this high would increase the level of carbonation in the beer in time, but in short spurts it won't hurt anything. Carbon dioxide at 25 psi will push the beer through the restrictor and knock tiny bubbles of CO₂ out of solution, producing the desired creamy effect. Immediately after tapping a beer, turn the pressure back down to 5 psi.

That's all there is to it. With a little practice, you can even achieve that "cascade" effect when drawing a pint of your favorite traditional English ale. 



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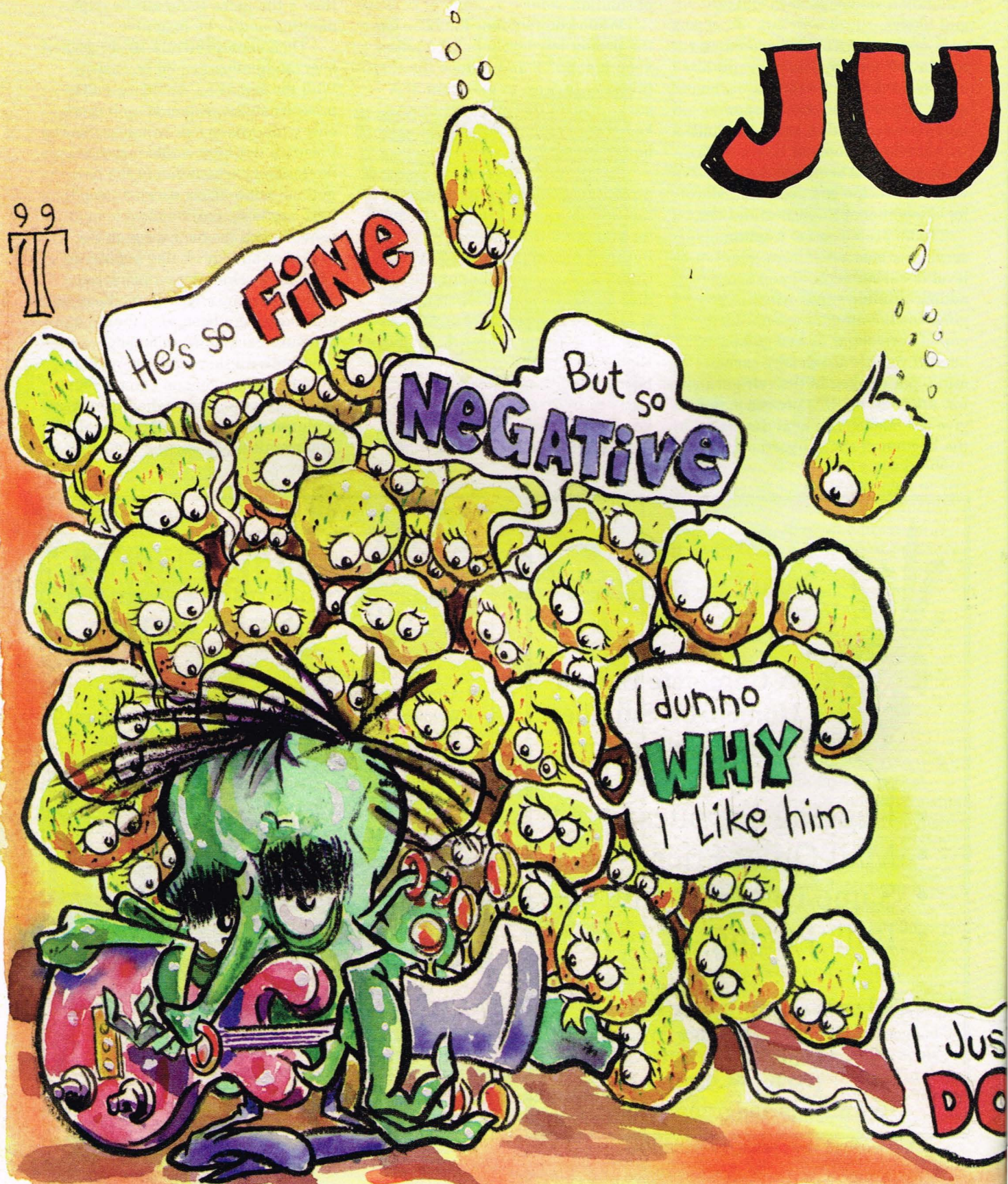
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ST FINE!

It's the bane of many a brewer. The occasional batch that just won't clear.

All is not lost. A variety of fining agents are available to encourage your beer to clear. The term "fining" refers to the process of clarifying beer, or to the agents that are used for that purpose. Finings are also described as fining aids or clarifying agents.

Browsing through the finings shelf in your homebrew supply store can be confusing, especially since most stores stock finings for both the brewer and the winemaker. Some finings are used in both specialties, but some are not. It's important to understand the distinctions when you choose a method for your beer.

Fog in the Forecast

Brewers and brewing scientists have spent many years exploring, discovering, and reporting sources of haze and cloudiness in beer. The homebrewer is generally concerned with two of them: chill haze and yeast in suspension.

Haze can be the result of biological contamination; that is when your beer becomes a growth medium for wild yeast and unwelcome bacteria. But the more common form of haze occurs when naturally

occurring compounds in the beer react with one another to precipitate (come together) as solids.

When large molecules of protein meet certain phenolic compounds, known as polyphenols or tannins, they latch on to one another and grow larger. As this process continues, they become large enough to be seen as haze, especially at serving temperature. That's chill haze.

In extreme cases, when the process continues unchecked, the haze forms at higher temperatures. This form is called permanent haze.

Heading Off Haze in the Kettle

Perhaps the most ubiquitous fining is Irish moss, a standard ingredient listed in nearly every homebrew recipe.

Irish moss is a type of seaweed that is gathered along seashores of the north Atlantic, including Ireland — hence its common name. It's also called carrageen, which is the name of its active ingredient. In addition to beer, components of Irish moss are used as thickening agents in ice cream, salad dressing, toothpaste, pudding, and paint.

Irish moss fits in the category of kettle finings. It is added to the brew kettle, usually during the last few minutes of the boil. It helps to

BY SAL EMMA

settle out proteins in the wort that could contribute to haze later on.

Ian Ward of Savilles, a manufacturer of beer finings in the United Kingdom, explains: "The action of all kettle finings, including Irish moss, relies on the kappa carrageenan molecule, a large molecule with a strong negative charge. When added to hot wort, some of the carrageenan dissolves. The proteins from the malt in the wort have a positive charge. They react with the negatively charged carrageenan, forming a particle that rapidly grows in size. The particles precipitate out to fall to the bottom," Ward says.

