

Brew

DECEMBER 2001, VOL.7, NO.10

THE HOW-TO HOMEBREW MAGAZINE

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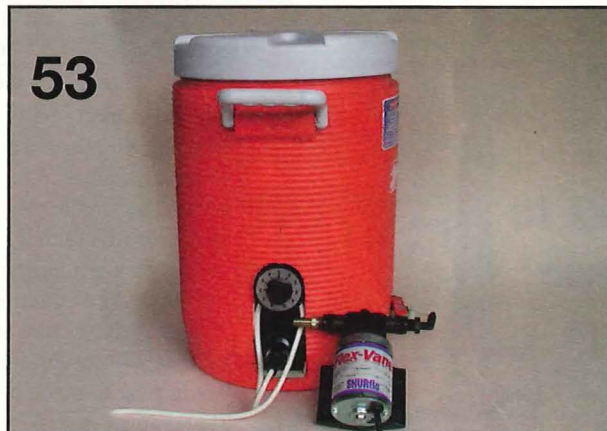
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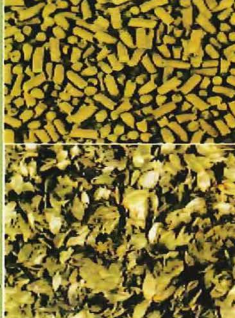
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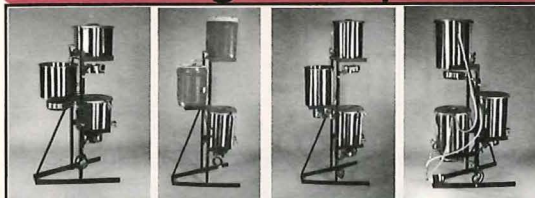
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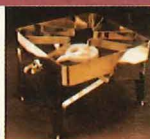
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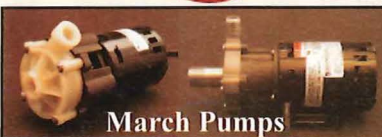
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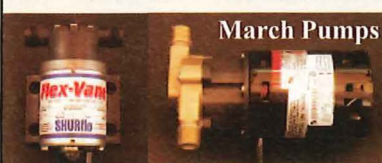
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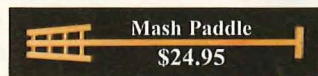
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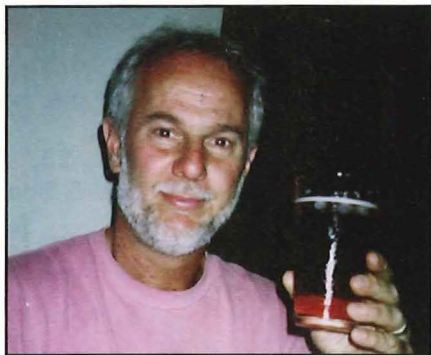


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Cover story author Paul Zocco's obsession with homebrewing started in 1994, when a friend who was moving away just couldn't fit all of his beer-making stuff into the van. After spending quite some time thinking

about starting the hobby, it seemed his opportunity had arrived, so Zocco made the commitment and bought the equipment. Since he had actually spent money on a new hobby, he felt obligated to pursue it to the next level. A good friend and veteran homebrewer offered to help him through his first batch of all-grain Oktoberfest.

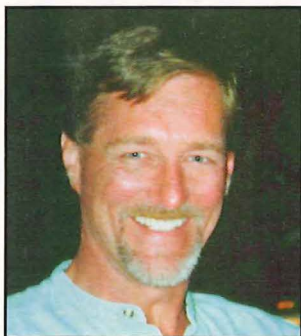
Zocco used a rolling pin to grind the grain in a Ziploc bag. The mash was conducted in a corn pot wrapped in a large beach towel. Sparge water was poured over the mash through a spaghetti strainer. Then it was back to the corn pot for boiling and hop additions before chilling in an ice bath.

Since that memorable first day, Paul experimented with extract brew-

ing for a while, gravitated to partial grain and then made the jump back into all-grain brewing. He now has a half-barrel brew system, counterpressure bottling gadgets and every other sort of beer-making hardware.

Two years ago, Paul opened his own homebrew supply retail shop, Zok's Homebrewing and Winemaking Supplies, in Willimantic, Connecticut. Zok's sponsors a homebrew club called SOB's (Society of Beermakers). Paul also teaches homebrewing and home winemaking at the local college.

Paul's Scotch ale piece was inspired by a trip to Scotland, where he and some homebrewing buddies traveled around Edinburgh touring major breweries and sampling local libations.



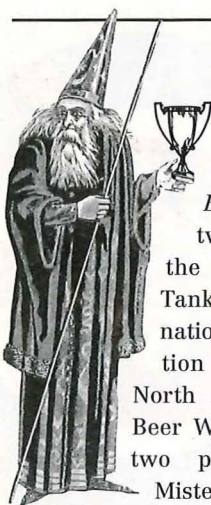
Review board member, author and brewer, Greg Noonan is an essential contributor to the December issue of *BYO*. Greg

is the owner and brewmaster of Vermont Pub and Brewery in Burlington, Vermont. He also is the author of the Classic Beer Style Series "Scotch Ale" (Brewers Publications, 1993). Greg used his extensive knowledge of Scotch ale to review the cover story and recipes for editorial accuracy. He also wrote a sidebar packed with tips on making world-class Scottish ales. The story starts on page 34.

Greg started homebrewing in 1977 with an all-grain brew. The dearth of information about all-grain brewing led him to teach himself the hobby through extensive research and exper-

imentation. Greg opened the Vermont Pub and Brewery, a 14-barrel brew-house, in 1988 after a three-year battle with local officials to allow on-premise brewing. Noonan embraced a broad range of traditional and historic styles, including Scotch ale. The pub is now renowned for its wee heavy.

Greg founded the Seven Barrel Brewery in West Lebanon, New Hampshire in 1994. Noonan is also the author of "Brewing Lager Beer" (Brewers Publications, 1986) and the coauthor of "The Seven Barrel Brewery Brewers' Handbook" (G.W. Kent Inc., 1996).



Let us take a moment for a quick pat on the back. *Brew Your Own* made two submissions to the 2001 Quill and Tankard Awards, a national writing competition sponsored by the North American Guild of Beer Writers, and we won two prizes. "Help Me, Mister Wizard" and its

anonymous author won a gold medal for best column and "Catch the Belgian Habit" (November 2000), an in-depth package written by Scott Russell, Tom Miller, John Oliver and Sal Emma, took a silver medal for best brewing feature.

Also worth celebrating is the amount of hardware pulled in by our review-board members at this year's Great American Beer Festival (GABF) in Denver: Our technical editor, Ashton Lewis of the Springfield Brewing Company, earned a silver for his Märzen. Randy Whisler of Smuttynose

Brewing Company won a gold medal for his robust porter. John Maier of Rogue Ales won a bronze for his robust porter and a silver for his chocolate stout. Matt Cole of Rocky River Brewing Company won a bronze for his Oompa Loompa stout and also took home a bronze in the "Belgian and French Specialty Ale" category for his artisan saison. And Denise Jones of Third Street Aleworks won a bronze medal in the "Classic English-Style Pale Ale" category for her Annadel pale ale. Congratulations to all!

TIME TO TIP THE PORTER BRIESS PORTER

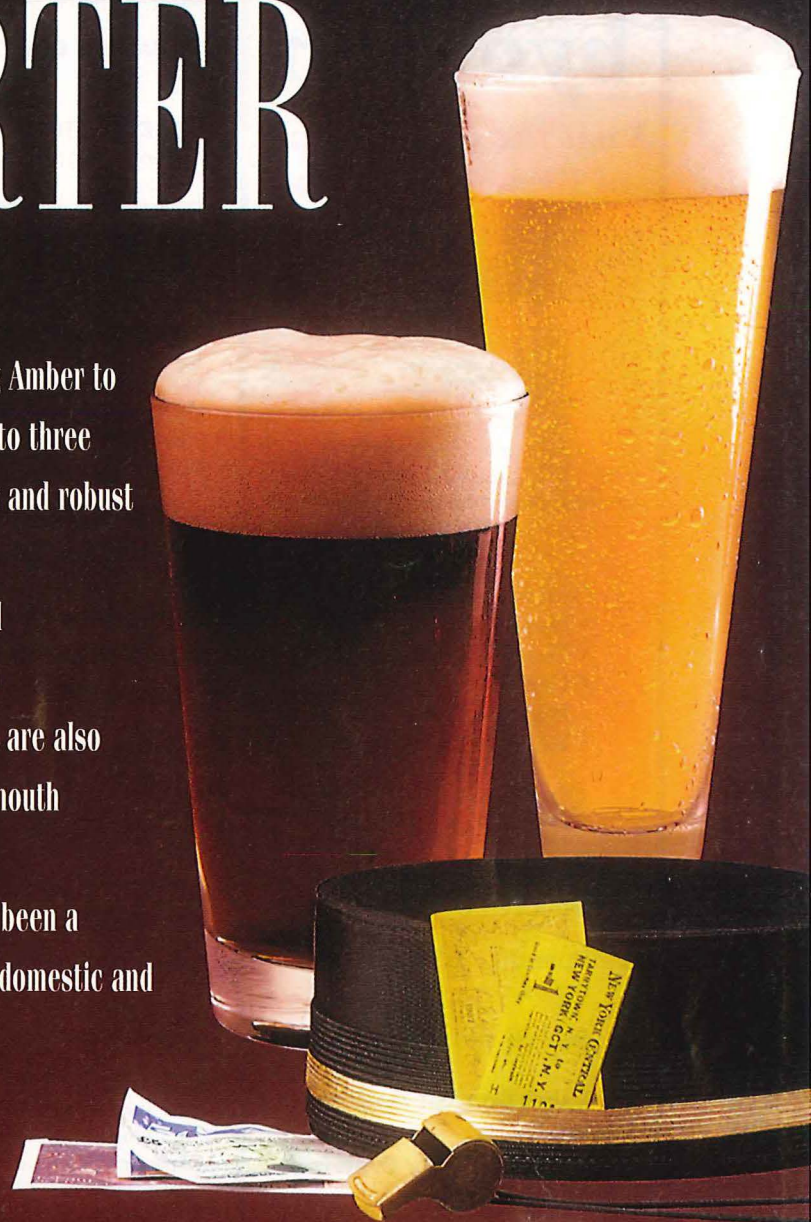
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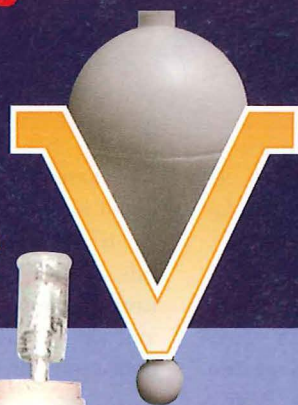
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No-Boil Backlash (and Defense)

I was a bit taken aback to see a no-boil recipe in the September 2001 issue. While it is possible to brew palatable beer from extract without boiling, boiling will ensure that proteins have been broken down and will ensure the utilization of any additional hops added (please don't claim that pre-hopped extracts ever have sufficient hops to make good beer!). Leading a beginner to believe that not boiling is okay is a disservice to homebrewers and the craft. Boiling for 15 minutes will greatly enhance most extract-only brews, even if additional hops are not added.

Tom Ellis
Pittsburgh, Pennsylvania

BYO technical editor Ashton Lewis responds: "No-boil kits can and do make good beer because the companies that make them know what they are doing! The name 'no-boil' kit is a bit misleading because the wort made from a no-boil kit already has been boiled by the kit manufacturer. Proteins have already been precipitated and the resulting beers are stable with respect to chill haze. Hops have also been added for bitterness and aroma. By boiling a no-boil kit, you lose the aroma hops. More could be added to compensate for this, but that would defeat the purpose.

No-boil kits are a great way for new brewers to get an idea of what homebrewing is all about without having to focus on every aspect of the hobby during their first few brews. Sanitation, fermentation, racking and bottling are skills all brewers use and are simple tasks for new brewers to master before moving on to wort boiling, cooling and the many other skills used by more seasoned brewers. Some brewers are very happy with no-boil brews and don't really want to move to boiling because of the additional investment in equipment and time.

We try to provide information that appeals to homebrewers at all levels.

Many brewers use no-boil kits and like the beer they make, so we also provide information to this audience.

Unexpected Used-Keg Warning

I have an important health warning for the readers of your magazine. This letter is prompted by the "Save A Keg" article by Thom Cannell in the September 2001 issue of *BYO*.



I am a narcotics agent and homebrewer in Oregon. On the job, I primarily investigate the manufacture of methamphetamine. The "beverage kegs" you discuss in your article are often used in the manufacture of methamphetamine and hydriodic acid (an essential chemical in the manufacture of methamphetamine).

The methamphetamine cooks combine amounts of red phosphorous, iodine and other chemicals in the beverage kegs. These are chemicals you do not want on your skin and certainly not in your beer. During my investigations, if I come across a beverage keg like the one in your article, it is treated as hazardous waste and disposed of in accordance with OSHA regulations.

Please make sure that homebrewers and others are aware of the origin of their used kegs. Most have probably served their previous owners well as a dispenser for beer, but a few may have been used for the mixing of potentially lethal, carcinogenic, caustic and corro-

sive chemicals used in the manufacturing of methamphetamine.

If anyone has questions regarding this, they can call local Drug Enforcement Administration offices and ask to speak to an agent or local police narcotics unit.

Chris Mueller
Portland, Oregon

We checked out Mueller's warning and can verify that he's no crackpot ... though apparently your used keg might be! Just another good reason to get your Corny from a reliable source. Otherwise, you'll never know where it has been.

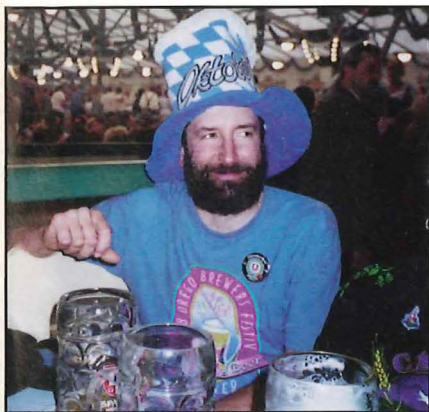
Diabetics and Real Beer

I am a diabetic homebrewer. The beer-loving friend mentioned in the October 2001 "Help Me, Mr. Wizard" column needs to talk to a certified diabetes educator. The American Diabetes Association recommends a limit of two servings per day for men and one for women (a serving equals 12 ounces of beer, 5 ounces of wine or 1.5 to 2 ounces of liquor).

Alcohol blocks the process of the liver, releasing glucose into the bloodstream, which can lead to low blood glucose levels even eight hours after the last drink. Food glucose reaches the bloodstream thirty minutes to two hours after you eat. Physical activity, such as dancing, also lowers blood glucose and can increase the risk of hypoglycemia. You might not heed the symptoms of hypoglycemia, thinking that they are the effects of alcohol — moodiness, numbness, confusion, shakiness, dizziness and fainting.

If you keep track of your servings of alcohol, you can counteract each serving with 10 to 15 grams of carbohydrate (a slice of bread, 8 ounces of milk). The calories from alcohol and carbs will interfere with weight loss. Still, diabetics do not need to entirely forego the pleasures of real beer.

W.R. Cate
Henderson, North Carolina



Hey, Gimme that Glass!

In "Tips from the Pros" (September 2001) you spoke with John Maier, the head brewer at Rogue in Oregon. In the photo he had some amazing blown-glass beer mugs on the table in front of him. Being a fan of interesting glassware, I was wondering if you had any ideas on where someone might find such excellent mugs.

Steve Panos
Maywood, New Jersey

The picture of John Maier was taken at the 1999 Oktoberfest in Munich. No need to fly to Deutschland, though: Dimpled glass steins similar to the ones in the photo are available at many homebrew retail shops, German restaurants and beer-related Websites.

Passing Thoughts on Passing Gas

I was just flipping through some back issues of *BYO*. I am such a geek that I couldn't help noticing an omission in Ashton Lewis' great article, "Beano Brew" (March 2001). Lewis states that flatulence is caused by the breakdown of undigestible carbohydrates into fermentable sugars and the subsequent fermentation of those sugars by bacteria that live in the human gut. One of the byproducts of fermentation is carbon dioxide gas, which leaves the gut in its infamous manner.

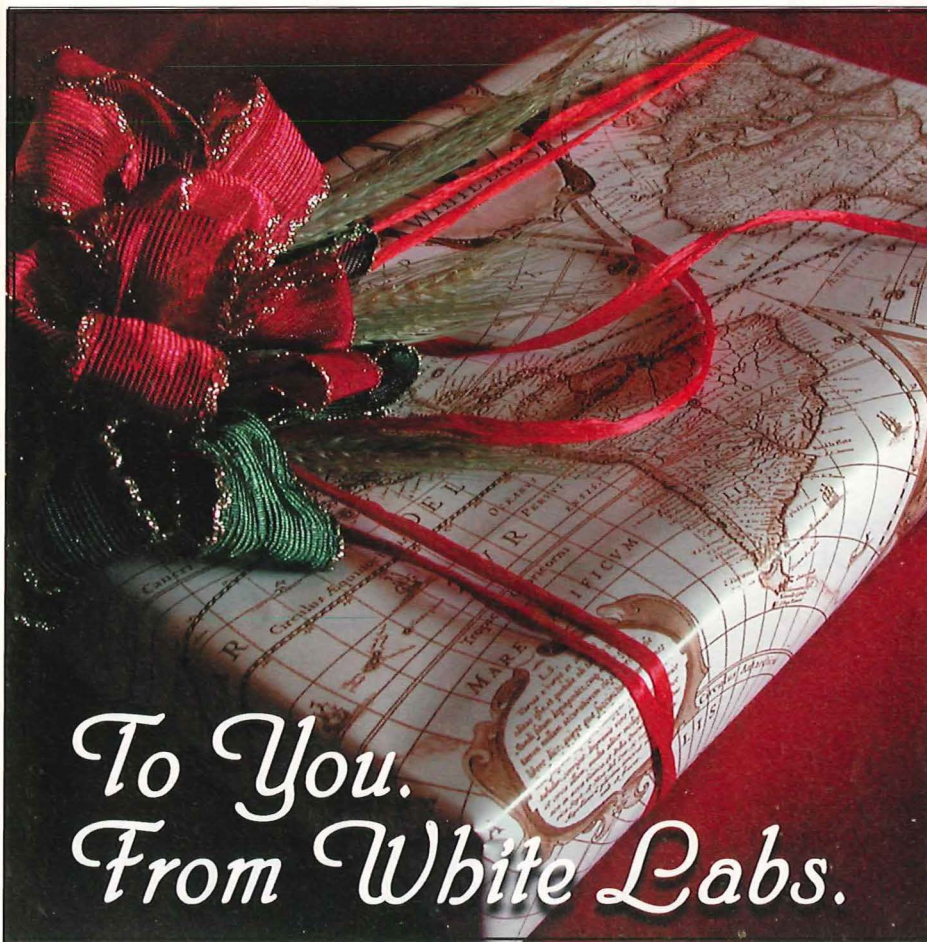
However, CO₂ gas doesn't smell bad and it's not combustible. The chemical responsible for those properties of flatulence is the methane. The

source of methane is a group of bacteria known as methanogens. Oxygen is toxic to methanogens so they live where there is little to no oxygen, like in swamps and in mammalian guts. Methanogens are responsible for the methane in swamp gas and flatulence.

For many organisms, the last step of breaking down food for energy is a process called oxidative phosphorylation, which produces lots of energy but also leaves behind some hydrogen ions. Organisms that breathe oxygen can attach those hydrogens to an oxygen atom and get water, which, by the way, is a significant source of water for some desert animals.

But methanogens can't survive the presence of oxygen, so they attach their leftover hydrogen ions to carbon, resulting in methane. How's that for a connection: swamp gas, oxidative phosphorylation, desert animal physiology, farts and beer! ■

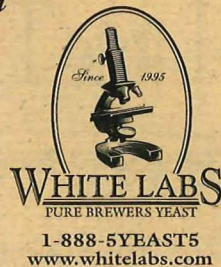
Steve Heulett
Whittier, North Carolina



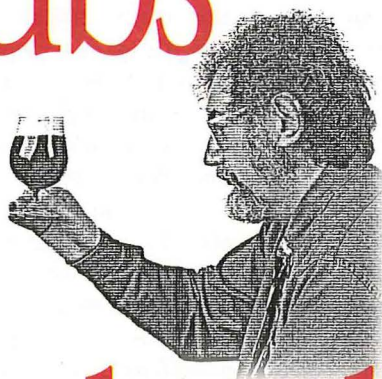
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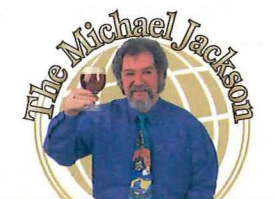


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brewer profile

Homebrew Judge • Bill "Sparky" Odendahl • Trumbull • Connecticut



PHOTO COURTESY OF BILL ODENDAHL

Bill and his assistant (also known as his daughter) grind some malt together.

When I turned 18 the Connecticut drinking age was raised to 19. This was a major blow to me, as well as many of my friends. One of my friends had read about homebrewing and told me about it. So I started making my own beer. That was 18 years ago. I have seen quite a few changes since then and it has never been easier to make good beer.

Today I brew at least once every few weeks in five-gallon batches. I usually brew at night after my daughter has gone to sleep. I use pretty standard equipment. I use an Oxynater (because I brew big beers) and a bottling bucket with a Phil's Philler. I keg and bottle my beer, depending on what it will be used for. I really like to brew beers with a high alcohol content, such as barleywines, Imperial stouts, Scotch ales and doppelbocks. My favorite style to brew and drink is Belgian tripel.

I do all of my brewing in the kitchen on a gas stove. I am one of the few remaining extract brewers in the Underground Brewers of Connecticut.

Despite this fact, I still win quite a few awards and last year placed in the top ten in The New England Homebrewer of the Year awards. I am also a certified BJCP Beer Judge and a competition organizer. I help organize the Southern New England Regional Homebrew Competition each January.

It's great to know that I can make good beer for less than it would cost to buy it. Some of the beers I make cost up to \$10 a bottle (for 12 ounces) to buy. Usually I brew alone, but I enjoy getting together with some pretty entertaining brewing buddies. One friend has a strange ritual of taking a big gulp of the yeast left on the bottom of the fermenter when we rack from primary to secondary.

Being a judge has been great. It gives me a better comprehension of brewing and I have had some funny judging experiences. As a judge, if you are asked to be on the Best of Show panel it means that none of your beers made it to the final round. On one occasion I was asked to be on the Best of Show by mistake. The organizer didn't realize I had a first-place ribbon. I ended up judging my own beer. I eliminated it because I didn't think it was as good as mine.

On another occasion, I brewed a very good beer that was in between categories. I didn't know how to label it so I entered it in both categories. It won first place in both. When I told the judges it was the same beer they didn't believe me.

Some members of my club gave me the nickname "Sparky." Now everyone knows me by that name. I got this nickname during a club trip. Apparently "Oden" was the God of Thunder. Thus "Sparky," because thunder creates sparks and I am a very energetic person. That was the one nickname I didn't like, so of course it stuck.

reader recipe

Bigfoot Barleywine Clone

OG = 1.104 FG = 1.027 IBU = 70+

Daniel J. Gestwick
Wheatfield, New York

Ingredients

8 lbs. Muntions light DME
4 lbs. John Bull amber liquid extract
1 lb. two-row pale malt
1 lb. dextrin malt
1 lb. crystal malt (40° Lovibond)
27 AAU Cascade hop pellets (6 oz. of 4.5% alpha acid)
27.6 AAU Centennial hop pellets (3 oz. of 9.2% alpha acid)
12 AAU Chinook hop pellets (1 oz. of 12% alpha acid)
Scottish Ale (Wyeast 1728)
1 tsp. Irish moss
1 tsp. Wyeast yeast nutrient
2 tsp. gypsum
2/3 cup corn sugar

Step by Step

Add 2 tsp. gypsum to 2 gal. of water. Bring to 160° F, add crushed grain and hold for 30 min. at 160° F. Strain grain into brewpot and sparge with 1 gal. of 160° F water. Add the DME and malt extract syrup. Add hot water to bring volume to 3-1/2 gal. Bring to boil. Add Chinook and 1 oz. Centennial and boil for 45 min. Add 2 oz. Cascade, 1 tsp. Irish moss and 1 tsp. yeast nutrient and boil 10 min. Add 2 oz. Cascade and boil 5 min., then remove from heat. Remove all hops. Add 1 oz. Cascade and 1 oz. Centennial and let steep while cooling wort to 80° F. Remove hop bags, strain into primary and add enough pre-boiled water to obtain a little over 5 gal. Aerate and add yeast. Ferment at 70° to 75° F for 7 days. Transfer to secondary and add remaining hops. Age 2 weeks at cellar temperature. Prime and bottle.

homebrew club

BONES • Philadelphia, Pennsylvania

PHOTO BY LORI SHEREL



Some BONES members with Michael Jackson at the Book and the Cook Fair.

