
Brew
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APRIL 2001, VOL.7, NO.4
THE HOW-TO HOMEBREW BEER MAGA
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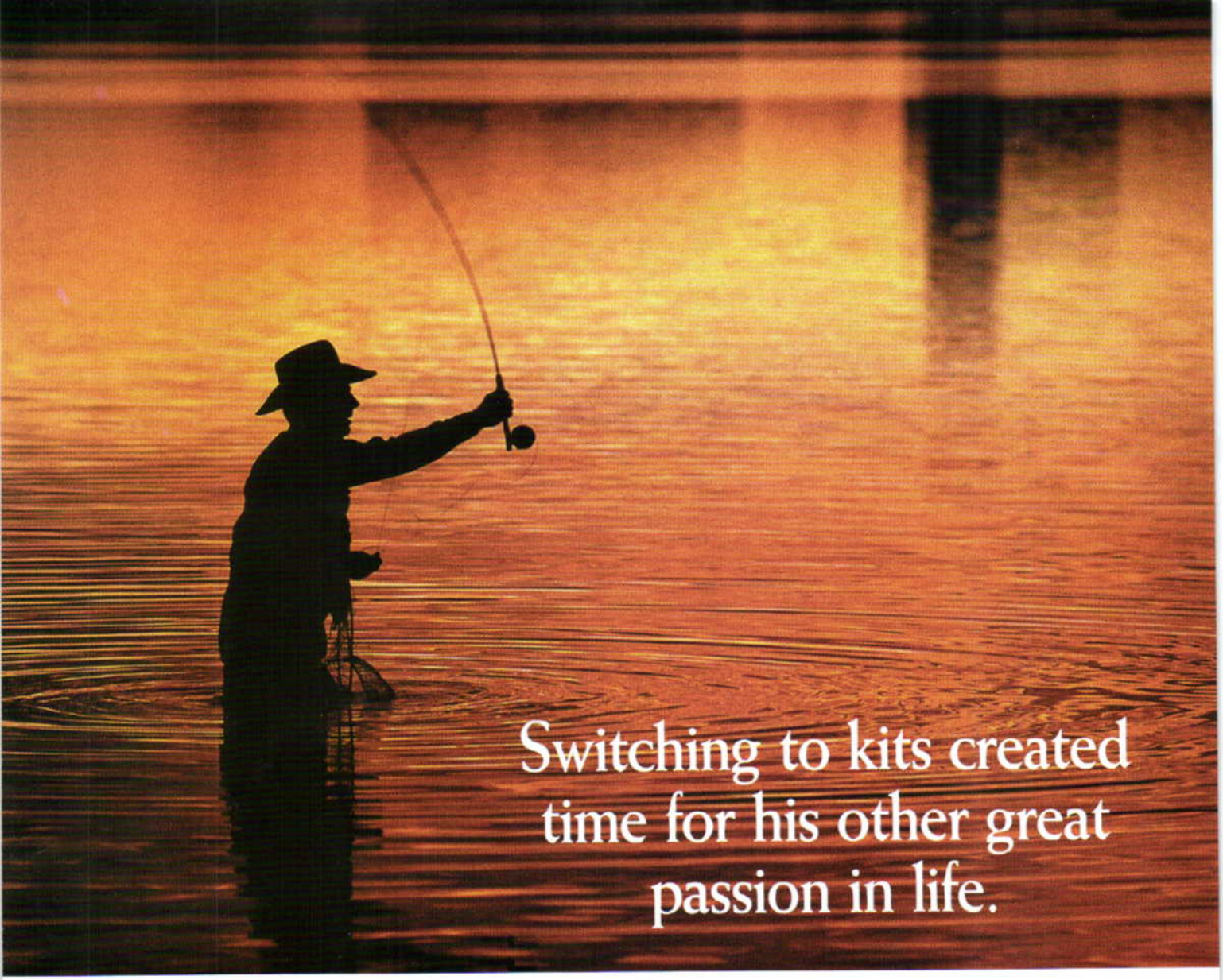

"It tasted just as good - if not better - than many a pint I've drunk in London pubs."

Richard Neill
'Weekend Telegraph' (April 99)

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

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

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

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

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

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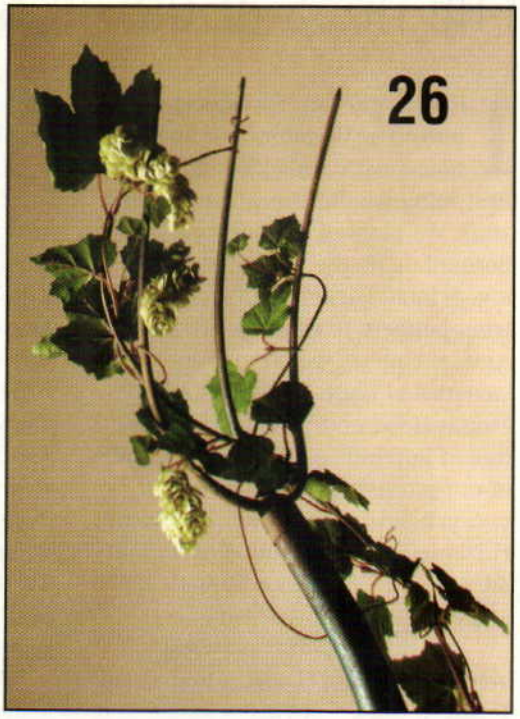

Where to Find it

Cover photo: Charles A. Parker/Images Plus

Departments

Editor's Note

The hops at our house

I love to garden. So when we moved to Vermont and bought a house with a big backyard, the first thing we did was start planting stuff. We planted annuals and perennials by the dozen. We put in a vegetable garden, with everything from peppers to eggplant and garlic. And, of course, we planted four varieties of hops: Fuggles, Cascade, Mount Hood and Liberty. We dug a line of hop hills along the back wall of our garage, which faces south and gets lots of sun, then tucked the rhizomes into the ground and created a simple trellis system with stakes and untreated twine.

Our first hop harvest wasn't very impressive. "Look, a hop," said Brad. And there it was: a single hop cone. (I'm kidding, but you get the picture.) Four years later, our hop vines were loaded with enough aromatic cones to justify a hop-picking party. We invited the *BYO* staff over on a Friday afternoon, poured a few pints of IPA and then took turns climbing the ladder and harvesting big handfuls of hops.

Growing hops is fun and easy, which is why we asked Joe and Dennis Fisher, organic farmers and authors of "The Homebrewer's Garden" *(Storey Books, 1998),* to write this month's cover story. From ordering the rhizomes to tending the vines and drying your hops, the brothers Fisher offer an excellent overview on planning a backyard hopyard. The article also contains recipes, sources for ordering hop rhizomes (that's the root-like part you plant) and a handy chart with a rundown on many hop varieties.

We also talk hops in "Pot Shots," where homebrewers who grow their own hops — including a guy who's giving it a whirl in Alaska! — share tales of planting, growing and brewing with our beloved *humulus lupulus*.

KATHLEEN

Contributors

New Jersey writer and homebrewer Sal Emma really gets into his beer.

Sal Emma didn't even like beer until 1985, when he visited England and developed a taste for British ale. A decade later, he bought some John Bull extract and made his first batch at home. These days, he's an all-grain brewer who spends most of his time trying to perfect his favorite style, ESB.

Sal is also a baseball fan — he lives in Palermo, New Jersey but roots for the Cincinnati Reds — so he had a great time researching "Baseball Beers You Can Brew" *(page 22)*. "Everybody talks about baseball and apple pie, but when was the last time you had a piece of apple pie at the ballpark?" he says. "When you go to a baseball game, you have a beer. Now that's an American tradition!"

BREW YOUR OWN
THE HOW-TO HOMEBREW BEER MAGAZINE

EDITOR
Kathleen James Ring

MANAGING EDITOR
Betsy Shaw

CREATIVE DIRECTOR
Coleen Heingartner

TECHNICAL EDITOR
Ashton Lewis

CONTRIBUTING WRITERS
Thom Cannell, Chris Colby, Joe and Dennis Fisher, Thomas Miller, John Oliver, Scott Russell, Dawnell Smith, Tess and Mark Szamatulski

CONTRIBUTING ARTISTS
Don Martin, Ian Mackenzie, Shawn Turner, Jim Woodward

CONTRIBUTING PHOTOGRAPHER
Charles F. Parker

PUBLISHER
Brad Ring

ADVERTISING DIRECTOR
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Brew Your Own

Editorial and Advertising Office:
Brew Your Own
5053 Main Street, Suite A
Manchester Center, VT 05255

Tel: (802) 362-3981
Fax: (802) 362-2377
E-Mail: BYO@byo.com

Advertising Contact:
Kiev Rattee
kiev@byo.com

Editorial Contact:
Kathleen James Ring
kath@byo.com

Subscriptions Only:
Brew Your Own
P.O. Box 469121
Escondido, CA 92046

Tel: 1-800-900-7594
E-mail: byo@pcspublink.com
Fax: (760) 738-4805

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MaiL

Not for Hopheads

In the February issue, you published recipes for five German beer styles. I can't wait to try them all. However, I don't see anything in the hopping schedule except the bittering hops. Is this correct? Should the recipes include any aroma or flavor hops?

Kevin Vaughn
via e-mail

According to authors Tess and Mark Szamatulski: "The helles and spaten lager are very light beers, so light that the bittering hops carry through and impart a bit of flavor and aroma. To add flavor and aroma hops would be overkill and would take away the light, delicate flavor. Weisse beers never have flavor or aroma hops, unless they are American wheat beers. In the dunkel, even though it is dark, it is still a delicate, malt-accented beer, in which the bittering hops follow through. If aroma and flavor hops were used, it would upset the delicate malt balance. For the Oktoberfest and Doppelbock, they are malt-dominated beers with no hop flavor and absolutely no hop aroma. The aroma should be of intense malt and the flavor should be rich and malty. These are not beers for hopheads!"

To Fry or Not

In your January 2001 issue, I was very interested in the "Adventures in Homebrew" article by Joe and Dennis Fisher. I'm going on a two-week trip to East Africa (Ethiopia, Kenya and Tanzania) this spring and we've been having some socials to better understand the African culture. For our next social I'd like to brew sewa. I just received some gesho from a friend, but need some clarification on the mashing technique for sewa. The recipe says to make the starter by simply combining the barley malt, gesho and water in a sanitized fermenter; however, in the article it says that Sean Richens uses frying to convert grain starches instead of mashing.

What is the correct way to convert the grain for sewa? Frying? If so, how? Traditional mashing? Or simply putting the crushed grain in the fermenter as the recipe states? I'm an all-grain brewer with almost two years of experience. I have a half-barrel three-tier gravity system using modified kegs.

Bruce Wayne Lovely
via e-mail

Author Dennis Fisher replies: "The whole sewa-brewing process takes three steps: making the starter, frying mattaka (the thin breads, which provide the starch for fermentation) and brewing and fermenting the sewa itself. Barley malt, gesho and water go into a fermenter for three days. This is the starter step. Meanwhile, the brewer mixes together millet flour and enough water to make a thin batter. Fry the batter into thin pancakes using as little oil as possible. One pound of flour should yield about 20 8-inch pancakes. Tear up the mattaka into smaller pieces.

The frying step converts the starch into a form that yeast can use and actually replaces the standard mash. For the 'brewing' itself, add the millet pancakes (mattaka), 1/8 pound of crystal malt and 1 pound of chopped dates to the fermenter, where the starter is already active. Ferment the sewa for two or three days and then strain. I hope that helps."

Okole-Maluna!

Thanks for publishing such

great, informative articles. It is such an enormous benefit for us beginners to have easy-to-follow information. I never realized that homebrewing could be so simple! I am so jazzed about making beer — I just wish I had started doing this years ago. I am definitely planning to add homebrewing to the list of things that I am passing on to my son. Thanks again, and as we often say in Hawaii, "okole-maluna" (bottoms up)!

Ernie Wakukawa
Honolulu, Hawaii

Temperamental Temperatures

I read your "Projects" article concerning how to build a temperature-controlled lagering refrigerator *(November 2000)*. My interest centers around the discussion of a self-defrosting versus a manual-defrost (simple cyclomatic) refrigerator. The author indicates the inside temperature may rise to 55° F every six to eight hours on the self-defrosting refrigerator. My experience has shown that the temperature may hit highs in the 30° F range or lows in the 40° F range, but nothing as high as 55° F. I also think that, considering the volume of the fermenter (usually five gallons), this temporary rise in temperature would have a negligible affect on fermenting lager at cool temperatures in the 34° to 50° F range. Any additional information that you can give me concerning these self-defrosting refrigerators for homebrewing would be appreciated.

Dennis Moore
Via e-mail

Author Thom Cannell replies: "The temperature range I gave in 'Ice Cold Beer' was quoted to me by an experienced refrigerator salesman and repairman who has created many lager chests for homebrewers. He observed, based on his experience with thousands of refrigerators, that the interior of a self-defrosting refrigerator may rise higher than your experience notes.

My opinion is based on owning three refrigerators. My two cyclomatic refrigerators cycle between well-defined margins. One of these, the lager chest produced for the article, varies only within its preset four degrees.

My self-defrosting refrigerator, on the other hand, serves me solid ice cream some days and semi-soft ice cream on other days. It also has a huge thermal mass (which addresses your contention that five gallons of beer should be stable), but my observation is that while the chicken stays frozen, the ice cream sometimes softens.

As always, your mileage may vary, and in the end, you're probably more than 50 percent correct." ■

Hop Madness

A homebrewer confronts her hop addiction

Robin Powlus • Saylorsburg, Pennsylvania

PHOTOS COURTESY OF ROBIN POWLUS

Robin's backyard hop garden with Nugget, Cascade and Crystal hops.

I was an extract brewer for one year and have brewed all-grain for the past four years. Some of my favorite homebrews include IPA, Belgian wit, Belgian dubbel and tripel, and alt. I have won several awards for my homebrews in AHA contests.

The more I homebrew, the more I love hops. I am a hop addict (isn't everybody?). As an all-grain brewer, hops had been a large part of my brewing budget. To cut hop costs, two years ago I started growing my own (hops, that is). I have three hills, six feet apart, each with two hop plants. For variety I chose Nugget (a bittering hop), Cascade (for IPAs) and Crystal, which is similar to Hallertauer (for German and Belgian brews).

The Nugget hops really shot up and reached the very top of the trellis.

These pictures were taken in early summer 2000. The Nugget really shot up and reached the top of my trellis at this time, but the Cascade and Crystal were a bit shorter. As you can see in the pictures, my hop trellis is made of 2x4 lumber. It was easy to make. I purchased two 2x4x12 (posts), one 2x4x10 (horizontal top board), and one 2x4x6 (cut up for braces). I assembled the trellis using carriage bolts, stained it, and sank it three feet into the ground in concrete. I tied some wire from the top of the trellis over to two nearby garden posts to help brace it in the wind. I then put three wooden posts into the ground and tied twine from there to the top board for the hops to climb. It works great. If I had to do it again, I would do the same, but use another 2x4x12 instead of the 2x4x10 as the horizontal top board.

I purchased my hops on the Internet from Freshops and was pleased with them. I dug a 2-foot deep hole, mixed some sand, peat and lime with the soil and planted the rhizomes. Although I planted in April, I did not see any sprouts coming up until late June. There weren't many flowers the first year, about 1/4 ounce per plant. The second year, I got around 8 ounces per plant, and I expect a greater harvest this year now that the plants are well established. One of my favorite hoppy brews is my IPA. I keep increasing the hops in it, but my taste for hops keeps increasing. I love hoppy IPAs and I have been refining my IPA recipe for several years. Here it is *(see right)*. →

Robin's IPA

(5 gallons, all-grain)
OG = 1.063 FG = 1.010 IBUs = 68

10 lbs. Briess two-row pale
0.5 lbs. American crystal malt (40° Lovibond)
0.25 lbs. wheat malt
0.5 lbs. Munich malt (10° Lovibond)
0.5 lbs. flaked barley
1/8 tsp. canning salt in boil
5.2 AAU East Kent Goldings (1.3 oz. of 4% alpha acid)
11.2 AAU Chinook (1 oz. of 11.2% alpha acid)
6 AAU Cascade (1 oz. of 6% alpha acid)
6 AAU Cascade (1 oz. of 6% alpha acid)
9 AAU Cascade (1.5 oz. of 6% alpha acid)
1/2 tsp. Irish moss
1 quart starter American Ale (Wyeast 1056)

Step by Step

Heat 3.5 gallons of water to 166° F and mash-in grains. Mash temperature should be between 152° and 154° F. Hold for 60 min. before beginning vorlauf. Recirculate wort until clear and begin collecting wort in brew kettle. Sparge with 168° F water to get 6 gallons of wort. Bring to a boil, add 5.2 AAU of EKG and 11.2 AAU of Chinook. Add 6 AAU of Cascade after 30 min. and again after another 15 min. of boiling, along with Irish moss.

Boil for 15 min. and remove from heat. Cool wort to 70° to 75° F, aerate and add yeast. Ferment at 71° F until fermentation is complete, as indicated by your hydrometer. Transfer to secondary and add 9 AAU of Cascade hops for dry-hopping. Bottle after 2 weeks using 2/3 cup priming sugar.

Northern Exposure

Jim O'Neil • North Pole, Alaska

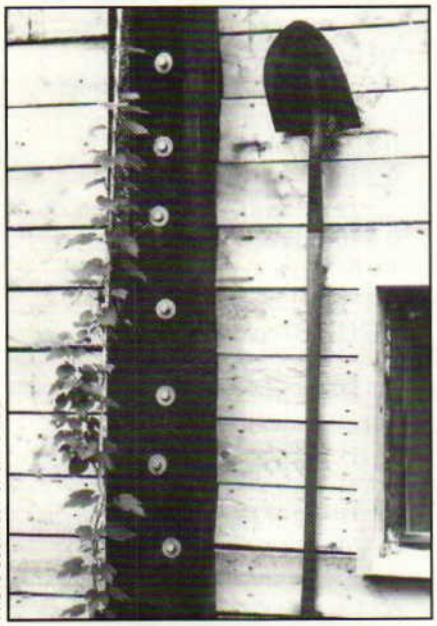


PHOTO COURTESY OF JIM O'NEIL

Jim's hops soak up the 20 hours of daily summer sun in North Pole.

I first started brewing back in the late Fifties, while in college in Florida, when all that was available was 3.2 beer. When I moved to Alaska in the mid-Sixties, I did some extract brewing but then got away from it. Just a few years ago I got back into the hobby and went to all-grain. Now I'm using Alaskan-grown barley as my base grain — a good friend of mine does the malting. Subsequently, I decided it might be interesting to try growing my own Alaskan hops.

You're thinking, "Grow hops in Alaska? That's just plain crazy!" Everybody knows that hops grow in the temperate zones (between the 30th and 55th parallel) and I live in the middle of Alaska, around the 64th parallel.

Hops need a minimum of 120 frost-free days and I'm lucky if I get 90. During the winter, I see temperatures as low as -60° F, but we get close to 24 hours of daylight and 80° F temperatures in the summer.

So early last spring, I ordered three rhizomes (root cuttings) and started them in the house in flower pots. I put them on a south-facing window sill. By late May they were over five feet tall and banging at the window to get out. On June 1st, I planted them close to the house on the south side. They won't see 120 frost-free days, but the sun will be up for over 20 hours every day, and the heat reflected from the house should extend the season a bit. After the plants got over the initial shock of being outside, they climbed 3 or 4 inches a day.

When the hops grew a bit more (over 15 feet tall), a young moose started hanging around and licking his lips. I'd go out and do yard work to discourage him whenever I'd see him. By the end of July, the hops had grown up to the eves and one was even trying to climb the roof.

In mid-September, I cut them back to ground level to lie dormant for the winter. Though they were beautiful plants, they never flowered. I'm not sure if that's because it was their first year or if our growing season is too short. It's only -20° F now, so spring isn't too far away. I'll see how they do this year.

Little Hops on the Prairie

George Weisiger • St. Joseph, Illinois

PHOTO COURTESY OF GEORGE WEISIGER

George and his guard dog Misty form a great hop-growing team.

I have been making homemade beer and wine since the early 1970s. After three decades of the homebrewing hobby, I was ready to try something new — growing my own hops.

Three years ago, I planted four Cascade plants in the east-central Illinois prairie soil. I was worried about mildew since the roses and lilacs in my garden suffer from it. I also worried that our hot sunny summers might cause the hops to have a strong, harsh taste. But — so far, so good — I haven't had any problem with mildew or disease yet. Japanese beetles have been the only insect pests, causing only minor damage. We do get rabbits, but my dog Misty protects the tender young shoots from harm.

I have made beer using my own hops for two years now. I have used my hops for bittering, flavoring and finishing in both my ales and lagers. My beer has been pronounced excellent by all who have tasted it. My only complaint is that my homegrown hops don't have that characteristic Cascade taste.

My hop garden seems to be thriving. In the second year I harvested about 1/2 pound, and in the third year I harvested 2 pounds. ■

TALES FROM THE FRUIT BASKET!

Do you love to brew with fruit? Send your story to edit@byo.com or 5053 Main St., Suite A, Manchester Center, Vermont 05255

Maibock is Your Bock

Tips and techniques for brewing this high-gravity spring beer

by Thomas J. Miller

Most people love May for its warm weather and feeling of impending summer. The Germans love it so much that they even named a beer style after it: Maibock, which means "May bock."

