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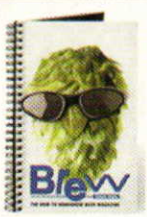

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NOVEMBER 2005
Volume 11 Number 7

Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

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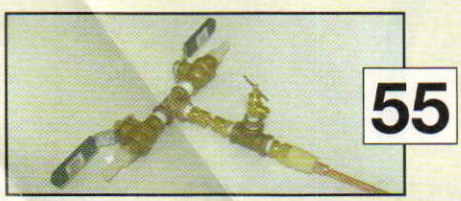

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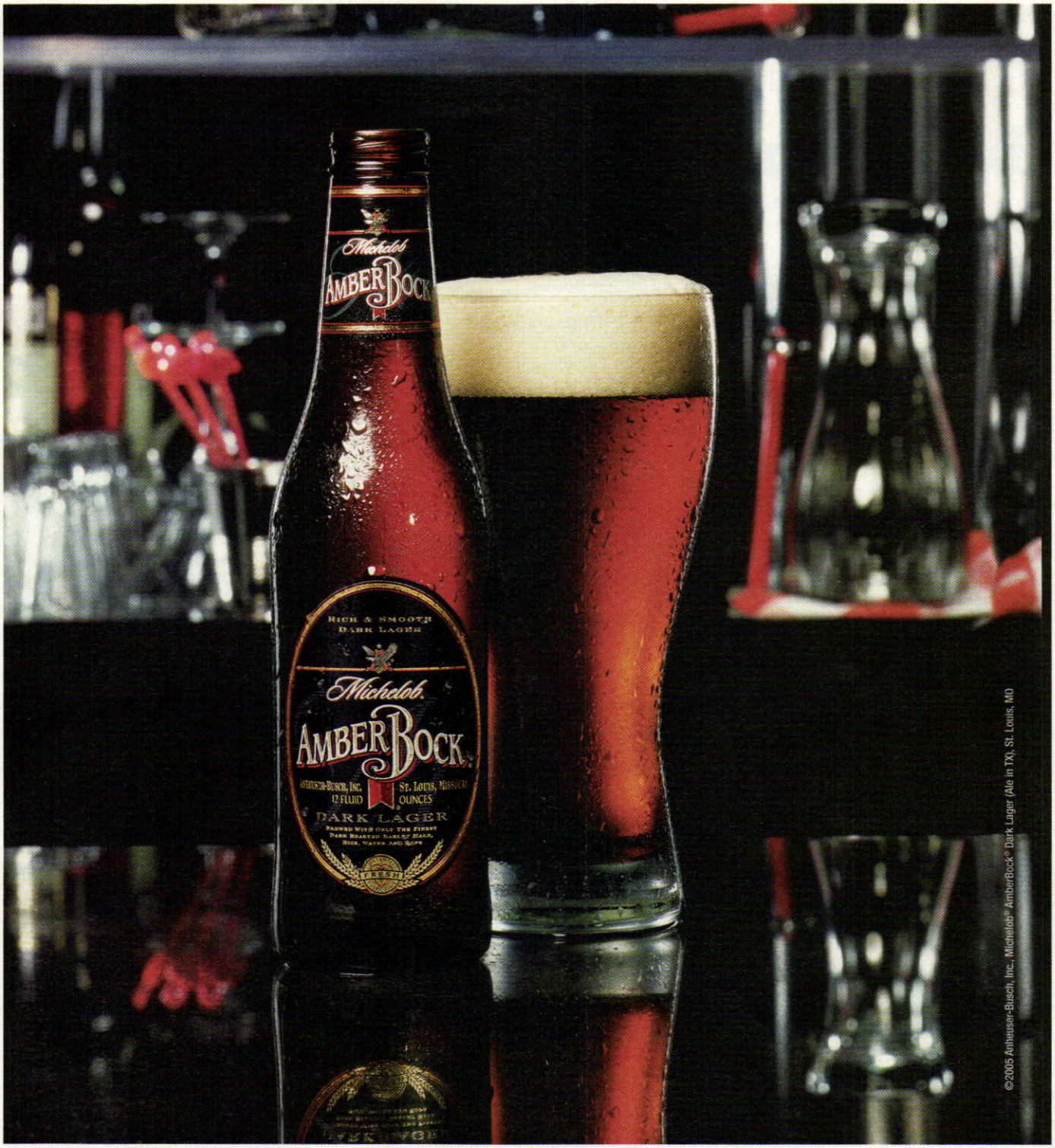

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RECIPE INDEX

BYO RECIPE STANDARDIZATION

Extract efficiency: 65%
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one gallon of water, would yield a wort of 1.024.)

Extract values for malt extract:
liquid malt extract (LME) = 1.033–1.037
dried malt extract (DME) = 1.045

Potential extract for grains:
2-row base malts = 1.037–1.038
wheat malt = 1.037
6-row base malts = 1.035
Munich malt = 1.035
Vienna malt = 1.035
crystal malts = 1.033–1.035
chocolate malts = 1.034
dark roasted grains = 1.024–1.026
flaked maize and rice = 1.037–1.038

Hops:
We calculate IBU's based on 25% hop utilization for a one hour boil of hop pellets at specific gravities less than 1.050.

Pumpkin Oil Ale

I read with great interest the article in the October 2005 *BYO* on Thanksgiving beer recipes. My question is specific to pumpkin beer. You mention in your article that there are basically two choices when it comes to using pumpkin, either fresh or canned. I'd like to throw out a third option and one that I've had great success in utilizing, pumpkin oil.

From what I understand, there are two basic reasons to use fresh or canned pumpkin; one being the fermentable sugars, the other being a certain level of color contribution. But what it boils down to is getting the pumpkin essence in your beer. Everything I had read prior to formulating my recipe was that pumpkin in the mash made for one heck of a cleanup, something I didn't really want to bother with. So, in looking for options, my wife suggested pumpkin oil. My wife has a side business as a cake decorator and had used pumpkin oil in some of her recipes. A local cake and candy shop sells the oil luckily. The rest of what defines this beer is in the spices, so any spice that is in pumpkin pie is in my recipe. I'm not a spice snob by any means, but have to admit that fresh ground spices, especially nutmeg, are the key to this beer's success. I'm attaching my recipe for your professional opinion. I was fortunate enough to win a gold medal in a local competition last year, and hope to do the same this year.

Doug Short
Cincinnati, Ohio

Doug's Pumpkin Ale

10.0 lbs. (4.5 kg) 2-row Briess brewers malt
0.50 lb. (0.23 kg) CaraPils or dextrine malt
0.50 lb. (0.23 kg) caramel malt (50 °L)
0.50 lb. (0.23 kg) honey malt (25 °L)
0.13 lb. (59 g) chocolate malt (350 °L)
5.6 AAU Cascade hops (60 min) (1.0 oz./28 g of 5.6% alpha acids)
2.5 AAU Fuggles hops (30 min) (0.50 oz./14 g of 5.0% alpha acids)
1.75 AAU Hallertauer Hersbrucker hops (30 min) (0.50 oz./14 g of 3.5% alpha acids)
2.5 AAU Fuggles hops (10 min) (0.50 oz./14 g of 5.0% alpha acids)
1.75 AAU Hallertauer Hersbrucker hops (10 min) (0.50 oz./14 g of 3.5% alpha acids)
1 tsp. Irish moss (boil 10 min)
2 tsp. allspice (boil 60 min)
2 tsp. cinnamon (boil 60 min)
2 tsp. ginger (boil 60 min)
2 tsp. nutmeg (boil 60 min)
3 cloves (boil 60 min)
10 drops pumpkin oil (boil 5 min)
0.66 lbs. (0.30 kg) brown sugar (dark)
White Labs WLP001 (California Ale) yeast

"Give Thanks for Beer" author, and BYO *editor, Chris Colby responds: "Homebrewers incorporate pumpkin into their beers in a variety of ways. I like roasting it, to bring out the flavor, and stirring it into the mash. (Canned pumpkin has already been roasted so you can just stir it in.) You will get some sticky "strings" in your spent grains if you use fresh pumpkin, but if you clean your lauter tun right away it's not that big of a deal. This method yields some nice pumpkin flavor and also some orange color.*

"Some brewers boil chunks of pumpkin (or canned pumpkin) to bring out the flavor. This works, but leads to starch in the wort. Starch will make your beer cloudy and serve as a source of nutrition for contaminating wild yeast or bacteria. (If you pay attention to your cleaning and sanitation and drink the beer quickly, however, this may not be a problem.) Like the mashing method, boiling extracts both flavor and color from the pumpkin.