BONES (Brewers of the Northeast Section) has come a long way in its four-year history. The club was founded in September 1997 by a small group of experienced and novice homebrewers who were interested in sharing tips and techniques, as well as the camaraderie of others who enjoy the hobby. The club is a laid-back group that espouses the well-known philosophy of “relax, don’t worry, have a homebrew.”

Comprised of both homebrewers and home winemakers, BONES has 45 members. The members come from throughout Philadelphia and several Pennsylvania and New Jersey suburbs. The club has three official BJCP beer judges among its ranks.

BONES sponsored its first full-scale homebrew competition in 2001. The BONES Bash (BONES appropriately scheduled Annual Show at Halloween) is a BJCP-sanctioned homebrew com-

petition held in October. Halloween was deemed the perfect time of year for a BONES competition, since the club’s logo is a dancing skeleton holding a beer mug. This event included a specialty category called the “Monster Mash,” open to any style of brew with an OG of 1.090 or above.

The BONES club also sponsors the International Beer of Champions (IBOC) every June. The IBOC is a competition with a twist. Each contestant starts out with the same ingredients and brews from the same recipe. This really tests brewing skills. Creativity is not forsaken: The brewer is free to add up to an additional pound of specialty grains and an additional ounce of hops. (See *winning all-grain recipe at right.*) The event is followed by an open awards ceremony and a tasting of the entries by the club at large.

The club meets monthly at the Brew By You shop in Philadelphia to plan club activities. Guest speakers are often on the meeting agenda and the meetings always end with an open tasting. BONES also sponsors regular “club brews,” where the members all brew a batch of homebrew together, then share the finished product.

Another activity is the Book and the Cook fair in Philadelphia, which features a tutored tasting with Michael Jackson. The club holds a holiday party every December, which gives everyone a chance to come together not only as a club but as a family.

—Lori Sherel

reader tip

Instead of filling your siphon tube with water to start it flowing, use a turkey baster. Simply place your racking cane and siphoning tube in the carboy. On the other end of the tube insert the tip of your baster (make sure you squeeze the bulb before you insert it into the tube to avoid forcing air into your wort). Then release the bulb. Holding the end of the tube slightly above the carboy, creating a “U” in the tube, prevents the wort from going into the baster. It also prevents the wort from running back into the vessel when you remove the baster to give it another squeeze. Repeat the process until the tube is holding enough liquid to start the siphon. Sanitize the baster first in case you get wort in it.

—Christian Figlia and John Schmitt
Seaford and Wantagh, New York

reader recipe

First Place IBOC ESB

(5 gallons, all-grain)

OG= 1.055 FG = 1.013 IBUs = 60

John McDonnell

Philadelphia, Pennsylvania

Ingredients

8 lbs. Warminster Maris Otter malt
1 lb. crystal malt (20° Lovibond)
1 lb. Victory malt
0.50 lb. Munich malt
0.50 lb. biscuit malt
0.75 lb. flaked maize
8.8 AAU Target hops
(1 oz. of 8.8% alpha acid)
5.1 AAU Fuggles hops
(1 oz. of 5.1% alpha acid)
3 AAU Kent Goldings hops
(0.6 oz. of 5% alpha acid)
3.75 AAU Kent Goldings hops
(0.75 oz. of 5% alpha acid)
0.33 oz. Burton water salts
London ESB ale yeast
(Wyeast 1968)
1 cup DME for priming

Step by Step

Mash grains in 3.5 gallons water, hardened with 0.33 oz. Burton salts at 166° F. After mash-in, bring temperature to 152° F and hold for 90 minutes. Sparge with 168° F water and collect 5.75 gallons wort. Bring wort to a boil. Add Target and 0.33 oz. Fuggles and boil for 35 minutes. Add 0.6 oz. Kent Goldings and 0.33 oz. Fuggles. Boil for 15 minutes and add remaining Kent Goldings and remaining Fuggles. Boil 10 more minutes. Cool to 80° F and pitch yeast. Ferment at 70° F for 5 to 7 days and rack to secondary. Ferment for 2 weeks. Prime with dried malt extract and bottle. ■

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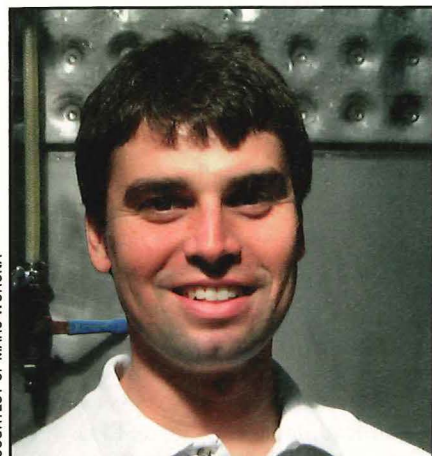


Strain to Style

Matching your yeast with your beer

Tips ^{from} the pros

by Thomas J. Miller



COURTESY OF MARC WORONA

Brewer: Marc Worona is the head brewer at Stoudts Brewery in Adamstown, Pennsylvania. He started homebrewing in 1987 before joining Stoudts in 1995. Marc took a microbiology course at the Siebel Institute and is the president of the Master Brewers Association of the Americas, district of Philadelphia.

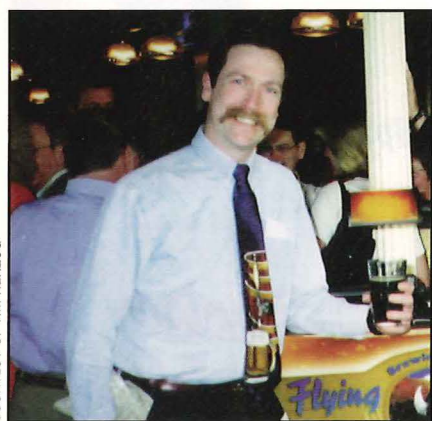
We're very into matching yeast strains to style at Stoudts. We have as many as twelve different

styles going at any given time and can have as many as five different yeast strains running. For our lagers we use a traditional Weihestephan strain. For our ales we have a standard ale yeast — it's clean with some fruit esters coming out in the finished beer. Our weizen is a combination of two different wheat strains. That's rather untraditional. We created a blend between the Weihestephan weizen strain and another wheat strain that gives us a good combination of esters and phenols in the finished beer. Our Belgian ale requires a strong abbey-style yeast. Our Scotch ale uses a bottom-fermenting ale yeast that ferments cool, between 50° to 55° F. We lager the Scotch ale as well.

In determining the yeast strain, our first step is to decide what we want the beer to taste like. We choose the grains and the color and the amount of residual sugar we want, then move on to the catalogs and literature and style books to determine which yeast is going to give us the characteristics and flavors we're looking for. We rely a cer-

tain amount on literature, but there are some tricks we can employ to get other flavor characteristics out of the yeast. With a weizen, for example, phenolic flavors can be created by stressing the yeast, so we might choose to underpitch the yeast or else under-oxygenate the wort. Either of these would give us some more phenols in the finished brew. With the Scotch ale, we keep the fermentation temperatures as low as possible to keep the ester tastes down. The same would be true of lagers. For lagers we want a yeast that is a low producer of diacetyl and flocculates out well, so we get a beer that clarifies and filters nicely. Of course, it also needs to withstand the colder fermentation temperatures and provide a clean flavor that brings out the flavor of the malt and hops.

It's very important to match yeast strain to style. You can really experiment with your yeast — see what you get out of it under different temperature conditions or with different grain profiles and different hop additions in your homebrew.



COURTESY OF TIM HERZOG

Brewer: Tim Herzog brews at Flying Bison Brewing Company in Buffalo, New York. He was a homebrewer for 20 years before he and his business partner started the company. He has taken seminar courses at Siebel and the American Brewer's Guild, plus owns "almost every brewing publication ever published."

You can look at yeast strains and see that they add a distinctive flavor to the beer.

For our Aviator Red and our German Kölsch, we wanted to be able to control the flavor based on what ingredients we used and not have flavors generated through the yeast. So we looked for something neutral and discovered Wyeast 1332 (Northwest Ale) yeast. This new strain flocculates well, it filters brightly and it ferments down quickly if you let it.

Our homebrewing experience helped us with our yeast selection. Since we're certified beer judges we were able to do much of the sensory evaluation ourselves when deciding which yeast to use. Sensory evaluation is simple. You need to become familiar with the beer you're going to brew. If you want to make British bitter, then

you should sample Fuller's ESB, Young's Ramrod and Bass Ale side by side. Take notes and compare your thoughts. Once you know what you like and don't like, you can use your sensory evaluations to match ingredients. These include malt, hops and yeast.

These days the parentage of yeast is thinly veiled in lab descriptions. An ESB yeast will leave a trace of diacetyl and malt. A Thames Valley ale yeast leaves behind a mineral flavor, similar to what you find in Bass Ale. You'll find the same for German lager or wheat beer yeasts.

The key is in the sensory evaluations and asking what the yeast is contributing to the beer. Maybe it's nothing, but maybe it is something noticeable. If you know about beer styles going into the process, you'll be able to select the yeast that you need.



Brewer: Marc Rubenstein is the head brewer and co-owner of Middle Ages Brewery in Syracuse, New York. Marc attended brewing school in Maine and then opened Middle Ages in 1995.

We use only one strain of yeast. We brew British ales, so Ringwood yeast from the Yorkshire coast of England works well for all of our styles. This yeast is used extensively in America. Shipyard Brewery and Geary's are two examples of craft breweries that employ it.

Ringwood is a two-strain yeast, meaning it was derived from two different strains. Originally it was used for cask-conditioned brews. It is a strain with a reputation for creating an extremely malty profile and finishing estery and fruity. Ringwood is rather difficult yeast to manage because of its high-flocculating characteristics. It also needs a high oxygen content in the wort to work best, plus it tends to have poor stability in storage.

Ultimately, this means that this yeast is a little tricky for homebrewers, but not impossible to deal with. It used to be that this yeast wasn't even available to homebrewers, but now Wyeast sells it (Wyeast 1187). Homebrewers who try this strain should pay attention to its unique characteristics; for example, it benefits from a thorough diacetyl rest after fermentation is complete. Knowing the basic characteristics of your yeast will yield the best results with the least amount of hassle.

Ringwood yeast is a very dominant strain. You can taste it through everything we make here. That's typical of most yeasts anyway. Homebrewers will discover through experimentation with different yeast strains just how they impact the flavor of their beers. Say, for example, you try the Ringwood strain first and then try other ale yeasts after that. With each successive batch you'll discover that the yeast impacts the beer's flavor in ways you may have never imagined. In the early days, homebrewers rarely considered that fact about yeast. Today, it's equally important as all other ingredients.

Matching strain to style is as much about tradition as it is taste. I know my yeast comes from Ringwood in England. They brew beers that have the same tradition as the beer I brew. That means I'm matching the strain of yeast to the style of beer I produce. But I also like the flavor I get and the resilience of the strain. ■

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Diacetyl Diaries

Mash rests, mashing with rice and types of barley

"Help Me,
Mr. Wizard"

Mr. Wizard

I brewed a German alt using German ale yeast (Wyeast 1007). It's been fermenting at 58° F for 9 days and it's nearing the end of the primary. I will then transfer it into a keg and let it condition for about 8 weeks. My question deals with diacetyl. Normally this is associated with lager strains, but I'm wondering if I have to worry about it with these special low-temperature ale yeasts? Is diacetyl only associated with lagers or is the temperature more of a key factor?

Michael Kesler
Milwaukee, Wisconsin

The real issue is not whether diacetyl is only associated with lagers, but rather if it is only unacceptable in lagers. Diacetyl is naturally found in all beers during fermentation and some beers can contain perceptible levels of diacetyl after aging. Diacetyl, also known as 2,3 butanedione, is produced outside of the yeast cell when the compound alpha-acetolactate is oxidized by metal ions or dissolved oxygen. During aging, yeast cells absorb diacetyl, use it as a hydrogen donor in biochemical reactions and convert into a flavorless alcohol called 2,3 butanediol. Style gurus all agree that diacetyl should never be found in lagers. Its presence is a sign of insufficient aging and is simply not acceptable in a type of beer named after its long, cold storage! Diacetyl can also originate from beer spoilage bacteria, especially *Pediococcus*,

and any off-flavor associated with bacterial contamination is bad, regardless of the fermenting strain. ("Wild beers," such as lambics, are of course held to a different set of rules.)

Oddly enough, if you asked the question "what is the easiest type of beer to brew without having to worry much about diacetyl," I would answer lager. In a classic lager fermentation there is plenty of time for diacetyl to be produced from alpha acetolactate and for yeast to absorb diacetyl and reduce it to 2,3 butanediol. The fact that lager yeast strains are typically less flocculent than ale strains also helps since contact between the yeast cell and beer is essential for beer-yeast interactions to occur. Although alt yeast is an ale strain, it is very non-flocculent. The cool, protracted method used to produce alt beers makes alts

more similar to lagers with respect to yeast behavior and fermentation technique than ales.

In other words, I would not worry much about diacetyl in your alt.

Thanks to advances in brewing science

over the past few decades, diacetyl is very well understood. The underlying biochemistry has allowed brewers to accelerate the aging process by manipulating beer temperature after fermentation. This has come to be known as the "diacetyl rest." The diacetyl rest is simply a

step in the fermentation process designed to reduce diacetyl levels. Some breweries have gone so far as to use immobilized yeast to speed up aging by increasing the contact between yeast and beer.

Globally, the result of this understanding has been a dramatic reduction in diacetyl levels in all sorts of beers.

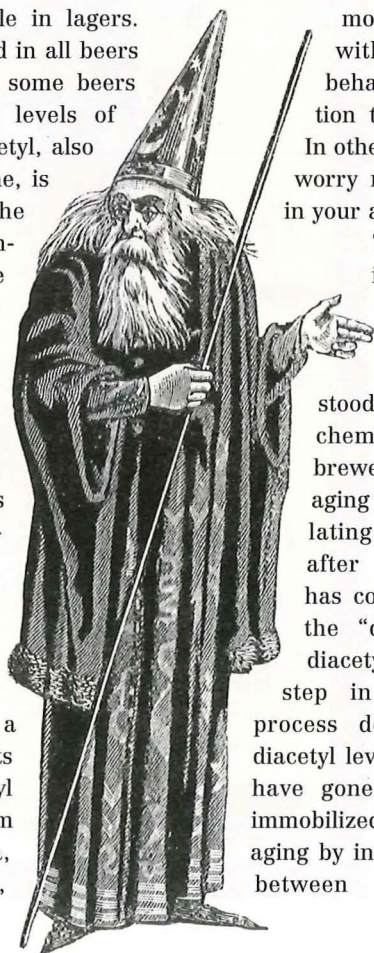
Diacetyl is one of those compounds some people like in small doses because it adds to the complexity of some beer (and wine) styles. Most brewers see it as a defect because of its association with beer spoilage organisms as well as its satiating effect on the consumer. For those brewers who wish to get more diacetyl, take the opposite route of alt brewing. Use a flocculent yeast, room-temperature fermentation, short aging and good racking techniques to minimize the amount of yeast carried into the bottle.

Mr. Wizard

Could you please cover the major types and strains of barley used in brewing? I often see recipes that call for specific types of barley, such as Harrington two-row. Others specify Klages. I understand these are barley varieties and not brand names. It would be good to know which varieties are present in various brands of malt.

Bill Wibbe
Philadelphia, Pennsylvania

I will try to cover the basics of malting barley varieties, but my answer is a very small tip of a very large iceberg! Barley grown for brewers malt is called malting barley, as opposed to feed barley, and is divided into two general types: two-row and six-row. The most obvious difference between a head of two-row barley and a head of six-row barley is the arrangement of the kernels when the head is viewed down its axis. The significant differences are found upon closer examination. In general, six-row malted barley has more protein and enzyme content than two-row malted barley, is thinner than two-row malt and contains less carbohydrate. There



"Help Me, Mr. Wizard"

are also flavor differences between two-row and six-row. Most brewers feel that two-row malt produces a fuller, maltier flavor and that six-row malt produces a grainier flavor in the finished beer.

Six-row barley is only grown in North America. Its high enzyme concentration after malting is one of the reasons cereal adjuncts like rice and corn can be used without causing problems with mash conversion. Six-row barley has become a symbol of what the European brewers don't use. However, six-row malt certainly has its place in brewing.

From a farmer's point of view, a good barley variety has good yield per acre, is disease resistant, does not have a tendency to lodge (fall over and make harvesting impossible) and does not shatter (the kernels fall out of the head onto the ground). Other traits include water requirements and ripening date.

The maltster has a different set of concerns. The maltster wants a barley

with excellent uniformity that is easy to germinate and modifies evenly during germination. Certain varieties require a considerable amount of coaxing in the malt house, for example in the steeping and aerating regimen, than others. If you are a maltster you definitely don't want a barley that makes your life too difficult.

Finally, there is the brewer. We want malt that makes good beer. Of course each brewer has different needs and the prudent brewer goes to a great deal of effort to ensure barley farmers and maltsters are producing malt to suit their needs. Other brewers rely on groups like the American Malting Barley Association to recommend and approve barley varieties based upon their brewing properties.

North American barley farmers grow both two- and six-row varieties. Examples of two-row varieties include Klages, Harrington, B1202 (a variety developed by Anheuser-Busch) and numerous varieties of Coors' Moravian

barley (for example, Moravian III). Six-row varieties include Morex, Russell, Excel, Robust and Stander. These are all spring barley varieties (planted in spring), which is the norm for North American malting barley varieties. The Europeans only grow two-row barley. Examples of European spring barley include Chariot, Alexis, Hana, Ferment, Steffi, Krona and Sissi. Winter varieties (planted in winter), mainly grown in England, include Maris Otter, Halcyon and Pipkin.

Of the varieties listed, there are only a few we as brewers ever hear mentioned. Klages is arguably the most noted American variety among home and craft brewers. It was a very prominent variety grown in the West and was prized by maltsters for its excellent malting properties. Harrington and B1202 have largely replaced Klages acreage because these varieties have better agronomic properties. Maris Otter is prized for its excellent malting and brewing properties in

The authors of CLONEBREWS have done it again!

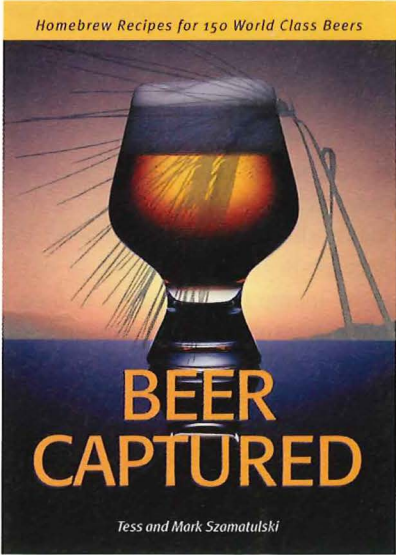
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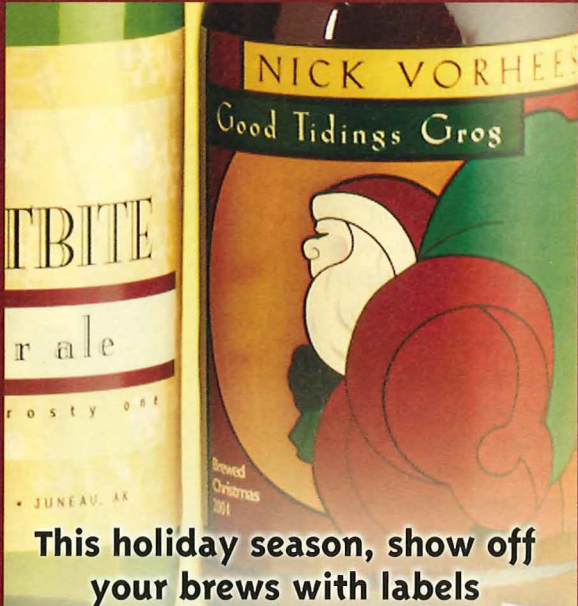
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England and Hana is one of the prized varieties used in the production of the lightly-modified Czech malts.

So how does the homebrewer use this information when it comes to buying malt? I wouldn't worry too much about hunting down a certain barley variety for a given recipe unless the variety is readily available as a "straight" malt. Most maltsters blend varieties after malting in order to produce a consistent product for the brewer. The only malt widely marketed by barley variety is Maris Otter. The U.K. maltsters who produce and sell floor-malted Maris Otter also sell "floor-malted ale malt" that is a blend of Maris Otter, Pipkin and Halcyon.

Usually, if the maltster wants the brewer to know what variety of barley is used in the malt they will advertise it. Oftentimes, brewers are more concerned about the lab analysis (typically referred to as the malt "spec" or specification sheet). Malt specs give insight into modification, protein content and size, wort viscosity, beta-glucan content, color, enzymatic activity, extract yield, moisture content, hardness or "friability" and aroma. This is why many malts are described by the type of beer they are intended to be used in — for example, ale, pilsner, lager and stout malts — instead of the variety of barley used in the malt. Big brewers are very concerned about malt specs and maltsters must produce malts to meet their specs. Maltsters accomplish this by blending various malts.

In practical terms, this means if you buy pale malt from a large malting company it has been designed to meet the specs of a large brewer because that's where the big malting companies make their money. If you want to brew beers with malts made from known varieties or single varieties, I would start by researching malt produced by smaller malting companies. Many small maltsters have Websites with good information about the varieties of barley they use. Some of these companies have U.S. sales representatives that will respond to questions about variety. You can then experiment with known varieties and determine how variety affects your beer.

Mr. Wizard

In reference to the table on page 54 in Steve Parkes' article "Enzyme Time" (September 2001), I typically do a single-infusion mash at a target temperature of 152° F. Since the beta amylase is most active between 131° and 149° F and alpha amylase is most active between 145° and 158° F, why is

it suggested to go straight to the rest at 144° to 149° F? The next rest shows temperatures of 158° to 167° F. What is the difference between a mash done the single infusion way at 152° F and one converted via the two rests described above? If I just raise or lower my target temperature 4° to 6° F, how close will I come to your mash?

*Michael Hackney
Cherry Hill, New Jersey*

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CIRCLE 5 ON READER SERVICE CARD

"Help Me, Mr. Wizard"

The table in question gives four main rests in the mash: the protein-beta glucanase rest (from 113° to 122° F), the fermentability rest (from 144° to 149° F), the extract rest (from 158° to 167° F) and mash-off at 172° F. The note at the bottom of the table suggests skipping the protein-glucanase rest when using well-modified malts, such as North American and British malt. These malts have had plenty of cell wall (beta glucan) and protein degradation during malting and this rest does not do much to the wort and resulting beer.

The first step recommended in this table is the 144° to 149° F rest. You are correct that the optimum temperature for beta-amylase is between 131° and 149° F and this rest is on the higher side of that optimum. It's important to note that the optimum temperature range for alpha-amylase is between 145° and 158° F. With your first rest in the 144° to 149° F range, you will have activity both from beta- and alpha-

amylase and the resulting wort will be more fermentable than a single-temperature mash at 152° F. Increasing fermentability results in a drier beer and a higher alcohol content.

The next step in the table is referred to as the extract rest. Although alpha-amylase activity rapidly drops off as the mash temperature increases above 158° F, the loss of activity is not instantaneous and some of the unconverted starch extracted from the grain is reduced in size by alpha-amylase during the last minutes of activity. Some refer to this as the extract rest since there is a further increase in extract yield. Finally, the mash temperature is increased to 172° F and all enzyme activity ceases and wort viscosity is further reduced before lautering begins.

If you have the proper equipment for multi-temperature mashing, do a test on a type of beer you like to brew. If you can do the test objectively, I would wager a few bucks that the step

mash will be a bit drier and the yield a little higher than the infusion.

These differences need to be put in context, however. If you typically brew really hoppy ales with a decent malt character the difference may be insignificant in the grand scheme of the flavor profile. On the other hand, if you like to brew lightly-hopped lagers with a very subtle malt character then the difference may be very obvious.

Mr. Wizard

I would like to get some specifics on brewing and mashing with rice. I want to make an America lager that is similar to Michelob for my friends. I have seen some recipes of this style that also called for corn grits or flaked maize as one of the ingredients. Could you give me a little more information on this as well?

I have always thought that corn typically gave beer "winey" flavor and I have not tried incorporating it into my

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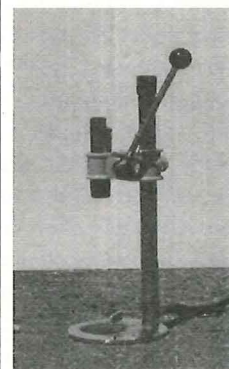
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CIRCLE 31 ON READER SERVICE CARD

beers. Any information you could provide on this subject would be greatly appreciated.

Brandon Wetzel
Telephone, Texas

The first thing I would do is run down to the local mini-mart and pick up a few six-packs of adjunct beers to get an idea what different adjuncts do to flavor. Michelob contains a small portion of rice in addition to malted barley. Budweiser contains a greater percentage of rice and Busch uses corn instead of rice. Perhaps the reason most homebrewers don't particularly appreciate these sorts of beers is that they typically contain very little in the hop department, both in terms of bitterness and aroma.