Bock beers should start at around 1.064 OG. Maibock is traditionally light-colored, malty and lightly hopped for medium bitterness. It's fermented with a lager yeast, at temperatures between 45° to 50° F. This month's pros suggest 4 to 8 weeks of lagering at near-freezing temperatures.

Maibock is potent, but it's also fragile. It's a big beer, yet it's a lager, which makes it vulnerable to temperature spikes. This makes Maibock a great experiment for the advanced brewer, but even beginners will benefit from this month's pro tips.

Brewer: Bryan Pearson of The Church Brew Works in Pittsburgh, Pennsylvania. After college (with a degree in physics and a minor in math), Bryan took a brewing job at the Village Brewery in Houston, Texas. He has attended numerous brewing seminars and has been a brewer at The Church Brew Works for almost five years.

There are two keys to a great Maibock. First, ferment it nice and slow, at cold temperatures. Second, age it. These steps make for a nice, clean beer.

Yeast selection is very important. It should be something clean and German. I use Bohemian Lager (Wyeast 2124) but you could get away with the Munich Lager (2308) or Bavarian Lager (2206). My yeast has moderate flocculation. It ferments nice and cool at 47° F. It also leaves a nice, malty flavor, and is very clean when fermented and stored at the right temperatures.

Maibock will be a very big beer that's complex, but weighted toward the malt. I prefer to use imported Belgian malts from De Wolf-Cosyns, with a malt profile that includes pilsen, Munich, aromatic, carapils and wheat malts. I have been pleased with the performance of these Belgian malts; the specialty malts work especially well for us.

The Munich malt adds to the body and maltiness, plus lends color, while the aromatic malt gives a bread-like character that accentuates the malt character of the beer. I add the carapils for body, and use a modest amount of wheat to enhance head retention.

We then do a double-decoction mash. We mash-in at 122° F for 5 minutes, using this as a protein rest. Then we pump away one third of the mash to the kettle, leaving behind the other two-thirds. We then slowly raise the temperature, holding it at 144°, and then 152° F, for a few minutes each time. Then we bring it to a vigorous boil for several minutes.

We pump that portion of the mash back into the other, letting it mix briefly. Because of the temperature of the boiled mash, the temperature rises to 144° F, giving us the first starch conversion.

Then we pump away one-third of the mash again, raising the temperature to 152° F and then to a boil. We pump it back, mix it up, and let the mash bed set up with the whole mash now at a temperature of 152° F. The mash continues until starch conversion, and we mash-out at 170° F. I really think that decoction is worthwhile. I believe it increases the complexity of the malt character and improves malt efficiency.

We shoot for 28 IBUs, using Perle for bittering hops and boiling them for 90 minutes. Ten minutes before the end of the boil, we add Tettnanger for flavor and aroma.

After the boil, we drop the temperature of the wort to 54° F and pitch the yeast. I double the yeast for a heavy beer like this, using about 25 to 30 million yeast cells per mL for the Maibock. After the yeast gets a good start, I drop the temperature to 47° F. It should ferment out in about one week.

Near the end of fermentation, I start a temperature rise back to 54° F for a diacetyl rest. This makes the yeast more active, ensures a more complete fermentation and mops up the diacetyl. If you don't do it, you risk a sweeter beer. Let your Maibock age a minimum of two months at, or just above, freezing.

Brewer: Lochlann Kehoe of Baltimore Brewing Company in Baltimore, Maryland. Lochlann started at the BBC after college and has worked there for three years.

Our Maibock is made with 100 percent pale malt. I find it crisp and refreshing. We add hops three times during the boil. The first addition is Nugget, followed by a mixture of Nugget and Hallertauer (at a ratio of two parts Nugget, one part Hallertauer). We then finish with Hallertauer, which gives us a hint of a flowery nose.

The finished beer is not very bitter. It's maybe one-quarter the bitterness of a pilsner. The IBUs should be around 30 for a Maibock.

Since it's a bock, you definitely want to taste the malt in the final brew. We get a good malt flavor by using domestic malt. The hop aroma and taste will come out mildly on the palate, and you should never be able to taste the alcohol when you drink the beer. Typically, a Maibock should be around 7 percent by volume. You can start tasting alcohol at concentrations between 8 to 9 percent by volume.

For the Maibock, we do step-mashes rather than a regular infusion mash. We think it improves the flavor and improves efficiency. There are four temperature rests along the way. Each is for 30 minutes. We start at 98.6° F, raise to 122° F, then between 144° to 149° F and then 158° F. Then we mash out at 170° F.

Sparge water should be at 171° F, since this is best for sugar extraction. It also knocks out the enzymes that were at work in the mash converting starches to sugar.

Since this is a lager, you should ferment around 48° to 50° F. As a homebrewer, my lagers always turned out awful because I couldn't control the temperatures. If the beer gets too warm, you get off flavors. If it's too cold, you knock out the yeast. And if it's too cold at the end of fermentation, you won't get any diacetyl absorption. Temperature is definitely one of the bigger challenges.

We don't do a diacetyl rest. We "trust the yeast," which means that we believe that it will do its job all the way through without us influencing the temperatures.

Age this beer for four weeks at least. We drop the temperature to just below freezing (31° F). After a month, it's a nice, crisp beer. ■

"Help Me, Mr. Wizard"

Mash Time

Converting Brix to SG to Balling, brewing stout and copper ions

Mr. Wizard

Can you give me a formula for converting degrees Brix to specific gravity, or degrees Balling? I have a refractometer and was told that I can check the gravity of my run-off when sparging. It sounds good to me! That way, I wouldn't have to wait for a hydrometer sample to cool. Also, it would be nice to just take a sample drop to check gravity during fermentation.

Vicky Melius
via e-mail

This question raises some issues of semantics that make giving a clear answer difficult without first addressing terminology. In general terms, °Brix, °Plato and °Balling are interchangeable. All three of these scales express the weight percentage of sucrose solutions and relate this weight percentage to specific gravity. The Balling scale is the oldest and is based on Balling's tables established in 1843. Brix later corrected some calculation errors in the Balling tables and introduced the Brix tables. In the early 1900s Plato and his collaborators made further improvements and along came the Plato tables. Essentially, they are the same, but the tables differ in their conversion from weight percent to specific gravity in the fifth and sixth decimal place of the specific gravity number.

Winemakers, the sugar industry and the juice industry typically use °Brix, continental brewers typically use °Plato, British brewers use specific gravity multiplied by 1000 (for example 1.040 becomes 1040) and American brewers use a mixture of °Balling, °Plato and specific gravity.

I use Plato and specific gravity because my hydrometers indicate °Plato, and specific gravity is always required when doing brewing calculations. For example, if you multiply °Plato (expressed in decimal form) by specific gravity, the result is kilograms of extract, a convenient number when doing calculations. Now for the conversion. The following formula shows the conversion from specific gravity to °Plato.

$$SG = \frac{°Plato + 1}{258.6 - [(°Plato/258.2) \times 227.1]}$$

To make sure you are doing your math properly, convert 12° Plato to specific gravity. The correct conversion yields 1.04838.

If you have a refractometer, you certainly can use it to determine density. Most refractometers are scaled in terms of °Brix because they are most often used in industries that use the Brix scale. For all practical purposes, you can use the formula above for the conversion. Use caution with your refractometer because light refraction is temperature dependent just like specific gravity. Your sample temperature should ideally be around 68° F. The great thing about a refractometer is that the sample size is small (about 1 mL) and very easy to cool to room temperature before measuring.

I don't like refractometers for two reasons. The first reason is that they are difficult to read unless they are really high-end. I do like these high-end ones (they resemble a microscope) but they cost $5,000 new! The second reason I don't like them is that they are not reliable for checking samples from the fermenter because alcohol interferes with the measurement differently than it does with a hydrometer. In other words, a hydrometer measurement on beer may indicate 2° Plato and the refractometer will indicate something different on the same sample. Most brewers express the final gravity as measured by a hydrometer. If you do want to use the refractometer, use it on wort only and then you will be fine.

Mr. Wizard

If you mash at 156° F for sixty minutes and the mash is fully converted, but you have to leave it at the same temperature for another thirty minutes before you mash out, what effect will that have on your mash?

Gerry Steele
Bloomington, Indiana

This is a good question! Mashing at a single temperature above 150° F strongly favors the enzyme alpha-amylase. Alpha-amylase produces a mixture of fermentable and non-fermentable sugars by breaking down the starches amylopectin (branched starch) and amylose (unbranched starch). Starch reacts with iodine to yield a black color and the mash is said to be "converted" when this reaction ceases to occur. Allowing the mash to stand at 156° F after

Mr. Wizard

conversion has occurred won't have any significant impact on the mash. Most commercial brewers will increase the mash temperature to the mash-off temperature after conversion has been confirmed by the iodine test.

Mash time has a more profound effect on wort when the enzyme beta-amylase is active. Beta-amylase produces maltose from starch and is known as the "fermentability enzyme." Beta-amylase activity is blocked by branches in the molecular structure of amylopectin and leaves partially degraded starch molecules known as beta-limit dextrins. Alpha-amylase, on the other hand, acts differently and can reduce the size of the beta-limit dextrins. When this occurs, beta-amylase can continue producing maltose. What this means is that alpha-and beta-amylase can work together to produce a highly fermentable wort if the mash rest between 140° F and 150° F is extended. The most effective method to get a really fermentable wort is to increase the mash temperature from 140° F to 150° F over 2 to 3 hours. Some big breweries use this technique to produce light beers with low residual carbohydrate contents.

What I recommend is that you get on with the day after confirming conversion. If you mash-off, go ahead and do it, and if not, start wort recirculation.

Mr. Wizard

I have a few questions about brewing stout. When mashing, do you also mash the dark grains (roasted barley and chocolate malts)? What do the commercial brewers do? I'm thinking of making a slightly smoky malt. Do I mash the smoked grains in with the others, or mash them separately? What are the best fermenting and storage temperatures to avoid a "ripe banana" aroma? I brewed a stout about a year ago that tasted great, but had a banana smell.

Matt Story
Chula Vista, California

There are several methods used by commercial brewers to brew stouts, and some of these methods surprise many brewers. When I brew stout or porter, I add all of the grains to the mash at the same time. I do treat my brewing water when brewing dark beers by adding carbonates to the mash water. The carbonates increase the mash pH and offset the acidic nature of roasted grains. I get good results with this method. If I were to brew a smoked stout or porter I would add the smoked malt to the mash along with the other malts.

Other brewers add the roasted grains (for example, chocolate malt, black malt and roasted barley) towards the end of the mash. Some brewers believe this method results in a more pleasing flavor and makes the wort separation process go smoother. Another reason to do this is because dark malts are acidic and tend to lower mash pH, which affects enzyme activity. Adding dark grains after conversion eliminates the need to adjust mash pH differently than other brews; a standard pH adjustment procedure can be used for pale and dark worts.

The real surprise about stout has to do with Guinness. Guinness produces a special product in Ireland and ships it around the world to all breweries that produce Guinness under license. The product is a concentrate produced from roasted barley and perhaps other proprietary ingredients and is known as GFE. GFE is added to beer after fermentation and turns a pale-colored beer into Guinness. To many brewers, this method does not have the romance of producing black wort in the brewhouse, but it does allow Guinness to control the consistency of its stout around the globe. The GFE is only produced in one location.

German brewers use similar malt extracts to produce a variety of dark beers from a pale base beer. Dunkel can be made by adding roast malt extract to a helles lager and dunkelweizen can be made by adding the same extract to a standard hefeweizen.

Whether producing stout or other beers, the banana aroma can be minimized in several ways. The banana aroma is associated with the ester isoamyl acetate. In general, ester production increases when wort aeration is low. Some weizen brewers actually limit aeration intentionally to get more banana aroma. You can do the opposite and aerate your wort more aggressively than normal.

Another factor is temperature. Generally, higher temperatures lead to more esters in the finished beer. Yeast strain also has a great influence on aroma and some yeast strains are known to produce more isoamyl acetate than others, for example, weizen strains. Finally,

there is wort original gravity. Ester levels increase with wort gravity.

I recommend using an ale strain for stout that is described as an English, Irish or American ale. Avoid Belgian or weizen strains for stout! They tend to lend fruity and phenolic aromas that aren't fitting with the style. Aerate the wort well and try to keep your fermentation temperature less than 75° F. Aging temperature has no effect on ester production.

Mr. Wizard

I have heard that copper ions in a boiled, sanitized wort can be beneficial to healthy yeast propagation and successful fermentation. If this is true, would a piece of copper tubing or pipe dropped into the boil do the trick?

David Woodall
Moscow, Idaho

Copper is an interesting metal that can affect fermentation and beer aroma. Copper used to make brew kettles and copper pipe is not pure and contains trace amounts of zinc. Zinc is an important co-factor for several enzymes involved in metabolism. If wort is zinc-deficient, fermentations may fail to complete, yeast growth may be insufficient for collecting and re-using yeast and yeast flocculation can suffer. Many brewers who use stainless-steel brew kettles add zinc to wort in order to bring the level of zinc between 0.05 mg/L and 0.20 mg/L. Higher zinc concentrations can hinder fermentation and cause premature flocculation of yeast.

Another way to get zinc into wort is with a chunk of copper in the brew kettle. Some commercial brewers with stainless kettles use copper tubes for heating and others insert a section of copper into the kettle. Tossing a piece of copper pipe into your kettle will work.

Copper affects beer aroma because copper binds sulfur. Copper ions present in the wort will bind the sulfur and diminish the rotten-egg aroma associated with hydrogen

sulfide. An old winemaker's trick is to add a small amount of copper sulfate to wines afflicted with a rotten-egg nose.

I don't recommend adding copper sulfate or any other salts of copper to beer or wine because copper is toxic. In fact, the United States Food and Drug Administration enacted legislation a few years ago that specifically dealt with the use of copper food-processing equipment. The gist of the legislation is that copper food-processing equipment is on its way out, especially with regards to acidic foods that are processed in copper equipment. To my knowledge, copper in the brewhouse is still acceptable, since yeast adsorbs most of the copper in wort and finished beer copper levels typically fall far below the maximum amount of copper permitted.

Mr. Wizard

Here in the Florida Keys, I brew in hot conditions. The minimum temperature in my basement is 74° F, and I often ferment at 82° F. Your magazine has provided great information regarding off-flavors caused by high temperatures. Do esters, fusel and higher-order alcohol and diacetyl have any negative health consequences? I can detect these by the smell when opening my fermenter. I get a Granny Smith apple smell and a pretty good whiff of alcohol. I rarely get much diacetyl because I usually rest the beer for a week after active fermentation.

Andy McHenry
Key Largo

The really bad headache-producers in alcoholic beverages are higher alcohols. The term "higher alcohol" refers to alcohols with a higher molecular weight than ethanol. They are associated with high fermentation temperatures, yeast growth and worts rich in amino acids. High-gravity worts have more amino acids than normal-gravity worts, and all-malt worts have more amino acids than worts made using adjuncts.

The best way to minimize higher-alcohol production is to use cooler fermentation temperatures and a healthy pitching rate. These terms are subjective, but if you wish to lower the concentration of these compounds, you can do it by adjusting your practices. Although higher alcohols are associated with headaches, they are also associated with spicy, vinous and fruity aromas that add complexity to many beer styles. Some Belgian ales are made using a very warm fermentation in order to increase the level of higher alcohols (and esters) in the beer. If you chug down three or four of these beers, you may have a headache the next morning. When consumed in moderation these beers are quite enjoyable.

The Granny Smith apple aroma

you refer to is acetaldehyde. Acetaldehyde is reduced during aging, like diacetyl, and the "green" or young beer characteristic is due to acetaldehyde. Acetaldehyde is a toxic compound that also causes wicked headaches. When ethanol is consumed, it is first converted to acetaldehyde and then to pyruvate. Pyruvate is a biochemical intermediate in the glycolytic pathway of glucose metabolism and can be used by the body to produce fats or to produce energy in the Kreb's cycle.

The key compound in alcohol metabolism is acetaldehyde. Acetaldehyde can cause headaches and other negative side affects from beers rich in this compound or simply by consuming too much ethanol. When higher alcohols are metabolized other aldehydes are produced and these have more potent side effects than acetaldehyde.

Your question considers what compounds in beer have negative health consequences. The real problem with alcohol is that aldehydes, especially acetaldehyde, arise during metabolism. When you drink beers rich in higher alcohols, you will be made more aware of the true toxicity of the byproducts of alcohol metabolism.

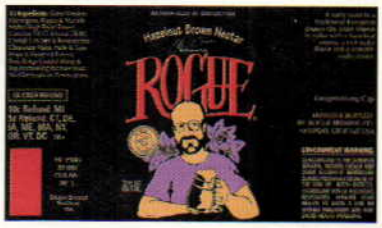
My advice is this: Ferment cool and pitch enough yeast. Then, most importantly, drink in moderation and your concerns about health and headaches will be best alleviated. ■

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

The Replicator

Sparkling Ale and Hazelnut Brown Nectar

by Dawnell Smith



Dear Replicator:

Coming from Adelaide in Australia, I'm quite proud of Coopers Sparkling Ale (the archetype for Australia's only truly indigenous beer style). Could you suggest a recipe for this?

Philip Ritson
Adelaide, South Australia

Nothing beats the dry Coopers Sparkling Ale. This cloudy, fruity, zesty beer has an intensity that comes from bottle fermentation, Schooner malt and plenty of carbonation.

The Coopers brewery still belongs to the family that started the enterprise in 1862. They keep their recipes a secret, but Mark Henry of Cascadia Importers, an importer for Coopers, knows quite a bit about Coopers beer.

Henry says the brewers use their own Schooner base malt, but extract brewers can get similar results by using Coopers unhopped malt extracts. "The color is more off-golden rather than amber. My guess is that they use a small amount of crystal malt for head retention," says Henry.

"Coopers uses Pride of Ringwood hops across the board, though any Hallertauer will work," he adds. "As for yeast, Coopers ales are produced with multiple strains of yeast. For authenticity, the homebrewer can purchase a few bottles of sparkling ale and harvest the yeast from the bottom."

Otherwise, use a packet of Coopers Homebrew Ale Yeast. Ferment at 64° to 70° F and prime with a full cup of corn sugar to impart the effervescence of its namesake.

For more information about the brewery, call (011-61-8-8300-4222) or go to www.coopers.com.au.

Coopers Sparkling Ale
(5 gallons, extract with grains)

OG = 1.050 FG = 1.006 IBUs = 25

Ingredients

6 lbs. Coopers light unhopped malt extract
0.50 lb. crystal malt (60° Lovibond)
1 lb. Belgian candi sugar (white)
4.75 AAUs Pride of Ringwood pellet hops (1/3 oz. at 9.5% alpha acid)
4.75 AAUs Pride of Ringwood pellet hops (1/2 oz. at 9.5% alpha acid)
4.75 AAUs Pride of Ringwood pellet hops (1/2 oz. of 9.5% alpha acid)
1 tsp. Irish moss
1 cup corn sugar to prime
Yeast culture from two bottles of sparkling ale or Coopers Homebrew Yeast or YeastLabs A01 (Coopers Ale Yeast).
7/8 to 1 cup corn sugar to prime

Step by Step

Steep specialty grains in 3 gallons of water at 150° F for 45 minutes. Remove grains and add malt syrup. Bring to boil for 30 minutes. Add 0.33 oz. Pride of Ringwood pellet hops. Boil 30 minutes, then add candi sugar and Irish moss.

Boil for 15 minutes and add 0.50 oz. Pride of Ringwood hops. Boil for 13 minutes and add remaining hops. Boil for two more minutes and remove from heat.

Cool to about 70° F and transfer to fermenting vessel with yeast. Ferment at 64° to 70° F until complete (about 7 to 10 days), then transfer to a secondary vessel or rack into bottles or keg with corn sugar.

All-grain version: Omit extract and mash 7.5 lbs. Schooner or Harrington two-row pale malt with crystal malt in 8.5 quarts of water to get a single-infusion mash temperature of 150° F for 45 minutes.

Sparge with hot water (170° F or more) to get 5.5 gallons of wort. Then bring to boil and use the above hopping and fermentation schedule.

Dear Replicator:

I am looking for the recipe for Rogue's Hazelnut Brown Ale. This is one of my favorite beers and I have been looking for this recipe for some time now.

Aaron Simmer
Butler, Pennsylvania

A hazelnut homebrew made with real hazelnuts inspired Rogue's legendary brewer, John Maier, to make Hazelnut Brown Nectar. The Rogue version includes hazelnut flavoring, not nuts, but it has a distinct hazelnut aroma and lush nut flavor.

Like many of the Rogue Ale beers, the hazelnut brown distinguishes itself through its unique flavors. Founded in 1988, in Ashland, Oregon, Rogue now runs a 50-barrel brew system in Newport that cranks out a slew of interesting beers, from Dead Guy Ale to Brutal Bitter and McRogue Scotch Ale.

As for making the Hazelnut, simply follow the directions proffered by the gracious brewer himself. Maier recommends mashing at fairly low temperatures (around 150° F) to avoid drying out the beer. The grain bill includes 58 percent two-row pale malt and a blend of Munich, Hugh Baird brown, crystal and Beeston pale chocolate malts. Perle and Saaz hops help to round out the beer. The Web site puts the IBUs at 33.

American Ale yeast (Wyeast 1056) will work fine with this brew. Ferment at 60° F if possible. Brewers may need to play around with hazelnut flavoring if they can't get the Stearns and Lehman brand. Whatever you use, add it during racking. An eighth of an ounce will do for a 5-gallon batch.