"Still other brewers skip the pumpkin altogether and just add the pumpkin pie spices.

"Your idea of adding pumpkin oil sounds fine, and it obviously worked for you. My 'professional' opinion of

your recipe is — if you brew it in such a way that it wins gold medals, it's probably pretty good.

"One last note on pumpkins: the best ones to use in brewing are those sold as pie pumpkins. These are usually sized between a large softball and a bowling ball. Large jack-o-lantern pumpkins are bred for size, not flavor, and don't taste as good.

Thanks for the recipe and good luck at your contest this year."

Head Over Heels for Lagers

With the changing of the season, I set out to brew a flavorful American lager similar to Yuengling. After two weeks of primary fermentation, I took the beer out of the refrigerator and put it near the coolest spot in the house — in front of an air-conditioning vent in a hallway — for a diacetyl rest.

While watching a movie later that night, I jumped up to grab my girlfriend something to drink. As I quickly rounded the corner through the hallway, I realized while free falling that I had made a significant error in the placement of the carboy. In slow motion, I saw 5 gallons of hard work shatter onto the kitchen floor just a split second before I fell onto the broken glass. As I slowly got up, I was adding up the cost of the ingredients, the glass carboy, the hours of time spent, and most of all the lost enjoyment. I was not even thinking about the brand new wood floors that I just installed a few months before.

After getting up, my girlfriend was in a state of shock. I was bleeding all over and was standing barefoot surrounded by shards of glass. I was bleeding mostly from three large puncture wounds on the side of my backside. I grabbed a towel from her and did the best I could to stop the bleeding. After 15 minutes of emergency first aid I got most of the bleeding stopped. During this time my girlfriend was cleaning up the beer, yeast, hop and blood slurry with every towel in the house. She then did a 3 a.m. run to Walmart to purchase the last package of butterfly bandages. I am attempting another batch of "Fall Lager" but this time I plan to use only plastic carboys. Also, I think I am going to take a picture of the scars on my butt and make that the logo for the batch.

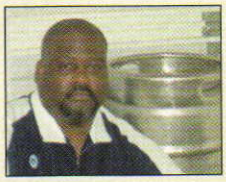
Jon McClow
via email

Ouch! Glad to hear you are OK. Your letter brings up a very important safety issue for homebrewers — the need to have a beer fridge in each and every room in your house.

Cream Ale Correction

In the July-August 2005 issue of BYO, *the boil time for Denny Conn's Cream Swill (his cream ale) given is not how long he actually boils his wort. Instead of the 90 minutes called for in the recipe, he only boils for 45 minutes. He also bottles with only ¾ cup of corn sugar.*

Reg "Gus" Pope caught the craft brew bug in Wyoming while working on



Forest Service fire crews during summer breaks. He began homebrewing in 1994 and worked his way up from 5-gallon (19 L) extract batches on the stove of his 500 sq. ft. apartment to his current set-up — a custom fab, stainless, tiered, half barrel all-grain system housed in a converted garage designed specifically as a brewhouse in the blueprint stage of construction of his current home. In addition to the standard brewing compliment, it contains a chemical/analytical test bench and a yeast bank. On page 55 of this issue, he explains how to build a counter-pressure bottle filler, which fills sediment-free bottles of beer from a keg. Reg lives in the Boise, Idaho area with his wife and 4 ½ year old "assistant brewer."

Julia Herz is owner of the main web site for commercial meaderies: honeywine.com. Visitors can purchase over 20 meads, which is handy since it

can be hard to find commercial mead in many establishments. She is also in charge of marketing and promotions for Redstone Meadery. Prior to this she worked at the Brewers Association, which is the organization that started and runs the Great American Beer Festival. She is a recognized beer judge in the BJCP program, and a homebrewer of over 14 years. Julia is also one of the founding Board Members of the International Mead Association (www.meadfest.org).

David Myers is Chairman of the Mead for Redstone Meadery and the other founding board member of the International Mead Association. On

page 38 of this issue, in an article co-authored by Julia Herz, he gives some insight into the world of commercial meaderies, information on mead making, a contest opportunity for home meadmakers and 3 mead clones.

Paul Zocco makes two contributions

to this issue. First, on page 32, he gives us step by step instructions on how to make mead, "the nectar of the gods." From his home in Willamantic, Connecticut — where he runs Zok's Homebrewing Supplies — he's been brewing award-winning meads for years. Then on page 42 Zocco teaches us how to build a three-tier brewing system. Last November, he also wrote a cidermaking story for *BYO*.

Reader PROJECT

BUILD A PROFESSIONAL-QUALITY FILTER

Graham Sanders • Thuringowa, North Queensland, Australia

Many commercial brewers filter their beer to remove suspended yeast and chill haze, ensuring their beer is perfectly clear, every time. Although we homebrewers don't mind drinking cloudy beer, there are times that demand the best of our brewing skills to show through. This is especially so for competitions, where filtering could make the difference between first place and oblivion. And I have found a way to make commercial-level beer filtering cost only a few dollars.

One secret for easier filtering and keg transfers is to use an adjustable device that maintains a slight pressure difference between the two kegs. Mine is just a normal gas disconnect, to which I attached the pressure relief value. The valve is held in place by a spring and screw-on fitting, and how tightly you screw it down determines at what pressure it releases gas. I can set it so there are a few pressure differences between it and the other keg in order to get a consistently slow flow.

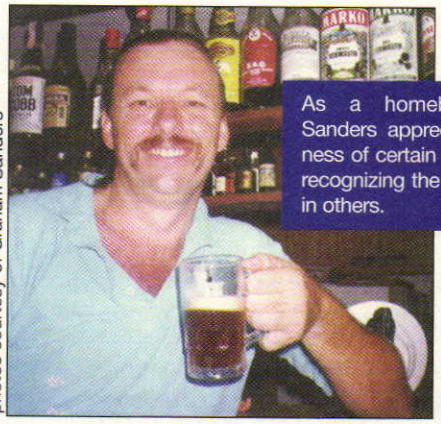
Commercial brewers often filter with diatomaceous earth (DE). This material is no different from that of swimming pool filters. So, I thought if it works with swimming pools, why not beer? I then found that you can buy graded DE that will filter down to 1 micron, which will polish your beer nicely.

A pool filter is basically a container of fine grade sand that supports the DE that filters the water. My beer filter is contained within a stainless steel pipe that is sealed and threaded at both ends. Once that is set up:

1. Put a screen in the bottom of the filter (fine enough to hold sand).
2. Half fill the pipe with fine grade pool sand.
3. Add at least an inch of DE to the top of the sand (the more you add, the finer the filtration).
4. Heat the entire set up in an oven at 266 °F (130 °C) for 30 minutes to sterilize (optional).
5. Flush with de-oxygenated water — this can be accomplished by bubbling CO_2 into the water or adding a pinch of sodium (or potassium) metabisulphite in order to compact and clean it.

If you do not remove oxygen from the water that you use to flush the filter, it will oxidize the filtered beer. Be careful not to change the vertical orientation of the filter once it is set up. You must also keep the pressure constant or you will disturb the filter bed. To do this:

(left): The homemade filter pushes beer through diatomaceous earth (DE).
(right): Components of the presssure valve.



photos courtesy of Graham Sanders

As a homebrewer, Graham Sanders appreciates the cloudiness of certain brew styles, while recognizing the demand of clarity in others.

1. With the tap in the off position, attach the beer line from the storage keg to the top of the filter.

2. Attach the line from the keg to which you are transferring to the bottom of the filter.

3. Keeping the other end of the line open with a blank, open the tap slowly and let the beer just flow through (this will fill the filter and push out the water and any remaining air).

4. When the beer flows out the other side let about 6.8 oz. (200 mL) flow out.
5. Turn off the tap, remove the blank and attach to the receiving tank.