Personally, I think beers brewed with rice have a crisper, drier flavor profile than those made with corn. Beers brewed with corn adjunct have a sweeter, fuller flavor. I have brewed lagers and ales using both rice and corn and have never noted any wine-like flavors associated with either of these adjuncts.

Rice and corn are similar in the sense that they both are composed almost entirely of starch and lack enzymes. When used in brewing they serve to contribute fermentable sugars and add little flavor, no color and increase the physical stability (for example, chill haze) by diluting wort protein and polyphenol levels. They are also cheaper than malt, a fact that affects the commercial producer much more than the homebrewer.

When using rice or corn I prefer to begin with whole rice or corn grits (white or yellow) as opposed to flaked rice or corn. Any kind of rice will work. Rice syrup and rice flakes and corn syrup and flakes can be purchased at homebrew stores. The raw form is more challenging to use and adds to the fun of brewing an adjunct beer. The typical mash profile used for adjunct brewing is called the "American double mash" and is a hybrid form of decoction mashing. In double mashing, there are two mashes. The first is the "cereal mash" and contains all of the adjunct (which needs to be milled into a very

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CIRCLE 21 ON READER SERVICE CARD

**"Help Me,
Mr. Wizard"**

fine grist (like grits) and about 10 to 20 percent of the total malted barley. (For milling rice, a coffee mill will work better than a homebrew grain mill.) High-enzyme malts, such as domestic six-row and domestic two-row, are preferred because the adjunct dilutes the enzyme concentration of the mash. European malts, especially British ale malts, are usually lower in enzymes than North American malts and are

not recommended for use with mash adjuncts.

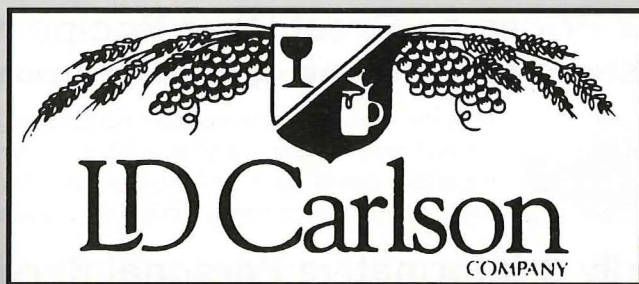
The cereal mash begins at about 158° F for roughly 15 minutes and then is quickly raised to boiling. Boiling helps to gelatinize the adjunct starches, which have a higher gelatinization temperature than malted barley and wheat. Boiling typically lasts for 20 to 30 minutes.

In the meantime, the second mash

is begun and held at around 120° F. This is called the main mash and accounts for between 65 and 75 percent of the total mash volume. When the cereal mash boil is complete it is added to the main mash and the mash temperature increases. The exact volumes and temperatures vary with the type of beer being made, but in the traditional double mash the cereal mash heats the main mash from its initial temperature to between 154° and 158° F. As with any other multi-temperature mash, some brewers use different intermediate rests, but all double mashes follow this general sequence.

I've had success in using one vessel for adjunct brews. I first perform the cereal mash in a full-sized mash vessel. Then the boiling cereal mash is cooled down with cold water. Once the mash temperature is near my first temperature step, I add the remaining malt and enough hot water to get the proper mash consistency and temperature. The remainder of the mash profile is like any other step mash.

You can also brew adjunct beers using flaked rice or corn. The flaking process gelatinizes the starch. This means they can be added to any type of mash without having to boil them. If you typically use a single-temperature infusion, you can add the flaked adjunct directly to the mash just like you would any other ingredient. Just remember that the adjunct dilutes the enzyme concentration and the amount of adjunct should not exceed more than about 40 percent of the total grist. (For more information on adjuncts, see page 42.) ■



From Grain To Glass And Everything In Between

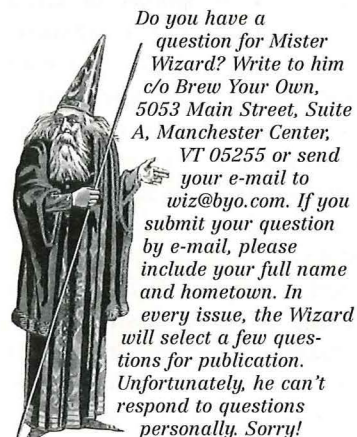
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Beers Cloned

BridgePort Porter and Easy Street Wheat

The Repl*ic*ator

by Steve Bader



Dear Replicator,

I used to live near Portland, Oregon and could not get enough of BridgePort Brewing Company's porter. Now that I live in Massachusetts, my only recourse is to bribe friends who travel there on business to bring me

back a six-pack. It has a very unique taste and I would love to be able to reproduce a similar brew!

*Dominick Pipitone
Watertown, Massachusetts*

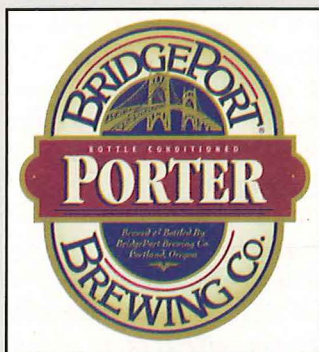
It's no wonder that you requested this beer. BridgePort's head brewer Karl Ockert is one of the pioneers of the Oregon microbrewing community. Karl was the original brewer for BridgePort when it opened in 1984 and brewed there for about 5 years. After a few stints in other breweries, Karl returned to his BridgePort roots and continues to brew his award-winning beers there.

Karl says this beer is more of a

robust porter, with strong dark malt flavors of roasted barley and chocolate malt. A robust porter is a bigger beer than a brown porter, with a bit more alcohol and more of the dark malt flavors. BridgePort Porter finishes a little sweet, with balanced hop bitterness. Karl recommends that you avoid over-bittering this beer, so try to keep your IBUs below 40. Your yeast should produce some fruitiness, with little to no diacetyl. BridgePort's Website also indicates that there are some mocha and nutty flavors. This beer is bottle conditioned, so it is ideal for a homebrewer to try. For more information check out BridgePort's Website at www.bridgeportbrew.com or call (503) 241-3612.

BridgePort Porter

(5 gallons, extract with grains)
OG = 1.056 FG = 1.015 IBUs = 35



Ingredients

6.6 lbs. Telford's amber malt extract syrup
1 lb. Muntons amber dry malt extract
0.5 lb. chocolate malt
0.75 lb. roasted black barley
8.7 AAU Magnum hops (0.67 oz. of 13% alpha acid) (bittering)

3.7 AAU Kent Golding hops (1 oz. of 3.7% alpha acid) (aroma)
California V Ale yeast (White Labs WLP051) or London Ale III (Wyeast 1318)
3/4 cup of corn sugar for priming

Step by Step

Steep crushed chocolate malt and roasted black barley in 3 gallons of water at 150° for 30 minutes. Remove grains from wort, add malt syrup and dry malt extract to wort, and return to a boil. Add Magnum hops and boil for 60 minutes. Add Kent Golding hops for the last 5 minutes of the boil. When done boiling, strain out hops and add wort to 2 gallons pre-boiled, cooled water in a sanitary fermenter. Top off with pre-boiled, cool water to 5.5 gallons.

Cool the wort to 80° F, aerate the wort and pitch your yeast. Allow the wort to cool over the next few hours to 68° to 70° F, and ferment for 7 to 10 days or until specific gravity reading stays constant. Prime and bottle your beer; age for at least 3 weeks for full flavor and enjoy!

All-grain option: Replace amber syrup and powder with 9 lbs. British pale malt, and mash your grains at 155° F for 45 minutes. Collect enough wort (7 gallons) to boil for 90 minutes and have a 5.5 gallon yield. Decrease bittering hops to 6.5 AAUs of Magnum hops (0.5 oz. of 13% alpha acid) to account for increased hop extraction efficiency in a full boil. The remainder of the recipe is the same as the extract.



Dear Replicator,

I have been searching for a clone recipe of Easy Street Wheat, brewed by Odell Brewing Company in Fort Collins, Colorado. Can you help me to recreate this easy drinking brew?

*Patrick Potter
Cheyenne, Wyoming*

Doug Odell, head brewer and owner of Odell, began homebrewing in 1975 (during what's considered to be the

dark ages of homebrewing) with extracts and dry yeast. Over time, he eventually moved up to all-grain brewing and, after some brewing classes at the University of California at Davis, he began commercial brewing in 1989. Here's what Doug has to say about brewing Easy Street Wheat.

Easy Street Wheat started out as a seasonal beer for Odell Brewing in 1991. They had originally thought that an unfiltered beer was too sophisticated for the market but they were wrong. Easy Street proved so popular that they had to make it a regular part of the lineup. It ended up knocking out Heartland Wheat, their filtered wheat beer. Doug says that Easy Street Wheat is best described as an "American-style wheat beer," which they do not filter.

This beer does not have the signature banana, clove or phenolic flavors associated with the German-style weizen beers. What this beer does have is light body, with some nice floral

and citrus (grapefruit) flavors. Since Easy Street is unfiltered, the yeast is encouraged to stay in suspension. They keg or bottle after mixing some of the yeast from the bottom of the fermenter, helping to give it some of its flavor and mouthfeel.

Doug says that they mash at a low temperature (148° to 150° F) in order to produce more fermentable sugars and to leave a low final gravity in this beer. Easy Street Wheat uses Cascade hops for bittering and Tettnanger for finishing. It also uses a low to medium flocculating Kölsch yeast, which gives it some delicate flavors and helps to leave the signature cloudiness in this beer. Easy Street won the gold medal at the 1993 Great American Beer Festival (GABF). It was named Easy Street because the brewers had it easy by not having to filter out the yeast. For more information about Odell Brewery go to the Website (www.odellbrewing.com) or call (888) 887-2797. ■

Odell Easy Street Wheat

(5 gallons, extract with grains)

OG = 1.045 FG = 1.008 IBUs = 13 to 18

Ingredients

3.3 lbs. Briess wheat malt extract syrup
1 lb. Briess wheat dry malt extract
1 lb. wheat malt
0.5 lb. Munich malt
2 oz. crystal malt (20° Lovibond)
3.75 AAU Cascade hops (0.75 oz. of 5% alpha acid) (bittering)
4.3 AAU Saaz hops (1 oz. of 4.3% alpha acid) (aroma)
4.5 AAU Tettnanger hops (1 oz. of 4.5% alpha acid) (aroma)
3/4 cup corn sugar for priming
German Ale/Kölsch yeast (White Labs WLP029) or Kölsch yeast (Wyeast 2565)

Step by Step

Steep crushed wheat, crystal and Munich malts in 3 gallons of water at 150° F for 30 minutes.

Remove grains from wort, add malt syrup and dry malt extract to wort, and return to a boil. Add the Cascade hops and boil for 60 minutes. Add the Saaz and Tettnanger hops for the last 2 minutes of the boil. When done boiling, strain out all the hops and add the wort to 2 gallons pre-boiled, cooled water in a sanitary fermenter. Top off with pre-boiled, cooled water to 5.5 gallons.

Cool the wort to 80° F with a wort chiller or in an ice bath. Aerate the wort well and pitch your yeast. Allow to cool over the next few hours to 68° to 70° F, and ferment for 7 to 10 days or until specific gravity remains constant. Bottle your beer, age for about one week and enjoy!

All-grain option: Eliminate the malt syrup and malt powder. Your grain

bill will be 3.75 lbs. of wheat malt, 3.75 lbs. of two-row malt, 0.5 lbs. of Munich malt and 2 oz. of 20° Lovibond crystal malt. Mash your grains at 148° to 150° F for 45 minutes. Collect enough wort (approximately 7 gallons) to boil for 90 minutes and get a 5.5-gallon yield.

Decrease bittering hops to 3 AAUs of Cascade hops (0.6 oz. of 5% alpha acid) to account for increased hop extraction efficiency in a full boil. The remainder of the recipe is the same as the extract.

If you have a favorite beer and would like to know how to replicate it, send your recipe request to the Replicator at edit@byo.com. Or write to us at Brew Your Own, 5053 Main Street, Suite A, Manchester Center, Vermont 05255.

Two Big Beers

Brit barleywine and German doppelbock

Styl^e calendar

by Tess and Mark Szamatulski

As a tradition, we always brew two beers in the month of December. The first one is an English barleywine. We close our homebrew store early and invite a few fellow brewers over to make a ten-gallon batch of this big British beer. We brew outside on a propane burner. The eve of our barleywine brew session also brings out the barleywine we brewed last December. It has been tucked away for a year, just waiting for the cold winter day when its successor is brewed. We also find time to take advantage of the weather and brew a doppelbock. Doppelbock is one of our favorite styles and can be lagered all winter.

English-Style Barleywine

OG = 1.080 to 1.120+

FG = 1.020 to 1.030+ IBUs = 50 to 100

SRM = 10 to 22 ABV = 8 to 12+%

Style Guidelines

English barleywines are the strongest ales offered by English breweries. Many are dated by vintage. Fullers Vintage Ale, for example, is dated by year and each bottle has its own serial number. Ballard's barleywine was once brewed to the original gravity of the year. The term barleywine is used to imply that these beers are as potent as wine, with alcohol by volumes (ABVs) as high as 15 percent. They are aged extensively before they are put to market and are usually released for the winter and holiday season. Barleywines are sometimes brewed for a special event, a royal wedding, the birth of a royal heir or a coronation. In general, the difference between English and American barleywines is that the American barleywine puts more emphasis on hop character and uses American hops.

Our English-style barleywine has a light-brown head that sits on a deep amber beer. The flavor is full of toffee

malt with a citrusy dryness and a vinous flavor. In England, oak barrels full of barleywine are rolled around the brewery to rouse the sleeping or drunk yeast. This produces the complex wine-like flavors that are traditional to this style. In this recipe, the aroma is moderately to intensely fruity tempered with caramel. The English hops range from mild to lightly assertive. The high alcohol content may cause low head retention.

The color ranges from burnished gold to very dark amber to brown with ruby highlights. Fruity in flavor, the focus is on the malt. Hop bitterness must balance the flavor and be prevalent. The alcohol should be apparent and some oxidative flavors may appear. English barleywines are full-bodied and smooth. Alcoholic warmth should be present.

Commercial Beers to Try

Young's Old Nick, Fuller's Golden Pride, Ballard's Trout Tickler, Bass No. 1, Whitbread Gold Label and Woodforde Headcracker are all good examples of barleywine.

Hops, Malt and Yeast

High-alpha hops (Target, Brewers Gold U.K., Challenger, Herald, Northdown, Omega, Phoenix or Pioneer) should be used for bittering (8 to 16 percent). Any English hop can be used for flavor and aroma such as U.K. Fuggles, Kent Goldings, Challenger, Target or Northdown.

A well-modified English two-row pale malt should comprise the majority of the grain bill, with Maris Otter being the superior malt. Use crystal for sweetness and color (up to 1.5 pounds in a five-gallon batch) and use up to 8 ounces of torried wheat for head retention. In the grain with extract recipe, up to 2 ounces of chocolate malt may be used for color. Use a U.K. extract, such as Muntions or John Bull.

For yeast, use Irish Ale (Wyeast 1084), London Ale (Wyeast 1028), London Ale 111 (Wyeast 1318) or California Ale V (White Labs WLP051). A one-quart starter, Wyeast tubes or XL packs should be used to begin fermentation. Three days before bottling, dose the beer in the carboy with the same strain of yeast that the beer was fermented with (1.75 fluid oz. liquid yeast) and carefully rock the carboy. This will ensure that the beer has reached the desired final gravity and will assure carbonation.

Serving Suggestions: Serve at 55° F in a brandy snifter with a light entree salad of seared sea scallops, grilled figs, Stilton cheese and watercress. Deglaze the pan that the scallops were seared in with barleywine and butter. Drizzle sauce over the salad and add touch of olive oil, sea salt and pepper.

English-Style Barleywine

(5 gallons, extract with grains)

OG = 1.104 to 1.106 FG = 1.025 to 1.026

SRM = 28 IBU = 59 ABV = 10.1%

Ingredients

14 oz. British crystal malt (55° Lovibond)
6 oz. torried wheat
2 oz. British chocolate malt
12 lb. Muntions extra-light dry malt extract
8 AAUs Northdown (1 oz. of 8% alpha acid) (bittering)
9 AAUs Fuggles (2 oz. of 4.5% alpha acid) (bittering)
5 AAU East Kent Goldings (1 oz. of 5% alpha acid) (flavor)
1 tsp. Irish moss for 15 minutes
2.5 AAUs East Kent Goldings (0.50 oz. of 5% alpha acid) (aroma)
2.25 AAUs Fuggles (0.50 oz. of 4.5% alpha acid) (aroma)
London Ale (Wyeast 1028) or California Ale V (White Labs WLP151)

1-1/4 cup Muntons extra-light dried malt extract (DME) for priming

Step by Step

Bring 1 gallon of water to 155° F, add crushed grain and hold for 30 minutes at 150° F. Strain the grain into the brewpot and sparge with 1/2 gallon of 168° F water. Add the dried malt extract and bittering hops. Bring the total volume in the brewpot to 4 gallons. Boil for 45 minutes, then add the flavor hops and Irish moss. Boil for 14 minutes, then add the aroma hops. Boil for one minute, then remove the pot from the stove. Cool the wort for 15 to 25 minutes in an ice bath or chill with a wort chiller.

Strain into the primary fermenter and add enough pre-boiled water to obtain 5-1/8 gallons. Add yeast when wort has cooled to below 80° F. Oxygenate-aerate well. Ferment at 68° F to 70° F for 7 days then rack into secondary (glass carboy). Ferment at 68° F to 70° F until target gravity has been

reached and beer has cleared (approximately 6 weeks). Prime and bottle the batch. Carbonate at 70° to 72° F for 3 to 4 weeks. Store the beer at cellar temperature.

Partial-mash option: Acidify the mash water to below 7.2 pH. Mash 2.25 pounds British two-row pale malt and the specialty grains in 1 gallon of water at 151° F for 60 minutes. Sparge with 1.5 gallons of water at 5.7 pH and 168° F. Then follow the extract recipe, omitting 2.25 pounds of Muntons extra-light dry malt extract from the boil.

All-grain option: Acidify the mash water to below 7.2 pH. Mash 18.5 pounds British two-row pale malt and the specialty grains in 6.25 gallons of water at 151° F for 90 minutes. Sparge with 5.5 gallons of water at 5.7 pH and 168° F. The total boil time is approximately 120 minutes.

Add 13.5 AAUs of bittering hops for the last 90 minutes of the boil. Add

the flavor hops, Irish moss and aroma hops as indicated by the extract recipe. To make this mash more manageable, you can decrease the pale malt by 5 pounds (2.3 kg.) and add 3 pounds (1.36 kg.) Muntons extra-light dry malt extract into the boil.

Helpful Hints: If your water is soft (below 50 ppm hardness) add 1/4 tsp. gypsum, 1/4 tsp. non-iodized table salt and 1 tsp. calcium carbonate (chalk). If it is moderate (between 50 to 200 ppm hardness) add 1/4 tsp. gypsum and 1/4 tsp. non-iodized table salt. If your water is hard (greater than 200 ppm) dilute it one-to-one with distilled water and add 1/4 tsp. gypsum and 1/4 tsp. non-iodized table salt.

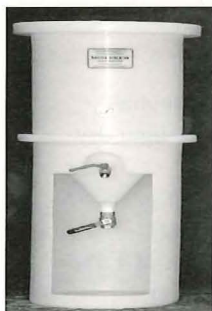
This English barleywine is ready to drink two months after it is carbonated. It will peak between six and eighteen months and will last for up to two years at cellar temperatures. Adding another dose of yeast three days before bottling will ensure that the beer is

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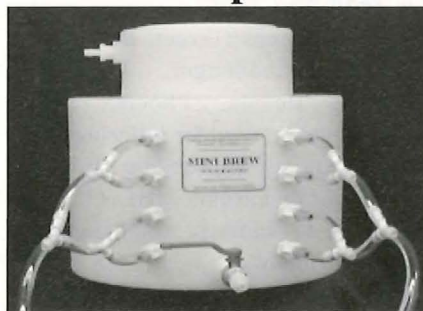
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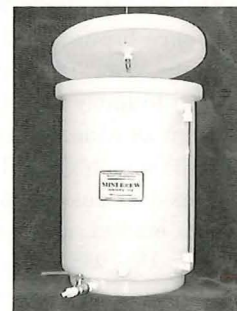
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Doppelbock

OG = 1.072 FG = 1.011 to 1.020

IBUs = 20 to 35 SRM = 4 to 10

ABV = 6 to 7.5%

Doppelbock was first developed and brewed in 1780 in Munich, Germany by the brothers of St. Francis of Paula (the Paulaner monks of Munich). They named it after the Savior (Salvator) who they worshiped. This malty beverage, often called "liquid bread," was brewed for sustenance during the long Lenten season. The original, historic versions were less attenuated than today's versions. The alcohol was lower and consequently the sweetness was higher. Many doppelbocks have the suffix "ator" in their names, imitating the original Salvator. In order to be an "-ator" the beer must have an OG greater than 1.074.

Style Guidelines

Most examples of doppelbocks are dark in color, due to the malt. There are, however, some pale examples of this style. The aroma is of intense malt with no hop aroma. Diacetyl should be low to none. Fruit aroma, described as grape, dried fruits or plums, may be evident because of the reactions between the malt, boil and lagering. In the darker offerings, a slight roasted aroma may be evident.

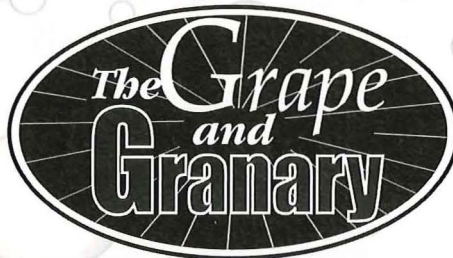
The color ranges from gold to dark brown. The beer should have good clarity due to lagering. Head retention and carbonation might be impaired by high alcohol levels.

Doppelbocks are full-bodied, rich and malty. Alcohol should be evident with a subtle, warming pleasantness and no harshness or burning (no fusel oils). There is little to no hop flavor and bitterness varies from moderate to low. The hops always allow the malt to dominate the flavor.

Hops, Malt, Adjuncts and Yeast

Continental European hops should be used throughout this beer, with the higher alpha acid varieties for bittering. In certain versions, flavor hops are

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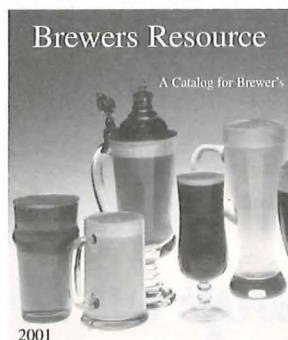


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put in the kettle but no aroma hops are used. Hop varieties include German Northern Brewer, German Hallertau Hersbrucker or Mittelfrüh and Tettnang. For pale versions, German pale lager malt should be the base grain. Munich and Vienna malts are used in the darker versions (this is where the color comes from), with a small fraction (1/2 to 2 ounces per five gallons) of dark-roasted malt. When doing a grain with extract version, use a German-style malt extract, such as Bierkeller or Weyermann. Use 6 ounces to 1 pound of malto-dextrin to emulate the maltiness of decoction mashing. German lager yeasts should be used, such as Munich Lager (Wyeast 2308), Bavarian Lager (Wyeast 2206), Bohemian Lager (Wyeast 2124) or Old Bavarian Lager (White Labs WLP920).

Commercial Beers to Try

The original doppelbock is Paulaner Salvator. Ayinger Celebrator, Spaten Optimator, Augustiner Maximator, Hacker-Pschorr Animator and Würzburger Hofbrau Sympator are a few other fine examples.

Serving Suggestions: Serve in a stemmed goblet or tumbler glass at 50° F with Chateaubriand and oven-roasted mushrooms and baby potatoes in a sauce made with doppelbock.

Doppelbock

(5 gallons, extract with grains)
OG = 1.083 FG = 1.022 to 1.023
SRM = 35 IBU = 24 ABV = 7.6%

Ingredients

12 oz. German Munich malt
12 oz. Belgian caraMunich malt
8 oz. German dark crystal malt
(65° Lovibond)
2 oz. British chocolate malt
7 lb. Bierkeller light malt
extract syrup
3 lb. Muntions extra-light
dry malt extract (DME)
8 oz. malto-dextrin
7.5 AAUs German Northern Brewer
(1 oz. of 7.5% alpha acid) (bittering)
1 tsp. Irish moss
Bavarian Lager (Wyeast 2206) or
(White Labs WLP920)

1-1/4 cup Muntons extra-light dry malt extract (DME) for priming

Step by Step

Bring 1 gallon of water to 160° F, add crushed grain and hold for 30 minutes at 150° F. Strain the grain into the brewpot and sparge with one gallon of 168° F water. Add the malt extract syrup, DME, malto-dextrin and bittering hops. Bring the total volume in the brewpot to 3.5 gallons. Boil for 45 minutes, then add the Irish moss. Boil for 15 minutes, then remove the pot from the stove. Cool wort for 15 to 20 minutes in ice bath or chill with wort chiller. Strain into the primary fermenter and add enough pre-boiled water to obtain 5-1/8 gallons. Add yeast when wort has cooled to below 70° F. Oxygenate-aerate well. Start fermentation at 60° to 62° F until fermentation begins (24 hours). Bring primary fermenter to 47° to 52° F for 7 days then rack into secondary. Ferment at 47° to 52° F until target gravity has been

reached and the beer has cleared (this will take roughly five weeks). Prime and bottle. Carbonate at 70° to 72° F for two to three weeks. Store at cellar temperature.