For more information about Rogue, call (541) 867-3660 or check out www.rogue.com. ■

Rogue Hazelnut Brown Nectar
(5 gallons, extract with grains)

OG = 1.056 FG = 1.014 IBUs = 33

Ingredients
4.5 lbs. Alexander's light dry malt extract
1.5 lbs. Munich malt (10° Lovibond)
1.2 lbs. crystal malt (75° Lovibond)
0.56 lbs. Hugh Baird brown malt
0.35 lbs. crystal malt (120° Lovibond)
0.35 lbs. crystal malt (15° Lovibond)
0.24 lbs. pale chocolate malt (187° Lovibond)
7.8 AAUs Perle pellet hops (1 oz. at 7.8% alpha acid)
1.75 AAUs Saaz pellet hops (0.50 oz. at 3.5% alpha acid)
1 tsp. Irish moss
American Ale Yeast (Wyeast 1056)
3/4 cup corn sugar to prime
1/8 oz. Stearns and Lehman Flavor-mate hazelnut flavoring

Step by Step
Steep specialty grains in 3 gal. of water at 150° to 153° F for 45 min. Remove grains and add DME. Bring to boil and add Perle. Boil 60 min., add Irish moss. Boil 30 min., add Saaz. Cool to 70° F, transfer to fermenter with yeast. Ferment cool (60° F) until complete (7 to 10 days). Transfer to secondary or rack with corn sugar and hazelnut flavoring.

All-grain version: Omit extract and mash 5.8 lbs. pale malt with specialty malts in 10 quarts of water to get a single-infusion mash temperature of 150° to 153° F for 45 min. Sparge with hot water of 170° F or more to get 5.5 gal. of wort. Bring to boil and use above hopping and fermentation schedule.

ReaderRecipes

Smithwick's Ale Clone
(5 gallons, all-grain)
OG = 1.050 FG = 1.010
IBUs = 22

When my wife and I visited Ireland, we really enjoyed our share of Smithwick's Ale. Smithwick's is a light-bodied, copper-colored ale with a pleasant hint of roastiness and a dry finish. Here's a successful homebrew version of Smithwick's.

Randy & Amy Germann
San Antonio, Texas

Ingredients
6.5 lbs. pale malt
5.75 oz. roasted barley (300° Lovibond)
7.25 oz. flaked barley
1 lbs. Karo light corn syrup
4 AAU East Kent Goldings (0.66 oz. of 5.9% alpha acid)
5 AAU Fuggles hops (1 oz. of 5% alpha acid)
1 tsp. Irish moss
Irish Ale Yeast (Wyeast 1084)
3/4 cup priming sugar

Step by Step
Add grains to 2 gal. water and hold temperature at 152° F until conversion is complete (30 to 60 min.). Sparge with 4 gal. of 162° F water. Add corn syrup and 3/4 gal. of water to the brew pot. Total boil is 60 min. At the boil, add 0.22 oz. of EKG. Boil 40 min. and add 0.22 oz. of EKG. Boil 5 min. more and add Irish moss. With two min. left, add 0.22 oz. of EKG and 1 oz. of Fuggles. Chill wort to 60° to 80° F and pitch the yeast.

After a week, transfer to secondary and hold for one more week. Bottle and condition for at least two weeks.

American IPA and Old Ale

A hoppy IPA for summer and a strong English ale for fall

2001

by Tess and Mark Szamatulski

April is one of those swing months in the Northeast. There can be a balmy warm day that will have you putting down the top on your convertible, and then a few days later, you may wake up to see snow on the daffodils. But spring is right around the corner!

Look closely at those hops you planted last year; their pointy little sprouts should be peeking out just about now. So celebrate the arrival of this season's hops by brewing a refreshing, flavorful IPA. And don't be caught without beer when September rolls around. Brew a luscious, warming old ale now and it will be perfectly aged and ready to drink when the first hint of fall is in the air.

INDIA PALE ALE

OG = 1.050 FG = 1.012
IBUs = 40 to 60+ SRM = 8 to 14

India pale ale originated in England in the late 18th century. These beers were shipped overseas to the troops and the rulers of the British Empire in India. They were brewed with a high gravity and hop rate in order to survive the trip from England. (Hops and alcohol are natural preservatives.) The beer was stored in wooden casks, which acted as ballasts for the ship. Still fermenting when the trip began, the beer matured at sea. Because of the extreme temperature changes and the listing of the ships during rough weather, when the beers arrived they were highly attenuated. The constant motion roused the yeast and kept it in solution and the higher temperatures promoted fuller fermentation.

A Scottish brewer named Ballantine came to the United States in the early 1800s and began brewing beer in Albany, New York. One of his beers was Ballantine IPA, aged in wood casks, which emulated the English IPAs. Americans adopted this style of beer, producing a version that was a little lighter in color, drier and hoppier than its English counterparts. This style of beer showcases American hops to the fullest. It pairs well with a wide variety of foods, from fiery Indian curries to standard backyard barbecue fare.

Our IPA has a dense, off-white head that sits on a pale amber beer. The aroma is fresh and citrusy, with a nuance of malt. The first sip is loaded with hop flavor, but a well-balanced malt profile softens the blow. The finish is long and dry, with a hop presence. This beer is a well-calibrated mix of malt and hops that complement and don't overpower each other.

Commercial Beers To Try

Almost every brewery has an IPA on its roster. Some of the more popular examples are Sierra Nevada Celebration, Anchor Liberty Ale, Bert Grant's India Pale Ale, Brooklyn East India Pale Ale, Great Lakes Commodore Perry IPA, BridgePort IPA, Magic Hat's Blind Faith, McNeill's Dead Horse IPA, and Victory Hop Devil IPA.

The beer should have a prominent hop aroma with a low level of caramel or toasted malt. Fruitiness

THE YEAR IN BEER

JANUARY:
Baltic Porter & German Pilsner

FEBRUARY:
Cream Stout & Dark Lager

MARCH:
Oktoberfest & American Brown Ale

APRIL:
American IPA & Old Ale

MAY:
Weizen & English Bitter

JUNE:
Fruit Ale & Belgian Strong Dark Ale

SEPTEMBER:
Kölsch & Robust Porter

OCTOBER:
Celebration Ale & Pale Lager

NOVEMBER:
Strong Scotch Ale & Vienna Lager

DECEMBER:
English Barleywine & Doppelbock

may also be detected. The color is medium gold to deep copper, with a slight haze at cold temperatures acceptable. Hop flavor is medium to high, with assertive hop bitterness. Malt flavor is low to medium but should balance the hops. It is important to have sufficient malt flavor, body and complexity to support the hops and maintain the balance of the beer. Low levels of diacetyl are acceptable and fruitiness should add to the complexity of the beer. Warming alcohol may be present in stronger-gravity beers. The mouthfeel is smooth and medium-bodied without astringency.

Hops, Malt and Yeast

Bittering varieties can be Chinook, Cluster, Eroica, Galena, Nugget, U.S. Northern Brewer, Yakima Magnum, or even combinations of bittering hops such as Cascade and Centennial. The most popular flavor hops are Cascade, Centennial, Willamette, Perle, Progress and Columbus. Aroma and dry-hop varieties include Cascade, Centennial, Crystal, Liberty, Ultra, Willamette and a newcomer to the market, Ahtanum. Ahtanum is grown in the Pacific Northwest and has a rich, spicy, floral character. Many brewers combine hops for a more complex IPA.

The base malt can be well-modified U.S. two-row or British two-row pale malt. Specialty malts include crystal (20° to 80° Lovibond), Munich, cara-Munich, torrified wheat, Victory and small amounts of roasted barley or chocolate malt.

Our favorite yeast choice for an American IPA is American Ale (Wyeast 1056) because it ferments dry and finishes soft, smooth and clean. Many other strains can be used successfully, such as American Ale II (Wyeast 1272), Northwest Ale (1332), British Ale (1098), British Ale II (1028) London Ale (1335), and California Ale (White Labs WLP001).

Serving Suggestions

Serve at 55° F in a pint glass with sea scallops quickly sautéed in lemon butter. Place the scallops on a mound of whipped Yukon Gold potatoes and surround with a broth of roasted garlic, carrot and ginger curry.

American IPA

(5 gallons, extract with grains)
OG = 1.065 FG = 1.017 IBUs = 51

Ingredients:

10 oz. U.S. crystal malt (60° Lovibond)
4 oz. U.S. Victory malt
4 lbs. Alexander's pale malt extract syrup
4 lb. Muntons extra-light DME
4 oz. malto-dextrin
13 AAUs Chinook (1 oz. of 13% alpha acid) (bittering)
5 AAUs Cascade (1 oz. of 5% alpha acid) (flavor)
2.5 AAUs Willamette (0.50 oz. of 5% alpha acid) (flavor)
1 tsp. Irish moss
5 AAUs Cascade (1 oz. of 5% alpha acid) (aroma)
1.25 AAUs Cascade (0.25 oz. of 5% alpha acid) (dry hop)
2.5 AAUs Centennial (0.25 oz. of 10% alpha acid) (dry hop)
American Ale (Wyeast 1056) or California Ale (White Labs WLP001)
1-1/4 cup Muntons extra light DME for priming

Step by step:

Bring 1/2 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 one gallon of 168° F water. Add the malt extract syrup, dry malt, malto-dextrin and bittering hops. Bring the total volume in the brewpot to 2.5 gallons. Boil for 45 minutes, then add the flavor hops and Irish moss. Boil for 14 minutes, then add the aroma hops.

Boil for 1 minute, then remove from heat. Cool wort for 15 minutes, then strain into the primary fermenter and add water to obtain 5-1/8 gallons. Add yeast when wort has cooled to below 80° F. Oxygenate-aerate well. Ferment at 68° F for 7 days, then rack into secondary and add dry hops. Ferment until target gravity is reached and beer is clear (approximately 3 weeks). Prime and bottle. Carbonate at 70° to 72° F for 2 to 3 weeks. Store at cellar temperature.

Partial-Mash Option: Acidify the mash water to below 7 pH. Mash 2.25 lbs. U.S. two-row pale malt and the specialty grains in 1 gallon water at 150° F for 90 min. Sparge with 1.5 gallons of water at 5.7 pH and 168° F. Follow extract recipe, omitting 1.75 lbs. of Muntons extra-light DME in the boil.

All-Grain Option: Acidify the mash water to below 7 pH. Mash 11.25 lbs. U.S. two-row pale malt and the specialty grains in 4.25 gallons of water at 152° F for 90 minutes. Sparge with 5 gallons of water at 5.7 pH and 168° F. The total boil time is approximately 90 minutes. Add 9.5 AAUs of bittering hops for the last 90 minutes of the boil. Add the flavor hops, Irish moss, aroma hops and dry hops as indicated by the extract recipe.

Helpful Hints: If your water is soft (below 50 ppm hardness), add 2 tsp. gypsum, 1/4 tsp. non-iodized table salt and 1 tsp. Epsom salts to adjust your water for the style. If your water is moderate (between 50 to 200 ppm hardness), add 1.25 tsp. gypsum, 1/4 tsp. non-iodized table salt and 1 tsp. Epsom salts. If your water is hard (greater than 200 ppm hardness), add 1/2 tsp. gypsum, 1/4 tsp. non-iodized table salt and 1 tsp. Epsom salts. Parts per million (ppm) is the unit used to describe the mineral content of your water.

This IPA is ready to drink 1 month after carbonation. It will peak between 1 and 3 months and will last for up to 7 months at cellar temperatures.

OLD ALE

OG = 1.060 to 90+ FG = 1.015 to 22+
IBUs = 30 to 60 SRM = 12 to 16

Old ales are often regarded as winter warmers and are brewed as

seasonal offerings for the cold weather. Traditionally they were brewed in the spring to be laid down during the summer months. The name of this style can be taken two ways: "Old" meaning the beer is aged for an extended period, or "old" meaning that it is a style that has been brewed for a long time. Some beers brewed in this style do not have the designation "old" in their name, for example, the lovely Young's Winter Warmer and the complex Sarah Hughes Dark Ruby.

Sometimes there is a gray area between old ales and barleywines, with commercial versions blending into each other — most notably, Eldridge Pope's Thomas Hardy's Ale. Generally old ales, even with significant alcohol strength, are not as potent or rich as barleywines and, for the most part, are darker in color. When laid down for six months (and in some cases, five years) they change, mature and become more potent.

Homebrewers can brew many different versions of old ale. The grain bill can range from 75 percent pale malt to 100 percent pale malt. A variety of brewing sugars can be added to the kettle, as well as small amounts of roasted grains and varying amounts of crystal malt. Brew our old ale and then use it as a base to experiment with this delicious, complex, warming style of beer.

Our old ale has a thick, light-tan head that gradually sinks into a tawny brown beer, leaving foam in its wake. The beer is sweet and malty on the palate with a subtle nuance of a secret ingredient, treacle, adding complexity and depth. The finish is surprisingly dry with a suggestion of alcohol.

Commercial Beers To Try

Commercial examples are hard to come by in the United States, but a good one to try is Full Sail Wassail Winter Ale. The UK brings us some delicious examples: Old Peculier by Theakston's brewery in North Yorkshire, Marston's Owd Rodger, Gale's Prize Old Ale, Young's Winter Warmer, Sarah Hughes Dark Ruby and, our favorite, Robinson's Old Tom. Tooheys Old Black Ale from Australia, Granite Brewery Peculiar from Canada, Broughton's Old Jock from Scotland, Renwick Hurricane and Shakespeare King Lear from New Zealand are all worth a try.

The aroma is malty, with complex fruity esters. A small amount of oxidation is acceptable because of the long aging period. The color can range from medium amber to extremely dark amber.

Hops, Malt, Adjuncts and Yeast

Hops are typically English in origin, but, because of the extended aging time and emphasis on malt, the variety is not as important. East Kent Goldings, English Fuggles,

WATER BASICS

The pH of water is the measure of acidity and alkalinity. It is measured on a scale of 1 to 14. Brewing water should have a pH of approximately 7.0. You can check the pH of your water and wort by using pH test papers, available from homebrew shops. The pH papers are only accurate at room temperature, so cool the samples before checking them.

Use diluted, food-grade lactic acid to acidify your water. Most homebrew stores sell 88% lactic acid. Wear protective eyewear and dilute the acid (9 parts water to 1 part lactic acid). Only a few drops are needed for a 5-gallon batch.

Shoot for a mash pH of 5.2 to 5.4 and a wort pH of 5.0 to 5.3. Your sparge water should have a pH of 5.7.

Challenger, Northdown, Styrian Goldings or Progress are all suitable. Kettle hops should be added for bittering, flavor and aroma. Dry hopping gives balance. The base malt should be well-modified British two-row pale. Generous additions of caramel malts should be used (55° to 80° Lovibond). In darker versions, small amounts of dark malts are used sparingly.

Torrified wheat and flaked barley can be used for head retention and to impart a smoothness and full body. Old ales can contain up to 15 percent brewing sugars, such as invert sugar, cane sugar, black treacle, Lyle's Golden syrup and brown sugar. Our yeast choices are all strains from the UK: London Ale (Wyeast 1028), Irish Ale (Wyeast 1084), London III (Wyeast 1318), or Ringwood (Wyeast 1187).

Serving Suggestions

Serve at 55° F in a footed goblet with pan-seared pork chops, caramelized Granny Smith apples and Vidalia onions in an old ale beer pan gravy, accompanied by steamed fingerling potatoes tossed with fresh garlic, herbs and oil.

Old Ale

(5 gallons, extract with grains)
OG = 1.077 to 1.080 FG = 1.018 to 1.020 SRM = 35 IBUs = 36

Ingredients

14 oz. British crystal malt (55° Lovibond)
6 oz. torrified wheat
2.5 oz. British chocolate malt
8.75 lbs. Muntons extra-light DME
6 oz. black treacle
7.8 AAUs East Kent Goldings (1.5 oz. of 5.2% alpha acid) (bittering)
5.2 AAUs East Kent Goldings (1 oz. of 5.2% alpha acid) (flavor)
1 AAUs Fuggles

(0.25 oz. of 4% alpha acid) (flavor)
1 tsp. Irish moss
5.2 AAUs East Kent Goldings (1 oz. of 5.2% alpha acid) (aroma)
2.6 AAUs East Kent Goldings (0.50 oz. of 5.2% alpha acid) (dry hop)
London Ale (Wyeast 1028) or English Ale (White Labs WLP002)
1-1/4 cup Muntons extra-light DME for priming

Step by Step

Bring 1 gal. of water to 155° F, add crushed grain and hold for 30 min. at 150° F. Strain the grain into the brewpot and sparge with 1 gal. of 168° F water. Add the dry malt, black treacle and bittering hops. Bring the total volume in the brewpot to 3.5 gal.

Boil for 45 min., then add the flavor hops and Irish moss. Boil for 14 min., then add the aroma hops. Boil for 1 min. Cool wort for 15 min. Strain into the primary fermenter and add water to obtain 5-1/8 gal.

Add yeast when wort has cooled to below 80° F. Oxygenate/aerate well. Ferment at 68° F for 7 days, then rack into secondary (glass carboy) and add dry hops. Ferment until target gravity has been reached and beer has cleared (5 weeks). Prime and bottle. Carbonate at 70° to 72° F for 3 to 4 weeks. Store at cellar temperature.

Partial-Mash Option: Acidify the mash water to below 7.2 pH. Mash 1.75 lbs. British two-row pale malt and the specialty grains in 1 gal. water at 150° F for 90 min. Sparge with 1.5 gal. of water at 5.7 pH and 168° F. Follow the extract recipe, omitting 2 lbs. of Muntons extra-light DME from the boil.

All-Grain Option: Acidify the mash water to below 7.2 pH. Mash 12.75 lbs. British two-row pale malt and the specialty grains in 4.25 gal. of water at 150° F for 90 min. Sparge with 5 gal. of water at 5.7 pH and 168° F. The total boil time is 90 min. Add 6 AAUs of bittering hops for the last 90 min. of the boil. Add flavor hops, Irish moss, aroma hops and dry hops as indicated.

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. chalk to adjust. If your water is hard (greater than 200 ppm hardness), dilute it 50/50 with distilled water. Old ale is ready to drink 3 months after carbonation. It will peak between 6 and 10 months and will last for up to 1 year at cellar temperatures. ■

Tess and Mark Szamatulski are the owners of Maltose Express in Monroe, Connecticut. All recipes are adapted from their new book, "Beer Captured" (Maltose Press, 2000).

BY SAL EMMA & TESS AND MARK SZAMATULKSI

BASEBALL BEERS YOU CAN BREW

There's just something about being at the ballpark, about watching a major-league game in a stadium filled with fans. The light makes the turf look perfect – beyond green. The men on the field transform from starch-pressed and crisp to slide-stained and dusty as the innings tick by. The crowd is an animated oil painting of a million shapes and colors — 40,000 voices reacting to the crack of the bat.

Everything's bigger, brighter and more intense at the ballpark. It's a carnival, a picnic, a childhood game with million-dollar stakes, all balled up in one big riot of sensory overload. There are few better places to spend a summer afternoon. And after suffering through seasons of less-satisfying sports, Opening Day is (finally) just around the bend.

If it were up to us, instead of the Super Bowl, Opening Day would be our national sports holiday. Even with TV and free agency and players' strikes and drug scandals and gazillion-dollar salaries, it's still a game — a game that's played much like it was a century ago. Baseball is still just hitting a leather ball with a stick and running for home.

A few things have changed, some for the better. Like the beer.

Fans have long been able to buy a bland yellow brew to wash down the salty peanuts. But thanks to America's awakening palate and the discovery of beer with flavor, microbrewed beer has found its way into America's ballparks — in a big way. From farm clubs to sparkling urban baseball cathedrals, hometown micros are on tap in ballparks across the country. And we thought baseball just couldn't get any better!

In honor of Opening Day and the upcoming season, we offer recipes for three great beers served at three great ballparks.

PHOTO COURTESY OF NYC & COMPANY - THE CONVENTION & VISITORS BUREAU

The house that Ruth built: Home of the Bronx Bombers, Yankee Stadium has a classic retro-style design and an early-century city charm that has inspired many new ballparks. And you can toast the team with a well-crafted Brooklyn Pennant Pale Ale.

OPENING DAY is just around the bend. In honor of our national pastime, we offer recipes for three great beers served at three great ballparks.

YANKEE STADIUM
NEW YORK, NEW YORK

Home of the Bronx Bombers, Yankee Stadium is known as "The House that Ruth Built." The park opened in 1923, when the crowds drawn by legendary slugger Babe Ruth had outgrown Manhattan's Polo Grounds. The Yanks bought a 10-acre plot of land across the Harlem River in the Bronx for $675,000 and built a state-of-the-art, three-decker park for $2.5 million. On April 18 of that year, a three-run homer by the Babe led the Yankees to a 4-1 win over the Red Sox in the inaugural game.

The park was built before minimum-distance rules. A lefty's paradise, in the early days a home-run over the rightfield wall needed to sail a mere 295 feet, helping to forever etch the names Ruth, Gehrig, Mantle and Maris in the record books. Though farther from the plate these days, the bleachers right of center are still called "Ruthville" and "Gehrigville."

Yankee Stadium has hosted many more World Series games than any other park. It's a must-visit for baseball fans — one of the classics, with the early-century city charm that has inspired many new parks, designed in retro style.

Across the East River, Brooklyn Brewery has made a name for itself by making traditional handcrafted beers. And you can get them at Yankee Stadium.