Steve Dresler, brewmaster for Sierra Nevada Brewing Co. in Chico, Calif., has been using Irish moss in Sierra Nevada products for many years. "We've done some trials without it and I like the results better with, especially in the original brewhouse," says Dresler. "Our whirlpool over there is high velocity

and has a tendency to break the proteins apart. The Irish moss keeps the protein well coagulated and makes it settle better in the whirlpool.

"In the test batches we've brewed without it, the trub is fluffier and not as sticky. It mixes back into the wort very easily," he says. "I'm comfortable using it because it's a traditional fining, it's inexpensive, and it's virtually completely removed before the beer is packaged," he says.

Modern surveys of beer chemistry indicate that Irish moss has little effect in low-protein worts, such as those made exclusively from extract. But Dresler agrees with the conventional wisdom: "Do it. Irish moss serves homebrewers well. It's cheap, and it can't hurt your beer," he says.

Sometimes It's Just Yeast

Occasionally particles of yeast refuse to settle out of the beer,

leaving the final product cloudy at any temperature.

Why does yeast sometimes refuse to settle? Usually, nobody knows.

"Every yeast has its own quirks and idiosyncrasies," says Steve Parkes, lead instructor and head brewer at the American Brewers Guild in Woodland, Calif. Parkes earned his brewing credentials at Heriot-Watt University in Edinburgh, Scotland. Yeast strains have different abilities to flocculate, but even very flocculent strains sometimes have difficulty.

"Every brewer encounters the problem at some time. There are myriad things that could have gone wrong. The yeast may be tired, running out of steam after many generations; you could have too much iron in the water; it could be an amino-acid deficiency; beta-glucan from a too-high sparge temperature," Parkes suggests.

Savilles' Ward adds that since the yeast particles all share the same negative charge, they all repel one another, continually bouncing around and remaining in a colloidal (suspended) state.

The favored traditional fining for yeast in suspension is isinglass, natural collagen from an unusual source: fish swim bladders. The swim bladder is like a narrow balloon nestled inside the fish. The fish controls buoyancy by inflating and deflating the swim bladder.

"Isinglass has been used as a food additive since medieval times, and its use in beer has been documented to go back at least 300 years," says Ward.

"The current thinking is that its discovery goes back to the days when wine, beer, and other liquids were carried in skins, usually of animal origin, sewn together to form a bottle. In some larger fish the swim bladder is quite large and made a perfect, ready-made vessel for liquids. Someone probably used one to store some cloudy wine and discovered quite by accident that the wine cleared inside the bladder," Ward says.

To understand how isinglass

Other Finings

Gelatin — the same stuff used to make gelatin dessert — is a collagen protein derived from bones, hooves, and other meat byproducts. It dissolves more readily than isinglass in hot liquid. It works by the same action, but at a less effective rate. Most homebrew supply stores sell it, but unflavored gelatin from the grocery store is just as effective.

About a teaspoon, or one packet of supermarket gelatin, will treat five gallons of beer. Before adding to beer chilled below serving temperature, mix it into a cup of room temperature water or beer in a small pot. Gradually increase the heat until it dissolves. Avoid boiling it, which will break it down and reduce its effectiveness.

Bentonite is a traditional wine fining made from a mineral clay,

the same material from which kitty litter is made. Bentonite is not well suited to beer, because it can take up to several weeks to work and settle out.

Sparkaloid is a wine fining combining a polysaccharide sugar with diatomaceous earth. It carries a strong positive charge, working similarly to isinglass or gelatin to allow particles to precipitate (clump and sink) better before filtering. It's not ideal for unfiltered beer but has been reported as an excellent fining agent for mead.

Papain is an enzyme derived from papaya, also used as meat tenderizer. Papain works by breaking down proteins in a very narrow temperature range. Its use was perfected by commercial breweries during the pasteurization process. It has little value in the homebrewery.

works, remember the properties of magnets. Like forces repel and unlike forces attract. Isinglass is made up of long, positively charged molecules. When introduced into beer, positive isinglass molecules latch onto negatively charged yeast, causing a clumping action.

"Imagine two graduated cylinders filled with water," says Ward. "If you drop a stone in one, it will drop very quickly to the bottom. But if you drop a single grain of sand into the other, it will drift around and sink much more slowly.

"The bigger the particle, the faster it will settle. In fact if you double the size of the particle, it will fall four times faster, because the rate of settlement is a function of the square of the size of the particle. Isinglass can increase the size of a clump of yeast cells by easily 100 times," he says.

Isinglass is a very effective cask fining when used properly. But using it properly can be a bit of a challenge, as Parkes explains.

"It's got to be well mixed in solution with cold water. That takes a long time. You want to keep it cool, since it will start to degrade around 68° F," Parkes says. "At the brewery we use a magnetic stirrer, which can stir indefinitely on its own. What I recommend for homebrewers is to measure the isinglass into water in a flask, stop it, and shake it very well for a good 15 minutes. Don't be tempted to use a blender, since that will tear the molecules apart and render them useless.

"Keep it in the fridge and continue to shake occasionally for a day or two. By then, most of it will be in solution and it will be ready to use," Parkes says.

Isinglass needs acid to dissolve. The commercial powders contain an acid component built in. Some suppliers make a liquid formation, ready to use, but Parkes says the powder is probably more reliable.

"There's no way to know the history of the product you're buying. If it's been held at high temperatures for any length of time, it may be ineffective. That goes for the dry

products, too, but they are probably not as susceptible as the liquid," he says.

Isinglass is the traditional English way of fining cask-conditioned ale. "Isinglass works very quickly. I usually hold off fining until 24 hours before serving, after the secondary ferment has been going for at least a week in the cask. The yeast need to stay in suspension to do their work during conditioning. You don't want to fine them out until they're finished," Parkes says.

Parkes says fining is best on a rising temperature. "That's a tidbit that every English cellarmaster knew but you won't find written in any technical manual, because it's

something we can't explain. Chill the beer to a degree or two below serving temperature, then add the isinglass, shake it up to mix well, and allow the temperature to rise for best results," he says.

Homebrewer Keith Chamberlin of Riverdale, Md., used isinglass to fine his real ale, which won a blue ribbon in a Washington, D.C., area homebrew competition last year. "Some people prefer gelatin when they learn where isinglass comes from. But I wanted my real ale to be as traditional as possible," he says.

Chamberlin used the liquid version and had no problems. "I primed in the keg for secondary fermentation and let it ferment out for about a week. I added the isinglass



about two days before the competition and it won first place. It was very clear," he says.

Another ale brewer, Tom Cannon of Fairfax, Va., is less confident. "I've had mixed results with the liquid stuff. I prefer to use the powder. I boil about two and a half cups of water to sanitize it and then chill it, mixing in the isinglass in a flask. I shake it like crazy until it gets very thick and viscous, then add it to the beer the next day.