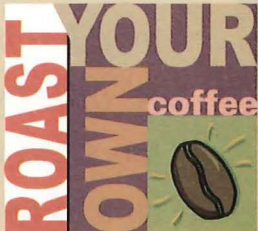
Partial-mash option: Acidify the mash water to below 7.2 pH. Mash 1 pound German two-row pilsner malt and the specialty grains in 1 gallon of water at 122° F for 25 minutes and then at 153° F for 60 minutes. Sparge with 1.5 gallons of water at 5.7 pH and 168° F. Then follow the extract recipe, omitting 1.75 pound of Muntons extra-light dry malt extract from the boil.

All-grain option: Acidify the mash water to below 7.2 pH. Mash 11 pounds German two-row pilsner malt, the specialty grains and an additional 3.25 pounds of Munich malt in 5 gallons of water at 122° F for 25 minutes and then at 153° F for 90 minutes. Sparge with 5.25 gallons of water at 5.7 pH and 168° F. The total boil time

is approximately 105 minutes. Add 6 AAUs of bittering hops for the last 90 minutes of the boil. Add the Irish moss as indicated by the extract recipe.

Helpful Hints: If your water is soft (below 50 ppm) add 1/4 tsp. gypsum, 1/2 tsp. non-iodized table salt and 1.5 tsp. chalk. If your water is moderate (between 50 to 200 ppm) add 1/4 tsp. chalk. If it is hard (greater than 200 ppm) dilute it one-to-one with distilled water and add 1/4 tsp. calcium carbonate (chalk). This beer can be lagered for three to four weeks. Begin lagering at 45° F and slowly decrease the temperature to 34° F over a period of two weeks. This doppelbock will peak between five and nine months after it is carbonated and will last at cellar temperatures for one year. ■

Tess and Mark Szamatulski are the authors of "Clonebrews" (Storey Publishing, 1998) and "Beer Captured" (Maltose Press, 2000).



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by horst d. dornbusch

With recipes and help in the Finnish
language from Mark Naski

*"She, the maid who
beer concocted,
Gathered six of grains
of barley,
Seven hop tassels next
she gathered,
And eight ladles
of water,
Then upon the fire
she placed it,
And allowed it there
to simmer,
And she boiled the
ale of barley,
Through the fleeting
days of summer,
Poured it then in
wooden barrels,
And in tubs of birch
wood stored it."
(From Kalevala, the
ancient Finnish
national epic.)*

PHOTO COURTESY OF THE FINNISH TOURIST BOARD

Even in modern times, sahti is still drunk out of a sahtihaarikka, a wooden bucket, often made from staves of juniper. A sahtihaarikka looks much like a horned Viking helmet turned upside down. It has two handles, one on each side, which allows for a firm grip even when the imbiber's motor control may no longer be reliable.

Illustration by Luanne Naski

MIGHTY FINN BEER

Celebrate the festive season with sahti, an ancient ale spiced with juniper.

Finland, a land of the midnight sun, covered with vast taiga forests and dotted with placid lakes, is home to one of the oldest continuously-brewed beers in the world, sahti. The name literally means juice (from grain) and probably derives from the German word for juice: saft. The beginnings of sahti are shrouded in mystery, but it is likely that the Finns started making sahti no later than a few centuries after their arrival in their northern homeland. The Finns — like modern Laplanders, Estonians, Hungarians and western Siberians — are descendants of the Ugrians, an ancient Asiatic people from east of the Ural Mountains. Some of the Ugrian bands started to migrate west about 2000 BC. By the first century AD, they had reached southwestern Finland. What we now refer to as the Finno-Ugric family of languages is very different from the Indo-Germanic languages used in the rest of Europe. Finno-Ugric speech is characterized by relatively long words that are rich in vowels and poor in consonants. It is therefore peculiar that the Finns' word for their traditional beer appears to derive from German. The regular Finnish word for beer, incidentally, is olut.

Sahti is a hazy, unfiltered coppery ale, usually between 6 and 9% alcohol, with a buttery to tangy aroma and a winy to spicy palate. It is a beer with genuine pagan roots. So if you are thinking of a spiced holiday brew for this year's festive season, consider making a sahti. Ever since the Bronze Age, most brews in Europe probably tasted much like sahti, because the early beers were often flavored with such plants as bog myrtle, yarrow and juniper. Perhaps only in a country like Finland, tucked away in the northernmost corner of the continent and protected from outside influences by its forbidding climate, somber remoteness and inaccessible language, could the brewing of such an ancient beer style survive largely unchanged.

Partigyle Brewster Juice

Similar to the partigyle brewing technique in use in some modern breweries, two different runnings of this Finnish "juice" were traditionally



PHOTO BY ELVA ELLEN KOWALD

Juniper twigs traditionally were boiled in the brewing water and placed under the grain in the mash.

fermented separately. The beer from the first runnings, though generally made by women (brewsters), was not consumed by them. The Finns considered this beer men's sahti. Once the grain bed had run dry, the mash was washed again with fresh hot water. The weak wort from this second running yielded a thin sahti, the only beer the brewsters were allowed to keep for themselves. The Finns called this weak beer *jälkijuoma*, which, literally, means "nosedrops." When you brew a batch each of mighty sahti and nose-drops from one mash, however, there is no harm in sparging continuously, without letting the grain bed run dry.

Sahti was generally brewed under the direction of the oldest woman in the household or village, since she had years of experience and knew all the tricks involved in preparing different sahtis for different occasions. Being a brewster in ancient Finland must have been a thankless job — all work and no fun. Sometimes, when male demands for strong libation exceeded supplies, the women even missed out on their thin sahti. Then they had to add sugar or honey to the fermenting nosedrops to turn them into a rough-tasting, high-alcohol brew, also destined for the masters of the tribe.

Unlike wort for modern beer, sahti wort was usually not boiled, but fer-

mented straight from the mash tun. When the Finns did boil their wort, it was not to coagulate proteins into trub or to isomerize and extract the hops' alpha-acids, as we do today, but to increase the brew's gravity. The beer that resulted from a boiled wort was called *tupulisahti*, which means "strong sahti." Just think of *tupulisahti* as the Finnish equivalent of a British barleywine or a Bavarian doppelbock.

Ale Born of Myth and Lore

Earliest records of Finnish sahti brewing are contained in the *Kalevala*, the Finnish national epic. *Kalevala* is the name the Finns gave their land after their migration from north-central Asia. Finnish did not emerge as a written language until the middle of the sixteenth century, so the saga was transmitted only as oral folklore. It first appeared in book form in 1835, when it was arranged and edited by a physician named Elias Lönnrot. It is a measure of the importance of beer in the daily lives of ancient Finns that the *Kalevala* contains some 400 stanzas about brewing, but only about 200 about the creation of the world! Sahti was certainly a regular affair in Finnish society by the Middle Ages, as we know from a rare report of a raucous funeral ceremony for a bishop named Hemminki, who died in 1366. By then, sahti was brewed in almost every home in the countryside.

Sahtis are made primarily with malted barley, probably kilned to a color rating somewhere between 10 and 20 °L. Sometimes sahti also contained an addition of malted rye, a grain that was apparently first cultivated in Finland in the twelfth century. Rye-based worts tend to yield a milder, lower-alcohol beer than do barley-based worts and give it a creamier, almost oily texture. The amount of rye varied greatly in traditional sahtis. Some sahtis were even brewed from rye alone, and, in some areas, malted oats were also part of the grain bill. Sahtis brewed from rye, however, usually did not contain junipers or hops.

Before commercial malts were readily available, sahti makers steeped sacks of grain in lakes or streams until the kernels began to sprout. After the

brewing grain had germinated, the Finns used their saunas to dry, kiln or even roast it (and probably drank the beer there as well). They opened the bags of moist, sprouted grain and spread the kernels over benches in a thin layer, while the fire was heating the room to the proper kilning temperature, anywhere between 110 to 220 °F. Kilning took about two to four days, during which the malt was stirred frequently so that it dried evenly and did not turn sour. Sometimes the Finns used a "smoke sauna" for kilning, where they burned raw, smoky juniper and alder wood to give the malted grains extra flavor.

The effect of sauna kilning on the grain is very similar to that of the kilning methods now used in the production of modern crystal malt. Such malt is first wetted and then held in a closed, heated container so that the moisture cannot escape. This results in a virtual premashing of the grain, during which proteins and starches are already being converted (modified) by the grain's enzymes. The maltster then dries the crystal malt with the vents open until the kernels become hard and crystalline and the endosperms take on a glassy appearance. The hardened sugars dissolve readily in the hot mash liquor and thus add non-fermentable (residual) sugars to the beer. These provide body and impart a pleasant nutty flavor and a slight sweetness. For modern sahti, therefore, an addition of 10 to 20% crystal or Munich malt to the grain bill will improve the authenticity of the brew.

Traditional mashing in Finland involved the gradual heating of the mash with the addition of hot water, usually in a wooden mash tun. The effect would have been similar to that of a modern step-infusion mash, which guarantees the conversion of both proteins and starches. To enhance the beer's aroma, juniper twigs (with or without) berries were often boiled briefly in the brewing liquor that was used to infuse the grain in the mash tun. Mashing by this method took several hours. At the end, the sahti brewster or brewer dropped red-hot stones into the mash to bring it a boil. The

stones were heated — where else! — over the sauna fire. Such a mash boil we would now call a decoction.

During lautering, the Finns placed juniper twigs under the mashed grain to impart bitter flavors to the wort. Juniper (*Juniperus communis*) grows as a coniferous shrub or columnar tree that is perhaps the most widely distributed tree in the world. It does well throughout most of the Northern Hemisphere, including North America. It can be found beyond the tree limit, from Alaska to Newfoundland, Greenland and Iceland. It ranges south through New England to the Carolinas and west through northeastern Illinois, Indiana, northern Ohio, Minnesota and Nebraska to the western mountains of Washington, California, Arizona and New Mexico. If juniper boughs are not available where you live, you can substitute them with fir or cedar twigs, but don't overdo it or else the sahti will taste more like Greek retsina wine than beer! If the juniper twigs are laden with berries, the bittering effect is also considerable stronger.

Sahti makers usually place whole hops on top of the juniper twigs in the lautering tun. Sometimes they add whole-hops tea (hops boiled or steeped in water) to the fermenter. The old Finns measured their hops by the handfuls. Depending on the size of the brewer's or brewster's hand, therefore, the hops content of a brew could differ considerably and every sahti maker had to experiment with hop loadings before the beer tasted just right. Some sahtis were even made without hops.

The first hops were probably grown in Finland around the twelfth century. To ensure an ample supply of hops for sahti throughout the land, there were even times when the law forced farmers to cultivate the vine. Even now, hops still grow wild in much of southern Finland, and it is generally accepted that these are "runaways" from the farmers' gardens of old.

Traditional Finnish hop types were rather harsh and rough-tasting by modern standards. They were almost too potent to be used fresh in brewing. The Finns, therefore, developed the practice of drying and storing their

hops until the color turned from green to grayish brown. Old hops are, of course, anathema to modern brewers, because the hops' alpha-acids oxidize during storage and cease to be wort soluble. In sahti making, however, it is not the bittering of the alpha-acids — which could clash with the juniper flavor — that is desired, but the preserving qualities of the beta-acids, which add very little flavor, but become wort soluble only after oxidation. Old leaf hops, therefore, are great for this brew. Since sahti wort is not boiled, only the hops' grassy flavor and aroma components reach the brew. Bittering values (in IBU) are therefore lacking from any sahti specification.

Most of us are probably familiar with juniper from the flavor it imparts to gin, but juniper — like hops — serves also as a disinfectant. Some brewers even washed their brewing vessels with hot juniper water called katajavari. Sahti brewed in washed vessels, it turned out, was usually of high quality. Unbeknown to the early Finns, of course, the boiling water helped to kill any bacteria that might reside in the vats. Thus, it was probably improved sanitation rather than the flavor contribution of the juniper water that was responsible for the improvement in sahti quality.

Some sahti makers simply let their mashes rest after the boil, and, instead of lautering the grain, ladled the wort from the top of the mash straight into the fermenter. Sometimes they even let the mash itself ferment. The finished beer was then drawn off the grain or ladled from above the grain into a mug for drinking.

The ancient Finns lautered their mash by ladling it into a long wooden trough-like vat, about six feet long and about one-and-a-half feet deep, with a bung hole at one end. The vat was usually carved from a single tree trunk (mostly aspen). In some areas, the Finns also lautered their sahti in an upright, three-legged tub instead of a horizontal trough. They arranged small pieces of wood as trub dams along the bottom of the vat and covered these with a layer of straw as a false bottom, on top of which they

placed a layer of twigs for flavor.

For lautering, the traditional sahti maker simply removed the bung from the vat, but only after the entire mash was transferred, and let the grain bed run dry. The first runnings of the extract were often poured back into the vat for additional filtering. This is similar to our modern practice of recirculating the wort. Unlike in modern brewing, though, the wort thus collected was usually not boiled. Instead it was fermented as is.

Traditionally, the Finns used open vats for sahti fermentation. Since maltiness was the main flavor objective and hop bitterness was less important, a sahti had to be well attenuated during fermentation to reduce any syrupy sweetness. Sweetness was allowed only in nosedrops. The dry aftertaste of a properly made sahti, therefore, resulted from a combination of juniper and good attenuation. In reverence to tradition, many sahti breweries in Finland still use bread yeast to this very day, but for more predictable results you can use a modern ale yeast.

At the end of primary fermentation, the ancient Finns transferred sahti off the sediment into wooden barrels. In summer, these were stored in cool root cellars for secondary fermentation. In winter, they were stored in heated rooms to keep them from freezing. Once fully attenuated, sahti was usually consumed quickly and straight out of the barrel. There is no tradition of bottling sahti in Finland, though it is now available in jugs, cans or bottles from modern breweries. Commercial sahtis, nowadays, also tend to be weaker than the traditional originals, brewed to a strength of about 5 to 6% alcohol by volume, halfway between a sahti of old and nosedrops. After fermentation, traditional sahti was stored in a cool place of about 40 °F to age.

Nowadays, the most popular beers in Finland, as in virtually every country in the world, are mass-produced German-style lagers. By the twentieth century, sahti brewing had virtually disappeared in Finland, because large breweries did not bother with the style for economic reasons, and private sahti brewing had simply been outlawed by

the government. It was only in 1985 that the government responded to the lobbying efforts of a few intrepid sahti enthusiasts and started to grant licenses to small commercial sahti breweries. The first to gain such a license was Pekka Kääriäinen, who founded Lammin Sahti Oy, in Lammi, in Central Finland, some 200 miles north of Helsinki. Now there are about half a dozen microbreweries across Finland supplying a niche market for the traditional ale of their forefathers (or "foremothers," since the ale was usually brewed by women!). Their brews are distributed by the state-run alcoholic beverage system, and sahti is now a regular entry at the annual Finnish Beer Festival.



PHOTO BY ELVA ELLEN KOWALD

Making Sahti with Modern Ingredients

Sahti requires a relatively large grain bill, if you are making both mighty sahti and nosedrops from the same mash. Expect to use about 18 pounds of grain or at least 14 lbs. of extract for one five-gallon batch of each. Modern brewers can use two-row barley as a foundation grist (or English pale ale malt extract) with the addition of some Munich malt for color.

ONLY IN A COUNTRY LIKE
FINLAND, TUCKED AWAY IN THE
NORTHERNMOST CORNER OF
THE CONTINENT AND
PROTECTED FROM OUTSIDE
INFLUENCES BY ITS FORBIDDING
CLIMATE, SOMBER REMOTENESS
AND INACCESSIBLE LANGUAGE,
COULD SUCH AN ANCIENT BEER
STYLE SURVIVE LARGELY
UNCHANGED.

THE NAME SAHTI LITERALLY
MEANS JUICE (FROM GRAIN).
IT IS ONE OF
THE OLDEST CONTINUALLY
BREWED BEERS IN THE WORLD.

Though not listed in all recipes here, you can always add an optional pound of malted rye for creaminess.

The recipes here take into account some of the variations in traditional Finnish brewing processes. You can add the hops to the mash or to the wort. You can boil the mash similar to a decoction process, or you can make the beer without boiling either the mash or the wort. Extract brewers should steep all flavor ingredients (twigs, juniper berries, hops and cracked malt) in hot brewing liquor before adding the canned malt. But never boil the twigs, because under prolonged exposure to high heat, they tend to impart a retsina- or turpentine-like flavor to the wort that can make the brew almost unpalatable. Purchase juniper berries in the spice section of your grocery store or supermarket. Specifically, do not experiment with any juniper preparations, such as juniper oil. These are usually designed for medicinal purposes only, and some may even be harmful if ingested!

At the start of the sparge, you can collect the initial runnings and pour them back over the mash for recirculation. Continue to recirculate the runnings until the extract runs clear. If the original gravity of the "men's" wort ends up to be higher than specified in the recipes (see gravities there), ladle small amounts of the nosedrop wort into it until you reach the target gravity. If the "men's" wort is too weak, you have no choice but to ferment it as is or to boil off excess liquid in the fashion of a tupulisahti. If the nosedrop wort is too strong, simply add another dose of hot water to the mash and draw off some additional, now very weak wort, to thin out the nosedrops. If the nosedrop wort is too weak, you may wish to "sacrifice" some of your "men's" wort to enrich the "women's" wort. Alternatively, you can free-style blend the two worts for any combination of gravities — and thus alcoholic strengths — you desire.

Once fermented (for fermentation times, see recipes), sahti is ready for consumption. But you get a mellower product if you let sahti mature and sed-

iment for one to two months, or longer. Nosedrops are at their peak after three months, while sahti, because of its higher alcohol content, mellows out after five months. Sahti and nosedrops are a bit turbid by nature, so there is no need to fine these brews, nor should they be filtered. Like all unfiltered, unpasteurized brews, sahti will ultimately go past its prime, but if stored at cold temperatures, it should last up to a year.

Sahti and nosedrops are only gently carbonated beverages. Priming is optional in sahti brewing. If you decide to bottle-condition your sahti, use at most half the usual amount of priming sugar or dried malt extract. Using a quarter teaspoon added into each 12-ounce bottle works well. If you serve your sahti or nosedrops out of Cornelius kegs, maintain a pressure of no more than 5 to 8 psi.

When you toast with sahti, say: "Kippis." It's Finnish for "cheers." ■

Horst Dornbusch was born and raised in Düsseldorf, Germany. He has been a resident of North America, first Canada and then the United States, since 1969. Horst has been a homebrewer since 1972. He is an active contributor to Brew Your Own and has three beer books to his credit: "PROST! The Story of German Beer" (Brewers Publications, 1997) and two volumes of the Classic Beer Style Series by Brewers Publications: "Altbier" (1998) and "Bavarian Helles" (2000).

Mark Naski (his real name is Markku) was born and raised in the small village of Hamina on the southeast coast of Finland, about 20 miles from the Russian border. The commercial brewing of sahti was illegal then (and is still highly regulated today). So Mark and his friends used to fish for salmon, which they traded for carboy-size milk containers filled with bootlegged sahti from a farmer 100 miles away. In 1972, Mark moved to Helsinki, where he became a computer scientist and homebrewer. In 1978, he moved to Canada and, in 1991, to St. Louis, where he has brewed many a batch of sahti and nosedrops.

All-Grain Sahti and Jälkijuoma (Mighty Sahti and Nosedrops)

OG: 1.095 (Mighty) and 1.045 (Nosedrops) FG: 1.025 (both)
ABV: 9.1% (Mighty) and 3.8% (Nosedrops)

18.5 lbs. English pale ale malt
2.2 lbs. Munich malt
3 oz. juniper berries
2.25 oz. any noble hops
with about 4% AA
Juniper twigs (or cedar or fir)
Wyeast 1084 (Irish Ale) yeast

Mash in at 120 °F. Add juniper berries and hops. Raise the mash temperature slowly over 90 minutes to the boiling point. Boil the mash for 10 minutes. Place juniper twigs on the false bottom of the lauter tun to cover it with a single layer. Ladle the mash into the lauter tun. Start sparging. Sparge the first 5 gallons into one container for Mighty Sahti. Sparge the second 5 gallons into a separate container for Nosedrops.

At the end of the sparge, raise the temperature of both worts to 180 °F and hold it there for 20 minutes to sterilize them. Do not boil! Let cool to about 70 °F and add yeast. After 3 days, siphon the Nosedrops into jugs or bottles and store in a cool place at 35 °F to cause the fermentation to stop and to ensure that the Nosedrops taste slightly sweet. Ferment the Mighty Sahti for 7 days. Then siphon into jugs or bottles and store in cool place (40 °F). Serve cold. Pour gently to avoid rousing sediment.

Extract Sahti and Jälkijuoma (Mighty Sahti and Nosedrops)

OG: 1.095 (Mighty) OG: 1.045 (Nosedrops) FG: 1.025 (both)
ABV: 9.1% (Mighty) and 3.8% (Nosedrops)

SAHTI AND NOSEDROPS

Six five-gallon recipes for making grain juice the Finnish way

14.25 lbs. English pale ale malt extract
2.2 lbs. Munich malt
3 oz. juniper berries
2.25 oz. any noble hops
with about 4% AA
Juniper twigs (or cedar or fir)
Wyeast 1084 (Irish Ale) yeast

Crack the Munich malt and place grains in steeping bag. Bring 2–3 gallons of water to a boil. Turn off the heat and immerse the juniper twigs, the juniper berries, the hops and the bag with cracked Munich malt into the liquid. Let stand for about 30 minutes. Strain the hot liquor and separate into two equal portions. Add 9.5 lbs. of extract into the first container and 4.75 lbs. into the second. Top off both containers with cold water and stir. Let both cool to about 70 °F and add yeast. Follow all-grain recipe above.

All-Grain Tupulisahti (Strong Sahti)

OG: 1.070 FG: 1.016 ABV: 7.02 %

11.1 lbs. English pale ale malt
1.5 lb. Munich malt
3 oz. juniper berries
1.1 oz. any noble hops
with about 4% AA
Juniper twigs (or cedar or fir)
Wyeast 1084 (Irish Ale) yeast

Mash in at 120 °F. Add juniper berries to the mash. Raise the mash temperature slowly over 90 minutes to about 160 °F. Rest the mash for 60 minutes. Keep the mash covered to retain heat. Place a few juniper twigs on top of the false bottom of the lauter tun to cover it with a single layer. Ladle the mash into the lauter tun. Start sparging. Add hops to the wort at the start of the run-off. At the end of the sparge, raise the wort tem-

perature to 180 °F and hold it there for 20 minutes to sterilize it. But do not boil it! Let the wort cool to about 70 °F and add yeast. Ferment until the brew reaches final gravity. Siphon into jugs or bottles and store in cool place (the best storage temperature is around 40 °F).

Extract Tupulisahti (Strong Sahti)

OG: 1.070 FG: 1.016 ABV: 7.02 %

8.5 lbs. English pale ale malt extract
1.5 lbs. Munich malt
3 oz. juniper berries
1.1 oz. any noble hops
with about 4% AA
Juniper twigs (or cedar or fir)
Wyeast 1084 (Irish Ale) yeast

Crack the Munich malt and place in steeping bag. Bring 2–3 gallons of water to a boil. Turn off the heat and immerse the juniper twigs, the juniper berries, the hops and the bag with cracked Munich malt into the liquid. Let stand for about 30 minutes. Strain the hot liquor. Add the extract. Top off with cold water and stir. Let cool to about 70 °F and add yeast. Ferment until the brew reaches final gravity. Siphon into jugs or bottles and store in cool place (best at around 40 °F).

All-Grain Lammilainen (Lammin Sahti)

OG: 1.065 FG: 1.016 ABV: 6.37 %

10.4 lbs. English pale ale malt
1.1 lb. rye malt
3 oz. juniper berries
1.1 oz. any noble hops
with about 4% AA
Juniper twigs (or cedar or fir)
Wyeast 1084 Irish Ale Yeast

Mash in at 120 °F. Add juniper

berries to the mash. Raise the mash temperature over 90 minutes to 160 °F. Rest the mash for 60 minutes. Keep covered to retain heat. Place juniper twigs in lauter tun to cover it with a single layer. Ladle in the mash. Start sparging. Add hops to the wort at the start of the run-off. At the end of the sparge, raise wort to 180 °F and hold it for 20 minutes to sterilize it. Do not boil! Let cool to 70 °F and add yeast. Ferment until brew reaches final gravity. Siphon into jugs or bottles and store in cool place (40 °F).