Brooklyn Pennant Pale Ale '55

(five gallons, extract with grains)
OG = 1.055 to 1.056 FG = 1.015 to 1.016 SRM = 15 IBUs = 27

Pennant is a well-crafted pale ale brewed as a tribute to Brooklyn's world champion baseball team of 1955. (That would be the Dodgers, who actually beat the Yanks in that crosstown series.)

Pennant pours with a dense light-beige head that sits on a chestnut-colored beer. The aroma is complex and malty, with a hint of freshly baked bread. The full malt flavor is balanced with a clean hop background. English hops provide a moderate bitterness that complements the smooth mouthfeel. The aftertaste is dry with a hint of hops.

Ingredients:

11 oz. U.S. crystal malt (80° Lovibond)
4 oz. Belgian biscuit malt
6 lbs. Muntons extra-light dry malt extract (DME)
7 oz. malto-dextrin
6 AAUs Willamette hops (1.5 oz. at 4% alpha acid) for 60 minutes (bittering)
5 AAUs East Kent Goldings hops (1 oz. at 5% alpha acid) for 15 minutes (flavor)
1 tsp. Irish moss for 15 minutes
2.5 AAUs East Kent Goldings (0.5 oz. at 5% alpha acid) for 1 minute (aroma)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale)
1-1/4 cup Muntons extra-light DME for priming

Step by step:

Bring 1/2 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 one gallon of 168° F water. Add the DME, malto-dextrin and bittering hops. Bring the total volume in the brewpot to 2.5 gallons. Boil for 45 minutes, then add the flavor hops and Irish moss.

Boil for 14 minutes, then add the aroma hops. Boil for 1 minute, then remove the pot from the stove. Cool wort for 15 minutes in an ice bath or chill with wort chiller. Strain into the primary fermenter and add water to obtain 5-1/8 gallons. Add yeast when wort has cooled to below 80°F.

Oxygenate-aerate well. Ferment at 68° F for 7 days, then rack into secondary. Ferment until target gravity has been reached and beer has cleared (approximately 3 weeks). Prime and bottle. Carbonate at 70° to 72° F for 2 to 3 weeks. Store at cellar temperature.

This ale is ready to drink 1 month after it is carbonated. It will peak between 1 and 3 months and last up to 6 months.

Partial-Mash: Acidify the mash water to below 7 pH. Mash 2.33 lbs. British Maris Otter two-row pale malt and the specialty grains in 1 gallon water at 150° F for 90 minutes. Sparge with 1.5 gallons of water at 5.7 pH and 168° F. Then follow the extract recipe, omitting 2 lbs. of Muntons extra-light DME from the boil.

All-Grain: Acidify the mash water to below 7 pH. Mash 9.5 lbs. British Maris Otter two-row pale malt and the specialty grains in 3.5 gallons of water at 152° F for 90 minutes. Sparge with 4.75 gallons of water at 5.7 pH and 168° F. The total boil time is approximately 90 minutes. Add 4.6 AAUs of bittering hops for the last 60 minutes of the boil. Add the flavor hops, Irish moss and aroma hops as indicated by the extract recipe.

SAFECO FIELD
SEATTLE, WASHINGTON

Besides its corporate name, there's nothing pedestrian about Safeco Field. After two decades at the Kingdome — a ballpark criticized by players, fans and sportswriters — Safeco opened in 1999 as a celebration of baseball. Home of the Seattle Mariners, Safeco is architecturally beautiful, fan-friendly and player-perfect.

The scientifically designed playing field marries the appeal of real grass with the control of Astroturf. It was custom-built for cloudy Seattle, with a multi-million-dollar irrigation and drying system.

The ballpark's stately brick and

PHOTO COURTESY OF THE SEATTLE MARINERS

Safeco's open design offers inspiring views of downtown Seattle and the Olympia Mountains. Better yet, you can still see the game when you go to buy a Redhook ESB.

ironwork are reminiscent of America's great turn-of-the-century parks. Views of downtown Seattle, Elliott Bay and the Olympia Mountains create an impressive backdrop, and custom artwork and sculptures enhance the views.

You can leave your seat, get a beer or stretch your legs without missing the game; fans can walk the entire circumference of the stands with play in full view. The $517 million price tag also included an innovative roof-on-wheels; it's been described as a giant umbrella to protect the game from Seattle's many rainy days.

Redhook ESB (Extra Special Bitter) is one of the popular micros they pour at Safeco Field.

Redhook ESB

(five gallons, extract with grains)
OG = 1.058 to 1.059 FG = 1.014 to 1.015 SRM = 13 IBUs = 31

This Extra Special Bitter is a deep copper-orange color, with an off-white, creamy head. The aroma is a judicious blend of fruity hops and toasted malt. Medium in body, it is full and round, with a nice blend of malt balanced with gentle hop character. Redhook ends with a sweet malt finish.

Ingredients:

11 oz. U.S. crystal malt (60° Lovibond)
4 oz. U.S. Victory malt
4 lbs. Alexander's pale malt extract syrup
3.5 lbs. Muntons extra-light dry malt extract
8 AAUs Willamette (2 oz. at 4% alpha acid) for 60 minutes (bittering)
2 AAUs Willamette (0.5 oz. at 4% alpha acid) for 15 minutes (flavor)
1 tsp. Irish moss for 15 minutes
4.5 AAUs Tettnanger (1 oz. at 4.5% alpha acid) for 2 minutes (aroma)
Wyeast 1968 London ESB or White Labs WLP002 (English Ale)
1-1/4 cup Muntons extra-light dry malt extract for priming

Step by Step:

Bring 1/2 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 one gallon of 168° F water. Add the malt extract syrup, dry malt extract and bittering hops. Bring the total volume in the brewpot to 2.5 gallons. Boil for 45 minutes, then add the flavor hops and Irish moss. Boil for 13 minutes, then add the aroma hops. Boil for 2 minutes, then remove the pot from the stove. Cool wort for 15 minutes in an ice bath or chill with wort chiller. Strain into the primary fermenter and add water to obtain 5-1/8 gallons. Add yeast when wort has cooled to below 80° F.

Oxygenate-aerate well. Ferment at 68° F for 7 days then rack into secondary. Ferment until target gravity has been reached and beer has cleared (approximately 3 weeks). Prime and bottle. Carbonate at 70° to 72° F for 2 to 3 weeks. Store at cellar temperature.

This ESB is ready to drink 1 month after it is carbonated. It will peak between 1 and 3 months and will last for 6 months.

Partial-Mash: Acidify the mash water to below 7 pH. Mash 2 lbs. U.S. two-row pale malt and the specialty grains in 1 gallon water at 150° F for 90 minutes. Sparge with 1.5 gallons of water at 5.7 pH and 168° F. Follow the extract recipe, omitting 1.75 lbs. of Muntons extra-light DME from the boil.

All-Grain: Acidify the mash water to below 7 pH. Mash 10.5 lbs. U.S. two-row pale malt and specialty grains in 3.75 gallons of water at 152° for 90 minutes. Sparge with 5 gallons of water at 5.7 pH and 168° F. The total boil time is approximately 90 minutes. Add 6 AAUs of bittering hops for the last 60 minutes of the boil. Add the flavor hops, Irish moss and aroma hops as indicated by the extract recipe.

WRIGLEY FIELD
CHICAGO, ILLINOIS

Another of America's classic ballparks, Wrigley Field is shoehorned into a blue-collar neighborhood on the North Side of Chicago. The stadium opened in 1914 as Weeghman Park, named for the man who built it. It's the second-oldest major-league stadium in the country, just two years younger than Boston's Fenway Park. It was renamed Wrigley Field in 1926, when Weeghman's ballpark and team were bought by chewing-gum magnate William Wrigley, Jr.

Baseball fans revere Wrigley for its ivy-covered outfield wall, manual scoreboard and old-fashioned bleacher seating. In 1941, it became the first ballpark to install an organ. Wrigley also was the first park to build a permanent concession stand, and the tradition of fans keeping foul balls if they're hit into the stands started there, too.

Wrigley keeps up some unique traditions, including flying a white flag with a blue "W" after Cubs victories and a blue flag with a white "L" after defeats. In deference to Mr. Wrigley's disdain for nighttime baseball, Wrigley went without lights for 74 years, the longest holdout in the league. Not without controversy, lights were constructed for the 1988 season.

Wrigley is well-loved by the hometown crowd. They call it "The Friendly Confines." It's surrounded by houses, many of which stage rooftop baseball parties when the Cubs are in town. They serve some excellent hometown beer, there, too: Goose Island Honkers Ale.

PHOTO COURTESY OF THE CHICAGO OFFICE OF TOURISM

Within the "Friendly Confines" of Wrigley Field, Cubs fans can sit in the old-fashioned bleachers, snag fly balls above the ivy-covered outfield wall and sip a Honkers Ale.

Goose Island Honkers Ale

(five gallons, extract with grains)
OG = 1.049 to 1.051 FG = 1.012 to 1.013 SRM = 14 IBUs = 38

Honkers is a medium-bodied pale ale with a perfect, off-white head. The aroma is a blend of spicy hops and fruit. The flavor is fresh and clean, with a rounded malt body and a dash of hops. The finish is reminiscent of the flavor. This beer is easy-drinking, thirst-quenching and full of character.

Ingredients:

8 oz. U.S. crystal malt (40° Lovibond)
8 oz. German Munich malt
8 oz. Belgian cara-Munich malt
5.75 lbs. Muntons light (DME)
8.5 AAUs Northern Brewer (1 oz. of 8.5% alpha acid) for 60 minutes (bittering)
2.5 AAUs Cascade (0.5 oz. of 5% alpha acid) for 15 minutes (flavor)
2 AAUs Willamette (0.5 oz. of 4% alpha acid) for 15 minutes (flavor)
1 tsp. Irish moss for 15 minutes
5 AAUs Cascade (1 oz. of 5% alpha acid) for 1 minute (aroma)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale)
1-1/4 cup Muntons extra-light dry malt extract for priming

Step by step:

Bring 1/2 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 one gallon of 168° F water. Add the dry malt extract and bittering hops. Bring the total volume in the brewpot to 2.5 gallons. Boil for 45 minutes, then add the flavor hops and Irish moss. Boil for 14 minutes, then add the aroma hops. Boil for 1 minute, then remove the pot from the stove. Cool wort for 15 minutes in an ice bath or chill with wort chiller. Strain into the primary fermenter and add water to obtain 5-1/8 gallons. Add yeast when wort has cooled to below 80° F.

Oxygenate-aerate well. Ferment at 68° for 7 days, then rack into secondary (glass carboy). Ferment until target gravity has been reached and beer has cleared (approximately 3 weeks). Prime and bottle. Carbonate at 70° to 72° F for 2 to 3 weeks. Store at cellar temperature.

This bitter is ready to drink 1 month after it is carbonated. It will peak between 1 and 3 months and will last for 6 months.

Partial-Mash: Acidify the mash water to below 7 pH. Mash 1.75 lbs. British two-row pale malt and the specialty grains in 1 gallon water at 150° F for 90 minutes. Sparge with 1.5 gallons of water at 5.7 pH and 168° F. Then follow the extract recipe, omitting 2 lbs. of Muntons extra-light DME from the boil.

All-Grain: Acidify the mash water to below 7 pH. Mash 8 lbs. British two-row pale malt and the specialty grains in 3.25 gallons of water at 152° F for 90 minutes. Sparge with 4.75 gallons of water at 5.7 pH and 168° F. The total boil time is 90 minutes. Add 6.7 AAUs of bittering hops for the last 60 minutes of the boil. Add the flavor hops, Irish moss and aroma hops as indicated by the extract recipe. ■

Sal Emma wrote the baseball text for this article. Tess and Mark Szamatulski contributed the recipes. The Goose Island Honkers Ale recipe is from their book "Beer Captured" (Maltose Press, 2000).

grow your own HOPS

by Joe and Dennis Fisher

NOTHING SAYS "a homebrewer lives here" like a glorious tangle of hop vines growing up the side of your house. Hop plants are easy to grow, hard to kill, come back year after year, and with little care produce bountiful harvests of that most important of all flowers, the hop. Hops are also easy to propagate, meaning you can share them with your homebrewer friends, trade varieties and start new hopyards. Truly a large-scale plant, they produce big roots, big vines, big leaves and big bags full of spicy cones for your homebrewing pleasure.

Hops have been used as medicinal and flavoring herbs for thousands of years, and cultivated for at least a thousand. They grow worldwide, and will flourish just about anywhere in the United States, though today most are grown in the vast commercial hopyards of the Pacific Northwest. If you have a little space and the desire to do it, you can grow, pick, dry and store all the hops you need to brew beer. Why grow your own? Well, it's fun. And using homegrown hops will improve the quality of your homebrew by giving you access to the freshest, best hops available.

You'll save money by using your own hops instead of buying them. The plants are vigorous, beautiful and can be trained to provide privacy, shade or to cover fences or outbuildings. Even if you don't brew with them, a trellis full of aromatic hops will impress your guests with your enthusiasm for and knowledge of beer.

First, a bit of biology

The hop plant *(Humulus lupulus)* is a vining perennial that arises from a fleshy underground rootstock or "rhizome." The vine (also called a bine, the botanical term for a spiny tendril) grows rapidly, and during the height of the season can grow up to a foot per day, topping out at a height of 30 or 40 feet. The hop cones are borne on lateral shoots that arise from the same nodes as the plants' leaves. Hop plants can tolerate dry, sandy soil or even clay, but will not produce well under such conditions. Hops prefer a rich, moist soil in full sun.

Hop plants are either male or female. Only the female vines produce the familiar hop cones (or strobiles) that are used in brewing. Males are easily identified when they blossom, because their blooms are small, five-petaled flowers. Any males that appear in your hop yard should be uprooted and returned to the supplier (male plants also pollinate the cone and lead to seeded hops, which are unwanted by most brewers for a variety of reasons).

Selecting hop varieties

Ideally, the hop varieties that you plant should be well adapted to your climate and soil, so they will grow vigorously and produce abundantly. One way to find out which varieties will work for you is to talk with other growers or inquire at your local homebrew store. Your cooperative extension, university, or local seed company may also be able to help. If you have a variety that you like to brew with and just want to plant it, go right ahead! You'll know in a season or so if it's right for your region *(for a rundown on hop varieties and characteristics, see the chart on page 29)*. You'll notice that we don't use exact alpha-acid percentages in the chart. That's because alpha-acid content depends on growing conditions such as soil chemistry, moisture, sunlight and latitude. Also, homegrown hops tend to be more bitter and aromatic than those bought in a homebrew store, simply because they are that much fresher.

You can order rhizomes through your local brewstore or directly from a supplier *(see "Ordering Rhizomes," page 33)*. Start with just a few varieties; for

Now is the time to start planning your backyard hopyard. So hop to it!

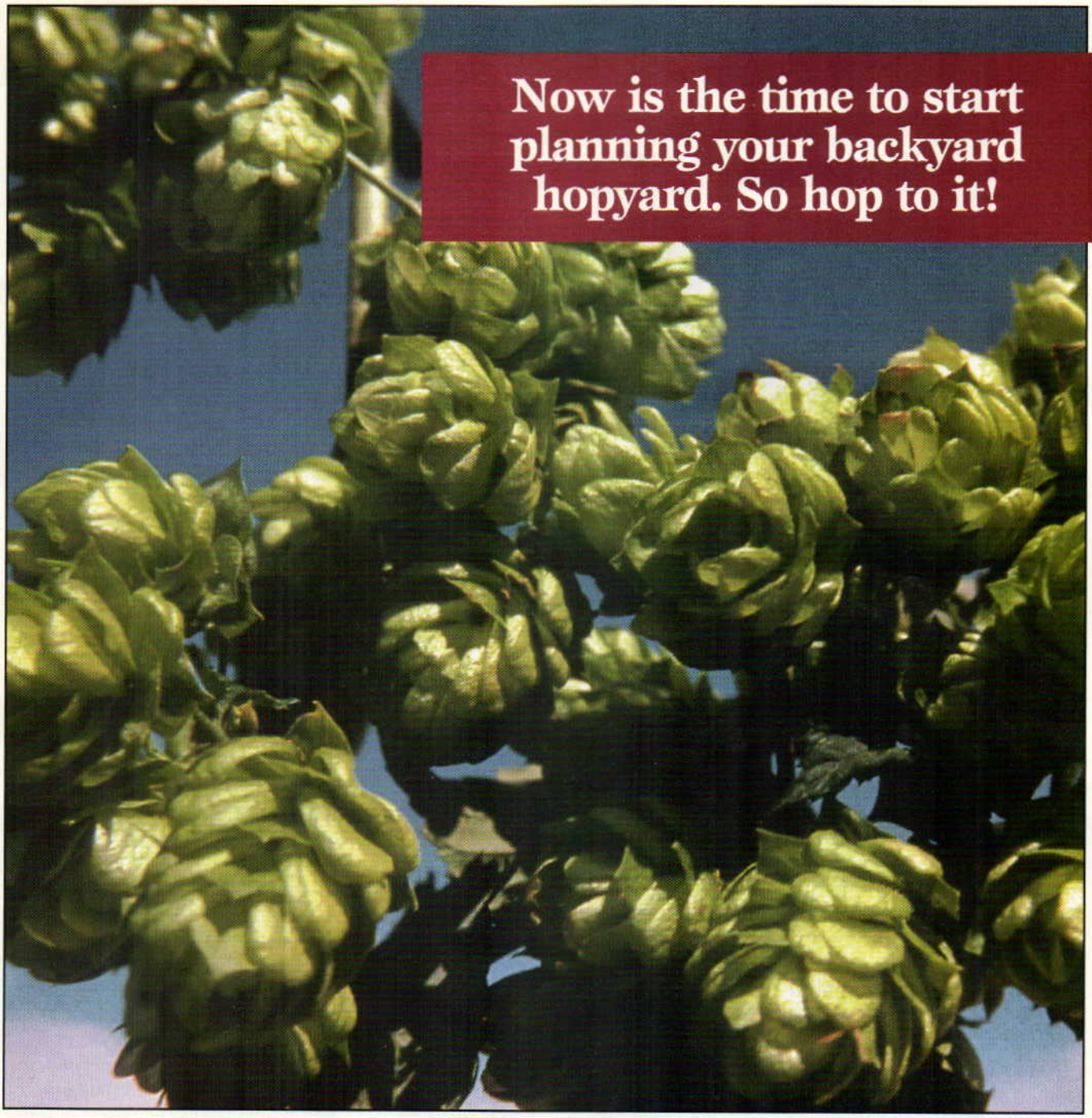


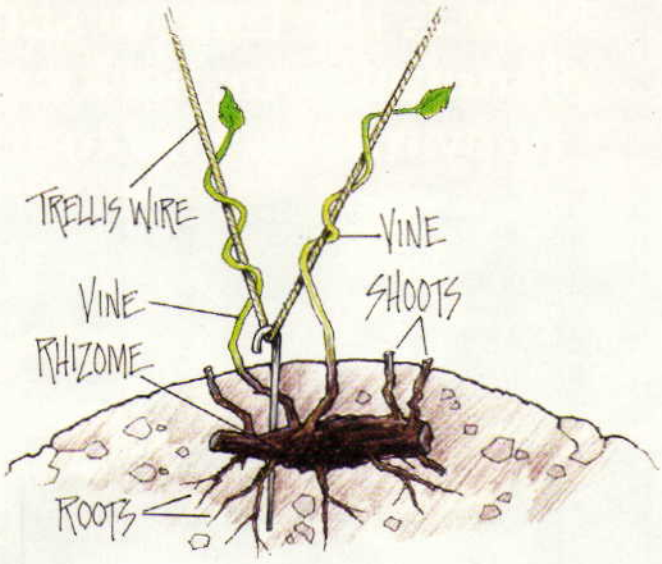
PHOTO COURTESY OF HOP GROWERS OF AMERICA

instance, you could pick an all-purpose workhorse like Cascade and an early German type like Perle. Both of these are hardy cultivars that will do well just about anywhere and will give you some interesting options for brewing. With Chinook and Willamette you would have four varieties offering a good cross-section of bittering and aromatic types.

Some cultivars are more challenging. Our friend Brad Hunter, who grows a lot of hops at his farm in Appleton, Maine, has this to say about these "advanced" types: "I would steer clear of the 'noble' types and all the Hallertau 'sisters,' like Crystal and Mount Hood, until you have established your hardy all-purpose yard and have the freedom to experiment."

Joel Balano-Stott, at the Purple Foot in Waldoboro, Maine, says that he usually gets his hops in March or April, and he only orders varieties that have been popular in the past, such as Cascade, Goldings and Fuggles. If you want a particular variety it's best to order ahead. Early March is a good time to put in your order. "Hop suppliers have a short window of harvest," says Joel. "They need to get the rhizomes out of the ground before they start to grow, and with hops, once the frost is off, the shoots start growing." His rhizomes usually cost between $2.50 and $4.50 each, and that's about average. Joel grows his own Cascade rhizomes for sale.

When your rhizomes arrive, take a good look at them. They



When planting a rhizome, be sure the green bumps (or sprouts) are facing up and the roots are facing down. Heap an inch or two or soil over it, allowing the sprouts, if already growing, to show. The vines will grow clockwise; train them around a string.

should be in good condition, firm, with no signs of disease. If they appear dry, flabby, shriveled or otherwise unhealthy, send them back. You can store your hops in the fridge until ready to plant.