The filter and beer line is now at the same pressure as the keg and you are ready to run the filter. To do this you will need a bleed valve:

1. Adjust the pressure in the receiving keg to the same level as the transfer keg.
2. Attach the bleed valve to the receiving keg and adjust it until it just lets the gas escape. It's important that the pressure in the receiving keg is slightly lower than in the storage keg, or the beer will flow back to the storage keg and disturb the filter bed.

3. Open the tap slowly.

If you have done it correctly there should be little flow because the two keg pressures are equal. To force the beer through the filter, unscrew the receiving valve slowly to get a flow. You may need to add extra pressure to the transfer keg if you cannot get a good flow. Enjoy your filtered beer!

homebrew CLUB

The Badger Brew Club (BBC) • Madison, Wisconsin

What do you get when you throw two geomorphologists, two civil engineers, two geospatial analysts, a mechanic, two chemists, an IT specialist, a shipping and receiving coordinator, and a pricing analyst together in one room? BEER TALK! Nothing more, nothing less. For the less interested wives and girlfriends, it is usually a cue to leave, otherwise succumb to an endless discussion of beer and beer styles, brewing techniques, what-ifs, and why-don'ts. I should point out, however, that once a high-quality batch of adult libation is ready for tasting, the girls come back in a hurry!

At last count, the Badger Brew Club had 12 members, but when the brew starts running, so do the girlfriends!

This is who we are, the Badger Brew Club, a group of guys from backgrounds and outside interests as diverse as you can get. Some of us brew often, and some of us brew less than often. Basically, it is just an excuse to assemble at someone's house on the third Thursday of each month to taste the latest and greatest products brewed by our members. We have toured a few local microbreweries and brew pubs, attended local beer festivals and we even like to drink from large, boot-shaped drinking vessels at the local German beer hall.

Our most recent adventure has us kegging the latest creations that come into existence. We found a bunch of used Corny kegs online, refurbished them ourselves, assembled a CO_2 setup, and quickly realized how easy kegging really is. We also started yeast farmin'! Yep, we've got a steadily growing yeast bank, perhaps with 8–10 different cultures, that all members have access to when needed. For more information contact Kevin Spigel: at kmspigel@wisc.edu.

The BBC has one central brew system that they use together AND a yeast farm of about 10 strains!

homebrew CALENDAR

October 26
Coconut Cup
Coral Gables, Florida

The deadline for the eighth annual Coconut Cup is October 26 and the event will take place on November 5 at the Titanic Brewing Company in Coral Gables, Florida. Entries will be accepted from all BJCP Style Categories. The fee is $6 per entry (2 bottles per entry. For more information contact Denise Graham at (305) 227-0848 or via email at sndg@bellsouth.net. The Website for the event is www.hbd.org/mash/coconut.html.

November 5
Foam On The Range 2005
Denver, Colorado

Deadlines for the annual Foam On The Range homebrew competition are October 25 through November 5. The cost is $5 per 2-bottle entry. All categories of the 2004 BJCP guidelines will be judged, including beer, mead and cider. Best Of Show prize is a brazed plate wort chiller. The awards ceremony will be held on November 12. For more information contact Tom Gardner via email at tomgardner@cs.com or visit www.foamontherange.org.

November 11
Hogtown Brew-Off
Gainesville, Florida

After the 2nd Annual Hogtown Brew-Off was cancelled last year due to a series of unasked-for hurricanes, the competition is back and bigger than ever! Entries will be accepted until November 11 in all BJCP categories of Beer, Mead and Cider. The fee is $6 per entry. For more information contact Craig Birkmaier via email at craig@pcube.com or visit www.hogtownbrewers.org.

we want you

Do you have a system or some unique brewing gadgets that will make our readers drool? Email a description and some photos to **edit@byo.com** and you too may have a claim to fame in your brewing circle!

If we publish your article, recipe, photos, club news or tip in Homebrew Nation, you'll get a cool t-shirt (courtesy of White Labs) and a *BYO* Euro sticker.

big winning RECIPE

Steve Piatz of Eagan, Minnesota won 1st place in the 1999 AHA National Homebrew Competition in the Historic/Experimental category.

Piatz's Historic Porter (5 gallons/19 L, all-grain)

OG = 1.082 FG = 1.012
IBU = 76 SRM = 65 ABV = 9.0%

This beer was an attempt to create the historic, wood-aged, stale porter from the glory days of the style in London.
— Steve Piatz

Ingredients

8.75 lbs. (4.0 kg) 2-row pale malt
1.21 lbs. (0.54 kg) aromatic malt
1.58 lbs. (0.71 kg) crystal malt (40 °L)
0.48 lbs. (0.21 kg) chocolate malt
0.12 lbs. (0.05 kg) roasted barley
0.48 lbs. (0.21 kg) black patent malt
13.5 AAU Northern Brewer hops (90 mins) (1.53 oz./43 g of 8.8% alpha acids)
13.5 AAU Northern Brewer hops (20 mins) (1.53 oz./43 g of 8.8% alpha acids)
Brewtek CL-160 yeast
Brewtek *Brettanomyces*

Step by Step

Mash at 153 °F (67 °C) with 1.33 quarts of water per pound of grain (2.8 L/kg). Boil for 90 minutes. Ferment at 70 °F (21 °C). The original batch was fermented with Brewtek CL-160 yeast and a Brewtek *Brettanomyces* strain was added after five days. You can use the English ale and *Brettanomyces* strains of your choice. The beer was about 14 months old when it took 1st place at the 1999 AHA National Homebrew Competition. *(Note: the extract efficiency in the original recipe is 90%; adjust the grain bill to match your system. For more on historic porter, see Steve's article, "Brewing with* Brettanomyces*," in the October 2005 issue of* BYO.*)*

homebrew systems that will MAKE YOU DROOL

Dave Talley • Austin, Texas

This is my set up for dispensing beer. I used a Woods freezer which holds three kegs easily. I got an Ibis tower from with the gold finish (I am a Vandy fan and the colors are black and gold). I use beer gas for dispensing with a manifold located in the freezer. The weight of the top is a little too great for the hinges of the freezer to hold, so I rigged up a support for it that pivots out as the top is opened.

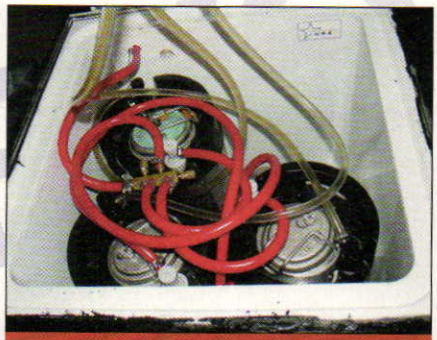
I have a probe thermometer inside which monitors the temp, and I have an extra probe that I can use to check the temperature of the beer. I have rigged up four feet of beer line from each keg to the respective faucet, so I don't have to worry about over-foaming. I use a temperature control unit to keep the beer at 52 °F (11 °C).

I put two shelves on the freezer to hold glasses and my collection of brewing magazines and books. I managed to hunt down some tap handles online with eBay.

I am currently dispensing a pale ale, an English style bitter and a sweet stout. I intend to get a gold-plated stout faucet (sometime in the future as my wife is still recovering from the purchases so far). Until then, I'll be relaxing and having a homebrew!

As a dedicated Vanderbilt fan, the black freezer and gold keg manifold was a must.


The temperature controlled keg freezer holds five Corny kegs with ease!


Dave draws his brew through 4 feet of beer line to minimize foam.


The weight of the tap manifold was a little heavy, so a brace was made to secure it.

replicator

by **Steve Bader**

Dear Replicator,

I have fallen in love with Sand Creek Brewing Company's Oscar's Chocolate Oatmeal Stout. The first time I had it was New Year's eve this year at a small supper club. I have since found the brew at a local liquor store, but it doesn't seem as fresh as the brew I had on New Year's. I would love to reproduce it on my own. Can you please help with a clone recipe?

Jason Johnson
Manitowoc, Wisconsin

Chocolate oatmeal stout? This sounds like it could be a cookie or a beer! It is a Gold Medal winner in the 2000 World Beer Cup, and Sand Creek Brewing Company's best-selling beer.