Cannon conditions his ale in a genuine English stainless firkin, which comfortably holds 10 U.S. gallons. "The nice thing about isinglass is that it continues to work, even if the cask is moved and the yeast sediment is disturbed. It will settle right back down quickly," he says.

Cannon says he's on the fence about isinglass only because he's encountered such a range of results. "I might switch to gelatin, just from a stability point of view," he says.

Attacking Haze in the Glass

The agents that are effective against yeast are generally ineffective against chill haze, because the particles that form chill haze are naturally positive in charge. To get them to clump and settle — or to filter better — brewers add negatively charged finings. These compounds include silica gel (Chillguard is a common brand) and a fine powder of PVPP plastic, known as Polyclar.

Polyclar works by latching on to tannins in the protein-tannin reaction. Silica gel achieves the same effect by latching on to the protein side.

Polyclar is a favorite among both professionals and homebrewers who use it. Brett Pacheco, head brewer of the Concord Junction Brewery in Concord, Mass., says Polyclar rescued his beer from a nasty haze problem.

"Over time our pale ale was setting a slight haze, even after

filtering," he says. "We were not sure what was going on but decided to run some Polyclar to see what would happen. It made a big difference immediately, and we have not had any problems since we began using it."

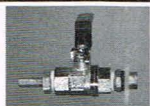
Pacheco says that subsequent analysis indicated that the brewery's water supply had a high level of tannin compounds, feeding the tannin-protein formula needed for haze formation. "The tannin level of our beer after being treated with Polyclar is near zero. And the beer stands up to forcing tests for both chill and permanent haze," he says.

Pacheco was a homebrewer for years before going pro in 1994, but he never used Polyclar at home. He says he would seriously consider it.

"It gets rid of haze-forming particles but does not seem to take anything good out of the beer. It's expensive, but in homebrew quantities that's not much of an

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issue. As long as it settles enough for removal, I can't see any reason not to use it," he says.

Homebrewer Doug King of Calgary, Canada, uses Polyclar to help clear his award-winning American-style light lager, a style that demands clarity for proper presentation.

"I do not filter any more. I have tried it with success, but decent filter cartridges cost too much. I fine with Polyclar to eliminate chill haze. This is done in the secondary fermenter, after lagering," King says.

King says the beer should be chilled to near freezing to form the haze before fining. To treat five gallons of beer, he uses three heaping tablespoons stirred well into two cups of boiling water.

"I do not stir or shake the beer, but rather allow the Polyclar solution to settle from the top. Use plenty of water (when mixing your Polyclar); otherwise, it can sink directly to the bottom when

poured in," he says.

"I have not had any success with other fining agents. I feel that polyphenols are the only haze-forming compounds that require fining. Other haze-producing things such as yeast and proteins will naturally settle out. I am a very patient brewer and try to never rush the natural processes," he adds.

Rita Liotta of Buffalo, N.Y., is also a Polyclar fan. "I hate haze because I believe there is an aesthetic aspect to the beer's appearance. Haze distracts me from the enjoyment of the beer.

"Polyclar is easy to use and effective. I've used it for years. I use one tablespoon for five gallons of beer. You can add it at racking, if you're sure fermentation is over, or later on in secondary. I've done both. I also cold-condition my beers in the bottle in the fridge for several weeks. That helps drop out the haze, too," says Liotta.

Del Lansing of Pittsburgh warns homebrewers to be careful when adding Polyclar to beer with a fair amount of dissolved CO₂. "Polyclar provides perfect bubble nucleation sites. If you dump it in too fast, the result is bubbles — and a lot of them. Can you say volcano? What a mess," Lansing says.

It's important to rack the beer off the Polyclar before you keg or bottle. Although it's inert plastic, the FDA approval is contingent on its removal before packaging. In fact because it's safe and does not damage foam stability, Polyclar is one of the few agents permitted under the German *Reinheitsgebot* brewing purity law.

The procedure for using silica gel is very similar. For a double-barrel approach, professional brewers use a combination of silica gel and Polyclar. However, silica gel is less widely available than Polyclar, which is the chill-proofing agent of choice for homebrewers. 

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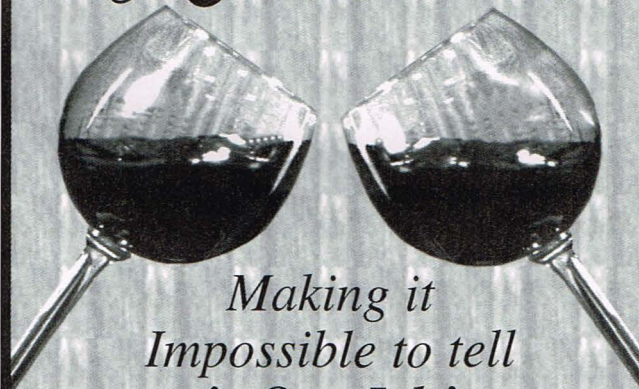
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The moment of truth has arrived. You hand your best buddy and toughest critic a pint of your latest brew. He raises the glass to his lips and sips. And says with a shrug, "Not bad. A little roasty for a mild ale." Hmm. Problem is, this recipe was for an imperial stout.

Your friend's beer-tasting qualifications aside, what he may have been getting at but didn't quite articulate was that your beer lacked body. If that comes as a surprise, read on. If you don't understand the concept of body and what factors influence it, you can't appreciate what you're doing to kill it.

Body, also referred to as mouthfeel, is the sensation of palate fullness or viscosity (sometimes called thickness) on the tongue. Literally, the way the beer feels in your mouth. Body is detected soon after the first sip.

Take a mouthful of beer. Is it thin? Almost chewy? Somewhere in between? Think of drinking a glass of water as opposed to a glass of orange juice.

The trigeminal nerve is responsible for this sensation. Unlike the olfactory (smell) or gustatory (taste) nerves, the trigeminal nerve produces a physical or tactile sensation. The trigeminal sensation is also responsible for detecting carbonation and for the perception of afterfeel.

The feeling of fullness or body is created by the concentration of solids in the finished beer. The presence of solids in your beer doesn't mean you've created a new "chunky" style. The term "solids" refers to the larger protein molecules that remain in suspension in the liquid throughout the brewing and maturation processes. This includes remaining yeast that has not flocculated (settled) out. These solids are products of the breakdown of starch and the solubilization (dissolving) of proteins during the mashing process that survive fermentation intact and so are present in the final beer. Large protein molecules make up the bulk of a beer's body, but unfermented sugars

by Gretchen Schmidhauser

Invasion of the Body Killers



(dextrins) play a role, as well.