Planning the hopyard

The hop garden, or hopyard, should be situated in a place with good air circulation, rich, well-drained soil, and as much direct sunlight as possible. While hops don't seem to mind poor ground, they will establish more quickly and produce more bountifully in good loam. If your only available soil is less than choice, you can always build it up with lots of compost and manure. Acidic soils will need lime, since hops like a pH of around 6 to 6.5. A soil test will tell you exactly what your pH is and what amendments you may need to add. Kits are unreliable, but will probably tell you something useful about your pH. Professional soil tests from universities, cooperative extensions or private labs are much better.

The sunlight factor is more critical. Hops will thrive in partial shade, but like sun for fast growth and good flower production. In the summer our hopyards get direct sun from about eight in the morning until five in the afternoon. Try for at least six hours of direct sunlight a day, and more than that if possible.

When siting the hopyard, think about vertical space. Hops are big, space-hungry plants that like to climb. You can restrict their growth by pruning if you need to, but they won't produce as well.

Our favorite place to site a hopyard is against the south-facing wall of a two- or three-story house. This provides a protective wall to the north, with plenty of sun and space to grow. With adequate moisture and food, this situation is ideal for fast hop growth.

You can also grow hops over fences, up pillars or flagpoles, over stones walls or arbors, and up trees. They won't be as easy to manage or pick, but they will grow and produce, if not as abundantly as on a trellis. If you are looking for a fast-growing ornamental vine, hops are a good choice.

Planting your rhizomes

Once the site is chosen, it's time to prepare the soil. If you can start a season in advance, that's great; if not, don't worry. Hops are essentially big weeds. They will probably thrive where you put them. Ideally, you can rototill or dig a bed about 4 feet wide by 3 feet for each hop hill. If you do this the year before, you can plant a cover crop like buckwheat, clover or rye grass to smother weeds and improve the soil. Perennial weeds will be your worst enemy in the hop bed, and if you can suppress them before you plant your hops you will be ahead of the game. Till again in late summer and plant winter rye. If you till this under in the spring just before planting, you will have a beautiful hop bed.

We realize you'll probably wait until just before planting to till or dig. No problem. Just use plenty of mulch to keep the weeds down, and let the hops do the rest. Straw mulch is best, but hay works well, too. You'll get grass weeds but they will be easy to pull from the loose, protected soil under the mulch.

We like to plant hops as early as the soil can be worked, which is usually May or June around here (we live in Maine). Hops can actually be planted just about anytime, but an early planting is necessary if you want a crop the first year.

Dig a generous hole for each hop hill, and space the hills three feet apart. You can put some gravel in the bottom in wet soils to improve drainage (hops love gravel). Pour a couple of gallons of water in the hole. Refill the hole with a mixture of compost and topsoil. We like to add about a handful each of azomite, rock phosphate, greensand and bloodmeal to each hill as soil amendments. We bury a tomato cage in each hole to tie trellis strings to. The hops will grow around the cage and hold it tightly. It doesn't matter how much of the cage is above the ground, as long as you have something to tie to. But at least a foot should be buried to provide a strong anchor. (An average tomato cage is 2.5 feet high, so leave 8 inches above ground. The cages can also be cut down if they

Name	Characteristics	Bitterness	Uses	Yield	Origin	Maturity
Brewer's Gold	Disease resistant	Low	Bittering	High	U.K.	Mid-season
Cascade	Vigorous, good general use	Medium	Bittering, aroma, flavoring	High	U.S.	Mid-season
Centennial	Vigorous, Brewer's Gold hybrid	High	Bittering, dry hopping	High	U.S.	Mid-season
Chinook	Goldings hybrid, distinctive aroma	High	Bittering, aroma	High	U.S.	Mid-season
Eroica	Vigorous, resists disease and insects	High	Bittering, aroma, dry hopping	High	Germany	Mid-season
Fuggles	Classic ale hop, likes moist climate	Low	Bittering, aroma, flavoring	Low	U.K.	Early
Galena	Vigorous, Brewer's Gold hybrid	High	Bittering	HIgh	U.S.	Mid-season
Goldings	Ale hop, susceptible to downy mildew	Low	Bittering, aroma, flavoring	Low	U.K.	Early
Hallertau	Classic lager hop, likes cool, moist climate	Low	Bittering, aroma, flavoring	Low	Germany	Early
Horizon	Nugget hybrid	High	Bittering	High	U.S.	Mid-season
Kirin II	Saaz hybrid	Medium	Bittering, aroma, flavoring	High	Japan	Late
Liberty	Lager type hop	Low	Bittering, aroma, flavoring	Med	U.S.	Mid-season
Magnum	High alpha acid	High	Bittering, aroma	High	Germany	Mid-season
Mt. Hood	Hallertau-like	Low	Bittering, aroma, flavoring	Med	U.S.	Mid-season
No. Brewer	Hybrid of Goldings, Brewer's Gold	Med-High	Bittering, aroma	Med	U.K.	Mid-season
Nugget	Vigorous, disease-resistant	High	Bittering	High	U.S.	Mid-season
Perle	Lager type hop	Medium	Bittering, aroma, flavoring	Med	Germany	Early
Saaz	Pilsner hop, fussy, low disease resistance	Low	Aroma, flavoring, dry hopping	Low	Czech Rep.	Early
Santiam	Tettnang hybrid	Medium	Bittering, aroma, flavoring	Med	U.S.	Early
Tettnang	Lager & aroma hop, tolerates downy mildew	Low	Bittering, aroma, flavoring	Low	Germany	Early
Ultra	Hybrid of Hallertau & Saaz, some disease resistance	Low	Flavoring, aroma	High	U.S.	Early
Vojvodina	Vigorous, disease resistant	Medium	Bittering, aroma	High	Yugoslavia	Early
Willamette	All-purpose ale hop, good for home growing	Medium	Bittering, aroma, flavoring	High	U.S.	Mid-season
Wye Target	Tolerates powdery mildew, rare in U.S.	Medium	Bittering, aroma	Med	U.K.	Late
Wye Viking	Some disease resistance	Medium	Bittering, aroma	Med	U.K.	Late

Sources: "The Homebrewer's Garden" (Storey Books, 1998) and Freshops (www.freshops.com)

GROW HOPS IN SMALL SPACES

You may have seen hops growing in barrels in front of a microbrewery or homebrew store. It's easy to grow hops this way, and yields will be good if you remember a few rules.

The most important rule is that the plants still need plenty of sunlight. Also, both overwatering and underwatering should be avoided. Hops need to be fed well to grow well — especially in a pot, where they are entirely dependent on you for nutrients.

The used half whiskey barrels that you can find in garden centers are ideal for hop growing. Drill a dozen or so half-inch holes in the bottom. Put two inches of crushed rock in the barrel for drainage. Then fill the barrel with a good quality potting soil mixed with compost and soil amendments *(see the section on planting)*. Plant your hop rhizomes just as if you were putting them in the ground. You can trellis your hops many different ways — for instance, if you are growing on a covered porch, you can train it up the posts and along the eaves. If you live in an area with hard freezes in wintertime, move the pot to a sheltered area or indoors after the vines die back in the fall.

are too big.) A stake will also work, or a big earth staple made of heavy wire bent in a U shape.

Now take out your rhizomes. Notice that there probably are some green bumps or sprouts along one side — this is the top of the rhizome and should face up. The bottom side will probably have some rootlets attached. Most growers recommend planting two rhizomes of the same variety per hill. Place the rhizomes in the hole and heap an inch or two of soil over it, allowing the sprouts, if any, to show. Water the hill and stand back. If you've already presoaked the hole, you won't need much at this point — just enough to firm the soil and eliminate airholes. Later on, when the plant starts to grow, you will need more, especially in a dry season and if the soil is at all sandy.

We mark each hill with an oak stake with the variety name painted on it. It's easy to lose track of your varieties, and once lost it's almost impossible to tell them apart. Make a map of your hopyard and put a copy in your computer, just in case.

Trellising the vines

The typical "straight pole" hop trellis was designed for commercial harvesting. We don't really like these for the home hopyard, since they tend to be enormous and awkward, and unless they are really well-supported it's unsafe to put a ladder against them. We have one that's 12 feet high and 70 feet long, not exactly a size suitable to the backyard. We made ours just strong enough to hold the hop vines and pick from a three-legged apple ladder. A better choice might be the old fashioned "tent pole." This is just a wooden pole (for instance a beech, spruce or cedar sapling) about 2 to 3 inches wide at the butt and 10 to 15 feet long. Stick them in the ground upright, one or two per hill, and let the hops climb. At harvest time just cut the vines, uproot the pole, and lay it on the ground for picking. People have been growing hops this way for hundreds of years, and it works well. Commercial hopyards all used poles before the industry was mechanized.

You can also string a trellis wire between trees or buildings. Make sure the connections are strong because the wire will have to hold a lot of weight and stand up to the wind. Use turnbuckles to tighten the wire. The trellis strings can be looped over the wire. The wire should be at least 10 feet tall (higher is better), but the higher you go, the more trouble you may have getting the vines down at harvest time.

If you decide to grow hops against your house or other building, trellising is a snap. This is really the best option for the home hopyard, and the masses of foliage growing vertically up your house will amaze your neighbors and impress your friends. Just hammer a big staple in the overhang of your roof, above each hill. A trellis string is tied to one side of the tomato cage, looped through the staple and then tied to the opposite side of the cage, forming an inverted V. The hop vines will grow up each side of the V and meet at the roofline.

We use untreated jute twine, as heavy as we can get. If it is untreated and too light it will degrade and break. Treated twine will last all season, but we don't use it. Cotton string, lightweight nylon or other synthentic line will also work. Trellis wire, the same kind grapes are grown on, is great but it's an expensive alternative.

Training the vines

The hop shoots will emerge a few weeks after planting and will start hunting around for something to climb. If your trellis strings or hop poles are already in place, the shoots will often find them by themselves. If not, you can help them by gently twisting the vines around the support. Hops grow clockwise, so train them in that direction and the small spines on the shoots will help them grab and hold. We like to train three vigorous shoots per string or pole and cut the rest back.

We usually mulch our hops to control weeds and to keep the soil from drying out. Once the shoots have appeared, you can heap mulch over the whole bed. As this breaks

down it will feed the soil and you can keep adding more. A good weed-controlling combination is a couple inches of dry leaves covered by six inches of straw or hay.

Through early summer, hop growth accelerates. The plants will usually overtop their supports in a few weeks (unless they are very tall) and start to fan out at the top, looking for something else to climb. They may double back or grow out into another vine or try to climb your roof. At the same time the side shoots will be developing along the length of the vines, where the flower will soon appear.

Tending your hops

Hops don't require much care. You should keep an eye on the side shoots to make sure they don't attack a neighboring vine. If the vines become intertwined it makes picking more difficult and it's hard to tell the varieties apart. We rarely prune our vines, except to discourage too many shoots or to remove diseased foliage. When pruning, use a sharp knife and make a clean cut.

Watering in the morning is good practice; when you do this, avoid splashing soil on your bottom leaves. You can prune the first three feet of leaves, especially if these have already turned yellow.

Homegrown hops aren't bothered much by disease. Still, it's smart to know what symptoms to look for. Downy mildew is the most notable hops disease in the United States. It only effects hop plants, and may not be found in all areas. It appears first in early spring, when the shoots emerge. Affected shoots will appear silvery-black and stunted. Remove and burn any affected plants. Downy mildew also can be controlled with a copperbased fungicide such as Kocide 2000. Since the mildew spores need water to germinate, it's a good idea to avoid wetting the foliage when watering. Removing the leaves along the first few feet of vine can also prevent infection.

Powdery mildew wiped out the

HOMEBREW WITH HOMEGROWN

These two recipes work very well with homegrown hops, added in the secondary for dry-hopping (we've noted in the recipes which hop additions should be homegrown). If you don't have a big harvest, this is a great way to use your small stash. You can also use your own hops late in the boil, for flavor and aromatics. Of course, if you have plenty of your own high-alpha hops to spare, go ahead and use them for bittering, too.

Keep in mind that the alpha-acid content will vary. Also, homegrown hops may be more bitter and aromatic than store-bought hops (they're often fresher). If you substitute storebought hops, consider using a bit more than these recipes recommend.

Hop Til You Drop
California Common Beer
(five gallons, all-grain)
OG = 1.053 FG = 1.015 IBU = 59

Though not super hoppy, California Common is a style that shows off the aromatic power of homegrown hops very nicely.

Ingredients
6 lbs. Klages malt
1 lb. Vienna malt
3/4 lb. crystal malt (60° Lovibond)
1 lb. toasted pale malt
15 AAU of Northern Brewer hops (2 ounces of 7.5% alpha acid)
3 AAUs Cascade hops (0.50 ounce of 6% alpha acid)
3 AAUs Cascade hops (0.50 ounce of 6% alpha acid)
Wyeast 2112 (California Lager)
0.50 ounce Willamette hops (homegrown)
3/4 cup corn sugar for priming

Step by Step
Toast pale malt for 10 minutes at 350° F. Cool and crush. Add malts to 3 gallons 130° F water, stabilize at 122° F and hold for 30 minutes. Add 1.5 gallons 180° F water, stabilize at 158° F and hold for 60 minutes. Raise to 170° F. Sparge with 4.5 gallons of 170° F water. Collect 6 gallons runoff. Add Northern Brewer and boil 60 minutes. Add Cascade, boil 20 minutes. Turn off heat, add Cascade and steep 5 minutes. Strain out hops, cool to 68° F, and pitch yeast.

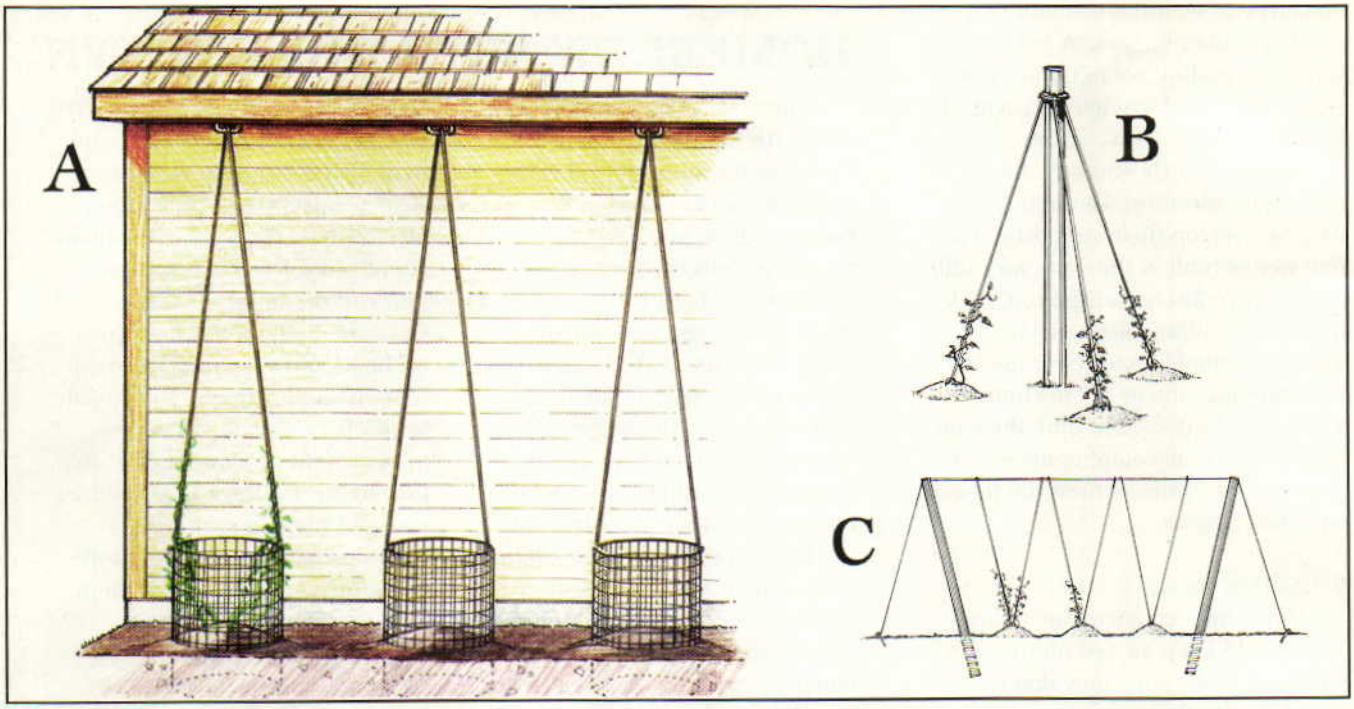
Ferment at ale temperatures (65° to 70° F). Rack to secondary and add homegrown Willamette dry hops for 5 to 10 days. Bottle when fermentation is complete.

Orthognathous Kölsch
(five gallons, extract with grains)
OG = 1.042 FG = 1.014 IBU = 47

Ingredients
0.5 lbs. cara-pils malt
0.25 lbs. wheat malt
3.3 lbs. Northwest gold malt extract syrup
2.2 lbs. Premier pale unhopped malt extract
4.5 AAU of Hallertau hops (1 oz. of 4.5% alpha acid)
0.5 oz. Hallertau dry hops (homegrown)
Wyeast 2565 (Kölsch)
2/3 cup corn sugar for priming

Step by step
Crush the cara-pils and wheat malt. Add the crushed malt to 1.5 gallons cold water and bring to a slow boil over 30 minutes. Sparge with 0.5 gallon boiling water. Add the extracts and return to a boil.

Add Hallertau. Boil 45 minutes. Strain out hops. Top up to 5 gallons with chilled water; pitch yeast when cool. Ferment at ale temperatures (65° to 70° F). When primary fermentation slows, add homegrown Hallertau dry hops for 5 to 10 days. Lager 6 to 8 weeks at 40° to 50° F before bottling.



There are many different ways to trellis your hops. Plan A: The simplest method is to grow them against a south-facing wall of your house. Hammer a big staple in the roof, above each hill. Tie a trellis string to one side of a buried tomato cage, loop it through the staple, and tie it to the opposite side. B: A "tent pole trellis" is a wooden pole, about 3 inches wide and 15 feet high, buried at least three feet into the ground. Guy wires keep it stable and double as trellis wires. Plan C: The more complex "straight pole" system involves two poles, sometimes angled away from each other, and held in place by guy lines attached to firm anchors.

hop industry in the eastern United States in the early 19th century. It appears as white, furry spots on either side of the leaves which soon spread to cover the entire leaf. Remove and burn any affected leaves. Powdery mildew can be controlled with a sulfur-based fungicide. Both of these diseases tend to be worse during rainy summers.

Although homegrown hops are generally vigorous and can tolerate certain amount of insect damage, insect pests can be a problem. Japanese beetles are especially voracious and difficult to control. A labor-intensive but effective control for these bugs is hand-picking in the early morning. Beneficial nematodes watered into the soil can control this beetle's larvae and keep their numbers low. Another problem pest is a specialized caterpillar called the hop merchant, larvae of the Question Mark butterfly. One or two sprayings a year with Bt will completely control this pest.

Hops also can be plagued by aphids and spider mites. Joel at the Purple Foot suggests cutting off the lower three feet of leaves to discourage aphids. Unfortunately, they are hard to get rid of once you've got them. Aphids tend to attack water-stressed and otherwise weak plants. Keeping plants well-watered will help. It's also not a complete disaster if you get a few aphids on your hops. You can winnow them off the cones pretty easily.

We've never had much trouble with spider mites — they are usually more of a problem with indoor plants, greenhouses and commercial hopyards. Cuke beetles are only a problem west of the Rockies; covering the young shoots with spunbonded row cover should keep them off until the vines are big enough to fend for themselves.

In the first year especially, hops need plenty of water. Try not to splash soil up onto the leaves, since this encourages disease. One or two deep waterings per week is better than several shallow waterings. At mid-season (around July in the Northeast) you will start to notice yellow leaves at the base of the plants. This is a common condition that can be helped by feeding and spraying the lower leaves with compost tea. Some growers advocate pruning off the vines' lower leaves for the first two feet or so.

To make compost tea for disease control, you need a well-aerated mixture with not too many nutrients in it. Put some compost in an old sock (for instance) and dangle it in a five-gallon bucket of water. Slosh it around a couple times a day to get some air into it, and after a week you can apply it. Dilute by 1/2 with water and apply with a hand sprayer or backpack sprayer. The disease-fighting agents are the microbes growing in the solution. Don't get the spray on any cones.

Hops really appreciate additional feeding at blossoming time. At about midseason, tiny burrs will begin to form on the side shoots. These are potential hop cones. When they form, feed each hop hill a few shovelsful of compost or rotted manure.

Picking your hops

Ready-to-pick hops are aromatic and feel slightly dry and springy to the touch. They will be full of yellow lupulin powder, which you can see by pulling a flower open. Most flowers of a given variety will mature around the same time, so you can pick them all at once. Don't let them go too long after maturity, because they will start to turn brown and lose quality.

The best way to pick hops is on the ground. Cut the string or pull the pole and lower carefully. The hop vines will be heavy, so you may want to use a line and a pulley to bring them down.

Picking is a two-handed job. Hold the cluster with one hand, and strip off the flowers with the other. We usually pick into paper bags, labeled to keep varieties separate.

Post-harvest maintenance

Once the hop cones have been picked, the vines should be cut off about three feet from the ground. Then allow the vines to die back. You need to do this to avoid shocking the plants too much and weakening them as they go into winter.

After the first hard frosts in autumn, cut the hop vines a few inches from the crown. Feed the hop hills generously with compost or well-rotted manure, and renew their mulch.