This is a beer that is perfect for homebrewing, since it was inspired by a homebrewer. The original recipe had ingredients like chocolate syrup and powdered chocolate. Todd Krueger, who is head brewer at Sand Creek Brewing in Black River Falls, Wisconsin, told me that they used that original homebrew recipe as a starting point then adapted it for commercial 20-barrel batches. While they don't use chocolate in the existing recipe, the malts and sweetness still have hints of chocolate. Todd was a homebrewer for 10 years before taking the Siebel short course and starting his brewing career. Todd described Oscar's Chocolate Oatmeal Stout as a beer with a well rounded roasted flavor from the roasted barley and chocolate malt. The oatmeal helps to smooth out the beer, and makes you start looking for your second pint before you are halfway done with your first! Todd uses a low attenuation yeast that does not ferment as much of the malt sugars as other strains, and shoots for a relatively high ending gravity of 1.020, retaining some sweetness to help produce the chocolate flavor. While I normally suggest that you always aerate your beer prior to pitching the yeast (to get the maximum sugar fermentation in your beer) with this beer I would suggest that you do not.

Invite a friend over to help brew and have fun with it — it's your responsibility as a homebrewer! And be sure to have a few beers from your last Replicator recipe on hand for inspiration. For more information you can visit the Sand Creek Brewing Website at www.sandcreekbrewing.com or call (715) 284-7553.

Sand Creek Brewing Company "Oscar's Chocolate Oatmeal Stout"

(5 gallons/19 L, extract with grains)

OG = 1.056 FG = 1.020 IBU = 30
SRM = 20 ABV = 4.75%

Ingredients

6.6 lbs. (3.0 kg) Briess light unhopped malt extract syrup
1.0 lbs. (453 g) Briess Munich malt (10 °L)
1.0 lbs. (453 g) Briess wheat malt
4.0 oz. (113 g) Briess roasted barley malt
4.0 oz. (113 g) Briess chocolate malt
10.0 oz. (283 g) Briess flaked oats
1 tsp. Irish moss (boil 60 minutes)
7.1 AAU Goldings hops (bittering hop, boil 60 minutes) (1.5 oz./42 g of 4.75% alpha acid)
4.75 AAU Goldings hops (aroma hop, boil 5 minutes) (1.0 oz./28 g of 4.75% alpha acid)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast
0.75 cup corn sugar (for priming)

Step by step

Steep the crushed malts in 1.5 gallons (5.8 L) of water at 150 °F (66 °C) for 30 minutes. Remove grains from wort and add water to make 3 gallons (11 L). Add the malt syrup to your wort and bring to a boil.

Add the Goldings bittering hops and Irish moss then boil for 60 minutes. Add the Goldings finishing hops for the last 5 minutes of the boil.

Now add the wort to 2 gallons (7.6 L) of cool water in a sanitary fermenter, and top off with cool water to 5.5 gallons (21 L). Cool the wort to 75 °F (24 °C) — do not aerate (you want a high ending gravity for this beer!). Pitch your yeast and allow the beer to cool over the next few hours to 68 °F (20 °C), and hold at this temperature until the beer has finished fermenting. Then bottle or keg your beer and enjoy!

All-grain option:

This is a single step infusion mash. Replace the malt syrup with 9.0 lbs. (4.0 kg) of Briess pale 2-row malt, and mix with the rest of your grains in the extract version. Mash the grains together at 150 °F (66 °C) for 60 minutes.

Collect approximately 7 gallons (26 L) of wort to boil for 60 minutes and have a 5.5-gallon (21-L) yield. Lower the amount of the Goldings hops to 1.25 ounces (35 g) to account for the better hop utilization of a full wort boil. The remainder of the recipe is the same as the extract. Enjoy your chocolate oatmeal stout!

Brewing Safety 101

Preventing burns, cuts and chemical injury

by Garrett Heaney

Homebrewers at every level can hurt themselves. This is a fact that we find out via mail, often containing vivid pictures that are not any more fun to look at than they are to take. Cuts, burns, bandages . . . we've seen it all! The goal of this segment of Beginner's Block is to educate brewers how to save themselves from the pains of unsafe brewing. Here are a few "anti-crash" courses in safety to protect you from the hazards.

Burn safety 101:

Possibly the most common brewing folly is burning hands and other parts of the body due to careless handling of kettles, hot liquids and brewing equipment. When you are working with boiling water and hot wort, it is important to be mindful of the fact that liquids over 120 °F (49 °C) are capable of turning an enjoyable brew session into a profanity-laden nightmare. All it takes is one clumsy bump of the kettle, or hasty pour to cause days — sometimes weeks — of severe pain. Follow these general rules of thumb:

1. Pay attention to what you're doing: Whenever you are working with hot objects and ingredients, it is critical that you remain focused. Monitoring the boil is also crucial, as this will prevent the dreaded "boilover," which calls for immediate action — just the type of situation where a brewer could act hastily and get burned. Also, take the utmost care when lighting propane burners. Always be sure to minimize the time between turning on the gas and igniting the flame. Anymore than a few seconds could potentially lead to an excess of gas and a severe burn.

2. For professional brewers, hand, eye and foot protection is critical. Wearing this gear at your kitchen stove would be overkill, but larger scale homebrewers should consider which of these items might be prudent, based on their setup and practices. Always wear eye protection when dealing with highly pressurized glass bottles.

3. Recognize the dangers of steam: Most people realize that boiling water is capable of burning them, but people are quicker to forget that the steam from this water is also a safety hazard. Whenever you pour boiling wort or water, be cautious of the steam, keeping limbs and faces clear. *BYO* Technical Editor Ashton Lewis says, "Steam is far worse than boiling water because of the tremendous latent heat of vaporization. When steam changes from gas to liquid it releases ~1,000 BTU/pound. This is 1,000 times more than the ~1 BTU/pound per degree Fahrenheit change in temperature when hot water is cooled." For further information on burns, read Chris Colby's December 2001 *BYO* article "Burn Safety."

Chemical safety:

Working with chemicals, acids and sanitizers can be dangerous. Mixing these agents — especially the mixing of chemicals with bleach, which can release dangerous chlorine gas — can cause toxic results. Our risk is lower than that of professional brewers as we don't need to climb inside our tanks to clean them. Still, always work in a well-ventilated area and leave the area if you begin to feel light-headed.

Chemical contact with skin can also cause as much damage as a burn. Wearing plastic gloves when using harsh cleaners or sanitizers will save your skin.

Crushing grain releases lots of dust, which can trigger asthma attacks. A standard dust mask will make this task safer (and more enjoyable) for asthma sufferers.

Cut safety:

Cuts caused from broken glass are also common brewing injuries. Although there are safer alternatives (plastic buckets and carboys), many brewers continue to use glass bottles and carboys. While there is absolutely nothing wrong with glass as a traditional container, the hazards of broken glass are very real. Some of the goriest photos I've seen in my inbox are the result of broken carboys and bottles. To prevent such maiming, it is critical that you are careful while transporting and storing glass. Always ensure that both your hands and the carboy are dry before attempting to lift it.

> . . . excess consumption on brewing day can lead to accidents if you aren't careful.

Many homebrewers like to enjoy a homebrew while brewing, but excess consumption on brewing day can lead to accidents if you aren't careful. Keep your head while brewing so you can enjoy your beer in good health!

Dealing With Diacetyl

Or learning to appreciate the flavor of the "flaw"

by Thomas J. Miller

Diacetyl is one of those easily-defined brewing terms that remains, nonetheless, a hard to understand conundrum. For years it was thought to be indicative of a bacterial flaw (and it can be), but advances in brewing science have proved diacetyl to also be a natural part of the brewing process. With that came techniques and strategies to reduce diacetyl in beer, the resulting bias is perceiving the slightest hint of diacetyl as a flavor flaw. That is a matter of opinion, of course, though if you plan to impress any judges with your favorite lager, make sure to heed the advice of our pros.

John Nielsen is the owner and Brewmaster of Prescott Brewing Company in Prescott, Arizona. He began homebrewing in 1983 and attended courses at both UC Davis and the Siebel Institute before turning pro and opening his brewery.