Choosing a Victim

The style of beer you've chosen to brew dictates the body of your beer, which will range from light- to medium- to full-bodied. A Berliner weizen should be light-bodied and refreshing, while you'd expect an English brown ale to be medium-bodied. An imperial stout is supposed to taste, well, majestic.

As one would expect, thin-bodied beers have a lower specific gravity than fuller-bodied brews.

If your stouts consistently have the body of brown ales, your bocks that of American lagers, and your Scottish ales the body of bitters, then your brewing technique needs a workout. But before you work on building that body, first look to see if you're doing something to kill it.

Several factors have a direct impact on body, among them the grain bill, mash temperature, filtration, and contamination. The

two main reasons, and the most common, for not achieving sufficient body are an inadequate grain bill and an inappropriate temperature in the mash.

The Usual Suspects

First, let's look at the most obvious: your ingredients. Whether you're an all-grain brewer or an extract brewer using a partial mash, you can't expect to make a bock with the same amount of malt you use for a lighter lager. Heavier beers require heavier grain bills.

Malt extracts that are low in proteins yield a thin-bodied beer. Obviously, the amount of grain or malt extract used also has an impact on body. Increasing the amount of grain or malt extract used increases the body. Adding dextrin malt, also known as carapils, enhances body and also head retention, as many thin-bodied beers have poor foam stability. Dextrin malt is used frequently in

light lagers and also balances the flavor of darker beers and ales.

Overmodified specialty malts — anything other than pale malts and especially crystal, caramel, and carapils — need to be included in the grain bill of any full-bodied beer.

Adjuncts also play a role in establishing the body of a beer. For example oatmeal, rye, and flaked barley, all high in beta-glucans, contribute to mouthfeel and head retention but can also make for a sticky mash. Corn, rice, and wheat, on the other hand, are used to thin out body.

For extract brewers, bulking up on malt and including one to two pounds of grain in a partial mash, if you're not already doing it, are your best bets.

On the other hand all-grain brewers who are using a proper grain bill and still not getting satisfactory body need to look more closely at their mashing regimen.

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Modus Operandi

The purpose of mashing is to convert the starches present in malted barley to fermentable sugars and other materials. Simply put, the degradation of starch is facilitated by a variety of enzymes that work within specific temperature ranges.

Beta-glucans, long chains of fermentable glucose molecules, are one of the initial byproducts of the mashing process. Beta-glucans are partially soluble (dissolvable) in water. Their solubility increases in hot water and when they are broken down into smaller units. Beta-glucans can be described as gummy and are major contributors to mouthfeel and viscosity. Unfortunately, due to their sticky nature, they can make lautering and filtration difficult.

In the mash beta-glucans are broken down by enzymes called beta-glucanases. Because of their low temperature stability, they are only active during the first few minutes

of the mash. Optimal temperature for beta-glucanase is about 122° F.

The use of a low-temperature protein rest increases the activity of beta-glucanases, allowing them to work efficiently, which reduces the amount of remaining dextrin.

This means that using a higher temperature infusion mash (152° to 158° F) and eliminating the lower temperature protein rest results in a brew that is richer in dextrins and more full-bodied. Conversely, employing a step mash with lower temperatures results in a lighter-bodied beer.

Of course, finding just the right temperature or temperatures to complement each beer style you brew is a matter of trial and error.

Standing in the Lineup

Other factors that are detrimental to body are filtration and contamination. If you're filtering your homebrew and have a problem producing anything

Body Builders

- **Use an appropriate grain bill** for the style. For extract brewers: Use one to two pounds of grain (including specialty grains) in addition to your malt extract for a partial mash.

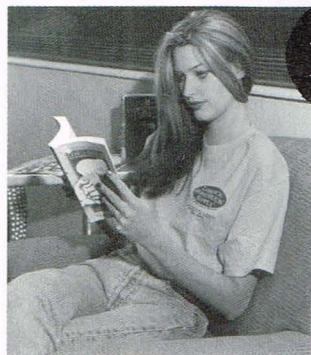
- **Include some dextrin** (carapils) **malt** in your recipe. Use about eight ounces for an all-grain, five-gallon batch.

- **Mash at higher temperatures** and eliminate the protein rest.

- **Consider the use of body helpers** such as lactose, an unfermentable sugar added to beer after fermentation has begun.

- **Avoid filtering medium-** to full-bodied beers.

- **Exercise scrupulous sanitization practices.**



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Be sure to sanitize
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well. Body-killing
bacteria commonly
develop in poorly
sanitized chillers.



but light-bodied beers, consider foregoing this step. Filtering can remove many of the solids that contribute to body, as well as stripping away flavors.

Contamination caused by wild yeast and bacteria can weaken body by breaking down carbohydrates,

resulting in a thin-bodied beer. Of course, this should be easy to pick up because your beer will also have off-flavors.

The solution? Sanitize everything that comes in contact with your beer religiously and thoroughly, including your bottle caps.

All-grain brewers should note that the wort chiller is often a likely source of contamination.

Age also plays a role. A beer needs to age properly to exhibit its true body. And like the human body, beer body also can suffer from the ravages of time.

Self-Defense

Adjuncts introduced after the fact, such as lactose, also can be used as body enhancers. When lactose, or milk sugar, is added to fermenting or unfinished beer, it imparts a slight sweetness and smooth mouthfeel. Some brewers prefer to add it at the end of the boil for sanitization reasons. Available in crystal form, lactose is a common ingredient in milk or sweet stouts.

Gretchen Schmidhausler is a graduate of the American Brewers Guild's Craftbrewers' Apprentice program. She has been a homebrewer for several years.

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Brewing Science: Controlling Diacetyl

by Christopher White

Yeast is an amazing organism. It is responsible for producing bread, wine, distilled beverages, and beer. When yeast ferments beer, it produces more than 500 different compounds. Many of these compounds give beer its characteristic flavor and aroma. One of these compounds — one that is usually considered undesirable — is diacetyl.

Diacetyl gives a buttery, butter-scotch-like flavor to beer. The flavor threshold of diacetyl — the level at which it can be perceived — is 0.1 parts per million (ppm) in “light”

beer (such as Budweiser and Miller). Homebrewed beer can have levels from 0.05 to greater than 1 ppm.