Spring care of mature hills just involves "root pruning" to control plant sprawl. Pull back the mulch and cut around the hills with a spade or garden knife about two feet out from the crown. Pull up any rhizomes you cut off. This will contain the plant in the bed and keep it from taking over your garden or lawn. The cut-off rhizomes can be potted and given to friends or transplanted to start new hopyards. Remember to label them! Root pruning is done once a year, in early spring, before the plants really start growing.

Drying your hops

If you have a hot, dry, dark attic or other space with good airflow, then you can dry your hops on window screens or even in paper bags. We've done this successfully many times, but not everyone has access to a good drying room. The next best choice for small amounts of hops is a food dryer set to low. If you expect a large harvest, think about building an oast, or hop dryer. This can be a large box with sliding screens or drawers with a hair dryer for forced hot air. Plans for oasts appear in our book, "The Homebrewer's Garden" (Storey Books, 1998) or you can find them on the Web.

However you dry your hops, they need to dry quickly to avoid molding or browning. Don't pile them too high — a few inches at most. Hops are dry when they feel light and crinkly without any detectable moisture content. After drying, a first-year hop harvest should yield a few ounces per hill.

Storing your hops

Dry hops can be stored in gallon-size freezer bags in a freezer, where they will keep well for a year or more. A bag will hold about an ounce of loose hops. Place the hops in the bag, press lightly to expel as much air as possible, and seal. Make sure to label different varieties and date each bag.

Using your hops!

Most people who grow their own hops prefer to use them only for aromatics, dry hopping or flavoring, since their delicate aromas are destroyed by a full bittering boil. This is an option if you don't have a big harvest and want to find the highest and best use for it. But if your harvest is large and you're growing high alpha-acid varieties, you'll want to know how to bitter with them.

Aroma hops can be used 1-1 in recipes, but bittering hops should be used with a little more caution — maybe cut down the amount a little. You can't really know how strong your hops are until you try them. It may require some experimentation to find exactly the right proportions, but starting with a small amount will guarantee that you never overhop a batch. Brewing with undried hops is a bad idea; they contribute a grassy, unpleasant flavor and very little bitterness or aroma. Why pamper your hops all season and then neglect to dry them? ■

Joe and Dennis Fisher are the authors of "The Homebrewer's Garden" (Storey Books, 1998). They live in Maine.

ORDERING RHIZOMES

Most homebrew supply retailers offer hop rhizomes in early spring. Here are some additional sources:

Beer Makers of America
15 South Main Street
Colfax, CA 95713
(800) 655-5682

Freshops
36180 Kings Valley Highway
Philomath, OR 97370
www.freshops.com
(503) 929-2736

The Herbfarm
32180 Issaquah-Fall City Road
Fall City, WA 98024
www.theherbfarm.com
(800) 866-4372

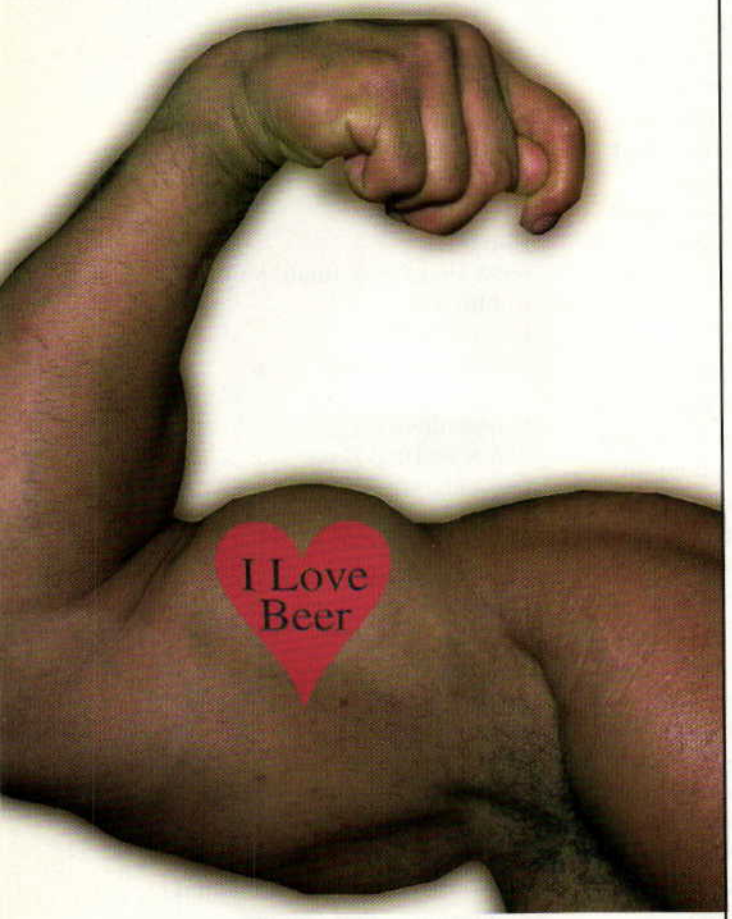
HopTech
6398 Dougherty Road, Suite 18
Dublin, CA
(800) 379-4677
www.hoptech.com

Marysville Oast
866 N.E. 1000 Oaks
Corvallis, OR 97330
Write with SASE for catalog.

Nichols Garden Nursery
1190 North Pacific Highway
Albany, OR 97321
email:nichols@pacificharbor.com
www.pacificharbor.com/nichols
(503) 928-9280

STRONG ALES

by TODD FRYE



Old ale, Scotch ale, barleywine or Belgian: Spring is a fine time to flex your brewing muscles and make a batch of STRONG ALE.

IT has always been in our nature as humans — and as brewers — to see how far we can go. We like to push the limits of the conventional or practical. Strong ales provide a great way for brewers to push their limits, not to mention their brewing equipment and their budgets!

Strong ale is an elusive beer to define, because the phrase refers to a wide variety of beers. Strong ales can range from 1.065 original gravity to 1.126, and final gravities range from 1.012 to 1.055 and beyond. The alcohol content can reach 12 percent or higher. Bitterness levels vary from 20 to 90-plus IBUs. With higher alcohol levels and higher hop rates, many strong ales benefit greatly from extended aging. This makes spring a great time to brew your strong ales. When fall and winter roll around, you'll be ready to savor them.

Old ale and Scotch ale are often described as strong ales, but barleywine, Imperial stout and some Belgian ales also fit this description. The common theme behind all of these beers is lots of malt! These beers are not about efficiency or economics. Strong ales are the best of the best, worth their weight in gold (at least to the brewer).

When brewing strong ales, the yeast is key

One of the most important considerations when making strong ale is the yeast. Most liquid yeast strains (and even some dry yeast) on the market today are hearty enough to ferment 8 or 10 percent alcohol and beyond, so the major decision is what flavor impact you wish the yeast to impart. If you are going to make an American barleywine, choose a vigorous and clean-flavored yeast like Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) to accentuate the hop character. If you want to brew an old ale, in which fruity flavors abound, your choice should be British in origin and produce some esters, like Wyeast 1098 (British Ale) or White Labs WLP005 (British Ale).

Just as important as yeast variety is the preparation of

The Strong Ale Cheat Sheet

OLD ALE is an English ale with a copper to dark color. English hops like Goldings, Fuggles and Northdown are used to carefully balance the powerful malt flavors of this high-gravity brew. Many have strong caramel flavors and low to medium bitterness levels, in spite of the large amounts of hops.The warming sensation of a high alcohol content and a heavy body make old ale a good choice for cold winter evenings. Because of the higher levels of alcohol and hops, these beers can be set aside for years and will mature well.

OG = 1.060 to 1.075 FG = 1.015 to 1.020 SRM = 10 to 20
IBU = 30 to 60 ABV = 5% to 8%

Hops: Golding, Fuggles, Northdown, Northern Brewer.

Yeast: Wyeast 1098 (British Ale), 1275 (Thames Valley Ale); White Labs WLP002 (English Ale), WLP026 (Premium Bitter).

Grain bill: Pale malt, caramel malt (20° L), chocolate malt.

Extract: Muntons or Edme light to amber malt extract

SCOTCH ALE is similar to Old Ale in strength, if not a wee bit stronger. Scotch Ales are labeled in shilling "cost," abbreviated by the "/" mark behind the number. (The higher the number, the stronger the beer and higher the cost. For example, "120/" means "120 shillings.") The heavier Scotch beers range from 90/ to 180/ and higher. Beers at the high end start with original gravities of 1.126 and beyond.

Scotch Ale has more malt character than old ale and even less hop presence. The malt flavors are complemented by the strong alcohol flavors. A common taste in Scotch ales is a slight smoky flavor. Sometimes this is a yeast by-product; smoke also can be introduced in the form of malt that has been smoked with peat.

OG = 1.070 to 1.126
FG = 1.019 to 1.029
SRM = 10 to 35 IBU = 25 to 35
ABV = 5% to 10%

Hops: Goldings, Northern Brewer, Fuggles.

Yeast: Wyeast 1728 (Scottish Ale), White Labs WLP028 (Edinburgh Scottish Ale).

Grain bill: Pale malt, brown malt, peated malt.

Extract: Mountmellick amber, Muntons amber dry malt.

BARLEYWINES are similar in strength to Scotch ale (1.085 and higher), but with more wine-like, fruity flavor to complement the big caramel malt taste. They can range in color from traditional dark amber to pale. Barleywines are usually boiled for a longer period of time to increase the gravity. The longer boil times also create caramel-like flavors in the wort. In the English tradition of barleywine, the balance between malt and hops is tipped in favor of the malt. In the American tradition, the hops are well balanced or dominating.

OG = 1.085 to 1.125 FG = 1.020 to 1.030 SRM = 12 to 26
IBU = 50 to 80 ABV = 8% to 12%

Hops: Northern Brewer, Goldings, Fuggles, Willamette, Centennial.

Yeast: Wyeast 1084 (Irish Ale), 1388 (Belgian Strong); White Labs WLP099 (Super High Gravity).

Grain bill: Pale malt, caramel malt, chocolate malt.

Extract: Yellow Dog malt extract, Briess, Muntons.

IMPERIAL STOUT has been called a black barleywine, but the style originated as a very strong stout. Great quantities of malt, including lots of the darker roasted malts, give this style a roasty, chewy flavor. More hops are used in this style for their preservative qualities, and at 50 to 80 IBU, the hop bitterness looms large. This is coupled with bitterness from dark roasted grains.

OG = 1.070 to 1.120 FG = 1.020 to 1.030 SRM = 35+ IBU = 50 to 80 ABV = 7% to 12%

Hops: Northern Brewer, Target, Goldings, Fuggles.

Yeast: Wyeast 1728 (Scottish Ale), 1388 (Belgian Strong); White Labs WLP099 (Super High Gravity), WLP007 (Dry English Ale).

Grain bill: Pale ale, roasted barley, black malt.

Extract: Lots of Muntons dry malt extract.

BELGIAN STRONG ALES generally have OGs of 1.080 or so, although they range from 1.062 to 1.120. Even though they are very similar to the rest of the group in that respect, they differ in several other ways. The hop flavors usually aren't overpowering, but blend with the other flavors. It is the use of spices and the choice of yeast that set this style apart. One example is Golden Strong Ale, which is pale in color and subtle in flavor. This beer has strength beyond its flavor, which comes from the addition of sugars to the boil. There is also dark strong ale that is richer in sweet malt flavor, heavier in body and darker in color.

OG = 1.062 to 1.120 FG = 1.012 to 1.024 SRM = 3 to 10 IBU = 25 to 35 ABV = 7% to 10%

Hops: Hallertau, Hersbrucker, Saaz, Tettnanger, Spalt.

Yeast: Wyeast 1388 (Belgian Strong), White Labs WLP001 (California Ale).

Grain bill: DeWolf-Cosyns pilsen, Munich, Caravienne, light crystal.

Extract: Muntons extra light dry malt, Bierkeller light.

the yeast prior to brew day. With strong ale, high gravity is the norm. And as the gravity increases, starting with enough healthy yeast becomes extremely important.

An active yeast starter is the best way to kick off fermentation in a reasonable amount of time. Yeast starters, simply put, are tiny batches of beer. Some people use 22-ounce beer bottles, champagne bottles or Erlenmeyer flasks. Whatever you choose, be sure you have enough room to make at least 500 mL of starter — but more is always better. You should make the starter of a medium gravity (around 1.040), using similar ingredients to the batch you are planning. The idea is to "wake up" the yeast and get them reproducing, so you are pitching more yeast into the wort.

The starter should be done a day or so before you plan to brew. The easiest yeast starter consists of one-third cup of dry malt extract boiled in a pint of water. Some people add yeast nutrient, yeast energizer, or even a hop pellet or two into the starter for safe measure. I believe in making starters similar to the wort I am planning, so whatever is going to be in the beer wort should also be in the starter. Whatever you do, boil the starter for 15 minutes, for sanitation. Cool to room temperature and pitch the yeast into the starter.

Once the starter has built up a head of foam or "kraeusen," pitch this starter into the beer. The more yeast you pitch to your high-gravity beer, the better off you will be. Some people pitch up to 1.5 liters.

If you are a feverishly ambitious brewer, you could brew an entire batch of moderate-gravity wort (at 1.050 or 1.060 OG) and pitch your yeast in that. Allow this to complete primary fermentation, then rack over to a secondary, leaving a healthy yeast cake at the bottom of your primary fermenter. Transfer your cooled strong ale wort onto the yeast cake in that same primary fermenter ... and KABOOM! This method will allow a huge portion of healthy yeast to begin fermentation very rapidly. Keep a close eye on things, as it tends to be an extremely violent fermentation.

Whichever method you used, aeration is mandatory. If you inject oxygen, pump air or just shake to aerate, do it until you are sure there is plenty of oxygen in there. Then do it some more. It is also a good idea to consider pitching fresh yeast, not only into the secondary fermenter but also at bottling time. Using a fresh starter of the same type would be ideal, but dry yeast also works well when rehydrated and mixed into the beer. The stress of these fermentations can be damaging to the yeast. This practice will help the yeast along.

Go heavy on the hops

Hops play a major role in strong ales, which range from 20 to 90 IBU or more. Originally, hops were used in large amounts so the beers could be exported without spoiling. Hops provide an antiseptic quality that, combined with high alcohol content, allows strong ale to be aged for long periods of time.

When planning what hops to use and when to use them, there are a few things to consider. The longer the hops are in contact with the beer, the more impact they have. The way in which they are used is also important. Hops placed in the boil have heat on their side, so contact time is reduced. Dry hopping allows the slow absorption of fragile hop aromas and flavors that may be lost in the boil. A cheesecloth bag with inert weights, like marbles, works well to submerge the hops.

Lots of hops are needed to balance all that sweet malt. And that's compounded by the fact that as wort gravity increases, the amount of utilization we extract from the hop is decreased.

IBU is complex to calculate. The formula from "The Brewmasters Bible" by Stephen Snyder (Harper Perennial, 1997) is fairly easy to use. The formula is: (ounces of hops) X (alpha acids) X (percent utilization), all divided by 7.25.

Ounces of hops are the weight of hops you plan to use for each hop addition. If hops are added 3 times, 3 equations will need to be added together — one equation for each hop amount, alpha acid content, and time in the boil (percent utilization). Alpha acids are given as a percent; in this equation, use the whole number, not the decimal equivalent (4.3 percent alpha acid = 4.3). Percent utilization is dependent on time in the boil and for us, wort gravity. Thirty percent utilization is very good for a bittering hop addition in normal-gravity wort for 60 minutes. So it's safe to say, given the higher-gravity wort of strong ales, that the percent utilization will be closer to 20 or 22 percent for the same time in the boil. The percent utilization for hops with 30 minutes in the boil goes from around 15 to 8 percent for strong ale. And hop additions that normally spend a very short time in the boil are reduced from 5 to 6 percent down to 1 or 2 percent. So the moral of the story? Hop to it! You'll need it!!

Malt: the heart of the matter

Strong ales can be made with malt extracts, a partial-grain mash with extract added, or all-grain. When I brew with malt extracts, I find I have more options if I start off with something plain and light, without hops. It is a good idea to use malt extracts that are similar in origin to the beer style you are going to brew. Muntons or EDME work very well in the English-style beers. And I've made many beers using Mountmellick; it is a fine extract for stouts or Scottish ales. I can have more control over the batch by using specialty grains for color and to reinforce the malt.

Crystal malts and, sometimes, dark roasted malts go well in English styles. Roasted barley and peat-smoked malts are used for Scotch ales. Crystal, cara-pils and chocolate malt all can contribute to the depth of a barleywine. Use lots of dark, heavily roasted malts to

three STRONG ALES

Shameful Barleywine

(5 gallons, extract)
OG = 1.090 to 1.095 FG = 1.020 to 1.025 IBU = 74

This beer is a luminous amber, with strong hop presence.

Ingredients

13.2 lbs.Yellow Dog Malt extract syrup
19.5 AAU Northern Brewer pellets (3 oz. of 6.5% alpha acid)
12 AAU Cascade pellets (2 oz. of 6.1% alpha acid)
1/2 tsp. Irish moss
4.8 AAU Willamette pellets (1 oz. of 4.8% alpha acid)
1 pint starter of American Ale (Wyeast 1056) or California Ale (WLP001) yeast

Step by Step

Bring malt extract to a boil and add 3 oz. Northern Brewer. total boil: 60 min. After 30 min., add 2 oz. Cascade and continue to boil for 15 min. Add Irish moss. Wait 10 more min., then add 1 oz. Willamette. Boil for 5 min. Shut off heat and cool to 65° F. Pitch one pint (or more) yeast starter. Ferment for 10 days at 65° F, then rack to secondary.

Dry hop in secondary with 1 oz. whole Cascade hops in a weighted bag for 2 weeks. Bottle when clear and still, adding fresh dose of yeast and 3/4 cup corn sugar. Age at least 3 months.

All-grain option: Substitute 25 lbs. pale ale malt and 1 lb. chocolate malt for the Yellow Dog malt extract. Mash in at 158° F with 8 gallons and hold for 1 hour. Sparge for 7 gallons sweet wort. Boil for 120 minutes, starting the hop additions at 60 min.

Trumpet Major Old Ale

(5 gallons, extract with grains)
OG = 1.130 to 1.135 FG = 1.038 to 1.042 IBU = 68

This is a beautiful dark and malty creation with subtle fruity tones and a very heavy body.

Ingredients

8 lbs. Mountmellick light malt extract
7.5 lbs. light dry malt extract
1/2 lb. crushed crystal malt (40° Lovibond)
1/2 lb. Briess Special Roast malt
1 lb. cara-pils
2 oz. chocolate malt
13.6 AAU Fuggles pellets (4 oz. of 3.4% alpha acid)
19 AAU Kent Goldings pellets (4 oz of 4.7% alpha acid
1/2 tsp Irish moss
6.2 AAU Sterling pellets (1 oz. of 6.2% alpha acid)
1 pint starter of British Ale Yeast (Wyeast 1098 or White Labs WLP005) or High Gravity English Ale (White Labs WLP007)

Step by Step

Place the grains in a cheesecloth bag and steep in 160° F water for 30 to 40 min. Remove the grain bag and stir in malt extract. Bring to a full boil. Add 4 oz. Fuggles and boil for 15 min. Add 4 oz. Kent Goldings hops and boil for 30 min. Add Irish moss and boil for 5 more min. Add 1 oz. Sterling, and continue to boil for the last 10 min. Shut down the heat, cool as quickly as possible. Pitch one pint (or more) of yeast.

Ferment for 10 days at 50° to 60° F, rack to secondary. Dry hop in the secondary with at least 2 oz. of whole Kent Goldings. Bottle when complete with 3/4 cup corn sugar and fresh yeast.

Partial-mash option: Substitute 10 pounds two-row malt for the light dry malt extract. Mash all crushed grains in at 155° F with 3.75 to 4 gallons for about an hour or until full conversion. Sparge for 6 gallons. Boil for 90 min. (wait 30 min. before adding the first hops).

Moonlight Madness Imperial Stout

(5 gallons, extract with grains)
OG = 1.100 FG = 1.028 to 1.030 IBU = 65

Dominated by rich, roasty malt flavors and a dark, heavy body, slightly fruity hints from the yeast punctuate this special tonic.

Ingredients

1/3 lb. black patent malt
1/2 lb. chocolate malt
1/2 lb. DeWolf-Cosyns Special-B
1/4 lb. black barley
1/2 lb. flaked barley
4 lbs. Mountmellick Stout extract
6 lbs. dark dry malt extract
1 lb. lactose
7.4 AAU Cluster pellets (1 oz of 7.4% alpha acid)
5.6 AAU Perle pellets (1 oz of 5.6% alpha acid)
6.5 AAU Northern Brewer pellets (1 oz of 6.5% alpha acid)
1 pint starter of Irish Ale Yeast (Wyeast 1084) or Burton Ale (White Labs WLP023)

Step by Step

Add the grains to a cheesecloth bag. Start steeping your grains as your water is heating up to 160° F and hold for 30 to 45 min. Remove the grains, add the dry and syrup malt extract and bring to a boil. Add all the hops at the start of the boil. Continue boiling for 1 hour, cool as quickly as possible. Pitch with a pint (or more) yeast starter. Ferment at room temperature for 10 days, then move secondary to cooler location (65° F). Bottle with fresh yeast and 3/4 cup corn sugar.

produce the rich complexities of an Imperial stout. Light malt extract is especially important with some Belgian styles — either because they rely on sugar adjuncts for flavors or colors, or because there is a light color in the finished beer.