Diacetyl (also known as 2, 3 butanedione) is a naturally occurring part of the fermentation process. Its profile is a distinct buttery aroma and flavor; some say it's like buttered popcorn or butterscotch. Some Belgian ales contain higher levels of diacetyl and it is considered part of the flavor profile — however in most ales it is found in small amounts. However, in lagers it is typically considered a defect.

Another source of diacetyl is bacterial contamination. There are two main types of bacteria that can cause diacetyl to form — *Lactobacillus* and *Pediococcus*. The first thing anyone should do is review all sanitation procedures and make sure everything is properly sanitized.

As mentioned earlier, diacetyl is a natural occurring process of fermentation. The yeast will produce diacetyl no matter what. However, just as the yeast produces diacetyl, it will also get rid of it. You must let the fermented beer sit on the yeast for two or three days after the termination of fermentation. This is called the diacetyl rest. The yeast will scrub the diacetyl out of the beer that it produced. After the rest, rack your beer into your mini kegs or bottles.

For homebrewers, if you don't have temperature controls on your equipment, allow the yeast to ferment the beer to about half of the terminal gravity, then allow it to warm up to about 65 °F (18 °C). It should reach this temperature on its own, if not, a water bath a little warmer than the beer will help it along. The beer will be far enough along in the fermentation process so the yeast shouldn't produce these flavors. Leave the beer at this temperature until there is no more diacetyl in your beer, then rack your beer for cold lagering.

How will you know when the diacetyl is gone? Easy, test for it. Take two samples of beer (about 3 ounces each) and put them each in a sealed jar. Mark one sample A and one sample B. Place sample A in the fridge, take sample B and heat the sample up to 140–150 °F (60–66 °C) and hold that temperature for no less than 20 minutes. Then place sample B in the fridge and chill. When sample B has reached temperature equal to sample A, take both samples out of the fridge and open A first. Swirl it and taste it, then open B and do the same. If you smell or taste any buttery notes, let the beer sit on the yeast longer. If they both smell and taste the same then you are ready to move on to the next step — bottling or cold lagering.

Ashton Lewis is *BYO*'s Technical Editor and the infamous "Mr. Wizard" who answers all of your brewing inquiries. He also is Head Brewer of Springfield Brewing Company in Springfield, Missouri.

With the exception of a very few notable lagers, diacetyl is considered completely unacceptable in the style. The interesting thing about the obsession with diacetyl in modern brewing, especially among lager brewers, has nothing to do with diacetyl's association with bacterial contamination.

Beers containing diacetyl, whether the consumer knows it or not, are satiating and make beer drinkers feel full. This translates to decreased beer consumption during a beer drinking session and a corresponding drop in beer sales. My tips to minimize diacetyl are:

1. Use a 3-day diacetyl rest for ales and a 7-day diacetyl rest for lagers following primary fermentation.

2. Select a yeast strain not noted for diacetyl production.

3. Minimize air pick-up during racking, filtration and packaging because oxygen causes alpha-acetolactate in beer to convert to diacetyl.

4. Keep a clean brewery and use clean yeast since lactic acid bacteria and *Pediococcus* can both cause diacetyl problems in beer.

Bill Kiester graduated the UC Davis Master Brewers Program in 1996. He worked for five years as the head brewer at Ram Big Horn Brewing Co. in Lake Oswego, Oregon. Currently, he is the head brewer at Backcountry Brewery in Frisco, Colorado.

Diacetyl, while present in many ales, is deemed more of a "problem" in lagers. Lagers are supposed to be "clean," which means little to no estery flavors (produced by yeast) or diacetyl. Although it is generally accepted that diacetyl is bad in lagers, I question why a brewer should disregard such an interesting flavor?

My understanding is that diacetyl is a function of yeast strain and fermentation conditions. So, selection of yeast at the very start is important. Grain selection will not influence diacetyl unless you are using a large percentage of adjuncts. Low levels of alpha-amino nitrogen in wort results in yeast that is less active and less able to reduce diacetyl. Use of yeast nutrients in high adjunct beer will improve yeast health.

Diacetyl is created in two steps. First, from the synthesis and excretion of alpha-acetolactate, a by-product of yeast metabolism. Second, through oxidation of alpha-acetolactate to diacetyl outside the yeast cell.

Diacetyl is controlled by allowing yeast the time to assimilate and metabolize it. Using time and temperature, a brewer can control diacetyl. At higher temps the oxidation of alpha-acetolactate is more rapid and given adequate time the yeast will reduce the amount of diacetyl. I have used two ways to increase the temperature. First, disable control of the fermenter at the end of fermentation to allow the temperature to drift higher and, second, increase fermenter control temperature when gravity is 50% or lower of starting gravity to increase temperature with yeast metabolism. Kraeusening can also be an effective means of reducing diacetyl by introducing fresh yeast, but I have not used this method.

Simply moving the beer to a warmer location will increase the formation of diacetyl. As long as the yeast is in good health it will reduce the amount of diacetyl in the beer. Be sure the initial wort has plenty of oxygen and nitrogen for healthy yeast.

Fermentability 101

A 200,000 BTU burner and a Sanke inquiry

Fermentable fundamentals

We have mashed at 149 °F (65 °C) and a starch-iodide test returns a negative result. The resulting wort should be highly fermentable and produce a dry beer if a highly attenuative yeast strain is used. If, however, the temperature is brought to 154 °F (68 °C) after the starch-iodide test, will there be further enzyme activity that could decrease the wort's fermentability? Intuitively, I think not because this would involve a restructuring of the sugars present rather than the breakdown of large starch molecules.

Bill McCormack
Brisbane, Australia

Your understanding of mashing is correct — sugars are not restructured when the temperature is increased from 117 °F (65 °C) to 122 °F (68 °C) — but I know a scenario where the wort would become less fermentable when the temperature increases. There is no odd biochemistry going on, just basic solubility.

Let's suppose that an infusion mash at 149 °F (65 °C) has run its course, the iodide test is negative and we are ready to begin wort collection. Before wort collection begins we quickly heat the mash to 169 °F (76 °C) by adding a measure of near-boiling water. This rapid mash-off step effectively denatures amylase enzymes. This step can also extract some unconverted starch from the grain kernels and decrease wort fermentability.

Many small commercial brewers have stirred mash mixers that permit multi-temperature mashing. Adding a step or two between the conversion step and mash-off is one way to deal with starch extraction late in the mash. In some of the mash profiles I have seen in German brewing texts there is a step at 162 °F (72 °C) that is used to allow alpha-amylase to whack up any lately extracted starch before the enzymes are rendered inactive by higher temperatures. So . . . there's your answer.

> In mashing, beta and alpha amylase convert starch to fermentable sugars.

Denatured debate

It has been a long accepted fact (myth?) in homebrewing that raising the grain bed above 168 °F (76 °C) for a mash-out denatures the enzymes and helps "fix" a beer's fermentable profile. However, I'm a frequent visitor to one of the many beer forums out there and this idea was bashed. Can you please shed some light on this? It has always been my understanding that the enzymes are heat labile over a period of time. For example, take a typical single infusion mash held at 154 °F (68 °C) for 60 minutes, then a mash-out for 15 minutes at 170 °F (77 °C). What is happening to my enzymes, have they been denatured at the mash out?

Joe Fleischman
Tampa, Florida

Hey Joe . . . I heard you cooked your old alpha amylase down . . . how are you going to mash now? I guess if you believe the threads about mashing-off on some of the homebrew forums you're going to keep on mashing because enzymes are actually not heat labile. I read some of the debate on this and see this as a classic case of error propagation.

There is absolutely no question that enzymes are heat labile and once denatured they permanently lose their catalytic activity. This biochemical fact is demonstrated when fruits and vegetables are blanched and when meat is grilled. Denaturation also happens at breweries around the world during mashing.

Some enzymes found in malt are extremely heat sensitive and never have a chance of surviving mashing if they make it out of kilning. These include lipoxygenase, phytase, beta-glucanse and a wide range of proteolytic enzymes. Most mashes begin no cooler than 140 °F (60 °F) and the listed enzymes have no activity in the mash because they are almost immediately denatured during mash-in.