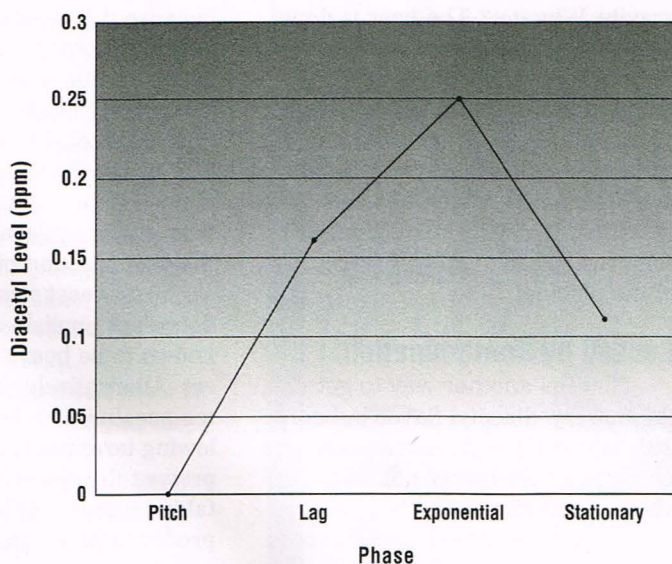
Factors that influence the diacetyl level in beer are fermentation temperature, aeration level, bacterial contamination, and the yeast strain. Diacetyl levels vary during the course of fermentation and maturation. (See Typical Diacetyl Time Line, left.)

Fermentation Control

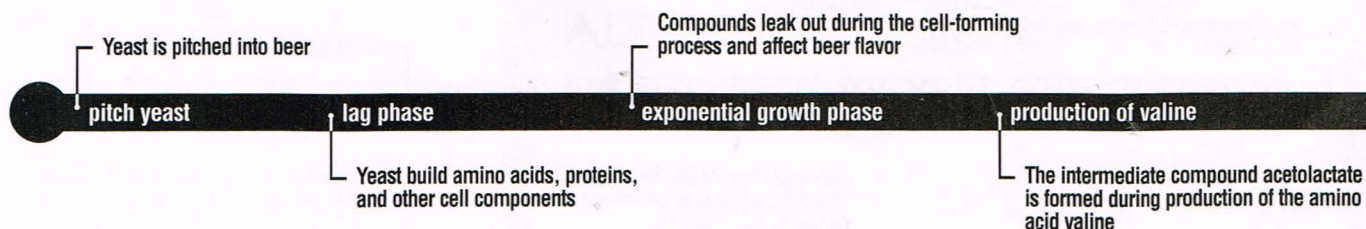
Diacetyl is a small organic compound belonging to the chemical group called ketones.

After yeast is pitched into beer, the yeast undergo a lag phase, followed by a phase of very rapid growth called the exponential growth phase. During both the lag and exponential phase, yeast build amino acids, proteins, and other cell components.

One of the amino acids produced by yeast is valine. An intermediate compound in valine production is called acetolactate. Not all of the acetolactate produced eventually becomes valine; some will leak out of the cell and into the beer. This acetolactate is then chemically converted to diacetyl in the beer. The chemical reaction is an oxidation, and high



Typical Diacetyl Time Line



fermentation temperatures favor this reaction. The higher the temperature, the more acetolactate is converted into diacetyl.

Another factor that increases diacetyl production in this phase is insufficient nutrients. Valine is one yeast nutrient. Valine levels vary by type of malt. If there is not enough valine (or other yeast nutrient), the yeast will produce its own. But the more valine yeast produce, the more acetolactate intermediate is required, and hence the more diacetyl made. There is a strain-specific phenomenon here, because given the same conditions, different strains produce different levels of diacetyl.

The Stationary Phase

As yeast slow down in fermentation, they enter what is known as the stationary phase. This phase is when beer undergoes a maturation process to develop the correct balance of flavors. One of the key elements of maturation is diacetyl reduction. Not only do yeast produce the precursor to diacetyl, they also consume the diacetyl that is produced and enzymatically reduce it. Yeast reabsorb diacetyl and convert it to acetoin and subsequently to 2,3-butanediol.

Acetoin and 2,3-butanediol have high flavor thresholds (they are difficult to detect), and so neither contributes much in terms of flavor.

Give It a Rest

It is important to provide sufficient maturation time for diacetyl reduction. This step is commonly

known as a "diacetyl rest." Diacetyl reduction is slower at colder temperatures, so it is essential to incorporate the diacetyl rest when making cold-fermented lagers.

The process is simply to raise the fermentation temperature from lager temperatures (50° to 55° F) to 65° to 68° F for a two-day period near the close of the fermentation. Usually the diacetyl rest is begun when the beer is two to five specific gravity points away from the target terminal gravity. The temperature is then lowered to conditioning temperature following diacetyl reduction.

For ale production, the fermentation temperature is usually 65° to 70° F, so temperature modification is not necessary. But the fermentation should still be "rested" at this temperature for two days to ensure proper diacetyl reduction. Many brewers make the mistake of quickly crashing the fermentation temperature following terminal gravity. Why not? The beer is done, people are thirsty, and there is no taste of diacetyl in the beer.

Even though the diacetyl can't be tasted, however, the beer might contain high levels of the precursor, acetolactate, which can be converted to diacetyl. Once the yeast is removed, there is no way to get rid of the diacetyl.

Caused by Contamination

There is another way to get the buttery, diacetyl flavor in beer. This is the diacetyl contribution that brewers would rather not talk about: contamination.

Lactic acid bacteria, *Pediococcus*

and *Lactobacillus*, produce diacetyl. These bacteria have historically been notorious contaminators of beer and are called beer spoilers. They are anaerobic and tolerant to alcohol and heat. This makes them happy to live in beer. The diacetyl produced by bacteria is far from pleasant and can taste like sour butter.

Small breweries and homebrewers have a difficult time bottling beer in a manner that eliminates lactic acid bacteria. This is one reason great-tasting beer can be bottled, only to develop pressure, sourness, and diacetyl flavors in as little as two months. What can be done? Sanitize well, bottle carefully, and leave some yeast in suspension. This yeast won't kill bacteria, but it will reduce any diacetyl produced from oxidation of acetolactate in the bottle.

Inviting Diacetyl?

Most brewers do not like the presence of diacetyl in their beer because it is a hint of a possible fermentation or contamination problem. But some brewers desire their beer to contain diacetyl in the final product. For example Redhook ESB has a characteristic diacetyl taste. This is most likely produced from the yeast strain used or from the fermentation profile employed.

Some yeast strains, particularly flocculent English ale strains, are known to be heavy diacetyl producers. Alternatively, the fermentation temperature can be crashed following terminal gravity, which would prevent the diacetyl rest from taking place. Low levels of diacetyl produced in this manner can be

Acetolactate is chemically converted to diacetyl

oxidation

improper fermentation conditions

High temperatures and insufficient nutrients contribute to oxidation and the production of diacetyl

Yeast slow down in fermentation

stationary phase

pleasant, and many classic beer styles such as Scotch ales and bitters allow for low levels of diacetyl to be tasted in the beer. ■

Christopher White holds a Ph.D. in biochemistry and is president of White Labs yeast company in San Diego.