Extract Lammilainen (Lammin Sahti)

OG: 1.065 FG: 1.016 ABV: 6.37 %

8 lbs. English pale ale malt extract
1.1 lb. rye malt
3 oz. juniper berries
1.1 oz. any noble hops
with about 4% AA
Juniper twigs (or cedar or fir)
Wyeast 1084 (Irish Ale) yeast

Crack rye and place in steeping bag. Bring 2–3 gallons of water to a boil. Turn off heat and immerse the juniper twigs, juniper berries, hops and the bag with cracked Munich malt. Let stand for about 30 minutes. Strain the hot liquor. Add the extract. Top off with cold water and stir. Let cool to about 70 °F and add yeast. Ferment until the brew reaches final gravity. Siphon into jugs or bottles and store in cool place (best at around 40 °F).

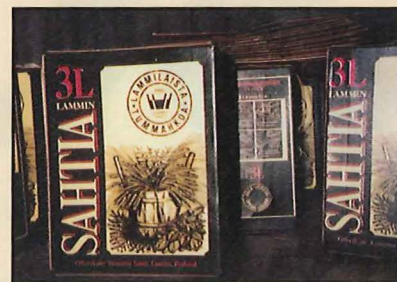


PHOTO BY ELVA ELLEN KOWALD



in East Hartford. His business plan calls for producing a light Scottish ale as the first public offering, with other styles to follow. By touring the breweries of Edinburgh and sampling their beers at the pubs, the Iceman and his head brewer hoped to learn about Scottish beers and modern brewing techniques. I had a similar goal: to sample as many beers as possible and pick up tips on brewing them at home.

From monks to modern times

To fully appreciate these age-old beers, it helps to know a bit about Scottish brewing history and beer styles. So I grabbed my copy of "Scotch Ale," a well-researched book by Greg Noonan (Brewers Publications, 1993). I tucked this reference in my bag before leaving for Edinburgh. It turned out to be a terrific tour guide.

Archaeological evidence proves that the Picts were making some sort of fermented beverage on the Isle of Rhum as early as 6500 BC. By the time the Romans invaded Britain in 43 AD, the Picts were brewing their beer with barley grains. They also used heather, an indigenous flower, to flavor and preserve the brew. It must have been powerful stuff, because in the late fourth century, an Irish king named Niall of the Nine Hostages waged war against

Any homebrewer worth his wort dreams of touring a major European brewery. What an adventure it would be! He's probably read about the historic breweries of Europe and has tried to emulate their classic styles at home. Actually traveling to a foreign land for the sole purpose of brewery touring and pub crawling sounds like a dream. Well, I have good news: Sometimes dreams do come true.

I'm the owner of a homebrew shop in Willimantic, Connecticut. Last year I spoke to a local businessman — who also happens to be a devout Scotsman — about organizing a short trip to

Edinburgh. After traveling there on numerous occasions, he had firsthand knowledge of the city and its neighborhood pubs. He wanted to share his experiences with friends on a return trip. As luck would have it, he'd heard of an affordable package that included airfare and accommodations on the Royal Mile, an Edinburgh thoroughfare rich in breweries, pubs and brewing history. Between my homebrew club companions (I belong to the Hop River Brewers in Andover) and his Scotch whiskey connoisseurs, we recruited enough people to make the trip.

The "Iceman," as this fellow is locally known (he's the proprietor of an icehouse), is launching a new brewery

great SCOT!

BY PAUL ZOCCO

A diehard homebrewer wanders through Scotland ...

...and returns with firsthand tips, techniques and recipes for brewing the country's classic "shilling" ales and wee heavies at home.

the Picts — not only to conquer the fierce tribe but to learn the secret of the legendary heather ale that Pictish warriors drank before battle. According to Noonan's book, Niall wiped out the Pict population of Galloway but left without the recipe, which even the last victim refused to reveal. (Heather ale survived for centuries in the Orkney Islands and has been revived nationwide in recent years. For a recipe, see page 38.)

In medieval times, the monasteries around Glasgow and Edinburgh became the first "commercial" breweries in Scotland. This region was nicknamed the "Charmed Circle" for its abundant underground springs. The soft water was perfect for producing the rich and malty ales that beer-lovers identify with Scotland to this day.

Secular breweries first appeared in the 1400s. Barley was grown and malted in the countryside — in such fertile agricultural regions as the Carse of Forth and East Lothian — and then shipped to breweries in Edinburgh, Glasgow and Alloa. All three cities were blessed with cool cellars of constant temperatures, abundant soft water supplies and close proximity to a deep-water port. For those reasons, these cities became — and still remain — the country's major brewing centers.

In the early 1600s, the importation of English ales into Scotland was forbidden. The goal of the English-beer ban was to protect and encourage the Scottish brewing industry, and it worked. In the late 1700s, there were 150 public breweries in Scotland; by 1820, there were 240. True to Scottish brewing tradition and available ingredients, most of these breweries produced a range of malty, low-hopped ales. Over time, these Scottish ales gained popularity not only at home but across Europe, where they competed with the pale ales, bitters, stouts and porters of England. By the late 1800s — thanks to the Industrial Revolution and a boom in the export market — the modern-day Scottish brewing industry was firmly established.

Styles and shillings

Now a note on nomenclature: Though all are malty with a low hop-



ping rate, there is a difference between “Scotch” ale and “Scottish” ales. Strong Scotch ale, also nicknamed a “wee heavy,” has an OG that ranges from 1.072 to 1.088+. Any beer with an OG lower than that is a “Scottish” ale. (Throughout this story, I rely on the official style guidelines published by the Beer Judge Certification Program.)

Designations of strength are called “shillings,” an historic tradition that referred to the tax rate. The beer with the least amount of alcohol was designated with the lowest shilling number, which meant it would be taxed at a

the most common beers in Scotland, though I did see a 90-shilling at one pub. The AHA guidelines for Scottish 70 state that the style should have an original gravity between 1.034 to 1.040, a final gravity of 1.011 to 1.015, a color range of 10 to 19 SRM (it can be a little lighter in color than the 60) and hop bitterness from 20 to 25 IBUs. The alcohol content ranges from 3.2 to 3.9 percent. The 70 shillings are a bit more malty, with a slightly higher alcohol level. Commercial examples of this style include Belhaven 70/-, McEwans 70/- and Maclay 70/-. When I was in

flavor and alcohol. Commercial examples include Traquair House, McEwan’s Scotch ale and Belhaven Scotch ale. There also are some fine American examples, most notably the strong Scotch ale brewed by Noonan at his Vermont Pub and Brewery. I’ve had the pleasure of enjoying a pint with Greg at his Burlington pub and found it the equal of any wee heavy in Scotland.

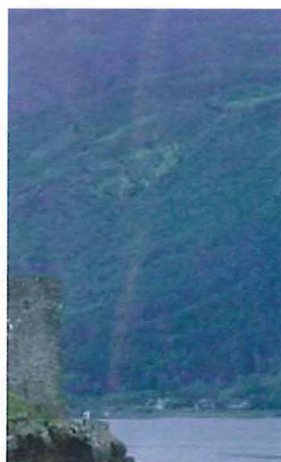
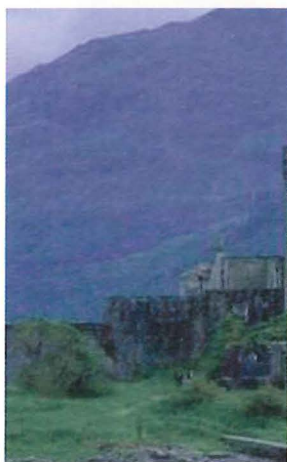
Wanderings of a homebrewer

I am very interested in present-day Scottish ales and wondered if the traditional malty, full-bodied ales had lost their character through the ages. Upon arrival in Edinburgh, my goal was to sample as many different Scottish ales as I could. Thankfully, the shilling ales in Scotland have a lower alcohol content than our American versions. I was able to drink a few pints and still walk out under my own power.

The first stop of our adventure was the Belhaven Brewery, located in the picturesque seaside village of Dunbar. Belhaven has been brewing at this site since at least 1719, though there was brewing conducted on the premises at a much earlier date. Dunbar is a lovely, small town about 35 miles northeast of Edinburgh on the Scottish coastline. We were greeted by the chief brewer, George Howell.

Besides Noonan’s book, I’d packed some beer in my bag — a few bottles of my 80-shilling ale and some commercial examples of American-style Scottish ales. Transporting 15 bottles of beer was a major task, but I was on a mission: At each of the breweries we visited, I hoped the head brewer would join us in a comparative tasting.

The Scottish ales of the 1800s were markedly different from the ones that are brewed today. The final gravity of these ales has dropped considerably from their heyday of the mid 1800s, effectively changing their flavor profile. The 90-shilling ale of the 1800s, for example, had a final gravity of 1.055, while a modern-day 90-shilling has an FG of 1.020. As a result, the flavor is a bit more subdued. The modern American versions of the same Scottish ales, by contrast, are brewed with a higher alcohol content and tend to fin-



lower rate and be cheaper for the patrons in the local pub. You’ll sometimes see shillings denoted by a symbol that looks like this: /-.

The “smallest” Scottish ale is the 60-shilling (or 60/-). This brew is often described as a “session” beer, which means you can drink a few pints before feeling the alcohol. This light Scottish ale should have an original gravity between 1.030 to 1.034, a final gravity of 1.010 to 1.013, an SRM of 12 to 34 and a hop bitterness rate from 9 to 15 IBUs. The alcohol by volume ranges from 2.5 to 3.3 percent. In other words, the 60-shilling is an easy-to-drink, low malt, low-hopped brown ale. They are subdued, but a pleasure to drink on cask. Popular commercial examples of this style include Belhaven 60/-, Caledonian 60/- and Maclay 60/-.

Following the 60s, of course, are the 70s and 80s. These three styles are

Edinburgh, the most common Scottish ales in the pubs were the 70-shillings.

As expected, the 80-shilling is higher in alcohol, maltier and hoppier than the 70. The AHA guidelines call for an original gravity of 1.040 to 1.050, a final gravity of 1.013 to 1.017, a color range of 10-19 SRM and hop bitterness from 15 to 36 IBU. The alcohol content ranges from 3.9 to 4.9 percent by volume.

The big boy of Scottish ales is inarguably the strong Scotch ale or wee heavy. I love this style for its over-the-top, extremely malty, caramel and alcoholic flavors. A strong Scotch ale should have an original gravity of 1.072 to 1.088+, a final gravity of 1.019 to 1.025+ (it has lots of residual sweetness), a color range from 10 to 47 SRM and a bitterness from 20 to 40 IBUs. The alcohol can range from 6.9 to 8.5 percent. This beer packs a wallop of

SCOT in the brewpot

From 60 shilling to wee heavy, extract and all-grain recipes for four great Scottish ales

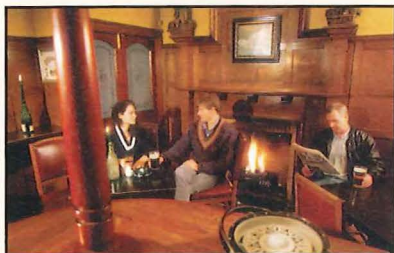


PHOTO COURTESY OF THE BRITISH TOURIST AUTHORITY

Scottish 60-Shilling Ale (5 gallons)

OG = 1.032 FG = 1.010 IBU = 15

The first impression when drinking this amber-brown ale is a malty nose with just a little hop aroma. The flavor is light malt that may have a touch of smokiness and toastiness. A small amount of roasted barley brings out a soft, complex background. The hop bitterness is quite low, just enough to balance out the malty background. With an original gravity of only 1.030 to 1.034, these are truly "session beers."

extract with specialty grains

4.25 lbs. amber malt extract syrup
2 oz. smoked malt
4 oz. carapils malt
4 oz. roasted barley malt
1 tsp. Irish moss
3.5 AAU Cascade hop pellets
(1/2 oz. of 7% alpha acid)
Scottish Ale yeast (Wyeast 1728)

Bring 2 quarts of water to 163° F, add crushed grains and hold for 1 hour at 158° F. Strain the grain into a brewpot and sparge with 2 quarts of 170° F water. Add the extract and bring the total volume to 2 gallons with water.

When boiling has begun, add the hops. Total boil time is 60 minutes. Add the Irish moss fifteen minutes before the end of the boil. Chill the hot wort by adding preboiled, cold water to a final volume of 5 gallons. When temperature is below 70° F, pitch yeast and vigorously aerate the wort. Ferment at 60° to 70° F (the closer to 60° F, the better). Transfer to a glass carboy when initial fermentation is complete (approximately 7 days). Leave in the secondary until all signs of fermentation are complete and beer is clear. Bottle with 1-1/4 cup of dry malt extract that has been pre-boiled with a quart of water. After carbonation has been achieved (2 weeks), store the beer at refrigerator temperature. This beer improves with cool storage.

all-grain

5.25 lbs. pale malt
2 oz. smoked malt
4 oz. carapils malt
4 oz. roasted barley
1 tsp. Irish moss
3.5 AAU Cascade hops
(1/2 oz. of 7% alpha acid)
Scottish Ale yeast (Wyeast 1728)

Heat 7 quarts of water to 168° F and add the crushed grain. Adjust the temperature and hold at 157° F for 1 hour. Sparge the grains into the boiling kettle with 8 quarts of 170° F water. Bring the total volume up to 6 gallons.

Bring the mixture to a boil, then add the bittering hops. Total boil is 60 minutes. Fifteen minutes before the end of the boil, add the Irish moss. When the boil is complete, chill to below 70° F and pitch the yeast. Vigorously aerate the wort. Ferment at 65° to 70° F until primary fermentation is complete (approximately 7 days). Transfer to a glass carboy and continue until the fermentation is complete (approximately 2 more weeks).

Transfer wort to a bottling bucket, add 1-1/4 cup of dry malt that has been preboiled with a cup of water. Bottle and let sit at 60° to 70° F for 2 weeks. When carbonation is achieved, store at refrigerator temperature. This beer improves at cool temperatures.

Scottish 70-Shilling Ale (5 gallons)

OG = 1.038 FG = 1.013 IBU = 22

The Scottish 70-shillings are similar to the 60s, but with a more pronounced malt presence. The original gravity and hop bitterness are a bit higher, and the alcohol content is 3.2 to 3.9 percent by volume, compared to 2.5 to 3.3 percent for a 60-shilling. The 70s are called "heavy" in Scotland, but they actually are a normal alcohol-range beer. It is still considered a "session beer," but the sessions might be shorter! This style is the most common type seen in the Scottish pubs. They are almost all exclusively hand pulled, with very low carbonation, and are served at about 55° F. I have brewed several Scottish ales in this style with excellent results. I personally like a touch of smoked grain in the mix.

extract with specialty grains

6 lbs. amber malt extract syrup
2 oz. smoked malt
5 oz. carapils malt

5 oz. roasted barley malt
1 tsp. Irish moss
5.25 AAU Cascade hop pellets
(3/4 oz. of 7% alpha acid)
Scottish Ale yeast (Wyeast 1728)

Bring 2 quarts of water to 163° F, add crushed grains and hold for 1 hour at 158° F. Strain the grain into a brewpot and sparge with 2 quarts of 170° F water. Add the extract and bring up the total volume to 2 gallons with water. When boiling has begun, add the bittering hops. Boil for 1 hour. Add the Irish moss fifteen minutes before the end of the boil. Chill hot wort by adding preboiled, cooled water to a final volume of 5 gallons. When temperature is below 70° F, pitch the yeast and vigorously aerate the wort.

Ferment at 60° to 70° F. Transfer to a secondary vessel (glass carboy) when the initial fermentation is complete (approximately 7 days). Leave in the secondary until fermentation is complete and beer is clear. Bottle with 1-1/4 cup of dry malt extract that has been pre-boiled with a quart of water. After carbonation has been achieved (2 weeks), store the beer at refrigerator temperature. This beer improves with cool storage.

all-grain

6.25 lbs. pale malt
2 oz. smoked malt
6 oz. carapils malt
6 oz. roasted barley
1 tsp. Irish moss
5.25 AAU Cascade hop pellets
(3/4 oz. of 7% alpha acid)
Scottish Ale yeast (Wyeast 1728)

Heat 7 quarts of water to 168° F and add crushed grain. Adjust the temperature and hold at 157° F for 1 hour. Sparge the grains into the boiling kettle with 8 quarts of 170° F water. Bring the volume up to 6 gallons. Bring to a boil, then add the hops. Total boil time is 60 minutes. Fifteen minutes before the end of the boil, add Irish moss.

When the boil is complete, chill to below 70° F and pitch the yeast. Vigorously aerate the wort. Ferment at 60° to 70° F until the primary fermentation is complete (approximately 7 days). Transfer to a glass carboy and continue until the fermentation is complete (approximately 2 more weeks, or until gravity remains constant).

Transfer wort to a bottling bucket and add 1-1/4 cup of dry malt that has been preboiled with a cup of water. Bottle and let sit at 60° to 70° F for 2 weeks. When carbonation is achieved, store at refrigerator temperature. This beer improves at cool temperatures.

Heather Ale

(five gallons)

OG: 1.048 FG: 1.008 IBU: 23

This is a light amber ale with an earthy, aromatic, flowery nose. It has a full malt character and a dry-wine finish. The heather lends a hint of chamomile, mint and lavender. Heather is a perennial ground cover with small flowers that thrives in Zones 4-7. You can buy dried heather at many homebrew shops. The recipe is based on the award-winning Fraoch brewed by Heather Ale Ltd. in Scotland (www.heatherale.co.uk). Hops are optional.

7.25 lbs. Maris Otter malt
1 lb. carapils malt
0.5 lb. crystal malt (20° Lovibond)
0.5 lb. crystal malt (40° Lovibond)
0.125 lb. chocolate malt
3 cups fresh or 1 to 2 cups dry heather flowers
4.2 AAU Fuggles hops
(1 oz. of 4.2% alpha)
2.1 AAU Fuggles hops
(0.50 oz. of 4.2 % alpha acid)
1 pt. starter of Scottish Ale yeast
(Wyeast 1728 or equivalent)
2/3 cup corn sugar for priming

Mash grain in 3 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. After 30 min. of boil, add half of heather. Continue for 60 min. Whirlpool and add second addition of heather or use a hopback. Cool to 69° F to pitch starter. Oxygenate-aerate well. Ferment at 60° to 70° F for seven days then rack to secondary. Continue fermentation for seven days until gravity is about 1.012. Rack, prime and bottle. Age seven more days before drinking.

Extract with grain: Substitute the pale malt for 7 lbs. English pale malt extract syrup. Start with 5 gallons of 150° F water. Steep crushed grain for 30 min. Sparge grains with enough 170° F water to make 5.5 gallons. Heat to boiling and add extract. Total boil is 60 min. At beginning of boil add half of heather. Continue for remaining 60 minutes. Whirlpool and add second addition of heather flowers or use a hopback. Cool to 69° F to pitch starter. Oxygenate-aerate well. Follow fermentation schedule above.

—Mikoli Weaver

ish maltier. They are more filling than the session beers that are common in the Scottish pubs.

The Scots tend to prefer a lighter ale. Most beers are cask conditioned or nitrogen forced, and are served at a warmer temperature (approximately 55° F). They are classic “session” beers and tend to be much less filling, with a lower malt profile. Though I tasted many beers, I did not come across the extremely rich and malty “wee heavy” I often drink in America.

The Belhaven “Wee Heavy” was my favorite beer from this brewery, with a rich and malty, but not overly sweet, flavor. The hops were just subtle enough to balance out the rich malts. There is a thick, creamy head that is simply delicious. This Wee Heavy was the most alcoholic and malty of their brews, with an original gravity of 1.060. Belhaven styles also include a Fuggles dry-hopped St. Andrew’s Ale (OG 1.046), their flagship Scottish Ale (OG 1.041), a McCallam’s Stout and a very refreshing Scottish Lager. Howell recommended that we sample these same brews in one of the local “tied pubs” in Edinburgh. (A “tied” pub is one that serves only the beers of a single brewery.) Heeding his good advice, our next destination was “The World’s End Pub” on High Street on the Royal Mile in Edinburgh.

It was a typical Scottish pub, adorned with colorful ale advertising mirrors, framed posters and other beer paraphernalia. The locals would gather here after a tough day at the office, just like back home in the States. The Belhaven beers served here were either on nitrogen tap or cask, and as you would expect, as fresh as possible. There was also a fine selection of single malt whiskies. After we sampled a few Belhavens, we were anxious to compare them with our next two brewery stops: Caledonian and Scottish & Newcastle.

Bright Monday morning, our thirsty group of ten descended onto the Caledonian Brewery in downtown Edinburgh. Ron Davies, our tour director and a savvy beer connoisseur, led us on a thorough “grain to glass” tour through this immense brewery.

Caledonian is a 160-barrel brewery that uses open fermentation and three yeast strains (two ales and a lager). It has three “coppers” (boiling kettles) in the brew house, the oldest of which was installed in 1869. Caledonian has a fine range of cask ales, including the 80 shilling; a unique Golden Promise that uses organic Kentish hops and malted barley from the Scottish borders; and the extremely popular and drinkable Deuchars India Pale Ale. The IPAs in Scotland are predominately cask conditioned, and served at a much higher temperature that Americans are accustomed to. The original gravities are lower than their American counterparts, with a more subdued hop bitterness and flavor. These creamy cask ales are meant to be drunk with friends and family in the small neighborhood pubs. The alcohol by volume is typically 4 to 5 percent, though Caledonian’s Edinburgh Strong weighs in at 6.4 percent. The brewery also produces at least a dozen seasonal ales, one for each month of the year.

After sharing many of the fine Caledonian brews with Mr. Davies and my brew pals, we were off on a four-block walk to the famous Scottish & Newcastle Brewery. We were greeted at the adjoining pub by Nick Silk, the chief brewer and head of production. Scottish & Newcastle had recently opened this modern American-style brewpub, complete with a five-barrel brew system. After sharing lunch and some of this pub’s fine ales, we headed to the big brewery.

Scottish & Newcastle is a sprawling mega-brewery in the heart of Edinburgh. The complex consists of numerous buildings situated on three city-sized blocks. Massive pipelines containing wort, beer and brewing water are piped under the public roadways between the buildings.

Our tour started on the eighth floor where the crushed grain is transported. From this point on, gravity is a key factor in the brewing process. The crushed grain is dropped into large mash tuns below. After the mash, the grain is then dropped into lauter tuns. The use of separate lauter tuns is common in Scottish brewing practices, a bit

Scottish 80-Shilling Ale

(5 gallons)

OG = 1.050 FG = 1.013 IBUs = 29

The Scottish 80, also called an "export" by the BJCP guidelines, is a strong ale by Scottish standards. The export name means that this is an ale with a higher alcohol content (3.9 to 4.9 percent) that was intended to survive trans-Atlantic voyages.

The increased alcohol content of these beers blend well with the toasty and roasty flavors of the grains. Hop bitterness and flavor are subdued enough to make this a malty, but not cloying, brew. Some examples of the 80s may show a hint of smokiness.

extract with specialty grains

6.5 lbs. amber malt extract syrup
2 oz. smoked malt
6 oz. carapils malt
5 oz. toasted barley malt
1 tsp. Irish moss
7 AAUs Cascade hop pellets
(1 oz. of 7% alpha acid)
Scottish Ale yeast (Wyeast 1728)

Bring 2 quarts of water to 163° F, add crushed grains and hold for 1 hour at 158° F. Strain the grain into a brewpot and sparge with 2 quarts of 170° F water. Add the malt extract and bring up the volume to 2 gallons with water.

When boiling has begun, add the bittering hops. Boil for 1 hour. Add the Irish moss fifteen minutes before the end of the boil. Chill hot wort by adding preboiled, cooled water to reach a final volume of 5 gallons. When temperature is below 70° F, pitch the yeast and vigorously aerate the wort.

Ferment at 60° to 70° F. Transfer to a glass carboy when the initial fermentation is complete (approximately 7 days). Leave in the secondary vessel until fermentation is complete and beer is clear. Bottle with 1-1/4 cup of dry malt extract pre-boiled with a quart of water. After carbonation has been achieved (2 weeks), store the beer at refrigerator temperature. This beer improves with cool storage.

all-grain

8 lbs. pale malt
2 oz. smoked malt
6 oz. carapils malt
6 oz. roasted barley
1 tsp. Irish moss
7 AAUs Cascade hop pellets
(1 oz. of 7% alpha acid)
Scottish Ale yeast (Wyeast 1728)

Heat 7 quarts of water to 168° F and add the crushed grain. Adjust the temperature and hold at 157° F for 1 hour. Sparge the grains into the boiling

kettle with 8 quarts of 170° F water. Bring the total volume up to 6 gallons. Bring to a boil, then add the bittering hops. Total boil is 60 minutes. Fifteen minutes before the end of the boil, add the Irish moss. When the boil is complete, chill to below 70° F, and pitch the yeast. Vigorously aerate the wort. Ferment at 65° to 70° F until primary fermentation is complete (approximately 7 days). Transfer to a glass carboy and continue until fermentation is complete (approximately 2 weeks).

Transfer wort to a bottling bucket, add 1-1/4 cup of dry malt that has been preboiled with a cup of water. Bottle and let sit at 60° to 70° F for 2 weeks. When carbonation is achieved, store at refrigerator temperature. This beer improves well at cool temperatures.