The two primary enzymes of interest in mashing are beta and alpha amylase because they convert starch to fermentable sugars. In a laboratory it can be easily demonstrated that these enzymes retain activity for some time period when held above their denaturation temperature. Enzymatic reactions are typically measured by monitoring the concentration of product over time and the change in product concentration over time indicates enzymatic rate. Usually these analyses are run at a fixed temperature to make the test conditions reproducible.

The rate of enzymatic reactions is highest when the substrate concentration is high, the product concentration is low and the temperature is at the optimum for the enzyme (there are many other conditions, but these are the most pertinent here). If malt and water are mixed together at 158 °F (70 °C) several things begin to happen. Starch begins to gelatinize, beta amylase begins to denature and alpha amylase begins to cleave amylose and amylopectin in smaller molecules. This temperature is well above the optimum temperature for beta amylase, but that fact does not stop beta amylase activity and maltose production is seen. Over time, the

population of beta amylase enzymes denatures and those molecules that are active keep working until they denature. The time period depends on environmental conditions and enzyme concentration.

The same thing happens with alpha-amylase during mash-off. The temperature increases, the last bits of ungelatinized starch gelatinize and alpha-amylase activity continues until the population of alpha amylase enzymes has been completely denatured. Everything has a time component and these reactions are not able to occur instantaneously.

So it is logical to conclude from such laboratory experiments (and the data is out there demonstrating these phenomena) that mashing at temperatures above the denaturation point of a particular enzyme does not instantly stop enzymatic activity. To jump to the next step and assume that mashing-off does not stop enzymatic is faulty logic. It is also out of context because mash-off usually occurs long after significant changes in the carbohydrate profile of wort continue. As I mentioned earlier, enzymatic rates are highest when substrate concentration is highest and this happens in the beginning of the mash. By the time mash-off rolls around changes have slowed down considerably. What does happen during mash-off is that the wort viscosity is reduced, some ungelatinized starch is freed up and alpha-amylase activity drops off, usually after the last bits of starch are converted.

It's a gas, gas, gas

I have been looking for information on how to calculate the volume of exhaust and make up air required for a 200,000 BTU natural gas ring burner. The model I have is Beer, Beer and More Beer's H210 Burner. I am trying to design an exhaust system but I do not know where to find this information.

Anthony Catalfamo
Rochester, New York

Safety and brewing is a topic that is near and dear to my heart. No matter how fun the hobby of homebrewing is, one cannot forget that some of the brewing procedures done at home can be dangerous. And firing up a 200,000 BTU/hr burner in the comfort of one's living quarters qualifies as a safety concern that you legitimately raise. I consulted with a professional engineer in my state of Missouri and was told that local building codes require 1 standard cubic foot per minute (scfm) of air flow per 2,400 BTU/hr of burner capacity. Your whopper of a burner requires 80 scfm of make-up air based on this guideline. Fortunately, most high-end kitchen exhaust fans I checked into supply this sort of air volume.

The key fact to keep in mind is that fresh air must be supplied to the room where your burner is located. In the brewery where I work we have a large louver panel that opens when our 2,000,000 BTU/hr boiler flame is on.

This means that when the flame is burning we have make-up air flowing into the boiler room and the combustion gases from the boiler exit the space through a chimney. Make-up requirement is something that the burner manufacturers provide and I suggest that you phone the supplier of your burner to determine the recommended scfm required for your unit.

Speaking of your unit . . . it's a freakin' monster! Your 200,000 BTU/hr flame-thrower is 1/10th the size of our boiler sized to heat our 1,000 gallon hot water tank and power our 500 gallon kettle's peak demand simultaneously. Either you have a huge brew kettle or have plenty of horsepower under the hood. Good luck and stay safe!

A stone in my Sanke?

I was reading one of your answers regarding nitrogen and it sparked a question. In your article you recommended a carbonation stone. I have been kegging my beer in Sanke kegs — is there a way to use a carbonation stone with a Sanke keg? If not, is there a process you can use to properly carbonate a stout beer and still use a Sanke keg?

Eric Floyd
Charleston, South Caroilina

Sanke kegs are the most common kegs used in the United States to deliver beer from a brewery to a bar and can be very handy at home provided that you have the right tap parts and a method to clean the keg and spear. The spear is the tube that goes to the bottom of the keg and has a valve-like assembly at the top — this allows carbon dioxide to flow from the tap into the keg headspace. The advantage of this type of tap is that one fitting allows for both beer and gas flow. Older keg types had separate valves for beer and gas, and have fallen from popularity with the arrival of one-valve kegs.

Sanke kegs are usually pressurized with carbon dioxide before filling and carbonated beer flows into it through the spear and displaces the keg pressure through a gas flow control valve that regulates the fill rate. You can fill these kegs with flat beer and either keg condition your brew using priming sugar or carbonate (or nitrogenate) by adding gas from a bottle. I mentioned in a previous column that the tanks I have at work have carbonating stones and that we introduce gas through these stones and slowly bleed gas from the top of the tank to speed up the carbonation or nitrogenation step. Tanks equipped with a stone also have a separate outlet connection.

If you were to equip the spear of a Sanke keg with a stone this would work for carbonation or nitrogenation, but it would not be too handy for dispensing, since the beer would have to pass through the stone to make its way to your glass — this of course would cause major problems with uncontrollable foaming! You would also need a $300 tool to remove the spear from the keg so that you could attach a stone to

it. The other option is to have a welder add a fitting to the top of the keg where you could insert a stone into the keg. The problem with this idea is two-fold; it's expensive and requires welding on a pressure vessel.

The great thing about homebrewing is that one thing hobbyists have that commercial brewers do not is "free time." You can easily and effectively carbonate or nitrogenate in your Sanke keg with no fancy tools or expensive modifications to your set-up if you invest about five days of patience. The pressure applied to the headspace of the keg supplies the force to drive the gas from the headspace into the beer, as long as there is a concentration gradient and gas concentration is a function of pressure. For a normally carbonated beer held at 38 °F (3 °C) the equilibrium pressure between the gas dissolved in the beer and the gas in the headspace is about 12 psi. For a nitrogenated stout gassed with a blend of 75% nitrogen and 25% carbon dioxide, the equilibrium headspace pressure is about 30 psi at 38 °F (3 °C).

During a recent dive vacation to wonderful Cozumel I was doing the unthinkable . . . day dreaming about work on an awesome reef in warm, clear water surrounded by all sorts of fish. I was actually thinking about this question because it related exactly to what my blood was doing during the dive — becoming enriched with nitrogen from the compressed air that I was breathing.

Just like a diver's bottom time is limited by depth (pressure), a batch of beer in a keg will be equilibrated with the headspace pressure after a given time period. Carbonation stones, shaking the keg and jacking the pressure up are some of the methods used to accelerate gas transfer, but adding a couple of extra days onto the brew calendar is equally effective and more apt to hit the mark. One thing to keep in mind about your Sanke keg is that it has a very low headspace volume when completely filled. You will find this process will go faster if you fill the keg with 15 gallons (57 L) of beer as opposed to the 15.5 gallons (58.9 L) maximum capacity, as the lower fill volume will expose more beer area to the headspace gas and increase the overall gas transfer rate. Good luck!

BYO Technical Editor Ashton Lewis has been answering homebrew questions as his alter ego Mr. Wizard for the last ten years. Do you have a question for him? Send inquiries to *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 personally. Sorry!

Kellerbier

A medieval homebrew from Franconia

by Horst D. Dornbusch

Kellerbier, literally "cellar beer," is a relatively unknown beer style in North America, yet in its home in Bavaria, Kellerbier ranks among the most popular beer garden brews. This beer is especially popular in Franconia, a region in southern Germany where the style originated. Franconia holds the distinction of having the greatest density of breweries in the world. There are about a hundred, mostly small, artisanal breweries and brewpubs within a 50-mile radius around Bamberg, the beer capital of Franconia, and many make Kellerbier or a closely related style, such as Zwickelbier or Zoiglbier (see page 21).