Diacetyl Formation Facts

- Some yeast strains produce a lot of diacetyl, while others produce less. Choose yeast that produces less, unless you are brewing a style that allows for the presence of diacetyl.

- High fermentation temperatures promote diacetyl production.

- Low aeration levels when yeast is pitched will produce less healthy yeast, which are prone to higher diacetyl production.

- Ale fermentations produce more diacetyl because ales are fermented warmer than lagers, but the reduction happens much quicker.

- Lager fermentations need to be given a "diacetyl rest" by increasing the fermentation temperature just before completing fermentation.

- A hydrometer should be used to measure the specific gravity to calculate when to start the diacetyl rest. Begin when the beer reaches two to five points of final gravity.

- The fermentation should never be rushed. Give the beer ample time for maturation.

- Sanitize well, particularly when bottling, to limit the effect of diacetyl from bacterial contamination.

maturation process

Beer undergoes diacetyl reduction — in which yeast consume and enzymatically reduce diacetyl — to develop the correct flavor balance

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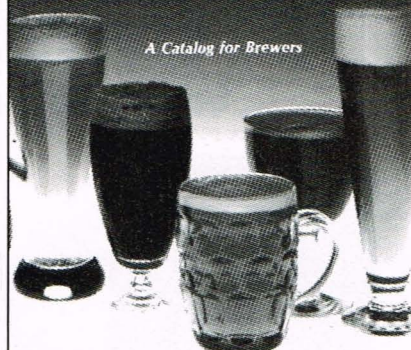
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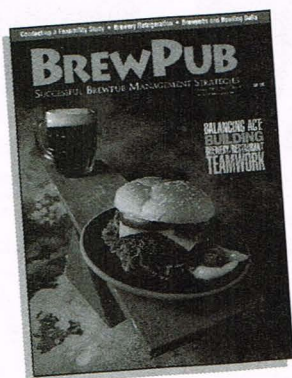


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Sitting around a mash vessel waiting for an hour to an hour and a half miracle mash conversion, wondering what is actually going on? There is nothing to watch. You can't hear anything. All you smell is the sweet aroma of the mash. At least during fermentation, the production of carbon dioxide gives an air lock or blow-off tube activity you can observe. How do you know if your mash is converting? How do you know when your conversion is complete?

Starches are long chains of simple sugars, including maltose, maltotriose, glucose, sucrose, and fructose. I compare this chain of sugars to a pearl necklace. The enzymes (which occur naturally in well-modified barley malt) act as scissors, cutting the pearl necklace into beads. These enzymes include beta-amylase.

Yeast is a single-cell organism that can't metabolize starches like humans can. This is the purpose for the breakdown of starches to simple sugars during the brewing process. There are a few key steps you can follow to ensure a great conversion.

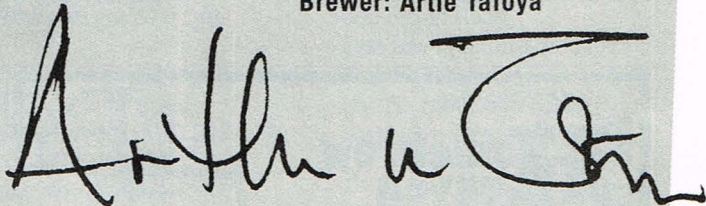
When mashing in, make sure the mash-in water is the proper temperature so that when mixed with the grist (grains), they will

Appalachian Brewing Co.



"Mash conversion seems quite technical, but it is actually very simple. Give the mash the proper consistency, temperature, and pH, and let the barley and water do the rest."

Brewer: Artie Tafoya



combine to reach the target "rest" or conversion temperature for the style of beer you are brewing. If you miss your target temperature, you will most likely have to add water to the mash to adjust the temperature. With the limited volume of most mash vessels, adding extra water to the mash will fill the vessel too high and prohibit hitting other rests and conversion temperatures throughout the mash schedule.

Second, check the temperature at different depths and different areas of the mash to ensure it is consistent throughout. Make sure the mash is mixed well, but do not oxidize the mash by overstirring. Ideally, the mash should be the consistency of a perfect bowl of

oatmeal. It should be thin enough to stir but thick enough to step infuse hot water (add hot water to increase the mash temperature) without creating barley soup.

After 45 minutes to one hour, determine visually that the conversion is complete by checking the clarity of any liquid resting above the mash bed. If your mash is a bit dry, you can create a small divot in the mash bed to get a puddle to form. If the liquid is clear, a complete conversion is near. If the liquid appears cloudy, you might want to wait a bit for additional clarification prior to further testing.

The iodine test is one way to determine whether there is any residual starch that lacks conversion.

Just head to the local pharmacy and pick up a "tincture of iodine." This is a small bottle that will last you about 10 years if you do not knock it over while performing the test.

It comes with a small dropper attached to the cap that allows you to lay a drop or two into a shallow sample of cool mash on a white dish. Be sure no grain material is present; this will yield a false positive. If the iodine color ranges from yellow to amber, conversion is complete. If the iodine turns dark purple to black, give the mash another 15 minutes and repeat the test. If a conversion is not reached after two hours, check your mash temperature. You may have undershot the target conversion-rest temperature.

When producing ales, I like to perform a two-step infusion mash schedule. Because most domestic pale malts are highly modified, a two-step infusion will suffice for most beer styles. I mash in to a strike

temperature of 149° to 151° F for approximately one hour. Once I reach visual clarity and obtain the desired iodine reading, I infuse 194° F water into the mash, raising the mash-out temperature to 158° F. This mash-out rest should be performed for 30 minutes, at which time you can start recirculating or running off depending on your system.

For German wheat ales, Belgium wits, and delicate lagers I use a four-step infusion. The four-step infusion includes a very thick strike for 20 minutes at 118° F, a quick infusion for another 20 minutes at 126° F, then a stop at a conversion temperature of 147° F. The complete conversion usually occurs in 30 to 45 minutes due to the beta-enzymes' jump-start during the protein rests. Then I mash out upon completion of conversion by infusing hot water to a strike temperature between 154° and 158° F. Normally the mash is pretty soupy at this point,

so be careful not to add too much water and jeopardize the run-off.

If your mash conversion temperature exceeds 153° F, a higher percentage of unfermentable sugars, called dextrins, will be produced. A higher level of dextrins occurs if your grain bill contains a good amount of caramel and caramelts, which are inherently high in these dextrins (14 percent to 18 percent). These dextrins are unfermentable and therefore will raise the final gravity and lower the alcohol percentage of the beer. I like to use a slightly higher mash conversion temperature when producing maltier styles of beer to utilize the dextrins that add body and mouthfeel to the beer.