Wee Heavy

(5 gallons)

OG = 1.080 FG = 1.020 IBU = 30

Strong Scotch ale, also called wee heavy, is a classic "big beer" with a powerful and deeply malty nose and flavor. Secondary to the initial malty blast are smoky and roasted aromas. The flavor is malty and caramel sweet. The body, as you would expect, is as full as it gets. With an OG that ranges from 1.072 to 1.088-plus, the sky's the limit on these beers.

My own Scotch ales that have done well in competition have had an OG of 1.080 and a FG of 1.020. I even have a small batch of OG 1.100 that is close in flavor and texture to a rich sherry. Though some of my Scotch ales are too big to meet AHA guidelines, I still savor them. The alcohol content of these big boys range from 6.9 to 8.5 percent and beyond. I recommend a yeast starter of at least two liters. I've experimented successfully with small amounts of Belgian aromatic and Special B malt.

extract with specialty grains

9 lbs. dry malt extract
1 lb. carapils malt
4 oz. smoked malt
0.5 lbs. melanoidin malt
4 oz. roasted barley
7.2 AAUs Fuggles hop pellets
(2 oz. of 3.6% alpha acid)
1 tsp. Irish moss
Scottish Ale yeast (Wyeast 1728)

Heat 2 quarts of water to 162° F, add the crushed grains, and hold for 1 hour at 158° F. Strain the grain with 2 quarts of 170° F water and add to the pot. Stir in the malt extract with water to reach a total volume of 6 gallons.

Boil is 60 minutes. At the beginning of the boil, add the hops. Add the Irish moss fifteen minutes before the

end of boil. The final volume should be 5 gallons. Chill to below 70° F and pitch the yeast. Aerate the wort vigorously. To make a yeast starter, boil two quarts of water with two cups of dry malt extract for fifteen minutes. Chill to below 70° F and add the yeast. I make my starters 6 days ahead of time.

After primary fermentation is complete (approximately 7 days), transfer the wort to a glass carboy. Allow the fermentation to finish for 2 more weeks. When you are sure that the beer is fully fermented (the gravity readings do not change for three days), transfer it to a bottling bucket. Boil 1 pint of water with 1-1/4 cup of dry malt extract for 15 minutes and add this to the bucket. Stir in gently and bottle.

Store the bottled beer for conditioning at 65° to 70° F for 2 weeks. After carbonation has been achieved, store at refrigerator temperature.

all-grain

12 lbs. pale malt
1 lb. carapils malt
4 oz. smoked malt
0.5 lb. melanoidin malt
4 oz. roasted barley
7.2 AAUs Fuggles hop pellets
(2 oz. of 3.6% alpha acid)
1 tsp. Irish moss
Scottish Ale yeast (Wyeast 1728)

Heat 15 quarts of water to 168° F, add crushed grains, and hold for 1 hour at 158° F. Sparge with 15 quarts of 170° F water until you reach a volume of 6 gallons. Stop sparging if the specific gravity gets below 1.012. Total boil time is 60 minutes. At the beginning of the boil, add the bittering hops. Total boil time is 60 minutes. Add the Irish moss fifteen minutes before the end of boil. The final volume after the boil should be around 5 gallons.

Chill to below 70° F and pitch the yeast. Aerate the wort vigorously for 5 minutes. To make a yeast starter, boil two quarts of water with two cups of dry malt extract for fifteen minutes. Chill to below 70° F and add the yeast to it. Make the starter 5 or 6 days ahead of time. After the primary fermentation is complete (approximately 7 days), transfer the wort to a glass carboy. Allow the fermentation to finish for 2 more weeks. When you are sure that the beer is fully fermented, transfer it to a bottling bucket and proceed as described above. This type of beer matures well with cold storage. High-gravity Scotch ales age well, and will last for years.

—Recipes by Paul Zocco

TIPS FROM THE MASTER

Greg Noonan, author of "Scotch Ale,"
gives homebrewers the lowdown

It's a great time of year to brew the ales of Scotland. Cooler seasonal temperatures make for cooler fermentations, which means less fruity esters. So stop grumbling about the cold and put it to work for you.

The most important thing to remember about Scottish ales is that they are defined by stand-alone maltiness, in contrast to the fruitiness and bitterness of most English ales and the usual hop character of German alts. If you want to brew a credible Scottish ale, take it easy on the hops, pitch an adequate amount of yeast, and ferment at as close to 60 to 65° F as you can manage.

The malty and sweet character that defines the beers of Scotland is achieved by brewing with a simple grain bill of 98 to 100 percent ale malt and up to 2 percent roasted barley. Fresh, flavorful pale malt and unhopped amber malt extract both make excellent bases. Scottish beer kits are available for those who like to keep it simple.

Many brewers like to emphasize the sweetness of these beers with light caramel malt, or they add Munich or melanoidin malt to punch up the maltiness. One or two percent roasted barley gives a characteristic bronze highlight to the color, and a subtle, roasty balance to the sweetness of these lightly-hopped ales. Smoked whiskey malt is another means of balancing out the sweetness if it is used conservatively, so that its intense flavor remains barely discernible. A heavy hand with smoked malt is not traditional, but many brewers appreciate the unique smoky, burnt astringency of a bit of peated malt – if that's what you're after, don't be deterred. If it is not – use less than you think you ought to.

In contrast to the cooler fermentation temperature, a hotter-than-usual mash temperature complements this style. Mash temperatures over 152° F produce progressively

more dextrinous worts, giving the beer a sweeter palate and a richer mouthfeel. For most homebrewers, this means heating the mash liquor up 5 to 10° F hotter than usual, for a mash temperature up to 158° F.

The mineral character of the brewing water is not overwhelmingly important. Because the bitterness is subdued, there is no need for sulfates to temper the hop character. Soft to medium-hard waters are ideal for brewing this style, but even hard water can be used without detriment. Some brewers like to add chloride (up to 1-1/4 teaspoon of calcium chloride or 1-1/4 teaspoon of table salt) for the accent it adds to the sweet malty flavor. Chloride, in fact, at 50-100 mg/l, is typical of lowland Scottish waters. Avoid adding gypsum; there is no need for it, and although it may not harm the beer, it won't improve its flavor either.

Scottish brewers on the whole are not particularly concerned about the hops they use, largely because they have so little influence on the beer flavor, other than an underlying vague bitterness balancing its rich sweetness. That said, they also seem to prefer traditional English hops, with low bitterness and relatively mild flavor characteristics. So as a general rule, avoid using flavorful hops like Cascades, and especially flavorful high-alpha hops. Use low-alpha English or European hops. Don't use too much!

This style depends on pitching a lot of healthy yeast cells. As with hops, however, the particular strain is not hugely important. What is important is that esters, aromatic alcohols and other flavor compounds associated with yeast's respiration and reproduction phases are subdued. This can be accomplished by choosing a yeast strain that is known to be relatively "neutral" in flavor impact. It can also be accomplished by pitching a large volume of any ale

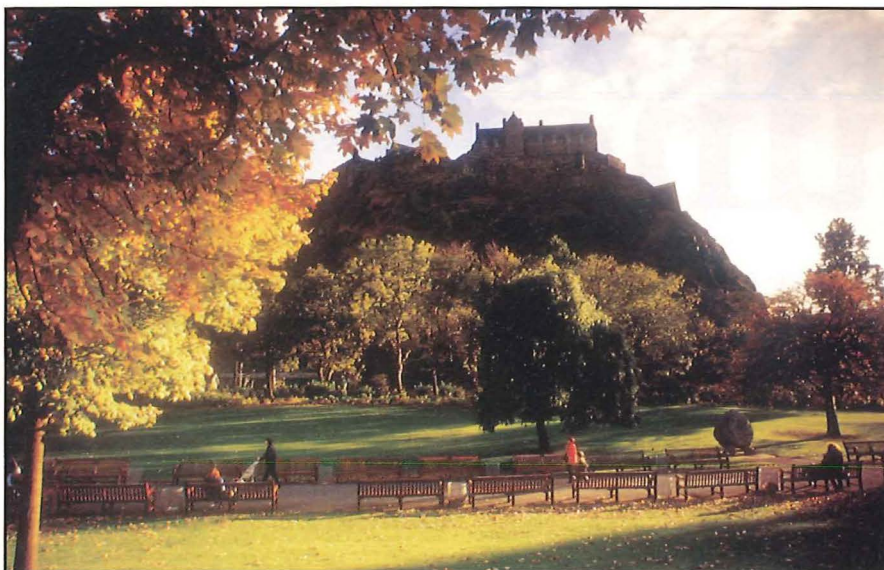
strain and fermenting at a cooler-than-usual temperature.

Appropriate results are easily achieved by fermenting at 60 to 65° F with any of the readily-available Scottish yeast strains. Fermentation temperature, and a pitching rate up to double that commonly used for fermenting English ales, are higher priorities than the strain itself. Most ale yeast strains will give relatively neutral flavors at 60 to 65° F. If you have to purchase yeast for this brew, then by all means choose a Scottish strain, or one known to emphasize malty-nutty flavors, and buy two.

Scottish beers should not be fermented out two or three days after pitching. The rapid growth and aggressive fermentation necessary to ferment a wort that quickly is going to infuse the beer with fermentation characteristics that are entirely inappropriate to the style. For most yeast strains fermenting in the low 60s, this will not be a problem.

Expect Scottish ales to ferment out within 7 days, and plan to condition them in a secondary for another week or so, to finish off the fermentation and round out the flavor profile. The strong Scotch ales demand that you either have a lot more patience, or a yeast strain that is vigorous at cool temperatures. Primary fermentation itself may take two weeks, and conditioning, for even up to a year, will improve the flavors. At the Vermont Pub and Brewery, we let our Wee Heavy age for 10 months.

Plan on saving bottles of Scotch ale; in vintage comparisons, three-year old Wee Heavy always comes out on top of this year's brew, and five-year old is preferred. Drink the 60- to 80-shilling ales while they are fresh; lacking hops, and without the immense alcohol of the stronger Scotch ale, they lose their maltiness within six months. So look on the bright side of the darker months and brew a Scottish ale this winter!



different from the common American three-vessel system. After lautering, there is another gravity drop to the kettle. Brewers can view large-screen displays to monitor and modify every step of the process. Computerized graphs show mash temperatures, concentrations and many other parameters.

Tasting notes from the trip

As mentioned earlier, I brought along four commercial American versions of Scottish ales and my own Scottish 80. The commercial beers included one from California, one from Colorado and two from Connecticut. (I don't want to name names, since the tastings and opinions were unofficial.) All four of the commercial examples and my homebrew were rated good in flavor by the pro brewers. There were similar flavors of treacle (molasses) in the beers from Connecticut and California. They noted fruity characteristics (raspberry) in one of the Connecticut beers and found the Colorado ale a bit cloying. They picked up on the slight licorice and treacle flavor in my homebrew.

In general, the tasting panel found the American beers more fruity and malty than their own ales, with a fuller body. These characteristics are similar to American versions of other foreign styles: American IPAs and barleywines tend to be much maltier and hoppier than their English counterparts, just as our American brown ales are more

assertive in bitterness than their European matches.

Neighborhood pubs are the real-life laboratories for the breweries we visited. They abound on every street corner, and we found them friendly and inviting. Caledonian, Belhaven and Scottish & Newcastle beers were the predominant brands. All of these fine ales were either on cask or nitrogenated, and a few bottled versions also were available. S&N offered a new style called SPA (Sparkling Pale Ale). This was a very refreshing, light-bodied and highly effervescent pale ale. I also liked a mild porter-like cask beer called Orkney's Ember 80.

The timing of our trip was fortuitous: The pubs were fully stocked with fresh ale for the anticipated onslaught of thirsty sports fans. The final of the Six Nations rugby series was scheduled for that weekend, and the championship match featured arch-rivals England and Scotland. What better place to watch the game than a Scottish pub? In a major upset, Scotland came out on top, prompting the population of the pub (and all of Scotland, for that matter) into a jovial celebration of national pride. We hoisted a pint with the locals, toasting the rugby team and the beer-tasting adventure of a lifetime. ■

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Grozet

(five gallons)

OG: 1.050 FG: 1.012 IBU: 11

Grozet is an old Scottish word for gooseberry. The modern version was recreated by Bruce Williams (who also brews Fraoch heather ale) from a 16th-century monk's recipe. It's very pale, with a perfumey nose from the herbs and a champagne-like effervescence. It's brewed with lager malt, unmalted wheat, bog myrtle (sweet gale) and meadowsweet. Gooseberries are added to the secondary. The herbs are available on the Internet, but getting gooseberries will be challenging unless homebrewers have a bush in the back yard. Cultivation of gooseberries is against the law in some states, since they can harbor white pine diseases. Pectic enzyme and campden tablets are winemaking supplies available from any homebrew store.

0.5 lbs. lager malt
5 lbs. Muntons extra-light dry malt extract
1 lb. dry wheat extract
2.5 AAUs Fuggles hops
(0.5 oz. of 5% alpha acid)
2 grams Brewer's Garden sweet gale (bog myrtle)
0.25 oz. dried meadowsweet leaves
Wyeast 1728 (Scottish Ale) yeast
8 to 10 lbs. fresh gooseberries
1 campden tablet
1 teaspoon pectic enzyme
1.25 cups dry malt extract

Three days before brewing, activate yeast pack. Raise 3 gallons water to 160° F. Add crushed lager malt and hold 20 minutes. Strain out grain, add extracts and bring to a boil. Add Fuggles bittering hops and boil 40 minutes. Add sweet gale and meadowsweet to final 20 minutes of boil. Chill wort to 75° F, strain into carboy and add enough cold water to make 5 gallons. Pitch yeast. Ferment at ale temperature until complete. Mash gooseberries and place in 6.5 gallon fermenter bucket. Crush campden tablet over berries. Seal fermenter and wait 24 hours for berries to sanitize. Rack grozet onto berries. Add pectic enzyme to prevent haze. Ferment berries and grozet together for 2 to 4 weeks. Carefully rack grozet off the gooseberries into a carboy. Lager the grozet at 45° to 50° F for 4 to 6 weeks. Prime, bottle and age 4 to 6 weeks at cellar temperature.

—Joe and Dennis Fisher



EXPLAINED Adjuncts

Text by STEVE PARKES
Recipes by CHRIS COLBY

Corn and candi sugar, rice and rye and more: Adjuncts can add flavor, boost strength, and improve your beer's mouthfeel, foam and clarity.



dark candi sugar



flaked corn



torrefied wheat



flaked oats



flaked rice



unmalting barley

It is fashionable among homebrewers to dismiss adjuncts as unworthy ingredients in beer. They often cite the German "Reinheitsgebot," a purity law promulgated in 1516 that allowed only the use of water, malted barley and hops. Yet adjuncts are viewed differently around the world. Köln and Brussels are both world-famous brewing centers. Although located within 165 miles of each other, the brewing philosophies of these cities are light years apart. While German brewers were restricted for centuries by the Reinheitsgebot, Belgian brewers have long obtained fermentables from a wide variety of sources. In fact, adjuncts play a role in some of the world's great beer styles.

Not all brewers define adjuncts in the same way. The most common definition is any source of starch that is not malted, but in this article we also will discuss "adjunct" ingredients like malted wheat and rye.

The use of adjuncts has been a popular topic of discussion over the years. "The Practical Brewer," a classic textbook published by the Master Brewers Association of the Americas, states that "adjunct use results in beers of lighter color with a less satiating, snappier taste, greater brilliancy, enhanced physical stability and superior chill-proof qualities." In the "Handbook of Brewing," a chapter on adjuncts written by Graham Stewart of Heriot-Watt University adds this: "Corn gives a fuller flavor than wheat, which imparts a certain dryness. Barley gives a strong, harsher flavor. Both wheat and barley adjuncts can considerably improve head retention. Rice will also give a very characteristic flavor to beer." Adjuncts not only lend different flavors to homebrews but also improve mouthfeel, head retention and clarity.

Adjuncts can be divided into two broad groups: kettle adjuncts and mashable adjuncts. Kettle adjuncts, like honey or candi sugar, contain fermentable sugar and are added to the kettle in the boil. Mashable adjuncts

contain starch. This starch needs to be converted to sugar before it can be used by brewer's yeast. These starchy adjuncts must be mashed, which means that enzymes degrade the starch to fermentable and unfermentable sugars and dextrins.

Most adjuncts — including rice, corn and kettle sugars — contain very little protein and they are reluctant to yield the protein they do have during mashing. So they also can be considered in terms of their ability to dilute the protein in a wort made from low-protein adjuncts and malted barley. All the protein in this wort comes from the barley, so adding a source of extract that carries no protein effectively dilutes the total protein in the wort. Protein in barley can cause haze. People generally prefer beers to be crystal clear and they expect that clarity to last for months. So by diluting protein with the proper amount of adjuncts, brewers can increase clarity and stave off the onset of chill haze.

When brewing with low-protein adjuncts, brewers must take care not to dilute the malt's soluble nitrogen too much, or a wort may be produced that lacks enough amino acids. Yeast need simple soluble amino acids in order to grow. Nutrient deficiency can result in poor yeast performance and off-fla-

ADJUNCT RECIPE FILE

vors. Most of the precursors to stale flavors in beer are derived from malted barley, so diluting the malt with a non-malt adjunct may reduce stale flavors.

Before the enzymes in the mash can break down the starch in the cereal, whether it's corn or malted barley, the starch must be gelatinized. Because starch is a mixture of chemical compounds, before it forms a solution it forms a thick gel. The way the starch is packed into the endosperm affects the temperature at which it will form gel.

Some mashable adjuncts have low gelatinization temperatures and some have high gelatinization temperatures. This has a tremendous effect on how we use the adjuncts. The starch in unmalted barley will gelatinize at 140° to 143.5° F, with the starch in malt slightly higher at 147° to 152.5° F. The starch in wheat gelatinizes at 125.5° to 147° F, so when it is added to a malt mash it will gelatinize along with the malt starch. Both corn (at 143.5° to 165° F) and rice (at 142° to 172° F) have high gelatinization temperatures and require a separate heat treatment. Usually corn and rice are mashed separately, along with some malted barley (10 percent), and then boiled in a cereal cooker. They are held for a while as they are heated at a temperature of 158° F to allow malt enzymes to act on the starch and make it less viscous. The cereal mash is then added back to the main malt mash at a controlled rate to raise the temperature of the main mash to its various enzyme rests.

Mashable Adjuncts

Mashable adjuncts can be further divided into two groups, depending on whether the adjunct has the enzymes it needs to break down starch. Malted adjuncts, like malted wheat or malted rye, contain enzymes; other adjuncts, like corn or rice, lack them. They rely on the fact that malted barley has a surplus of enzymes, enough to convert the starch of both barley and adjunct.

The degree to which we can use unmalted adjuncts without experiencing difficulties depends on the base malt and the mashing regime. With a multiple-temperature mash, American six-row malts can tolerate up to 50 per-

Condoleeza Lager (5 gallons, extract with rice syrup) OG = 1.045 FG = 1.010 IBU = 11

4 lbs. dried malt extract
(light, unhopped)
16 oz. rice syrup
3.52 AAU Hallertau hops
(0.88 oz. hops at 4% alpha acid)
1 tsp. yeast nutrient
Wyeast 2007 or White Labs WLP840

Bring 4 gal. of water to a boil. Turn off heat and add extract and rice syrup. Stir to dissolve, then boil wort for 1 hour. Add hops at beginning of boil. Add yeast nutrient for final 15 min. Cool and transfer wort to fermenter. Aerate wort and pitch two-liter yeast starter. Ferment 1 week at 52° F. Transfer to secondary and lager for 90 days. Keg or prime and bottle.

Older but Wiser Rice Beer (5 gallons, all-grain with rice) OG = 1.044 FG = 1.008 IBU = 11

6.5 lbs. pale malt (6-row)
1.5 lbs. rice
3 AAU Hallertau hops
(0.75 oz. hops at 4% alpha acid)
Wyeast 2007 or White Labs WLP840

Mix rice with 1/4 lb. crushed pale malt and 1 gal. water and hold mini-mash at 158° F for 15 min. Boil mini-mash for 30 to 45 min. Add 2.25 gal. water at 110° F to the mini-mash, along with all remaining malt, to bring temperature to 122° F. Hold mash for 15 min., then raise temperature to 150° F for an hour. Heat to 158° F for 5 min., then mash out to 168° F. Recirculate wort for 20 min., then collect 4.5 gal. of wort. Sparge water should be at 168° F. Add 1.5 gal. of water to wort to make 6 gal. Boil wort vigorously for 1 hour. Add hops when boiling starts. Cool wort. Siphon to fermenter. Aerate wort and pitch one-gallon yeast starter. Ferment for 7 days at 52° F. Rack to secondary fermenter and lager beer for 90 days. Keg or prime and bottle.

RMS Corn-Fed Lager (5 gallons, extract with corn syrup) OG = 1.045 FG = 1.010 IBU = 13

3.5 lbs. dried malt extract
(light, unhopped)
24 oz. corn syrup (no preservatives)
4.24 AAU Hallertau hops
(1.06 oz. hops at 4% alpha acid)
1 tsp. yeast nutrient
Wyeast 2007 or White Labs WLP840

Boil 4 gallons of water. Turn off the heat, then add the malt extract and

corn syrup. Stir thoroughly. Boil wort for 1 hour, adding hops as soon as the wort begins to boil. Add yeast nutrient for last 15 minutes. Cool wort. Transfer wort to fermenter and aerate. Pitch two-liter yeast starter. Top fermenter up to 5 gallons with boiled and cooled water. Ferment for 1 week at 52° F. Transfer beer to secondary fermenter and lager for 90 days. Keg or prime and bottle.

Iowa City Maize Lager (5 gallons, all-grain with flaked maize) OG = 1.044 FG = 1.008 IBU = 13

6 lbs. pale malt (6-row)
2 lbs. flaked maize (corn)
3.52 AAU Hallertau hops
(0.88 oz. hops at 4% alpha acid)
Wyeast 2007 or White Labs WLP840

Mash malt and flaked maize using a step mash. Mash for 15 minutes at 122° F followed by 45 minutes at 152° F. Mash out by raising the mash temperature to 168° F. Recirculate wort for 20 mins. Run-off and sparge wort; sparge water should be 170° F. Collect 4.5 gallons of wort. Add 1.5 gallons of water, making 6 gallons of wort. Boil wort vigorously for 1 hour. Add hops as soon as wort begins boiling. After boiling, cool wort, then siphon to primary fermenter. Aerate wort thoroughly and pitch sediment from one-gallon yeast starter. Ferment for 7 days at 52° F, then rack to secondary. Lager beer for 90 days, then keg or prime and bottle.

Big Daddy Dry Stout (5 gallons, all-grain and flaked barley) OG = 1.040 FG = 1.008 IBU = 45

5 lbs. pale malt (2-row)
1.5 lbs. flaked barley
0.7 lb. roasted barley
12 AAU Fuggle hops
(2.4 oz. hops at 5% alpha acid)
Wyeast 1968 or White Labs WLP002

Combine pale malt with roasted barley and flaked barley and mash at 150° F for an hour. Heat to 158° F for 5 minutes. Recirculate wort for 20 minutes and collect 4 gallons of wort. Sparge water should be at 168° F. Add 2 gallons of water to make 6 gallons. Boil for 1 hour. Add hops immediately after boiling starts. Cool wort. Siphon to primary fermenter. Aerate wort and pitch yeast from one-gallon starter. Ferment for 7 days at 68° F. Rack to secondary and ferment for an additional 7 days.

Partial-mash option: Replace 2-row pale malt with 2 lbs. 6-row pale malt and 2 lbs. dried malt extract (light, unhopped). Make a partial mash of the

malted, flaked and roasted barley. Hold partial mash at 150° F for 30 minutes. Rinse the grains with 1 qt. of water at 170° F, then bring wort to a boil. Add extract when boil begins.

Forgotten Carboy Lambic
(5 gallons, all-grain and raw wheat)
OG = 1.055 FG = 1.005 IBU = almost 0

6 lbs. pale malt (2-row)
3 lbs. wheat
3.08 AAU Tettnang hops (aged 3 years)
(0.88 oz. hops at 3.5% alpha acid)
Wyeast 3273 (no starter)

Make mini-mash of wheat and 1/3 lb. pale malt. Hold at 158° F for 15 minutes, then boil for 30–60 minutes. Combine remaining pale malt with wheat mini-mash. Step mash all grains at 120° F for 15 minutes followed by 150° F for 45 minutes. Heat mash to 168° F and hold for 5 minutes. Recirculate wort for 20 min. and collect 5 gallons. Sparge water should be at 168° F. Add 1 gallon of water to make 6 gallons. Boil wort for 1 hour. Add hops immediately after boiling starts. Hops should be aged. Cool wort. Siphon to primary fermenter and pitch yeast (no starter). Ferment for 7 days at 68° F. Rack to secondary and ferment for 3 months to 3 years. Package beer and serve.