Kellerbier profile

Traditionally, Kellerbier is an "unbunged" (*ungespundet* in German) cask-conditioned lager, requiring slow, cool maturation in oak, for several months. When served on tap, Kellerbier is usually just gravity-poured. For homebrewers, this means no priming. If you dispense your beer out of Cornelius kegs, use a minimum amount of pressure, perhaps 3 PSI. When tapped the traditional, unpressurized way, the brew runs yeast-turbid into the mug. Because of the lack of carbonation, a Kellerbier typically produces next to no head — more like a British ale than a German lager.

Authentic Kellerbier is unfiltered, unpasteurized and strongly flavored with aromatic hops (Hallertauer or Hersbrucker are traditional). It is also generally brewed to a Märzenbier strength of roughly 5–5.5% alcohol by volume.

The Kellerbier grain bill and color, too, are Märzen-like, with an emphasis on the darker versions of Munich malt of about 20 °L. In fact, the flavor of Munich malt (I use about 30% of the grain bill; the rest is Pils malt) is one of the key characteristics of an authentic Kellerbier. Compose your mash for a light to deep amber beer color in the 10 to 20 SRM range, best with a reddish or orange tinge.

To imitate cask-conditioning in a homebrew environment, where casks are hard to come by, resort to the old oak-chip tea trick, which is explained in the recipe to the right. Most modern beer casks are all pitch-lined and thus impart no flavor to the beer. But in the Middle Ages, pitch-lining was not necessarily universal. Therefore, if an authentic medieval flavor is what you seek, you can imitate cask-conditioning in raw, charred wood by resorting to the oak-chip treatment.

The Kellerbier's body should be medium — less heavy than that of a bockbier, but softer and more full-bodied than that of a regular Bavarian lager. The middle flavor should be

photo courtesy of Bavarian Brewers Federation, Munich, Germany

Kellerbier by the numbers

OG	1.056 (14 °P)
FG	1.014 (3.5 °P)
SRM	10–20 (rarely lighter or darker)
IBU	35
ABV	5–5.5%

RECIPE

Caveman Kellerbier

(5 gallons/19 L, all-grain)

OG = 1.056 FG = 1.014
SRM = 15 IBU = 35 ABV = 5.4%

Ingredients

8.0 lbs. (3.6 kg) Weyermann Bavarian Pils malt (2 °L)
3.75 lbs. (1.7 kg) Briess Munich malt (20 °L)
2 cups French oak chips (light toast)
8 AAU Hallertauer Mittelfrüh or Hersbrucker hops (bittering) (2 oz./55 g of 4% alpha acid)
1.5 oz. (42 g) Hallertauer Mittelfrüh or Hersbrucker hops (flavor/aroma)
1 pkg. Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager), White Labs WLP838 (Southern German Lager), or White Labs WLP920 (Old Bavarian Lager) yeast

Step by Step

On the day before brew day, make an "oak chip tea" as follows: Mix about two cups of oak chips in hot but not boiling water (180 °F or 80 °C), in a tightly sealable jar. Seal the hot jar, let it cool off, and then keep it in the refrigerator overnight. Before steeping, toast the oak chips on a cookie sheet in a 250 °F (121 °C) oven for about an hour. Use the tea at pitching time. On brew day, start a traditional multi-step infusion mash with a conventional dough-in at 122 °F (50 °C). Let the mash rest for about half an hour before infusing it with hot water until the temperature reaches 148 °F (64 °C). Keep the mash at that temperature for 15 minutes; then raise the

continued on page 20

temperature to 156 °F (69 °C) for another 15-minute rest. Then sparge slowly with near-boiling water until the mash is at a temperature of 170 °F (77 °C).

Lower the sparge water temperature, to keep the mash at or slightly below 170 °F (77 °C) for the rest of the sparge. Stop the sparge at a kettle gravity of about 1.050 (12.5 °P), to allow for evaporation loss during the boil. Boil for about 90 minutes. Add the bittering hops, as usual, about 15 minutes into the boil. At the end of the boil, check the kettle gravity. Make adjustments, if needed, by adding water or lengthening the boil time.

Once the kettle is at the correct original gravity, add the flavor/aroma hops. Stir the wort gently with a spatula to create a whirlpool effect. Wait about half an hour to allow the trub to settle. Then heat-exchange the wort off the trub. Reduce the wort temperature as close to a fermentation temperature of 48 °F (9 °C) as your setup allows. Strain the oak chips off the liquid and add this cool, sterile "tea" to the fermenter. Then pitch the yeast, aerate and place the brew in a cool place. Let it ferment to completion (in perhaps three weeks). Rack the brew into a clean carboy and let it warm up to room temperature for a two-day diacetyl rest. Rack the brew again, but do not prime it. Let it mature unpressurized for about two months at a typical cellar temperature of about 50–55 °F (10–13 °C). Do not rack again.

Caveman Kellerbier

(5 gallons/19 L, extract plus grain)

OG = 1.056 FG = 1.014 SRM = 15
IBU = 35 ABV = 5.4%

Ingredients

6.5 lbs. (2.95 kg) Weyermann Bavarian Pils liquid malt extract
3.0 lbs. (1.4 kg) Briess Munich malt (20°L)
2 cups French oak chips (light toast)
8 AAU Hallertauer Mittelfrüh or Hersbrucker hops (bittering) (2 oz./55 g of 4% alpha acid)
1.5 oz. (42 g) Hallertauer Mittelfrüh or Hersbrucker hops (flavor/aroma)
1 pkg. Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager), White Labs WLP838 (Southern German Lager), or White Labs WLP920 (Old Bavarian Lager)

Step by Step

Make an "oak chip tea" as described for the all-grain batch. Then mill the specialty malt coarsely and divide it equally into two muslin bags. Place these in at least two gallons of cold water and raise the temperature slowly, for about half an hour, until it reaches 170–190 °F. At this point bubbles should start to pearl up in the liquid, but the pot must not boil. Lift the bags out of the steeping liquid and rinse them with several cups of cold water. Do not squeeze them. Discard the spent grain. Turn off the heat and stir in the canned extract. Fill the kettle and bring the wort to a boil. Add the bittering hops and continue with the instructions for the all-grain recipe.

Caveman Kellerbier

(5 gallons/19 L, extract only)

OG = 1.056 FG = 1.014 SRM = 15
IBU = 35 ABV = 5.4%

Ingredients

5.8 lbs. (2.63 kg) Weyermann Bavarian Pils liquid malt extract
2.7 lbs. (1.22 kg) Weyermann Bavarian Dark liquid malt extract
2 cups French oak chips (light toast)
8 AAU Hallertauer Mittelfrüh or Hersbrucker (bittering) (roughly 2 oz. or 55 g of 4% alpha acid)
1.5 oz. (42 g) Hallertauer Mittelfrüh or Hersbrucker (flavor/aroma)
1 pkg. Wyeast 2206 (Bavarian Lager), Wyeast 2308 (Munich Lager), White Labs WLP838 (Southern German Lager), or White Labs WLP920 (Old Bavarian Lager)

Step by Step

Make an "oak chip tea" as described for the all-grain batch. Mix the two malts with your hot brewing liquor. Bring the wort to a boil and add all hops. Then follow the remaining instructions for the all-grain recipe.

substantial and slightly bready. The cask treatment (real or by "tea") contributes to the brew's mellow taste. It is also responsible for the brew's surprisingly dry finish, considering the amount of Munich malt in the grain bill. The dryness in the finish, therefore, is more perception than reality. What comes through though is a touch of non-sweet, slightly nutty maltiness that nicely balances the brew's noble-aromatic German hop character.

When poured, Kellerbier should have a pronounced but delicate hop nose. The overall impression is one of surprising drinkability, considering the brew's "weight." This beer is rarely served chilled, which would kill its bouquet, nor is it served at room temperature, which would keep the beer from being refreshing. For storage, on the other hand, you can keep it in the refrigerator. Just let it warm up a bit before you serve it. A Kellerbier tastes most balanced at a cellar temperature of perhaps 50–55 °F (10–13 °C). Because of its aromatic qualities from the noble hop varieties and its oakiness from the long aging in casks, Kellerbier makes for a great appetite-enticing aperitif beer.