Although mash conversion might seem like a miracle, you can be in control of every aspect. Consistently hitting your strike temperature and completely finishing your starch conversions will improve your efficiency and your beer. ■



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The Elusive Quality of Terroir

by Alison Crowe

You've probably heard it bandied around in boardrooms, seen it in the pages of pretentious periodicals, and even read about it on your favorite wine-making Web site.

No, it's not just another term cooked up by Wine Snobs Inc. to stymie would-be winemakers in their pursuit of a greater, Zen-like relationship with the fruit of the vine. Believe it or not, "terroir" actually means something, even though few folks seem to understand it or use the term correctly.

What Is Terroir?

Terroir is a French word meaning soil or earth. It is pronounced "tare-wah." In the wine world it means the combined influence that the soil, sun, wind, and climate have on the growth of the

grape and the finished product.

As simple as this concept might seem, the larger definition and connotation of "terroir" differs across philosophical as well as international boundaries. The French, especially the Burgundians, assert that "terroir" is an essential element, possibly the *most* essential element, in any wine worth its salt. They believe that if the finished wine does not express the essence of the land that gave it birth, then it is at best a soul-less product, one that can only be tolerated and never thoroughly enjoyed.

Many "new-world" grape growers (and wine drinkers), on the other hand, are more apt to be pleased with the finished wine if it is of itself distinctive, never mind where the fruit came from. For these relatively new winegrowing areas, terroir only comes into the picture if a grower has been in business long enough to recognize the particular personality of a certain vineyard or vineyards and has been able to track those changes, subtle as they often are, over the years. Even then, the "terroir" of a site is treated as only one factor in the greater winemaking process.

Why Do Winemakers Care?

Hence the crux of the great terroir debate. Is it the land that produces truly fine wines, or is it the skill of the winemaker in taking the produce of the land and working magic with it? In Burgundy, the Mecca of carefully nurtured "terroir wines," grape growers will certainly chose the former. They are not alone.

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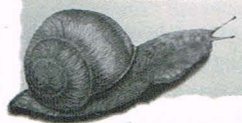
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governed by a rigid body of laws originally put in place during the 19th century as protection against fraudulent practices. A good idea in an unscrupulous grape and wine market that often tried to peddle off Le Plonk du Jour as a Grand Crus, the French Appellation Controlee system and many others like it have since morphed into juggernauts of legal hoops through which vintners must jump. These laws dictate which varieties can be planted where and which grape-growing and winemaking techniques can be used when, not to mention countless other minutia dealing with bottling, labels, and sales.

Many happily enslaved vintners like to lord over other countries their own commitment to excellence, to tradition, and to fine "terroir" winemaking. They disparage many "New World" wineries and winemakers for seemingly higgledy-piggledy planting techniques, for using non-traditional vine and row spacing, for introducing revolutionary growing practices, and for using innovative technology in the care of the vines and the making of the wines. The terroir-heads like to claim that these unschooled wines have no soul, no life, no tie to the land from which they sprang, in essence, no "terroir."

However, the question begs whether the balance among grape, climate, and soil known as "terroir" was achieved before the hand of the law came crashing down upon the European grape grower and insinuated itself into every aspect of his farming and winemaking regimen. Perhaps the grape growers did have the time to figure out by default which kinds of grapes grew best and which winemaking techniques jived with the fruit before the imposition of these laws. But is the terroir of today just a reflection of 19th-century farming practices, or could more of the hemmed-in wines of Europe be even better if the grape growers and winemakers were allowed to experiment and try new things? That's not to advocate an all-out state of winemaking

anarchy. But could it be that in some cases the idea of terroir, and a legally imposed sense of it at that, might actually hamper quality as opposed to sustaining and promoting it?

Unfortunately, many of the present-day "terroir" wines are expensive, rare, and have inflated market value, all because their producers are generally of the small and exclusive set. Some wineries in the United States like to talk about terroir in their wine marketing programs, not necessarily because they believe in the concept itself but most likely because they believe the term carries a hefty amount of marketing cachet.

Why Should Home Winemakers Care?

If those that hold fast to the brass ring of terroir look askance at "New World" wineries, then what must they think of home wine-makers? Those of us who buy our fruit from a different supplier each year and see how creative we can be in turning it into a great wine are surely misunderstanding the call to be a vintner. Those of us who make wine from non-grape fruits or, heaven forbid, grape-concentrate kits must lie only a step above a heretic.

Thus we flip the coin and come back to the other side of the terroir debate. Home winemakers are among the most vocal advocates for the view that great wines are crafted by the hands of creative and skilled winemakers, not simply sprouted from the chalky hillside of some obscure European village.

While it is true that we cannot make great wines with poor grapes, many of us would argue that it is possible to make great wines from a variety of sources, including non-Vitis vinifera grapes and other fruits and vegetables. In addition, while it is always the job of the winemaker to serve as a hands-off supervisor to what is essentially a natural process, we home wine-makers would be the first to admit that creativity, inventiveness,

and flexibility are the keys to our success.

For home winemakers the only way to truly make a wine that can be said to have a recognizable terroir is to buy fresh grapes from a reputable source. If the vineyard has been well tended and if the site is unique, then it is likely that your resulting wine will have a recognizable terroir, one that will distinguish the finished product from wines grown in other locales.

Unfortunately, unlike sugar, acid, and oak, terroir is not one of the components that make a great wine that can be adjusted at the whim of the winemaker. Terroir is an ephemeral quality present in some wines almost, it seems, by chance.

The wine snobs (and this includes some critics, consumers, and producers) of the world

would have it that the word terroir only be applied to wines that are rare, expensive, or hard to come by and would never think of deigning to imagine that a humble home-made wine could even show the slightest hint of terroir. Hence the grain of salt that must be taken whenever we hear, read, or use the word ourselves.

As home winemakers we have the freedom to blend, ameliorate, and chaptalize as we please. We can buy grapes from whomever we choose, or even decide to make a sparkling wine from a Chenin Blanc kit. Do our wines always come from the same place every year and express the unique soil and climatic combinations of that specific terroir? Sometimes, but not always.

Is the quality of the wine indiscriminately better because it does

express said characteristics? Again, sometimes, but not always. If a wine you make can be said to have "terroir," does this necessarily mean that the wine can command a high price or be in a higher "glamour" bracket? Unfortunately, in today's wine marketplace, yes, it usually does.