The Kurgan's Scottish Ale
(5 gallons, extract with brown sugar)
OG = 1.060 FG = 1.020 IBU = 20

5.5 lbs. dried malt extract
(light, unhopped)
1 lb. brown sugar
0.75 lb. roasted barley
7 AAU East Kent Goldings hops
(1.4 oz. hops at 5% alpha acid)
Wyeast 1728

Heat 3 gallons of water to 160° F. Crush barley and place in a nylon grain bag. Steep barley in heated water for 30 minutes. Do not allow the water temperature to drop below 150° F. After steeping, heat the water to a boil. Shut off heat and add extract. Stir thoroughly and bring to a boil. Boil for 1 hour, adding the hops immediately after the boil begins. Add the brown sugar with 15 minutes left. Make sure to stir well. When the boil is finished, add 1 gallon of cold, aerated water to your fermenter. Pour wort into fermenter. Cool wort to between 60° and 65° F. Pitch two-liter yeast starter and top up to 5 gallons with water. Ferment for 7 days at 60° F. Rack to secondary. Ferment for 14 days. Bottle condition for 14 days, then serve.

cent adjunct, and American two-row can tolerate up to 30 percent. British malt used in a single-infusion mash can tolerate up to 20 percent.

Flaked and torried grains are not malted and do not contain the necessary enzymes to convert starch. Flaked grains are made by treating the cereal with steam and then crushing the grain between hot rollers. Common brewing grains in flaked form are oats, rye, corn and rice. Torried grains are made by heating grains to a temperature of 500 degrees until they “pop,” like puffed wheat.

Rice

Rice is the first mashable adjunct that comes to mind, perhaps due to the fact that the world's biggest-selling beer, Budweiser, proudly advertises its use on the label. Rice is a staple food for over 50 percent of the world's population and comes in many aromatic and non-aromatic varieties. The non-aromatic varieties are used for brewing. The brown rice harvested from the paddy fields is milled to remove the bran and germ and the whole kernels are sold for domestic consumption. The kernels that get broken are sold at a lower price to brewers.

Rice has a high gelatinization temperature and must be boiled prior to use. Some brewers boil the rice under pressure to increase the temperature. Rice has the highest starch content of all the cereal adjuncts and may yield as much as 90 percent extract efficiency.

Corn

Corn is used by brewers in two main forms: milled grits or flakes. Corn grits are the most widely used adjunct by commercial brewers in the United States and are an important adjunct in Great Britain, where it is called maize. Grits are produced from yellow and white corn (mostly yellow), which is milled to remove the bran and germ. Grits are widely available and require

a cereal cooker and separate boiling step similar to brewing with rice. Corn flakes resemble the breakfast cereal and can be used directly in the mash. They can be milled with the malt or crushed by hand and mixed with the grain. Though a box of Kellogg's contains additives that are best left out of homebrew, you can find bulk corn flakes at health-food stores or homebrew shops that are additive-free and sometimes sweetened with malt extract.

Corn and rice are both used in the production of American pilsners. In some of these lagers, the cereal may represent up to 50% percent of the total extract. If you are trying to brew a light-colored beer, using corn or rice will allow you to brew a beer that is lighter in flavor and color than an all-barley malt version of that beer. Typically, brewers use up to 30 percent of these adjuncts.

Unmalted barley

Unmalted barley is used as an adjunct in several major breweries around the world. It is significantly cheaper than malted barley and can be blended at up to 50 percent, provided the enzyme levels are high and an extensive temperature-profile mashing schedule is used. It is difficult to mill as the kernels are extremely hard. It contributes a large amount of beta glucan to the wort, because this troublesome compound is reduced during malting. Beta glucan can improve foam stability, but in excess it impedes lautering.

Sorghum

Sorghum, also called millet, is the fifth most popular cereal crop in the world. It is used as the base grain in several native African fermented beverages and is used by brewers in Africa and Mexico as part of the grist in their lager-style beers. Sorghum was used in American breweries in the 1940s when traditional ingredients were scarce due



flaked rye



belgian wheat

to the war, but quality problems led to it being abandoned.

Unmalted wheat

Unmalted wheat is used in some recipes that require its specific attributes; namely, the raw grain flavor and cloudy appearance associated with Belgian white beer. It requires a multiple-temperature mashing regime with temperature rests at 120° F (beta glucan rest), 150° F (beta amylase rest) and 170° F (alpha amylase rest). The gelatinization temperature is lower than barley so it can be mixed into the mash directly.

Oats

Oats are low in starch, high in oil and protein and extremely high in beta glucans. As a result, they are not used as a major substitute for malt in the grist. However, they add a smoothness and increased mouthfeel to beers and have become popular as an additive to stouts. One of my favorite brewing stories involves a famous English brewer who was planning an oatmeal stout. He ordered the finest oats for his masterpiece only to find that, when they were delivered, an uninformed gate guard had directed the delivery vehicle to the brewery's stables.

Rye

Rye is another grain that is used for its flavor, rather than as a malt replacement. It has a strong distinctive bite but is difficult to lauter, so extract recovery is difficult and slow. Rye is known to impart an orange tinge and a spicy character to beer.

Brewing with malted grains

Wheat, rye and oats are all available as malted grains. These adjuncts should be used for specific flavor or quality contributions.

Malted wheat may be 50 to 75 percent of the grist in a German wheat beer. Since wheat has no husk, brewing

with malted wheat can be tough. Many brewers use rice hulls to establish a good filter bed in the mash. Rice hulls replicate the role of barley husk in the lautering stage and hence aid wort separation. Commercial brewers are unlikely to need rice hulls even with malted wheat concentrations as high as 50%, since lauter tuns are well designed for effective wort separation. On homebrew equipment, a handful of rice hulls will go a long way to improving matters. Wheat adds a tangy character and improves head formation and retention.

Malted rye is used in rye whisky and can be used to make distinctive beers. Rye malt makes up to 10 percent of the grain bill in rye beers. Rye cannot be used in larger quantities because it contributes to stuck mashes.

Some stouts are brewed with up to 25 percent malted oats. Oats, with their high oil content, add a creaminess to beer.

To use malted adjuncts, all-grain brewers simply crush the grains along with the malted barley and add it to the mash. Extract brewers must do a partial mash. Malted adjuncts contain amylase enzymes, so they can convert their own starch into sugars without the addition of malted barley to the partial mash.

To do a partial mash, the grain must be crushed and placed in a nylon grain bag. Steep the grain in water at a temperature of 150° to 158° F for 30 minutes. Make sure you have enough water to completely submerge the grains. During this time, the starch will be solubilized and the amylase enzymes will chop the starch molecules into sugar molecules. After mashing for 30 minutes, remove the grain bag with a large kitchen strainer. Rinse the grains with a few cups of 168° F water to extract sugars still clinging to the grains. Next heat the mash water to boiling, add your malt extract and finish brewing as you normally do.

53rd and 3rd Rye Brown Ale (5 gallons, all-grain and flaked rye) OG = 1.050 FG = 1.012 IBU = 34

6 lbs. pale malt (2-row)
0.75 lb. flaked rye
0.75 lb. chocolate malt
10 AAU Cascades hops
(2 oz. hops at 5% alpha acid)
Wyeast 1056 or White Labs WLP001

Combine pale malt, flaked rye and chocolate malt. Mash grains at 152° F for one hour. Raise mash temperature to 168° F for 5 minutes then recirculate wort for 15 minutes. Collect 4.5 gallons. Sparge water should be at 168°F. Add 1.75 gallons of water to make 5.75 gallons. Boil the wort for an hour. Add hops immediately after boiling starts. Cool wort and siphon to the primary fermenter. Aerate wort and pitch two-liter yeast starter. Ferment for 7 days at 68°F. Rack to secondary fermenter for an additional 7 days. Bottle beer and condition 2 weeks.

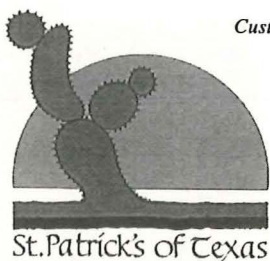
Partial-mash option: Replace 2-row pale malt with 1.5 lbs. 6-row pale malt and 3 lbs. dried malt extract (light, unhopped). Make a partial mash of the pale malt, chocolate malt and flaked oats. Hold mash at 152° F for 30 min. Rinse grains with 1 qt. hot water (170° F). Bring wort to a boil, add extract.

Sorghum Porter (5 gallons, all-grain with sorghum) OG = 1.052 FG = 1.012 IBU = 40

4 lbs. pale malt (2-row)
2 lbs. Munich malt
1 lb. sorghum
1 lb. crystal malt (30–40° L)
0.5 lb. chocolate malt
0.5 lb. roasted barley
12 AAU Northern Brewer hops
(1.2 oz. hops at 10% alpha acid)
Wyeast 1272

Crush barley malts and sorghum separately. Mix sorghum with 1/4 lb. pale to make a mini-mash. Hold mini-mash at 158° F for 15 minutes, then boil for 45 minutes. Combine mini-mash with the crushed barley and barley malts. Hold mash at 122° F for 15 min. Raise mash temperature to 150° F for an hour. Heat to 158° F for 5 minutes and mash out to 168° F. Recirculate wort for 20 minutes, then collect 5 gallons of wort using sparge water at 168°F. Add 1 gallon of water to make 6 gallons. Boil wort for 1 hour, adding the hops right after the boiling starts. When finished boiling, cool wort and siphon to a primary fermenter. Aerate and pitch two-liter yeast starter. Ferment for 7 days at 70°F. Rack to secondary and ferment for 7 more days. Bottle, condition for 3 weeks and serve.





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Brewing with flaked grains

All-grain brewers can simply add flaked grains to their mash. Although flaked grains have no amylase enzymes, excess enzymes from the barley can degrade the starch. When using over 20 percent flaked corn or rice, it is preferable to use six-row malt for the remainder of the grain bill. Six-row malt has more enzymes than two-row and is better able to convert the extra starch load. And the low protein of the adjunct helps dilute the extra protein from the 6-row malt.

As with malted grains, extract brewers must perform a partial mash if they wish to use flaked grains. When mashing these flaked grains, the brewer must also add barley malt to supply enzymes. A 1:1 mixture of flaked grains and six-row barley malt is usually sufficient. Crush the barley malt and place it in a grain bag with the flaked grain. The flaked grain does not need to be crushed but it helps to break it up. Once the grains are mixed, steep the grain in 150° to 158° F water for 30 minutes, rinse the grains and proceed.

Kettle adjuncts

Many adjuncts already contain soluble sugar and do not need to be mashed. These adjuncts are added to the wort during the boil and are called kettle adjuncts. This group includes a wide variety of sugars and syrups. Syrups may be produced directly from sugar beet or cane, or extracted from corn or wheat starch. They may be pure glucose (dextrose) or a mixture of glucose and fructose (invert sugar). Or they may contain maltose, maltotriose and large dextrins. Kettle adjuncts are used in small amounts, typically less than 10 percent of the grain bill, although like cereal adjuncts they can be used in much higher amounts.

An excellent lager produced in Asia called Singha contains a lot of brown sugar. In the UK, I once used a completely non-fermentable dextrin syrup as a solvent to add a fresh ginger character to an alcoholic ginger beer. Some kettle adjuncts — like honey and molasses — add flavor to beer.

Most types of honey have a delicate flavor, so adding small amounts — less

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than 5 percent of the fermentables — will have little effect. If you want a big honey flavor in your homebrew, you can add up to 30 percent honey. If you use over 15 percent, however, add some yeast nutrients. If you are brewing with molasses or maple sugar for the first time, go easy. Both are available in a variety of forms that are more or less flavorful.

Other adjuncts mainly just boost the strength of the beer. Cane sugar, corn sugar, Belgian candi sugar, corn syrup and rice syrup add little flavor when used in small quantities (around 10%). They boost the amount of fermentable sugar in the wort without adding protein and color to the beer. Over about 10 percent, these sugars can lend a solvent-like, highly alcoholic taste. Over 30 percent and yeast nutrition can suffer, especially in beers made from malt extract.

When I brewed in England I would often use sugar to increase the original gravity of the wort, including a couple of medal-winning barleywines that included 25% sucrose. For my lighter beers, I used an invert sugar, as a straight replacement for malt, that was delivered in solid blocks of paste. Invert sugar is produced when a more complex sugar, such as sucrose, is treated with acid or an enzyme to split it into its component molecules. This changes the rotation of light when viewed through a special instrument and the change is referred to as an inversion.

Brewing with kettle adjuncts

Handling kettle adjuncts is simple. Once the wort has come to a boil, shut off the heat and stir the adjunct into the wort. If you do not shut off the heat, the thick, sugary solution can fall to the bottom of the kettle and scorch. When the adjunct is dissolved, resume the boil. You can add kettle adjuncts at any time during the boil, but they should be boiled long enough to ensure the wort is sterile. One factor to consider is that increasing wort gravity reduces the efficiency of hop utilization. To improve hop efficiency it may be wiser to add syrups near the end of the boil. I usually add kettle adjuncts for the final 15 minutes of the boil.



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Burn Safety

A guide to pain-free homebrewing

by Chris Colby

TYPES OF BURNS

Degree of Burn	1st	2nd	3rd
Skin layers affected	Outer layer	Two outer layers	All layers
Appearance	Skin reddened	Red, moist skin with blisters	Red, black (charred) or white (blanched) skin. Loss of skin.
Pain	Moderate	Mind-numbing	Depends
Scarring	No	Maybe	Yes
Medical attention required	Not unless extensive	If burn is palm-sized or bigger	Yes
Heals	2 to 5 days	About 3 weeks	Over 3 weeks

I should have been mowing my lawn this past August 16th. Instead, I was brewing a lawnmower beer. I wasn't paying attention as I poured five gallons of just-boiled water from my brewing pot to the bucket I use for my hot liquor tank. I was scanning the tree line, looking for the armadillo that occasionally wanders through our yard, and I ended up pouring the near-boiling liquid on my foot. When I finally got my shoe removed, I whipped off my sock and a little trailer of skin flew along with it. The pain was amazing. So intense that it shut off every part of my brain except the part responsible for sensing pain. (Okay, the part of my brain that generates expletives was also working.)

Have you ever seen one of those TV shows where they show real-life emergency rooms? In episodes with burn victims, they always say that "burns are the most painful kind of injury." They aren't kidding. In this article, I'll explain how homebrewers can mini-

mize their chances of getting burned. I'll also explain what you need to do if you do get burned.

Preventing Burns

There are essentially three different ways you can get burned in homebrewing: direct contact with flames from a burner, contact with hot surfaces or contact with hot liquids. But if you set up your brewery right and follow a few simple steps each time you brew, your odds of getting burned are very low. Avoiding burns while homebrewing involves using common sense. It's likely that nothing in the prevention section of this article will surprise you. But since the consequences of forgetting these preventive measures can be severe, it's worth reviewing them.

1. Wear rubber boots if you brew in large volumes

You should wear rubber boots if you brew in large-enough volumes that a spill could get deeper than the soles

of your shoes. For 5-gallon batches of beer, boots would be overkill, but for homebrewers making 10-gallon batches it is worth considering.

2. Take care when lighting the burner

Make sure your fire-starter works when lighting propane burners. Don't wait until the gas is on to find out the lighter is stubborn. If you don't get the burner to go within 5 seconds or so, shut off the gas and wait a minute.

3. Avoid tripping or snagging hazards

Set up your brewery so you won't have to step over or duck under anything connected to a heat source or a container of hot liquid. Typically, there's a lot of piping and tubing involved in homebrewing. If you get snagged on any of it and tip something over on yourself, you'll have to worry about disentangling yourself in addition to potentially getting burned.

Also, keep pets and small children away from your brewery when you're using it. There are worse things than burning yourself.

4. Avoid boilovers by leaving room in your kettle

This one is easy. Wort foams when it nears boiling. Leave enough room in your kettle to avoid boilovers.

5. Protect your hands when touching metal surfaces

Hot metal looks just like cold metal. So don't touch any metal surface that has recently been heated. Use a pot-holder or heat-resistant gloves. If you think that a surface — such as the handle of a brewpot — has cooled, test it by touching the surface lightly.

6. Check that all valves are closed before transferring hot liquids

Most homebrewers store their brewing vessels with the valves open so they can dry. Remember to close any outflow valves before you start filling a vessel.

7. Whenever possible, use gravity or a pump to move hot water or wort

Carrying large volumes of hot

water or wort is dangerous, as I learned the painful way. You should never carry any container of hot water that is too heavy to manage easily. If possible, transfer hot liquids by gravity or pumps. A three-tiered brewery with propane burners for each vessel ensures that you won't need to lug hot liquids around. Gravity will do that for you. Alternately, high-temperature pumps can be used to move water or wort between vessels. Finally, it's easier and safer to bring your wort chiller to your wort than to bring your wort to your chiller.

8. Always have a clear path to a cold water source

If you do get burned, you will need to have access to cold water quickly. Make sure your path to a cold water source is uncluttered so you don't have to step over or duck under anything. (It's hard to maintain a long string of expletives when navigating an obstacle course.) If your cold water source is a sink, keep it clear of dirty brewing

equipment so you can quickly put your arm (or leg) under running water.

9. Pay attention to what you are doing

The best way to stay safe is to pay attention while doing anything that could potentially be dangerous. This is easy to forget.

First Aid for Burns and Scalds

There are many kinds of burns, including thermal burns, electrical burns, chemical burns and radiation burns. Burns from open flame, contact with hot surfaces and contact with hot liquids are all thermal burns. A thermal burn from a liquid is also called a scald. First aid for a scald differs slightly from that of other thermal burns. It's important to know the proper first aid for scalds because this is the biggest hazard for homebrewers. Contact with flame or a hot surface would likely affect only a small area of your body. In contrast, it is possible to scald large portions of your body when homebrewing.

Immediate First-Aid

The first step in the treatment of any thermal burn, including a scald, is to cool the affected area as quickly as possible. In the case of a scald, your first priority is to remove any clothing that is soaked in hot liquid. If you do not remove the wet clothing, the heat from the liquid will continue to burn you. Running cold water over soaking wet clothing will cool down the outside of clothing quickly while the portion next to your skin remains hot. If your skin is stuck to the clothing, however, do not remove it — cut the clothing off later. Once you have removed your wet clothes, cool the scalded area with cold water. Either submerge the burned areas in cold water or run cold water over them. (Do not apply ice directly to the burn or submerge the burn in ice-cold water because prolonged contact can cause frostbite or even hypothermia.) Cool the burn for 20 minutes.

In the case of other thermal burns, the kind you get from a hot surface or



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flame, your first priority is to cool the burn with cold water. In a burn, your clothing is much more likely to stick to you than in a scald. After 15 to 20 minutes of cooling with water, you can cut any loose clothing off. Avoid pulling on the clothes and tearing your skin.

You should never apply butter, grease or ointment to a fresh burn. Oily substances will only trap heat inside the burned area and increase the damage the burn does. It also increases the chance of the burn getting infected. Always cool a burn thoroughly with water before applying any other medication or ointment.

After you have cooled the burned or scalded area, you should decide if you need medical attention. Whether you need medical attention depends on a few different variables, including how much of your body is burned, the degree of the burns, and whether or not you are in shock. The signs of shock include clammy skin, lightheadedness, a fast, weak pulse and confu-

sion. If your burns cover a large part of your body or you are in shock, seek medical attention immediately. If the burn covers a small area — smaller than your palm, for example — whether or not medical attention is required depends on the severity and location of the burn. Burns are rated according to the amount of damage they do to the skin. There are first, second and third degree burns. (See box on page 48.)

First-degree burns, also called superficial burns, damage only the epidermis, the outermost layer of skin. A first-degree burn will turn red, but will not blister. It will hurt, but should heal in 2 to 5 days without leaving a scar. For most first-degree burns, it isn't necessary to seek medical attention unless it covers a large area.

Second-degree burns, also called partial-thickness burns, affect the outer two layers of skin. A second-degree burn will turn red and develop blisters filled with a clear fluid. A sec-

ond-degree burn will be moist and excessive fluid loss can occur in second-degree burn victims. Infection can also be a problem.

The pain from a second-degree burn is very intense. The time it takes for a second-degree burn to heal is also longer than the time it takes for a first-degree burn. It takes about three weeks for a second-degree burn to heal and the affected area may be scarred. If you receive a second-degree burn larger than the palm of your hand, you should seek medical attention. Also, seek medical attention if you receive a second-degree burn on your face, hands or genitals.

Third-degree burns are also called full-thickness burns because they damage all the layers of skin. They may also damage tissue beneath the skin. (Some sources call burns that extend into underlying muscle or bone fourth-degree burns.) The skin affected by a third degree burn may turn red, black or white and will be dry. Often, one or

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First Aid Tips

more layers of skin will be removed by the burn. Because of this, infection is a major risk with a third-degree burn.

A third-degree burn will take over three weeks to heal and will leave a scar. The pain from a third-degree burn is typically less than that associated with a second-degree burn because third-degree burns can damage your nerves. Severe third-degree burns do not hurt at all since all the pain-sensing nerves are destroyed. You should seek medical attention immediately for any third-degree burn.

Long-Term Care of Burned Areas

Anti-inflammatory painkillers, such as ibuprofen, help reduce the pain of burns. To reduce the risk of infection, burns should be covered with a non-stick gauze pad. Alternately, you can apply Second Skin gel pads to the burn. These pads are made mostly of sterile water and can soothe and protect the burn in the early stages of healing. Before covering the wound, anti-

In case of scalding (contact with hot liquid)

1. Remove affected clothing unless it is stuck to your skin.
2. Cool the burn with cold (not ice-cold) water for 15 to 20 minutes.
3. If your clothing is stuck to your skin, cut off loose clothing.
4. Determine if you need medical attention.
5. Take an anti-inflammatory pain-killer (for example, ibuprofen).
6. Apply Dermaplast and/or antibiotic ointment to burn.
7. Cover burn with a non-adhesive gauze pad or Second Skin gel pads.
8. Don't pop any burn blisters.

Other thermal burns (contact with hot surface or flame)

1. Cool the burn with cold (not ice-cold) water for 15 to 20 minutes.
2. Remove affected clothing.
3. If your clothing is stuck to your skin, cut off loose clothing.
4. Determine if you need medical attention.
5. Take an anti-inflammatory pain-killer (for example, ibuprofen).
6. Apply Dermaplast and/or antibiotic ointment to burn.
7. Cover burn with a non-adhesive gauze pad or Second Skin gel pads.
8. Don't pop any burn blisters.



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biotic cream and pain-reducing sprays, such as Dermaplast, may be used. To reduce the risk of infection, you should not pop burn blisters.

The Risks of Homebrewing

Our hobbies are no different than any other part of our lives; there are risks and there are rewards. The risks associated with brewing a five-gallon batch of extract beer are roughly equivalent to the risks involved in cooking. For homebrewers making larger batches, the risks are greater. This is especially true if your equipment and technique has not been scaled up to match your batch size.

Personally, I think that homebrewing has one of the greatest rewards of any hobby — beer. There are safer hobbies than homebrewing, of course, but I think I'll stick with homebrewing. Plus, knitting needles are sharp. ■

Chris Colby is a regular contributor to BYO. He lives in Bastrop, Texas.

Other Homebrew Hazards

Burns are a major hazard of homebrewing, but there are other hazards. Fumes from cleaning chemicals can be very dangerous. Direct contact with some chemicals used for cleaning and sanitizing can also cause chemical burns. Always clean your equipment in a well-ventilated area and closely follow product guidelines. You should also wear durable protective gloves and eye protection while using cleaning chemicals. It is a good idea to have an emergency plan in mind. Don't brew alone and have an accessible emergency eyewash station prepared in the event that you get chemicals in your eyes.

Using propane burners in an unventilated area can lead to carbon monoxide (CO) poisoning. This colorless, odorless gas can cause a variety of health problems. In small concentrations, CO exposure

causes headaches, dizziness or drowsiness. An exposed person may also have a flushed face. At higher concentrations, CO can cause permanent brain damage or death. The effects of CO may be heightened by the consumption of alcohol. Keep your brewing area well-ventilated and check that the vents are open and unblocked. If you detect the symptoms of CO exposure or poisoning, get some fresh air and don't exert yourself. Seek medical attention if symptoms are severe. As a precaution, you can install a CO detector.

Many homebrewers use glass carboys. Glass is slippery when wet. When lifting wet carboys, there is a risk of losing your grip and dropping it. The resulting broken glass can be a hazard. Thoroughly drying both the carboy and your hands before lifting will minimize this hazard.

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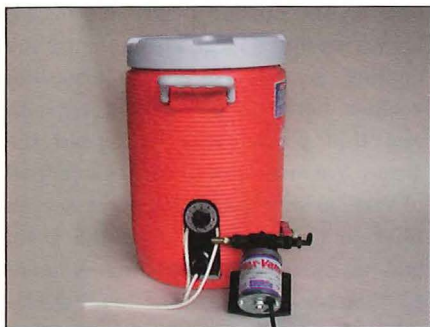
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Two Simple RIMS

Electrify your mash tun with a heater and a pump

Projects

by Thom Cannell



The finished Cordon Brew RIMS with a SHURflo Brew Buddy pump attached.

More than two years ago *BYO* ran one of my first do-it-yourself stories, "Build a \$50 Mash Tun" (September 1999). That device has since brewed dozens of batches of all-grain beer with great success. Now it's time to take it to the next level and add an internal heater and external pump. In other words, it's time for us to make our inexpensive mash tun into an inexpensive RIMS (Recirculating Infusion Mash System).