Because malt extract is already concentrated, you can reach some astonishing original gravity readings. But careful planning will help in hitting the gravity you desire without losing your head. Malt extract will deliver a gravity reading of about 1.038 to 1.045 with one pound in one gallon (syrup malt extract and dry malt extract, respectively). Using this as a guide, you can estimate how many pounds of malt extract you will need to hit your target OG.

First, abbreviate your desired OG to the numbers behind the decimal (1.090 OG = 90). Then multiply by the number of gallons and divide by the abbreviation of the gravity contribution of the malt extract for one pound in one gallon. Say you want to approach Thomas Hardy's brew that starts with an OG of 1.125. Take the abbreviation for 1.125 OG, which is 125, multiply by 5 for a five-gallon batch and divide the whole thing by 38 (if using syrup malt extract) or 45 (for dry malt extract). Here goes: (125 x 5) / 38 = 16.45 pounds of syrup malt extract or (125 x 5) / 45 = 13.89 pounds of dry malt extract.

If you are planning an all-grain strong ale, it can be difficult to reach high original gravities. Probably the most efficient solution would be mashing as much grain as you are able to, collecting the volume you need and "bumping up" with malt extract or sugar in the boil if necessary. The addition of sugars to the boil is not uncommon in the creation of some strong ales.

There are, however, ways to get what you need solely from your malt. Long wort boils, two to three hours or more, can do the trick. By evaporating some of the water during long boil, you concentrate your wort, and also create rich caramel flavors that go well in barleywines. Taking only the first, highest-gravity runnings from the lauter tun also will help you achieve higher gravity with less caramel tones. But you will need more grain, as this method is much less efficient. And because you will get about half as much extract out of the grains, due to low efficiency, you may need to do more than one mash, adding the runnings together, or have a large mash-tun to handle all the grains.

One final tip: Use small bottles for your precious strong ale. It will make the beer last longer ... or maybe it just seems that way! ■

Todd Frye owns The Home Brewery, a homebrew supply and mail-order firm in Ozark, Missouri.

HYDROMETER

GETTING THE MOST FROM YOUR

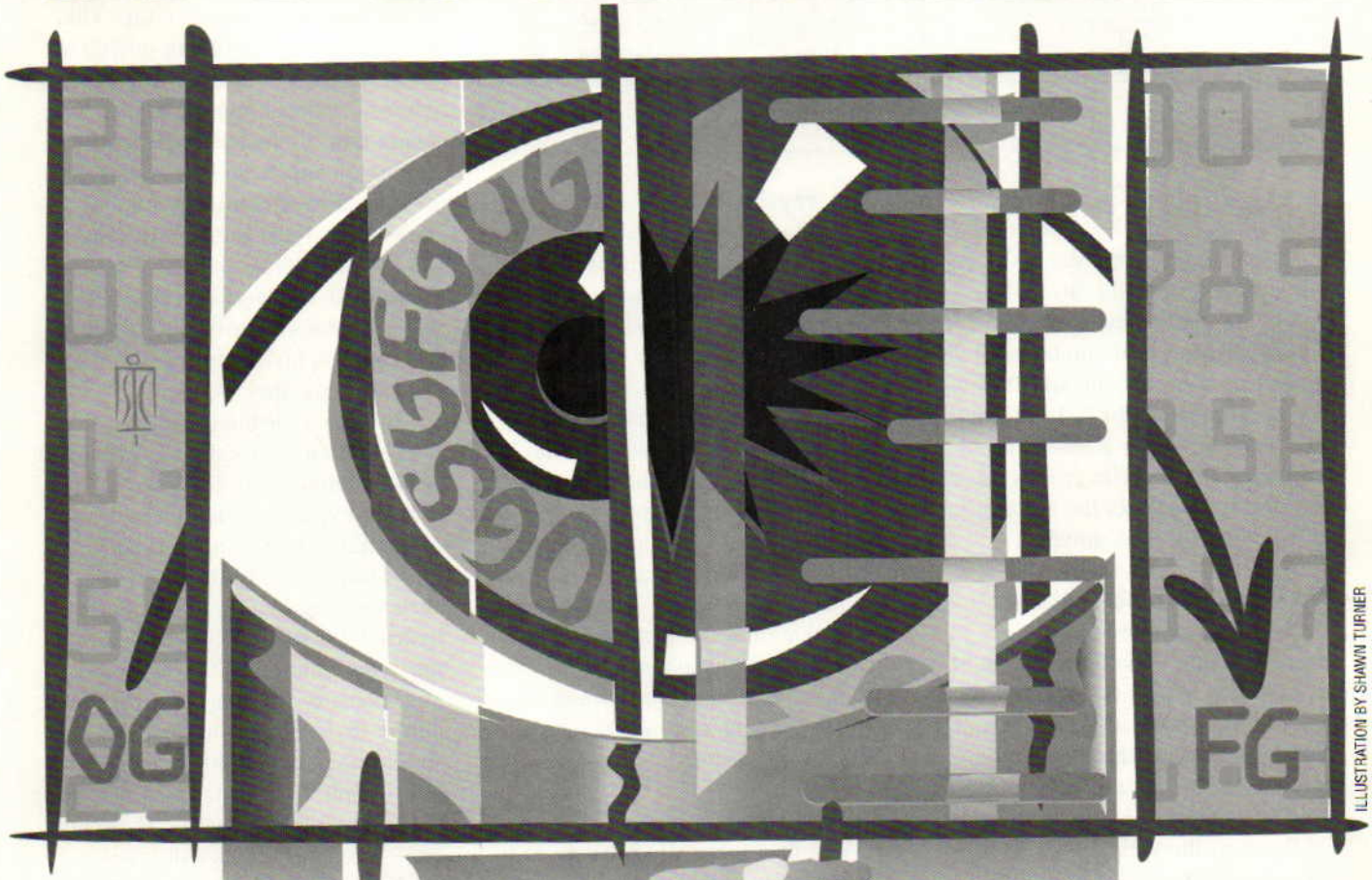


ILLUSTRATION BY SHAWN TURNER

NINE TIMES OUT OF TEN, A HYDROMETER CAN TELL YOU WHAT'S GOING ON WITH YOUR BEER.

By Mark Garetz

Other than our eyes, nose and taste buds, the hydrometer is probably the most important tool the brewer has at his disposal. The hydrometer can tell us many important things about the beer: how efficient our mash was (or whether we managed to get all the malt extract into the fermenter), whether or not the beer is done fermenting and how much alcohol is in the beer. When there is a suspected problem with a fermentation, nine times out of ten the hydrometer can give us an answer. I get calls every day from brewers who think they have fermentation problems, but not even one out of ten has used their hydrometer before calling! Maybe they don't know how, or maybe they don't realize the range of answers and clues it can give us about what is going on with our beer.

The Basics

During fermentation, beer is a living thing. We can control the conditions and try to coax it into behaving as we would like, but we really aren't in control. You can't reason with your yeast. As the saying goes, "Given the strictest control of all the conditions, the yeast will do as it damn well pleases!" We can hope that fermentation will be done in two weeks, but if it's not, it's not. So the best we can hope to do is measure what the beer is doing.

Beer starts out as sweet wort — sweet because it contains a large amount of sugars. The yeast eats these sugars and produces carbon dioxide and alcohol. At some point, either the sugar is all eaten up or the yeast has produced so much alcohol that it kills itself. In either case the fermentation will have stopped. But other conditions can cause the fermentation to stop prematurely — or not even start. And

TEMPERATURE OF SAMPLE	SPECIFIC GRAVITY CORRECTION
50° F	Subtract 0.005
60° F	No correction
70° F	Add 0.001
77° F	Add 0.002
84° F	Add 0.003
95° F	Add 0.005
105° F	Add 0.007

the way we can tell what's happening is by using our hydrometer.

A hydrometer measures the specific gravity of a solution, typically water. The name says it all — "hydro" (water) and "meter" (a measuring device). The specific gravity of pure water is 1.000 (at 60° F). When sugar is dissolved in the water, the specific gravity goes up. As the yeast eats the sugar, the specific gravity goes down.

The Hydrometer Itself

The hydrometer is made of glass. The thin end contains one or more scales where we take a reading. The fat end is weighted (usually with lead shot) so the hydrometer floats upright. The amount of weight is adjusted so the hydrometer floats at the right level (also known as being calibrated). The typical homebrewing hydrometer is calibrated to read a specific gravity of 1.000 in pure water at 60° F.

The hydrometer will typically contain three scales or systems of measurement, and you'll commonly see them referred to as "triple scale" hydrometers. The three scales are specific gravity, Balling (or Brix) and potential alcohol. We've discussed specific gravity. Balling and Brix are the same scale with a different name and express the sugar content in terms of percent sugar by weight. (You'll sometimes hear brewers refer to degrees Plato. The Plato scale is almost identical to the Balling scale.)

When the hydrometer floats in the liquid, the thin end sticks up out of the liquid. The point where the liquid level crosses the scale is where we take our reading.

The Hydrometer Jar

While you can float the hydrometer directly in the fermenter, that's not a recommended way to use it. Instead we take a small sample of the beer and put it into a thin cylinder, called a hydrometer jar or flask. It's basically a graduated cylinder, but without the graduations. This allows us to have a much easier time of sighting along the liquid line to take the reading. The best hydrometer jars are those that are just a little bigger in diameter and taller than the hydrometer itself. This allows us to use the smallest possible sample when taking the reading and makes taking the reading easier.

Taking a Reading

The first thing you need to do is get a sample of the wort. There are several ways to do this, but the most convenient is to use a device known as a "wine thief." It's called this because it's used to steal a sample of wine, typically from the bung hole of a wine barrel. They work the same way a straw does when you play with your drink at the restaurant: When you immerse the straw in the liquid and put your finger over the upper end, you can lift the straw out of the drink and liquid remains in the straw.

If you don't have a wine thief, a ladle or clean turkey baster will also work (get a new one and never use it for basting). Just make sure you squeeze the bulb before putting it in the wort so you don't inject unwanted air into the wort. Be sure to sanitize whatever you use to get the sample, but it's not necessary to sanitize the hydrometer or the flask. You'll not be returning the sample to the wort.

One thing you should be aware of: Sugar can stratify in the wort, meaning there can be more sugar at the bottom than at the top. This is usually only a problem during an all-grain run-off into the kettle, where the first runnings are very sweet and the last runnings have almost no sugar. So it's always a good idea to stir the wort to make sure you get a representative sample, but only prior to fermentation. Do not stir the wort if taking a sample near the end of fermentation — the sugar is no longer stratified and this could oxidize the beer.

Fill the hydrometer flask to about 1 inch below the top. This will vary depending on the flask — you can float your hydrometer in water and make a mark on the flask to know how far to fill it. Just make sure there is enough liquid so the hydrometer doesn't touch the bottom. Now take your thermometer and measure the temperature of the liquid. Record the temperature. It should be between 50° and 105° Fahrenheit. (Do not try to measure hot or boiling wort with a hydrometer — the heat stress will break it.)

Now gently lower the hydrometer into the liquid. (Don't drop it in! The hydrometer could break when it hits bottom.) Make sure that the hydrometer is not touching the bottom or sides of the flask and that the flask is level. Also make sure that there are no bubbles adhering to the sides of the hydrometer, which would cause it to float higher than it should. Spinning the hydrometer to dislodge the bubbles is a good trick. Now position yourself so that you can sight along the level of the liquid. Record the reading that's even with the lowest level of the liquid. (Due to surface tension the liquid tends to climb up the side of the flask and hydrometer, creating a "meniscus." Take your reading at the bottom of the meniscus.)

Now we need to correct for temperature. Hydrometers are typically calibrated to read accurately at 60°

F. If the temperature is different than that, the reading will be off. Your hydrometer should have come with a sheet that lists the temperature correction factors. If you no longer have this sheet, the chart at left *(see page 40)* will probably be close, if not identical. If your reading was 1.054 and the temperature of the sample was 77° F, for example, the actual corrected reading would be 1.056.

What it Can Tell You

I use the hydrometer at two places in my brewing cycle — at the beginning and again at the end.

Taking a reading at the beginning serves several purposes. For the all-grain brewer, it will tell you how efficient your mash was. Did you get a good conversion and rinse all the sugars out of the grain? For the extract brewer, did all the sugars you put in (in the form of extract) make it into the fermenter? To see how good a job you did, check the gravity reading against your recipe. If you are in the ballpark, you are okay. If it's way high or low, something is wrong (check for sugar stratification — stir the wort and take another sample). Having a reading at the beginning is also necessary if we want to estimate the amount of alcohol in the beer. Make sure you keep track of the reading — you'll need it.

Taking a reading at the end of fermentation tells us if the beer is really done fermenting. If you bottle the beer, this will ensure consistent carbonation levels and prevent exploding bottles! To tell if your beer is done fermenting, wait until you think the beer is done. Estimate this by looking at the beer, not by some arbitrary amount of time. There should be no signs of fermentation — the bubbling has stopped, the foam has subsided. There is no such thing as "the beer will be done in X days." The only accurate way to tell if the beer is done fermenting is by taking hydrometer readings.

If you think the beer is done, take a reading (being sure to correct for temperature). Accuracy of the reading is important at this stage. Write this reading down! Now wait three days. Take another reading. If the readings are the same and in the right range (more on this in a moment) then the beer is done.

If the second reading is lower than the first, the beer is still fermenting. (If the second reading is higher than the first, then one of your two readings is wrong! Start again!) Write this reading down, too. Wait three days and take another reading. If this reading is the same as the previous reading, the beer is done. If it is still lower, then keep taking readings at three-day (or longer) intervals until you get a pair of readings that are the same.

What we're actually doing is reading the sugar levels. Hopefully, the yeast will have eaten all it can and the two readings will be the same. If the second reading is lower, it means that the yeast was still eating sugar, because there is less now than before.

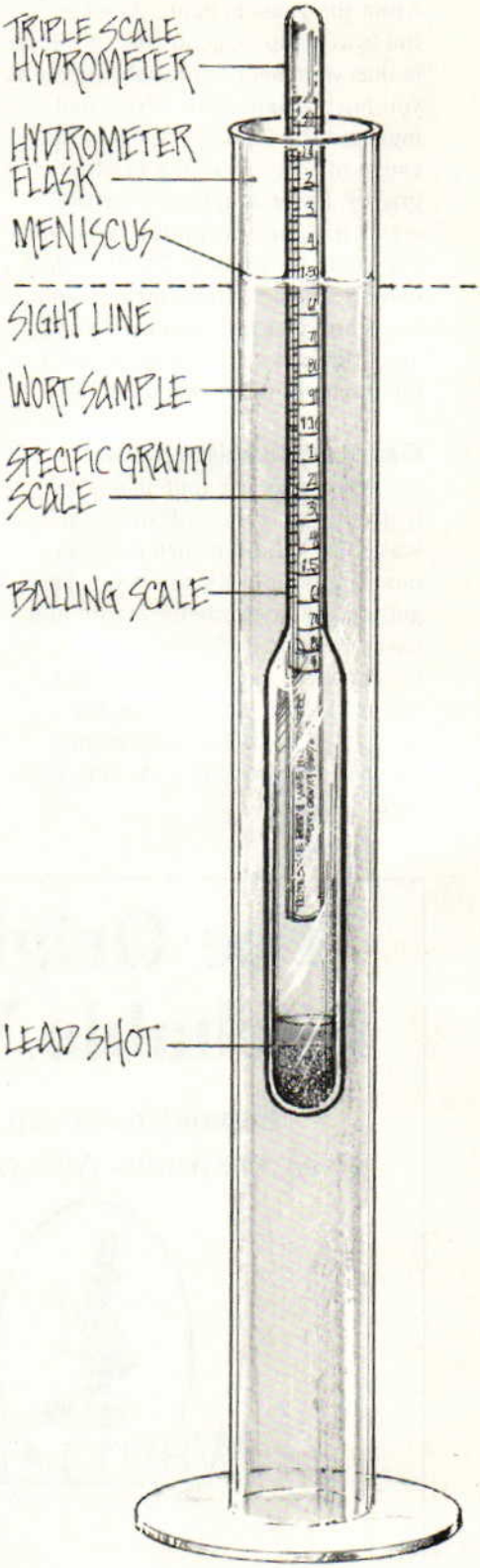
Now that we have readings from the beginning and end, we can calculate the alcohol content of the beer. Subtract the ending reading from the beginning reading and divide by 8. For example, if the starting gravity was 1.056 and the finishing gravity was 1.012, subtract 1.012 from 1.056 to get 0.044. Drop the zeros and decimal point (44) and divide by 8. That equals 5.5 or 5.5% alcohol by volume.

You can also use the potential alcohol scale built into the hydrometer. If the first reading is 8% potential alcohol and the ending reading is 2% potential alcohol, you subtract the second from the first to give us 6% alcohol.

Where Should it Finish?

There's no hard-and-fast rule about this. The answer depends on the yeast, the starting gravity and the fermentability of the wort.

Homebrew worts tend to be pretty high in unfermentables. Unfermentables raise the specific gravity, but yeast can't eat them, so



When taking a hydrometer reading, be sure to sight along the liquid at the bottom of the meniscus. Triple-scale hydrometers, like this one, measure specific gravity, Balling (or Brix) and potential alcohol.

when the yeast is done, they keep the gravity up. A good rule of thumb is that your beer is probably done if you have a pair of identical readings and the final gravity is in the range of 1/4 to 1/3 of the original gravity. For example, if your OG was 1.056, an acceptable range for FG would be 1.014 to 1.019. (When doing this calculation, forget about the 1 and just use the lower digits. To get the low end, divide 56 by 4, for the high end divide 56 by 3.)

Care and Calibration

When you are done using the hydrometer, rinse it off in warm water. Dry it and return it to the box or tube that it came with. The glass of the hydrometer is thin and easily broken. Never boil your hydrometer; the glass may break due to thermal stress. Also, the weights in the bottom are usually secured with sealing wax. You don't want to melt it.

To check your hydrometer's calibration, get some distilled water and bring it to 60° F. Float the hydrometer in it. The hydrometer should read 1.000. If it does, your hydrometer is calibrated. If it doesn't, record the reading. If it's below 1.000, subtract that reading from 1.000. If it's above 1.000, then subtract 1.000 from the reading. This will give us a correction factor. For example, you check your hydrometer and it reads 1.002. Subtracting 1.000 from that gives us .002. Your hydrometer is reading .002 above normal, so subtract that from actual readings to get an accurate number. If your hydrometer reads 0.098, then subtracting that from 1.000 also gives us .002 — but in this case your hydrometer is reading .002 below normal, so you would add that to your readings.

Hydrometers are not prone to changing their calibration over time, so there's no need to keep rechecking it. However, sometimes your hydrometer will develop a small crack. This will change the calibration, but the hydrometer now needs to be replaced anyway.

Final Words

Some brewers tell me they don't want to take a final set of readings because they're concerned about infecting the beer. Here's my opinion: Either you can sanitize a wine thief or you can't. If you can't, then what about your bottling bucket, tubing, bottles and caps? Others worry about taking the lid off the fermenter and causing oxidation. Don't worry. If all has gone well, you'll have a nice blanket of carbon dioxide to protect the beer while you take the sample. Just be gentle, don't stir the beer and you'll be fine. ■

Mark Garetz owns HopTech, a mail-order homebrew supply company based in Dublin, California.

Bottling Time

Getting your beer from the fermenter to the bottle

by Chris Colby

Number of Bottles in a Five-Gallon Batch

Bottle Type	Number of Bottles
5 gallon Cornelius keg	1
2 L "growler"	10
1 L "torpedo"	20
22 oz. bottle	29
16 oz. bottle	40
12 oz. bottle	53
6 oz. bottle	107

ACCORDING TO SOME Eastern philosophies, every good thing has a corresponding bad thing. Every ying has its yang. For homebrewers, we have our beer (good) and our bottling (bad). Luckily, with a little planning and the proper equipment, we can minimize the drudgery of bottling.

First, it's important to know that there are alternatives to bottling. Kegging is quick and easy, but it also requires a large initial investment (usually $150 to $200) and a large amount of fridge space. And even if you do keg, there are times you'll want some bottled beer. Bottled beer is easy to give away and carry to parties. Plus, entries for homebrew contests need to be packaged in bottles.

The basic idea in bottling is to move your beer from one big container (your fermenter) to numerous small containers (the bottles). In the process, you want to avoid introducing any oxygen, bacteria or wild yeasts to the beer. Oxygen introduced after fermentation will cause the beer to go stale faster. Bacteria or wild yeasts can lead to off flavors in the beer or gushing bottles. For bottle-conditioned beers, you also want to prepare the beer so it will carbonate to the right level in the bottle. There are four steps to bottling: cleaning, sanitizing, preparing the beer and filling the bottles.

The equipment you'll need is: a bottling bucket, a racking cane, a large spoon, tubing to move the beer from the bucket, a tubing clamp or a bottle filler, bottles, sugar, bottle caps and a capper. A large picnic cooler is a convenient container to sanitize your bottles in.

Bottle Selection

You can modify how much work bottling is by selecting bottles of different sizes. The chart on this page shows the number of bottles of various sizes needed to bottle a five-gallon batch.

If possible, use brown bottles and store your bottles in a dark place. Clear or green bottles offer less protection from UV rays and beer can get "skunked" quickly if exposed to sunlight.