The good news, however, is that home winemakers, unlike commercial winemakers, are neither hemmed in nor hampered by strict production laws or the vagaries of the market. Whether our wines exhibit terroir or not, we are equally proud of, and equally enjoy, the fruits of our labor. ■

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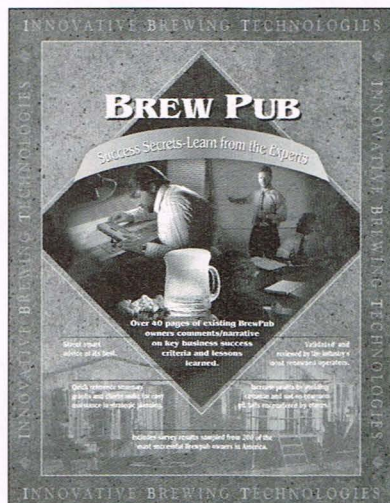
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Caution: Brewers at Play

by Topher Gayle

Add some hops now, Paul!"

"Okay."

"Now add some malt. Careful! You don't want it to boil over like it does when Mommy and Daddy are brewing."

"Okay, okay! Now can I put some more hops in?"

"Not yet, we have to wait for the alphabet acids to convert."

I could hear the kids in their play kitchen, brewing beer. Our oldest, Julie, was masterminding the process. Younger brother Paul seemed to be getting most of the grunt work. A couple of the neighbor's kids, Erica and Wayne, were new to homebrewing so were asking most of the questions.

Wayne asked, "What're alphabet acids, Julie?"

"It's the secret ingredient in hops, dummy! Duh! Everybody knows *that*! And hops are what makes beer taste like beer!"

This, I thought, was a good answer. Not bad, Julie.

"So what're you gonna convert them into?" asked Erica, and from my listening post in the study, I waited breathlessly for her reply.

"Well, you have to boil the hops to convert the alphabet acids into number acids! Otherwise they stay like letters all the time. Okay now, Erica, you go get some junk out of the trash can."

"Here's some crumpled-up newspaper. Is that good enough?" Huh? I had to wonder.

"Sure," she said, "Now add the junk to the brewpot." Ah. Adjunct.

"Is it beer yet?" asked Paul.

"No it isn't. First, we have to boil it and boil it and boil it 'til the whole house stinks. Erica can turn on the stove. Now Paul, you can put the brewpot on the stove. Now it's boiling!" Nice stove, I thought, if it can boil a big brewpot in just seconds.

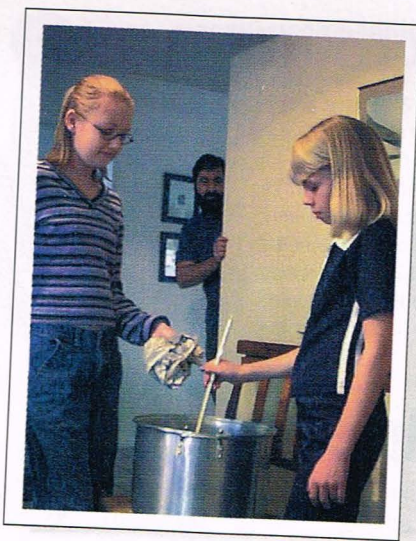
"Smell the wort?" asked Julie.

"I don't want to smell your ugly old wart!" howled Erica. "This is a dumb game. Let's play Nintendo."

"It smells yucky," complained Paul. "It must be ready!"

"Okay now, pour it into the ladder tune and we'll spartch it and wreck it and stuff," bossed the brewmistress. "This bucket is the ladder tune. So pour the beer into the bucket and then shake it up and put the bucket into the bathtub full of ice and then we wait *forever* for it to get cool enough to pitch yeast into."

"I can do that!" said Wayne.



My daughter, Julie, and her friend Erica like to mimic my brewing process when they play.

"I got my mitt and everything!"

"Okay, so it's almost cool enough. Let me test it." Julie must have been using her toy first-aid kit's thermometer, which always reads 98.6. "Perfect!" she cried. "Pitch the yeast, Wayne!"

I heard the gentle thud of a Nerf ball being deposited into the

make-believe brewpot. "Score!" yelled Paul. "Is it beer yet?"

"No, dummy, beer has to foment first. We put it in a big jar and put, like, a big plastic straw in it, and then it sits around while we look at it and shake it and worry about it."

Paul chimed in, "Julie, Daddy always hooks up the fishtank pump before it foments. Maybe we need to, too!"

"Good idea, Paul! Let's go get it."

This could get messy; I figured I'd better step in. I could picture the carnage afterward: water everywhere, gravel underfoot, plastic tubing draped over chairbacks. Come to think of it, that's about what it looks like after a real brewing session! The kids easily made a substitution by putting the hose on the blower end of the vacuum cleaner. Hmmm. High power aeration. Wonder if that would work for me?

"Dad? Can we have some root beer?" came Paul's little voice. I fetched a glass of my homebrewed pop for each kid. "How about straws, Dad?" asked Julie. No problem. Then back to work in my study, with a protective ear out.

"Blub-blub-blub-blub!" The kids were blowing bubbles in their glasses. "What happened to your brewing project?" I called out.

"We're fomenting right now!" the kids giggled. Obviously this was the best part, since all four straws were in action now. "And now we're drinking our beer! Hey Erica, homebrew is the *best*!" crowed Paul.

"It sure is!" she agreed. "And it's surprisingly easy to make!"

I couldn't have agreed with her more. ■

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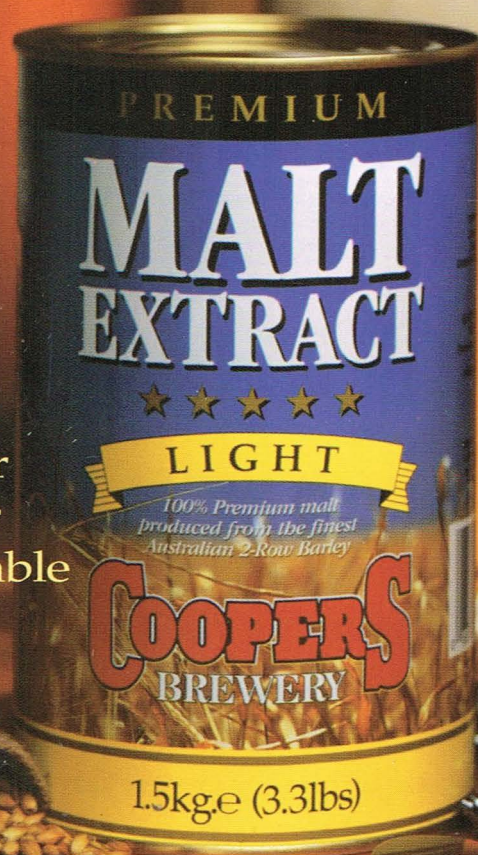
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