Fair warning: This project involves electricity. If you're not comfortable playing with potentially lethal voltages, don't. Or get help from an electrician.

What is RIMS? Why use it?

Some of you may be asking, "What the heck is RIMS?" If you were to remove a quart or two of wort during your mash and return it to the mash tun, that would be recirculation. Every all-grain brewer recirculates wort at the end of the mash to clarify the wort. Clarification removes all the particles of grain, large and small, from sweet wort before boiling. If you were to run off some wort during a mash, heat it to 158° F and then return it to the mash tun to bring up a low mash temperature, you'd be doing exactly what the RIMS concept proposes — recirculating an infusion mash, manually.

Why not stick to a single-infusion

mash? There are several benefits of RIMS. First, constant circulation helps maintain a uniform temperature in the mash, which ensures mash efficiency and maximum enzyme utilization. Second, circulation clarifies the wort. Third, since you can add heat you can easily do a step mash (see "Homebrew 501" in September *BYO*), which adds complexity to your brewing. Fourth, once you own a pump you don't have to rely on gravity to move water or wort any longer. Your brewhouse can be at one level — no more heavy lifting.

The RIMS concept was first proposed in 1992 by Rodney Morris. Morris used a pump, a heater and a precision controller to precisely vary the temperature of a mash tun. In essence, wort was pumped across an electric heater element, then returned to the mash tun. The system was closed; no air was admitted, nor splashing permitted.

In Morris' system, a precise control system measured existing temperature and the temperature of wort after it passed the heater. This meant building or purchasing a complex electronic device. Our RIMS is less precise and much simpler. It's based on an electric mash tun I saw at a friend's house long before I'd heard of RIMS. My pal had installed a heating element inside a Rubbermaid cooler. His grain bed was suspended above the heater in a precisely fit mesh colander. A pump recirculated the wort and a rheostat controlled the heating element. The heating system was based on parts taken from a "Cordon Brew" system from Great Britain. These parts are available from several homebrew shops (see box at right). In Great Britain, most homebrewers heat their mash and boil in the same plastic kettle. Heat is provided by a 30 amp/240 volt element (British current is 240V, not 110). A controller provides temperature sensing and power control.

In the U.S., most electric RIMS systems use heating elements from electric water heaters. They are run on 120V current, which quarters the amount of heat the element can produce. This means that the element doesn't get hot enough to scorch the sugars in your wort — if you choose the correct heating element.

I decided to build two versions of a simple RIMS system. One relies on parts from a Cordon Brew system. The other uses a Chromalox Water Wizard water heater element and home-built power control. Both versions need a pump, the heart and soul of any RIMS.

Picking out the pump

Any pump could move wort, right? Not really. A wort pump must be capable of moving boiling liquid. It needs to move it from very low to very high (if you have a typical multi-level brewing system) and be tough enough to handle the odd chunk of grain.

Parts List

You can buy a suitable RIMS pump from many homebrew outlets, including:

Beer, Beer and More Beer

(800) 600-0033

www.morebeer.com

Moving Brews

(301) 779-8609

www.movingbrews.com

SHURflo Brew Buddy pump \$110

Parts for the Chromalox RIMS can be found at most home-repair and service stores.

Chromalox Water Wizard \$30

(Model SGW 2207)

Lutron Centurion dimmer \$35

Brass union \$4

Heavy duty (20 amp) outlet \$4

Power cords (12 gauge) \$3

You can order Cordon Brew parts by mail from several homebrew outlets, including:

Grape and Granary

(800) 695-9870

www.grapeandgranary.com

NFG Homebrew

(978) 840-1955

www.geocities.com/nfg_homebrew

Element \$35

Thermostat \$50



The Chromalox heating element is protected by a vertical standoff made from a bent 1/4-inch brass welding rod.



The Cordon Brew heating element under the standoff, which protects the element and supports the mash screen.

Several homebrew merchants sell heat-resistant pumps with a pump section that is magnetically coupled to the electric motor (the pump can stall or stop and not burn out the motor). I chose a non-magnetic pump from Beer, Beer and More Beer rated to 220° F. It uses a flexible impeller (pump) that resists clogging and heat and can pump wort 7.5 feet higher than its inlet (called the head). The SHURflo Brew Buddy self-priming pump comes with a mounting bracket, an on-off switch and a rebuild kit. It is threaded inside and outside the intake and discharge, which makes for easy hook-up.

Modifying the mash tun

Our mash tun, a simple Gott or Rubbermaid cylindrical cooler, gets its filtration from two pizza screens (available at restaurant food supply stores everywhere) with two pieces of bronze screen sandwiched between them. To provide an exit, I constructed a bulkhead fitting to replace the original spig-

ot. It is a pipe nipple going through the cooler with a rubber O-ring and ball valve on the outside, a union and large homemade backing plate on the inside.

We need to put a hole into the inner cooler wall of sufficient size for the heating element. We need a larger hole on the outside to provide access for wiring and a large nut to secure the heating element. We need a large thin washer between the heater element and thin plastic wall to spread the stress. We must also provide some kind of vertical support for the pizza-screen filter to hold the weight of the grain bed away from the heating element (see photos 1 and 2). The heating element should have at least 1/2 inch of space above it, but not more than 1 inch. I built a standoff out of bent 1/4-inch brass welding rod.

Version One: Chromalox

When making a Chromalox RIMS, you start by building a controller. I began by measuring the sizes of a

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Centurion C1000 incandescent light dimmer and a commercial quality electric outlet. Then I built a plywood box to house the controller (see photo 3).

Purchase a two-wire, heavy-duty electric power cord (at least 12-gauge wires). Drill a hole into the box to admit the cord. Then wire the outlet. The white wire from the power cord goes directly to the silver terminal on the power outlet. The black wire from the power cord connects to one black wire on the Lutron controller. The other black wire from the Lutron controller connects to the brass-colored screw on the power outlet. Green wires from the power cord and Lutron connect to the green screw terminal on the power outlet. Important: Connect the green ground wires from the power cord and controller to the green screw on the outlet (photos 4 and 5). Always use a grounded circuit. In fact, don't use this controller on a circuit without a GFI (ground fault interrupter) to prevent any serious or fatal accidents.

Chromalox heater element

Installing a Chromalox heater element is easy. Selecting it is not. Heater elements vary in heat output (watts) and length. We selected a Chromalox 2000 watt SGW 2207 based on these criteria. It was the correct length to fit the diameter of our mash tun (9-3/32 inches in a 10-inch diameter cooler) and it had sufficient wattage to produce enough heat. (Remember, using a 240V heater on 110V quarters the effective output: $2000/4 = 500$ watts). And this element's sheath material is nickel alloy for longer life.

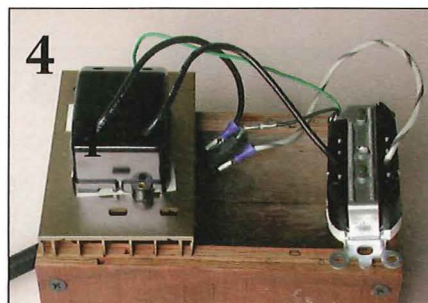
Step One: Mark a vertical line on the mash tun 90° from the outlet (so wort will be drawn across the heater.)

Step Two: Measure the outer and inner height of the mash tun, subtracting inner height from outer. Mark the bottom of the inner vessel on the exterior of the mash tun.

Step Three: Measure the threaded size of the element — ours was 1 inch. Measure up 1/2 inch from the bottom of



The Chromalox heating element and controller parts: light dimmer, electrical outlet and a two-wire power cord.



The black wire goes from power cord, to controller, to brass terminal screw. Green ground wires go to the green terminal. The single white wire runs to the silver-colored screw.

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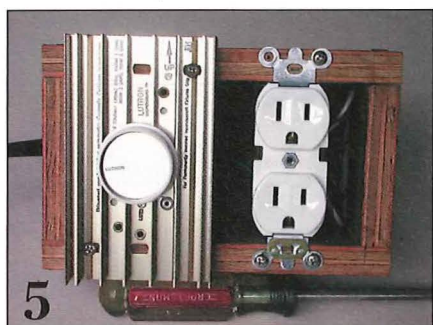


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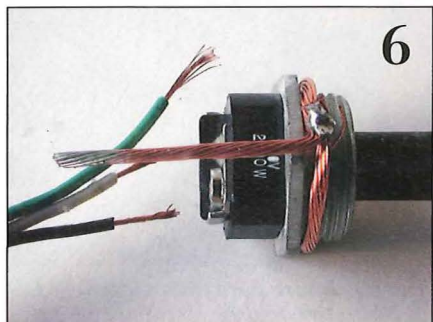
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CIRCLE 27 ON READER SERVICE CARD



5 Once it's properly wired, use screws to finish assembling the controller box.



6 Ground the Chromalox element by making a circle out of 10-gauge stranded cable. Leave a 1- to 2-inch tail.

the inner vessel plus half the element's diameter (one radius) — $\frac{1}{2}$ inch + radius = 1 inch for us.

Step Four: Drill a $\frac{1}{8}$ -inch pilot hole through both walls, starting on your mark. Then drill a large, 1- $\frac{1}{2}$ to 2-inch hole through the outer wall and part of the insulation. You'll need this aperture for wiring and a cover cap.

Step Five: Drill a 1-inch hole through the inner wall. Clean up any remaining insulation. Your Chromalox heater element will be installed outside-inside. Because the inner support wall is thin plastic, you'll need to make a large metal or plastic washer to distribute torsional forces that would eventually crack the plastic wall.

Step Six: Using hole saws or a saber saw, cut a 2-inch diameter washer with 1-inch inner diameter hole. I made my washer out of aluminum but would have preferred brass or copper. I could have added a solder lug to the copper or brass and it is absolutely necessary to ground the heater ele-

ment. Normally, a heater element is grounded to the water heater but our all-plastic installation requires us to create a ground.

Step Seven: Make a 1-inch circle out of scrap, 10- to 12-gauge stranded cable or Romex (ordinary solid house wiring cable), leaving a 1- to 2-inch pig tail (see photo 6). Once you've created your homemade grounding, you're ready to assemble the parts.

Step Eight: Slip the ground wire over the heater element, followed by your metal washer.

Step Nine: Apply a thin bead of silicone seal (use black, red or gray so you can see it) to the washer-thread junction and push the heater through the mash tun walls (see photo 7).

Step Ten: Secure it with a homemade nut inside (maybe adding a little silicone seal on the inside for security). Since water heaters have built-in threaded ports you'll have to make your own nut. I used a brass 1-inch coupling and cut it into two.

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Step Eleven: Take another heavy-duty power cord and connect it to the heater element. The element has no color code, so connect black and white wires as you will. Be certain to connect and insulate the ground wire. I suggest crimp-on connectors for all connections; they're cheap insurance.

Step Twelve: Take a PVC cap and run your power cord through a properly sized hole (see photo 8). After all the electrical connections are complete, seal the cap into the mash tun with a bit of silicone seal. You don't want wort or water getting into the connections.

Cordon Brew Version

If you chose to purchase a Cordon Brew system, everything goes much the same. This version costs a bit more but it is easier to assemble.

Step One: Locate the correct placement of the larger-diameter Cordon Brew heater element (bottom thickness + 1/2-inch + 3/4-inch radius = X) before drilling your pilot hole (see photo 9).

Step Two: Drill an outer hole large enough (2 inches) to fit the large nut.

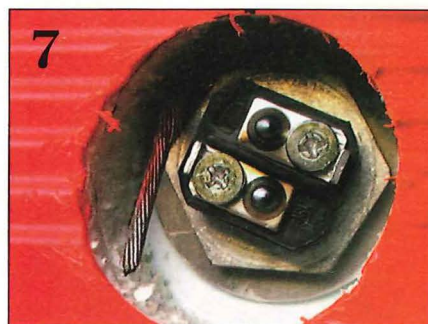
Step Three: Drill the inner wall hole (1-1/2 inch). Test-fit the securing nut from the outside.

Step Four (optional): Cut away additional outer wall and insulation if you choose to mount the controller to the inner wall as we have (see photo 10). Or secure your controller to the exterior with a hook-and-loop fastener.

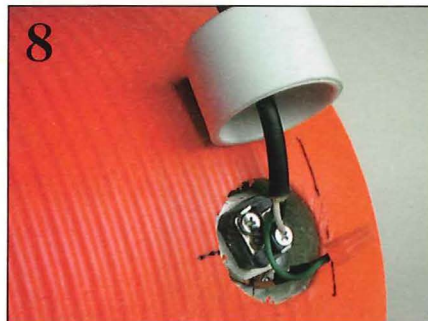
Step Five: Wire the wall plug. The Cordon Brew system includes the controller, so you'll just need to purchase a heavy-duty 120V wall plug.

Hook up the pump and calibrate

Now that you've completed your simple RIMS mash tun, it's time to connect the pump. First you'll have to decide on hose hookups. Every pump will have different attachment methods. My pump will accept 3/8-inch male pipe thread fittings or garden-hose fittings. Plumbing the RIMS requires two hoses with matching fittings — I used



Apply a thin bead of silicone seal to the washer-thread junction and push the Chromalox element through the walls.



Connect a power cord to the element, connect and insulate the ground wire, and run cord through hole in PVC cap.

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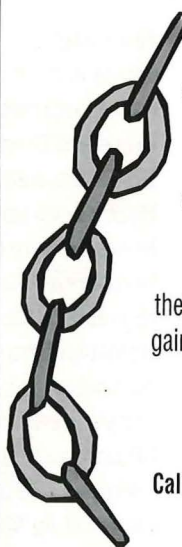
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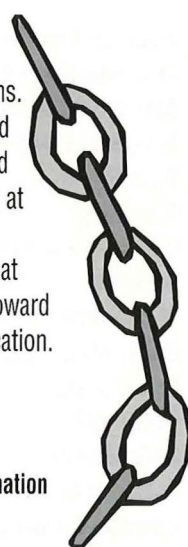
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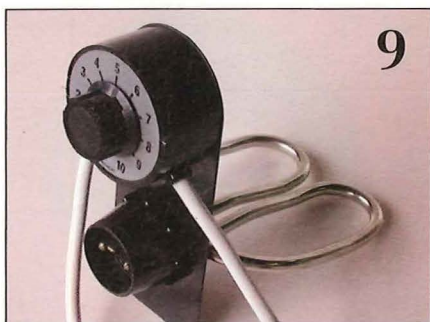
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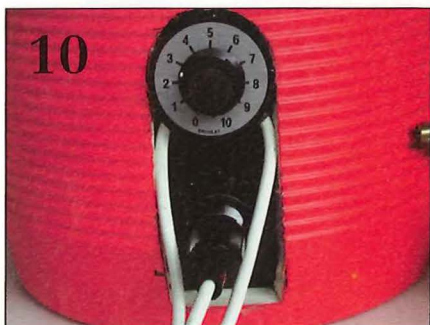
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CIRCLE 1 ON READER SERVICE CARD



9
The Cordon Brew heating system comes with a built-in controller and a large securing nut.



10
Cut away extra outer wall and insulation if you choose to mount the Cordon Brew controller to the inner wall.

3/8-inch barbed fittings. One hose connects the mash tun output (your ball valve and barbed fitting) to the pump input. The other hose returns wort from your pump's outlet to the mash tun. It is usually connected to a sparge arm. You also need to add a ball valve at the pump's discharge — the best place to control flow volume. Open the mash tun discharge fully, keeping the pump inlet unrestricted. (If you were to use the mash-tun ball valve to control inflow to the pump, it might run dry and burn up.) Adjust flow volume by limiting the pump's outlet flow to the mash tun. A flow of 25 to 50 percent should be correct to keep the pump running in liquid, yet prevent pumping the liquid so quickly that the mash bed gets tightly compacted. Be sure to only use specialty tubing or reinforced (woven) vinyl tubing, available at hardware stores and homebrew shops.

Once the pump is hooked up, you need connect the power and calibrate the system. Neither RIMS will be linear

— that is, halfway on either controller will not produce 212.5° F. Running either heater at full power might produce enough heat density to scorch your wort. Heat density is the amount of heat per square inch of surface. Of the two systems we built, the Chromalox has the lower heat density.

To calibrate your system you'll need to prime the pump and start circulating water. Then power up the heater and see how long it takes to heat five gallons to 158° F. Discover what mark (self-made or provided) will equate to 122°, 144°, 149°, 153°, 158° or 168° F. You may discover that you run the controller at 80 to 90 percent until you're close to your target, then dial back to the set point, then to zero.

RIMS proponents say the heater should be able to raise wort temperature by 2° F per minute. In my first test of the Cordon Brew system it exceeded this when heating 2 gallons of water. Further tests will be necessary to calibrate my system. ■

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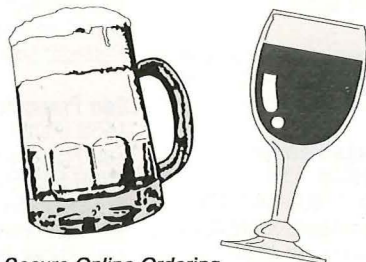
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Sam Piper
Laguna Hills, California

Tools of the Trade

My love affair with brewing gear



The "grain mill of death," invented by Vin Ludwig, looks like a creepy electric chair.



Where would I be without my grandfather's deluxe cast-iron capper, circa 1930?



Q: Can you guess what this gizmo is? Hint: My grandfather used it. (Answer at right.)

I remember the first time I brewed beer. I had the kitchen set up like a surgical suite. The boil pot was the patient, the stove was the operating table and yours truly, Dr. Piperstein, presided. My "sterile" instruments sat on a towel soaked with a disinfecting bleach solution — just like the surgeon's sterile instrument pack arrayed upon a sterile tray. Only instead of hemostats, sponges, scalpels and retractors, I had a hydrometer, stainless-steel spoons, strainer, funnel, fermentation lock and a pair of tongs. Taped on a kitchen cabinet was the master recipe: steps, tasks, ingredients, values — everything I needed to make beer.

It was an adventure! And fifteen years later, I still feel like that adventurous person when I brew — a cross between Dr. Jekyll, Louis Pasteur, Ben Franklin and Merlin the Wizard. It's the inventor role that I play today, for homebrewing is dependent upon technology and invention. Early man, or early monkey for that matter, could easily make a simple fermented beverage from honey, barley or grapes. But modern beer requires modern tools.

My grandfather, Leo Niehe, made beer for over fifty years with just a few tools. He had a five-gallon ceramic crock, an oversized rubber-coated cloth to cover the fermenter, a rubber siphon tube with a close-off valve, a cast-iron capper and a floating hydrometer with a red line near the top. That and some bottles was all it took to make beer 75 years ago.

Think of it: no scales, mash tun, lauter tun, refrigerator, thermostats, burner, thermometers, grain mill, flasks, pH strips, kegs, CO2 apparatus, fermentation locks or pumps — none of the toys we take for granted. Can you imagine a meeting of homebrewers back in 1937? What did they ever find to talk about?

For me, one the best parts of this hobby is creating my homebrewery and acquiring the tools I use to brew. At club meetings I enjoy learning about the ingenious and outlandish gizmos we create. A good friend, Vin Ludwig, made a grain mill stand that looks like an electric chair — we call it the "grain mill of death."

Back in the 1970s, almost two decades before you could buy a roller mill for home use, there was a nifty roller mill design floating around that used conveyer rollers taken from grocery check stands. My first garage burner was made from an element I took from a dead hot-water heater and attached to a welded cast-iron stand made from a porch railing.

You can tell the level of homebrewer by what he's scrounging for. There's an implied priority list: first a boil pot and fermenter, then a capper, burner, mash tun, grain mill, kegs and CO2 tanks. Regardless of where you are in the process, it's hard to walk by a garage sale or flea market and not look things over with your brewery in mind.

I remember driving one Saturday morning and seeing a stainless-steel Budweiser keg at a yard sale with a \$5 sign on it. Needless to say, I made a U-turn and scarfed it up. The guy who taught me to brew, Terry Hale, showed me how to get a remote bulb thermostat from the Grainger catalog to transform a refrigerator into a fermentation chamber or a chest freezer into a cellar for Cornelius kegs. Now you can find the thermostats in most any homebrew supply store.

The next time you're making beer, take a look at your tools. Then take a minute to admire the tradition of invention and the technological tool-making community of brewers to which we belong. And if you've got a tool you're really proud of, be sure to let the rest of us know. ■

A: It's a siphon weight made of nickel. My grandfather used it to hold his siphon tube at the bottom of his fermenter crock.



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If you don't have the time nor the inclination to brew your beers starting from the raw grain, or perhaps you think that brewing is as difficult as brain surgery but you don't have a high opinion of beer from beer kits, we recommend you try a **BREWFERM** home brew kit. The results may well surprise you! **BREWFERM** use nothing but the finest ingredients in their kits, and their beers are tailored to demanding Belgian tastes. Your own homebrewed Abdijbier, Tripel, Tarwebier, Grand Cru, Diabolo, ... 13 types in all ... without a hassle, thanks to **BREWFERM**!

- The only NO-BOIL kits using genuine Belgian recipes and ingredients, available in 13 different types
- Very straightforward to use
- Makes 9-15 litres of absolute TOP QUALITY BEER!

DARK ABBEY type for 9 l.

Starting specific gravity : 1.070 Alcohol content : 8 %.
One of the most well known Belgian specialties : an Abbey style beer with vinous character due to its high alcohol content. Deep amber, full flavoured with lots of malt aroma with caramel notes. Improves with long maturation times and can be kept for several years !

AMBIORIX type for 15 l.

Starting specific gravity : 1.060 Alcohol content : 6,5 %.
Amber beer with a red copper tint. Slightly acidic palate at first but with a nice fruity aroma. Moderate hop bitterness. Comparable with the well known beer of Roeselare.

DIABOLO type for 9 l.

Starting specific gravity : 1.071 Alcohol content : 8 %.
Belgian specialty beer : Strong, golden coloured beer with a thick and long lasting head (lacy). Characteristic aroma of devil type Belgian beers, soft palate with a slightly sweet aftertaste. Improves with long maturation times and can be kept for several years !

KRIEK type for 12 l.

Starting specific gravity : 1.053 Alcohol content : 5,5 %.
Kriek is the best known of the famous Belgian fruit-beers, made by macerating cherries in beer. A slightly acidic, sweet aromatic beer with a red topper tint. Each kit contains pure cherry juice of at least 3 kg of cherries ! This beer gives you the perfect balance of fruitiness without tasting like grenadine as some commercial kriek's do.

OLD FLEMISH BROWN type for 12 l.

Starting specific gravity : 1.060 Alcohol content : 6 %.
A dark brown beer with a woody notes flavor a slight liquorice aftertaste that also compares with the Dutch Bock-beers.

CHRISTMAS type for 7 l.

Starting specific gravity : 1.065 Alcohol content : 8%.
Dark, strong and full-bodied Belgian beer, sweeter than Abbey style beers. Strong malt flavour and aroma. Improves with long maturation times and can be kept for several years !

WHEATBEER type for 9 l.

Starting specific gravity : 1.053 Alcohol content : 5%.
Very similar to the well known Belgian "Witbieren" : pale, opaline colour with low alcohol content. A real summer beer with a pleasant aroma, mild hops and a smooth malt character. Slightly acidic and thirstquenching. Based on an old recipe using barley, wheat, oat flakes and a secret herb mixture with coriander and sweet orange-peel.

GRAND CRU type for 9 l.

Starting specific gravity : 1.075 Alcohol content : 8%.
Gold opaline coloured, with strong flavour of grains and even bread. Very little hop aroma. Very mouthfull with light fruit notes and a pleasant sweetness. Also this kit contains wheat malt and a special herb mixture.

TRIPLE type for 9 l.

Starting specific gravity : 1.075 Alcohol content : 8%.
Triple is a well known, deep golden coloured, Belgian specialty. Due to its high malt contents it has a very pleasant aroma and taste, mouthfull, full bodied and even a bit herbaceous. High alcohol content.

FRAMBOOS type for 12 l.

Starting specific gravity : 1.053 Alcohol content : 5,5%.
FRAMBOISE or raspberry beer, is a Belgian specialty. Together with the BREWFERM KRIEK, this FRAMBOISE is the only fruitbeer kit available in the world. Each kit has an equivalent of 2 kilo of raspberries. This FRAMBOISE beer has a very delicate aroma and is ideal as a refreshing summer-beer or as a surprising aperitif !

PILSNER type for 15 l.

Starting specific gravity : 1.042 Alcohol content : 4,6 %.
Light, blond beer, with a moderate bitterness and dry finish, comparable with the commercial Lager or Pilsner beers. Low alcohol content.

GOLD type for 12 l.

Starting specific gravity : 1.053 Alcohol content : 5,5 %.
A real deluxe pilsner type with more malt flavor than the normal Lagers. Moderate hop bitterness. Comparable with the Scandinavian deluxe-Beers.

GALLIA type for 12 l.

Starting specific gravity : 1.055, Alcohol content : 5,5 %.
The latest addition in our range: A thirstquenching pale amber beer with a refined bitterness and a soft finish, a worthy alternative to the commercial Belgian ales.



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BREWFERM PRODUCTS

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