Cleaning the Bottles

Cleaning bottles can be the worst part of bottling, especially if you leave the job until bottling day. Yeast sediment at the bottom of an empty bottle gets harder to clean as time goes on. The sediment will support the growth of bacteria and wild yeasts and this growth could contaminate subsequent batches. You can save a lot of time on bottling day if you clean your bottles as soon as you empty them. Hot water alone should rinse out any yeast, bacteria and residual beer. But if you'd like, you could clean the bottle with a small amount of TSP (trisodium phosphate) or PBW (powdered brewery wash). If you use soap on your bottles, be sure to rinse until the rinse water is free of suds. Residual soap will decrease head retention. If you see any residue in the bottle, rinse it again.

Store your clean bottles dry and upside-down. I place my bottles in a six-pack holder with a paper towel covering them until the six-pack holder is full. Then I place the bottles upside-down in case boxes. Many homebrew shops sell bottle trees (drying racks for bottles). The bottles rest upside-down allowing them to drain and dry after washing. Some bottle trees also have a sanitizer sprayer built in.

If you waited until bottling day to clean your bottles, you'll need two things to clean your bottles — a jet-washer and a bottle brush. A jet-washer is a tube that connects to your faucet and releases a stream of water that blasts the bottom of the bottle. Jet-washers are inexpensive and greatly reduce the time it takes to wash or rinse bottles. If you don't already have one, get one.

Any remaining yeast not blasted out by the jet-washer can be removed with a bottle brush. Once

the bottle is visually clean, use a little bit of water with TSP or PBW and the bottle brush to remove the stuff you can't see. Nasty bottles can be soaked in a bleach, TSP or PBW solution overnight before cleaning.

Sanitizing the Bottles

Clean bottles need to be sanitized before they are filled. Most homebrewers sanitize their bottles by soaking them in a sanitizing solution. Bleach is a cheap and effective way to sanitize bottles. Bottles can be soaked for 30 minutes in a bleach solution of one cup of bleach per five gallons of water. Iodine solutions provide more killing power and the soak time is shorter. You can soak your bottles for 30 minutes in a iodine solution made from one ounce of Iodophor to five gallons of water. Other sanitizers and disinfectants are available.

It really saves time if you soak all your bottles at once. A large picnic cooler can hold all your bottles in an orderly fashion. My 100-quart cooler holds sixty 12-ounce bottles. Sixty bottles is enough bottles for 5.5 gallons of beer. In a cooler, you don't stack bottles on top of each other. Not stacking bottles reduces the risk of chipping them.

To sanitize your bottles, fill the container with water, add the sanitizer (bleach, iodine or other), and mix. Submerge the bottles for the appropriate amount of time. Remove and rinse thoroughly with your jet-washer. I triple-rinse to ensure that no sanitizing solution is left. If you are uncertain about contamination in your water supply, some sanitizers can be used without rinsing. Check the labels carefully for the correct concentrations to use if you are not rinsing.

Bleach is also effective in cleaning bottles. It's tempting to think about combining the cleaning and sanitizing steps but don't. Soaking dirty bottles in bleach can work, but you run the risk of infecting the entire batch.

Preparing the Beer

Before you can fill the bottles, you need to siphon the beer from the fermenter to the bottling bucket and prime it so it will carbonate. The bucket and the racking cane should be cleaned and sanitized first. (This is a good time to sanitize the tubing as well.)

Try to minimize the amount of splashing or agitation, which can introduce oxygen into the beer and accelerate staling. Place the end of the racking tube at the bottom of the bottling bucket, so it remains below the liquid level as the bucket fills. Use more than one racking cane to save time siphoning. Start the siphon with one racking cane, and once there is a small amount of liquid in the bottom of the bucket, start the subsequent siphons.

Once the beer is in the bottling bucket, you need to add a source of fermentables for carbonation. Most homebrewers use corn sugar to prime their beer. Between 2/3 and 1 cup per 5-gallon batch is enough to carbonate it. Two-thirds of a cup of corn sugar will provide a soft carbonation suitable for some English ales. A full cup of sugar will produce a fizzy brew. Avoid using cane sugar (ordinary table sugar). It can impart a cidery taste to your brew.

Measure the sugar into a small sauce pan and add water until the sugar just dissolves. Boil for 15 minutes, then add it to the beer in your bottling bucket. If you want, you can let the solution cool before adding it to the beer but cooling really isn't necessary. A cup or so of boiling liquid will only raise 5 gallons of beer by a few degrees Fahrenheit. Gently stir the beer and sugar with a sanitized spoon. Some homebrewers feel that stirring introduces oxygen and promotes early staling of the beer. If you are concerned, add the sugar to the bottling bucket early and let the whirlpool that naturally develops swirl the sugar into the beer.

There are times when adding fresh yeast at the bottling stage is a good idea. If beer is left in secondary fermentation for an extended amount of time, almost all of the yeast drops out of solution. After a high gravity fermentation, the yeast may be tired. Beer may take a long time to bottle condition when few yeast cells are present or the yeast are not in good health. Adding a bottling yeast will help your beer to condition faster.

Sometimes, the yeast doesn't flocculate well or has other undesireable characteristics. Using a bottling yeast that is flocculant (it clumps together well during fermentation and sinks to the bottom) can help pull down some of the less-flocculant yeast in the bottle.

If you are using bottling yeast, use a cleanly fermenting strain that flocculates well. I use American Ale II (Wyeast 1272).The bottling yeast only ferments a small amount of sugar, so its impact on the flavor of your beer should be minimal. Be sure to choose a compatible yeast strain for your beer style. Don't pick a highly attenuative yeast if your main yeast was not. A more highly attenuative yeast will ferment sugars left by your main yeast if it is a poor attenuator. This can result in overcarbonation, changing a sweet beer into a dry beer. If you use a yeast with decent flocculation and don't let your beer sit in secondary for an excessive amount of time, you don't need to use bottling yeast. Most homebrewers don't.

To use a bottling yeast, add between 1/2 and 1 smack pack of yeast to the bottling bucket after you add the sugar. Or, pour the beer

out of a bottle that contains a type of bottling yeast you'd like to use. Fill the bottle about 1/3 full with fresh, aerated wort and let the wort reach high kraeusen before adding it to the bottling bucket.

Filling the Bottles

Next you need to move the beer from the bottling bucket to the bottles. Some homebrewers use a racking cane to siphon their beer into bottles. If you have a bottling bucket with a spigot, this stage is easier because you don't need to start another siphon. To minimize spillage, use a small tube with a tube clamp. The clamp will stop the fluid flow when you are done. With a small tube, capillary action will keep the liquid inside the end of the tube. If you use a larger tube, beer will drain from the end of the tube when clamped.

To begin filling, set the bottle on a white background such as a paper towel. This will help you see the liquid level as the bottle fills. Put the end of the tube in the bottom of the bottle. Open the clamp and let the beer start flowing. As the liquid level rises, slowly retract the tube from the bottle while keeping the end below the level of the liquid.

The fill level affects how fast it carbonates. Bottles with high-fill levels carbonate slower and may not fully carbonate. Bottles with low-fill levels carbonate faster and may over-carbonate. The "right" fill level is the level most commercial beers are filled to, about an inch below the top of the bottle.

When the bottle is filled, close the clamp. Remove the tube and place a blank cap on top of the bottle. When you're done filling your bottles, crimp the caps on with your bottle capper and you're done! ■

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

Counter-Pressure Bottle Filling

In counter-pressure bottling, the homebrewer moves carbonated beer from a keg into bottles. The resulting bottled beer does not need to condition in the bottle and is free of sediment.

There are a lot of different types of counter-pressure fillers, but they all work similarly. The filler forms a seal over the mouth of the beer bottle and fills the bottle with carbon dioxide under slight pressure. Beer is then pushed into the bottle, displacing the CO_2, and the bottle is capped. Counter-pressure filling is tricky, but worth it. You can also choose to bottle just a few bottles with a counter-pressure filler, leaving the rest of the beer in the keg.

Box Your Beer

Build your own sturdy boxes to hold your beer bottles

by Thom Cannell

PHOTOS BY THOM CANNELL

An inside look at your sturdy new homemade beer box. This one will hold a dozen 16-ounce bail-top bottles.

To add handles for easier transport: Just start with two drilled holes, then connect the dots with a saber saw.

I had only made about three batches of homebrewed, bottled beer before it occurred to me that I had no idea how I was going to store this stuff. Soon thereafter, I discovered the awful truth: Good beer boxes can be hard to find.

Sure, you might be able to talk a clerk into handing you the castoffs from a commercial bottler. And you might be lucky; your favorite homebrew supply shop might keep boxes in stock. But where are the sturdy cases of old? The ones with flip-tops and solid cardboard meant to survive years of returnable abuse?

And what about those of us who choose to use large bottles? I need something that can hold all of the 16-ounce and 22-ounce bail-top bottles I've collected over the years, not to mention the 22-ounce bombers that I use for laying down barleywines and Belgians. I need a container that is solid and sturdy, but not too heavy.

Plus, I like to build things. So I decided to custom-design my own.

Build Your Own: Figuring out what you need

After some thought, I decided that what I really needed was a simple design that would be easy to build on a beer budget. Fortunately, I only had to look into my wine cellar to find an example of a wooden box with no frills.

Unfortunately, wine boxes are made of a thin wood that can't be found at Home Depot and aren't really all that knock-about sturdy. I needed alternative materials and precise measurements. *(See sidebar containing material list, measurements and sizes, below.)*

After measuring my collection of Kalamazoo Brewing longnecks, squat Anchor bottles, import bail-tops and bombers, I figured I needed two different box sizes. I needed one box that would hold a case of 12-ounce longneck bottles and another box that would hold a dozen larger bottles.

The next obstacle was dividing the interior spaces. How would I

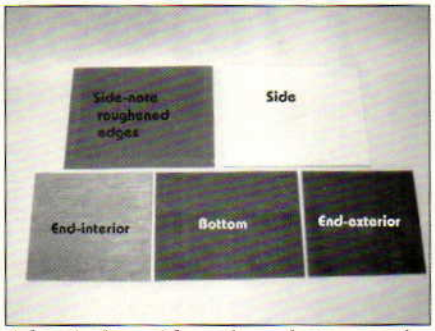
HARDWARE SHOPPING LIST

Materials (4x8 sheet)	**Cost**
Hardboard 1/4"	$9.50
Iso board 1/4" underlay	$8.47
Iso board 1/2"	$10.97
Luan 1/4" underlay	$8.47
Luan 3/4"	$35.77
MDF 1/2"	$13.10
MDF 3/4"	$18.70
Plywood 1/4" BC	$10.97
Plywood 3/8" BC (11/32)	$12.17
Plywood 1/2" CDX (15/32)	$9.48
Multiply underlayment 4x4	$9.97

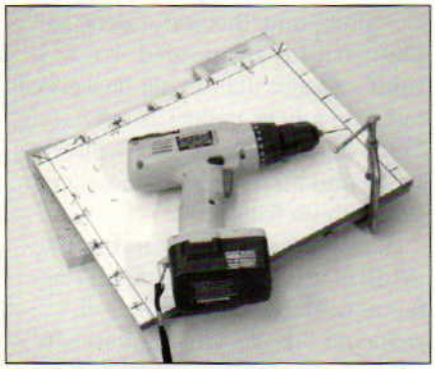
BOX SIZES

24 12-ounce Longnecks
Interior size 16" L x 11" W x 10" H
Assuming 1/2" plywood or MDF base/ends
Base 16" L x 11" W x 1/2"
Ends 11" W x 10.5" H
Sides 17" L x 10.5" H x (your choice)

12 16- or 22-ounce Bail-Top or Bombers
Interior size 14" L X 10.5" W x 11" H
Assuming 1/2"plywood or MDF base/ends
Base 14" L x 10.5" W x 1/2"
Ends 10.5" W x 11.5" H x 1/2"
Sides 15" L x 11.5" H x (your choice)



A box is four sides, plus a bottom and sometimes a top. We're going topless.



Hardware stores can advise you on the right drill size for your nails or screws.

partition the space? The easiest answer is also the best: simply recycle some cardboard partitions from your beer or wine shop. They last. If you are a real woodshop junkie, you can use them as a template to recreate your own set of partitions made of wood.

For our example, we'll build one box for longnecks, by far the most popular bottles for home use, and another box for bombers or bail-tops. And we'll experiment with different materials. I have included the measurements for both. *(See box on page 47.)*

Materials and Cost: Searching the scrap pile

Like any sensible homebrewer, before I priced out the materials I looked into my large scrap pile and found enough of the plywood, medium density fiberboard (MDF), and hardboard necessary to make several boxes. Then I measured the bottles and did some math, confirming my figures by measuring existing boxes and cases.

Cut the Pieces: Choosing to go topless

A box is four sides, plus a bottom and perhaps a top. For increased simplicity (and to save time), we've chosen to skip building a top. The bottom in our example is completely internal. This means that the sides wrap around it, instead of resting on top of it. This should be stronger and more simple to build.

Adding a top is primarily a hinge issue. Hinged tops, whether one- or two-piece, can add both unnecessary time and effort. You might disagree. What you won't contest, though, is that hoisting a case of beer can be backbreaking! To simplify lifting, I decided to add handles on each end. I measured in 3.5 inches from each edge and 2

inches down for height, then I drilled two 1-inch holes and connected the dots with a saber saw. That seems both easier and superior to making a handle out of rope (two holes and knotted rope ends) or attached blocks of wood. Just don't forget to sand the openings nice and smooth and perhaps bevel the edges with a file or router to make it easier on your hands.

Putting it Together: Glue, nails and screws

For any permanent construction, you need to use screws (or nails) and glue (or construction adhesive) at each joint. Glue provides the bonding and the nails provide clamping force while the glue dries and structural strength.

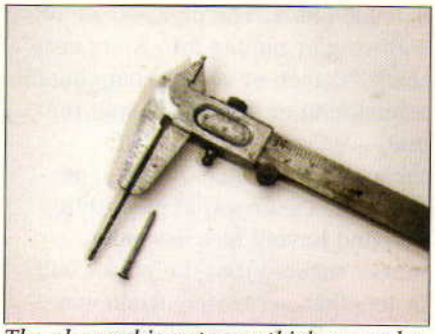
The best sides are made from 1/4-inch plywood or 1/8-inch flooring underlayment like Luan (a tropical hardwood). It's easier to drill and nail than hardboard and the surface compresses nicely when sinking nails or screws. It's also a few ounces lighter.

A potential problem with hardboard or leftover paneling scraps is that the surface is slick and tough to adhere things to. In order to ensure a good bond, roughen the three glued edges and nail or screw every 3 to 4 inches.

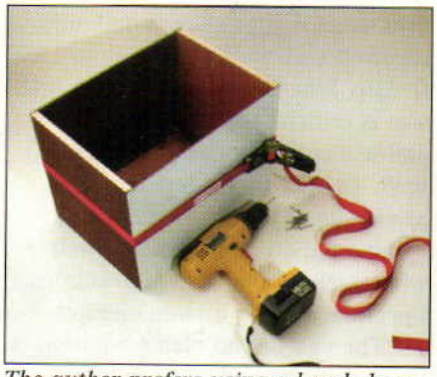
At the ends, where your plywood end panels attach to a plywood base (or MDF to MDF) I suggest exterior-grade "deck" screws three times as long as the end is thick. For attaching the sides, I tried both screws and flat-headed ring-shank nails. The nails are quicker but not as elegant. All screw heads should be countersunk so they are flush against the wood.

Preassembly and Predrilling: Making sure everything fits

Preassembly and predrilling pilot holes for both screws and nails



The plywood is not very thick, so make sure your screw or nail isn't too big.



The author prefers using a band clamp to hold things together for predrilling.

is a good idea. The plywood we're screwing or nailing into is not very thick, 1/2 inch or so, and banging in a thick nail or screw will split the end — or your nail will drift through the surface. Besides, pre-assembly ensures that everything fits, and having nice assembly marks ensures that the pieces will fit together accurately when everything is slippery and sloppy with glue or adhesive. Most hardware stores can advise you on the correct drill size for your chosen nail or screw. If you use MDF (Medium Density Fiberboard) the correct drill size is critical; too small and the end will split, too large and it won't hold. To hold things together for predrilling, I first tried a dry-fit using a band clamp (a fabric belt with ratchet) and then pipe clamps. I preferred using a band clamp.

The easiest, no-clamp solution is to predrill the ends, just holding them accurately in position, and drilling gently. Then apply glue and attach the ends to base. Next lay this big "U" shape on its side and predrill one set of side holes. Use care; the ends tend to lean in a bit. Then you can apply the glue and screw or nail the side to the base and the ends and repeat the process for the other side.

Boxing Day: Celebrating your creation

Now that I have enough boxes ready to hold my next fifteen gallons of homebrew, I made the following observations: The boxes are sturdy and should last decades. They are inexpensive, less than $5 apiece unless you want walnut veneer or solid oak. Plywood is lighter and makes better sides; MDF is heavier, easier to work with and paints better. In my opinion, plywood is a better all-around choice. It takes an afternoon to make one or three boxes; with a friend, a nice table saw and a full-size drill press you could make a dozen.

A final note: Throughout my preliminary search for beer boxes — I tried the Web, stores and catalogs — I never thought to visit each of my local homebrew shops. It just so happens that one of these, The Red Salamander in Grand Ledge, Michigan, does indeed carry sturdy beer boxes. So if you like the idea of wooden beer boxes but don't have the time, motivation or tools to build your own, be sure to check with your favorite homebrew supplier first. You could also order from the Red Salamander. Phone: (517) 627-2012. Web: redsalamander@virtualave.net. The boxes cost $10 plus $2 for shipping. ■

Thom Cannell is a veteran automotive writer and editor and an avid homebrewer. He lives in Lansing, Michigan and is a regular contributor to BYO.

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BREWER'S MARKETPLACE

Until the Cows Come Home

One man's adventurous tale of brewing with his spurs on

by Jim Bermingham

PHOTO COURTESY OF JIM BERMINGHAM

Jim Bermingham tries to make up with his horse by offering it some warm barley mash.

SO YOU THINK YOU'VE HAD bad brewing days? At about 5 AM the other day, I got up, made my usual pot of coffee and noticed that it was raining. I put on my slicker and went out to feed my animals. After feeding the horses and donkeys, I got on the tractor and hauled four bales of hay out for the cows. When I finished with my morning chores, I cleaned up and had breakfast.

After breakfast, I started grinding grain for a 10-gallon batch of Classic American Cream Ale. I hand-ground 17 pounds of grain. It was still raining, so I got the trucks out of the garage and set up my brewery in there. I put water in the pots for mashing and sparging and turned on the burner to heat up the mash water. Just as I was adding the grain to the hot water, my wife came out and said the neighbor was on the phone. He'd called to say that either his herd had doubled overnight or my cows had gotten in with his.

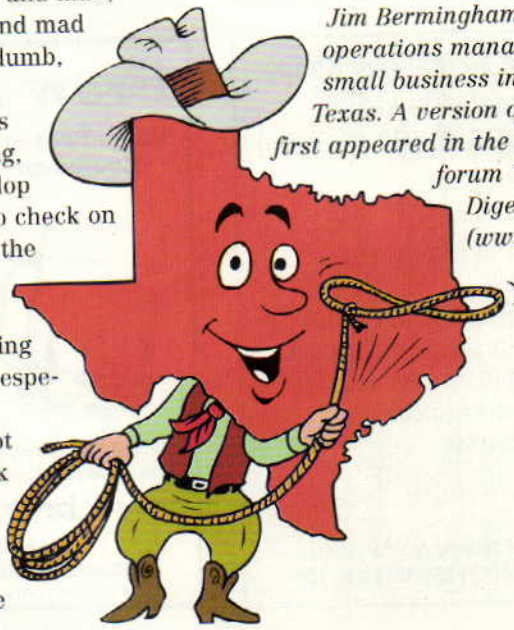
I put on my slicker and walked the fence line until I saw where it was down. I made a temporary gate and went to get a couple of horses. I took the horses to the barn and went back to check on the mash. I stirred the mash and made adjustments to the temperature. Then I went back to the barn and saddled the horses, got my wife and my dogs, and off we went to get the cows.

Now, it ain't easy to separate 72 cows from another herd of about the same size. You first have to convince your cows that their grass is greener than the neighbors. At the same time, you have to convince your neighbors' cows that their grass is better so they don't follow you home. Meanwhile, it's raining, your wife is wet and mad, your horses are wet and mad, your dogs are wet and mad and your cows are dumb, wet and mad.

While doing this cow-separating thing, I kept having to gallop back to the house to check on the mash and start the sparging. My wife just loved this. She always enjoys herding cattle by herself ... especially in the rain.

So we finally got all of the cows back in, the horses unsaddled and turned back out to pasture, my wife back in the dry house, the dogs on the front porch and me in the garage, firing up the old kettle. I got into dry clothes, pulled up a chair, grabbed a homebrew, fired up a cigar — it was brew time. Wife still mad, dogs mad, horses mad, cows mad; you know, it just don't get no better than this.

My first introduction to homebrewing was at age six when I used to help my dad cap his bottles. I brewed my first batch in college. After college, I quit brewing but was able to sample all of the fine beers of the world by traveling extensively with my job. When I retired from that job, and stopped traveling, I missed all of that great beer so I decided to make my own. Now, with the farm animals and a new job, I don't have that much free time for brewing. I just reserve a day, and — come what may — I brew. ■



Jim Bermingham is an operations manager for a small business in Milsap, Texas. A version of this story first appeared in the online forum "Home Brew Digest" (www.hbd.org).

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