Kellerbier is traditionally drunk out of earthenware rather than glass mugs. One of the finest Kellerbiers I have ever had was in a pub in the Franconian hop-growing village of Hersbruck, where I was served a brew called Bruckmüller Kellerbier. The Bruckmüller was a satisfying quaff with a local brewing tradition dating back to 1490.

Commercial Kellerbier availability

In North America, brewpubs and microbreweries rarely make Kellerbier, and the few brands that are imported are only sparsely distributed. Part of the reason for the relative dearth of imported Kellerbier is the brew's inherently short shelf life. If made authentically, it just doesn't ship well. Kellerbier is fairly rare outside Bavaria, because small artisan breweries (no matter where they are located) usually do not own sophisticated, oxygen-eliminating bottling equipment that is a

prerequisite for making beers safe for transport over long distances. Most Kellerbiers, therefore, are served only locally, right out of the casks in which they are allowed to age.

The few Kellerbiers that are transported to more distant markets for modern beer distribution are always packaged in standard kegs and bottles. Such beers are often aged at atmospheric pressure in steel tanks rather than casks. They may also be mildly filtered before the filling process to remove some of the beer's natural cloudiness. Finally, they may be carbonated for just a touch of effervescence. These characteristics, of course, make them less authentic than classic cask-conditioned brews.

Perhaps the most readily available Kellerbier in the New World is the St. Georgen Bräu Kellerbier, sold in half-liter bottles with a traditional wire-bale top. The St. Georgen Brewery is located in the small Franconian village of Buttenheim, slightly south of Bamberg, where it has been a family-run business since 1624. The St. Georgen Kellerbier is a happy medium between authenticity and the dictates of modernity. Though it is bottled, it is still cask-conditioned the old-fashioned way, as was done before the invention of refrigeration in the late 19th Century. After fermentation, the St. Georgen brew is allowed to mature for a few months in sturdy oak casks in rock caverns right outside the village — a true "cellar beer."

Zwickel and Zoigl – Two Keller variations

There are two sub-styles of Kellerbier, called Zwickelbier and Zoiglbier (or just Zoigl), neither of which appears to be available in the New World. Given current usage of these two terms in Bavaria, one can argue that Zwickelbier and Zoigl (bier) are just different names for Kellerbier. However, I have found that, on average, beers designated Zwickel or Zoigl tend to have slightly different characteristics that set them apart from mainstream Kellerbiers and turn them into distinct brews.

Both Zwickelbier and Zoiglbier are generally more effervescent than Kellerbier. Zwickelbier tends to be more pétillant than Zoiglbier because its maturation casks or modern tanks are bunged or capped (*gespundet* in German) just before the end of fermentation. This allows for just enough carbon dioxide to build up giving the Zwickelbier a nice creamy head when poured. Both Zwickelbier and Zoiglbier are generally slightly weaker in alcohol, both below 5% ABV. They are also both slightly darker than Kellerbier, — whereby Zoiglbier tends to be the darkest due to the use of highly kilned caramel malts. Milder versions of Zwickelbier are sometimes brewed with dehusked malt and both brews tend to be less hop-accented than Kellerbier. Nowadays, Zoiglbier is brewed exclusively with Hallertauer. While Kellerbier is aged for months, Zoiglbier is usually

aged for only a few weeks, and Zwickelbier tends to be served as soon as it finishes fermenting.

Horst Dornbusch writes "Style Profile" in each issue of BYO.

What's in a Name?

The name Kellerbier, of course, stems from the brew's cask maturation in cool cellars. The name Zwickelbier simply derives from Zwickel, the German name for a sampling device. A Zwickel is usually mounted on the flat side of a cask or the manhole door of a tank for drawing tastes to check on the brew's progress.

As for Zoiglbier, the story is more complicated: Zoigl is the Franconian vernacular for "sign." In Franconian medieval homebrewing (and farm brewing), a Zoigl was a six-pointed white-and-blue star, made from two triangles of wooden slats and assembled into a shape that is similar to the Star of David. Inside the star was usually a cutout of a beer mug or a pine branch.

Burghers and farmers used to hang a Zoigl in front of their doors whenever they had homebrew ready to drink. It was an invitation to the neighbors to come over and have a few. One triangle of a Zoigl symbolized the three elements involved in brewing: fire, water and air. The other triangle symbolized the three ingredients of brewing: malt, hops and water. The function of yeast in brewing had not yet been discovered in the Middle Ages. Rather yeast was considered a byproduct of fermentation, known as "stuff" (*Zeug* in German).

In the Bavarian regions north of the River Danube, the right to brew came automatically with the deed to a parcel of land. These brew-privileged medieval landowners often brewed their beers in communal brew houses, with open brew kettles and a powerful wooden fire underneath. Communal brew houses were set up as a public safety measure, because they reduced the incidents of fire, an ever-present danger in cramped medieval cities. Communal brewing is probably the origin for the custom of communal beer consumption under the Zoigl.

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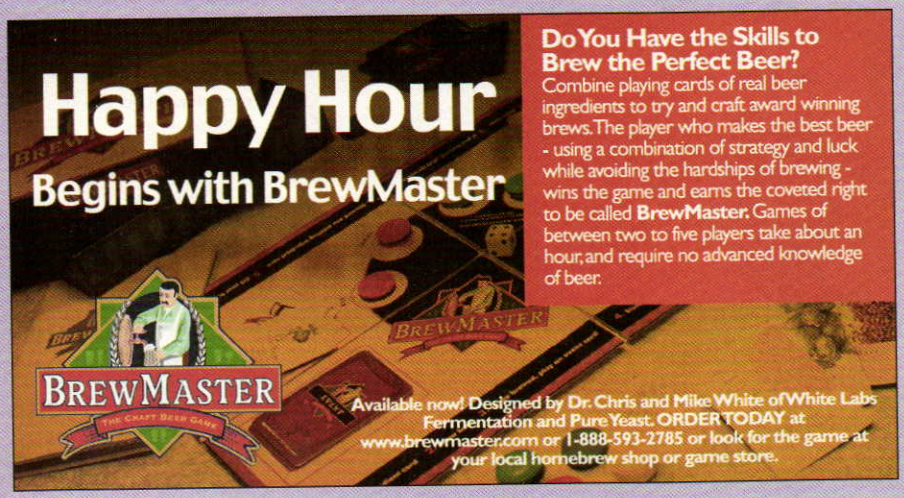

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PR02594

by **CHRIS COLBY**

expand your brewing horizons

Homebrewing offers nearly endless possibilities to the homebrewer, but sometimes you get stuck in a rut. If you find yourself stuck in this situation, there are many ways to break out of it. With all the ingredients, brewing techniques, beer styles and other opportunities in homebrewing, you only need to look to something new to reinvigorate your desire and improve your brewing to boot. In this article, the second to last in our 10th anniversary series, I give ten things to try to stoke your fires and (hopefully) expand your homebrew horizons.

1. Make a Monster

At some point, every homebrewer should try brewing a monster — a big, burly, boozy brute of a beer. Brewing a massive beer offers several challenges. For the all-grain brewer, handling the large amount of grain required and conducting the long boil to condense the wort will stretch the limits of your system.

All brewers will need to pitch — and perhaps repitch — a large amount of healthy yeast to get the beer to ferment to completion. For exceedingly huge beers, you may even need to employ advanced techniques such as adding some fermentables after primary fermentation or employing multiple shots of aeration before the onset of fermentation. And, of course, brewing a massive beer teaches a brewer patience.

This patience will be greatly rewarded, however, when you unleash your beast on your friends, family or homebrew club buddies. A well-done big beer is sure to impress any beer lover. And, since a big beer keeps well, you can continue to enjoy it over a longer period of time than an average strength beer. You can also taste how its flavor evolves over time.

2. Attain Perfection

One of the great things about homebrewing is that you can make a different beer every time you brew. However, picking one of your favorite beer recipes and tweaking it to perfection can be a nice diversion from the "random roulette" of

10 things to try

10 YEAR
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brewing a different style every batch. Rebrewing and tweaking a single beer can teach you how different variables affect your beer. The effect of individual variables might not be so obvious when you brew a cream ale one month and an oak-aged Russian imperial vanilla stout the next.

To successfully tweak a beer, take careful notes when you brew — noting not only what you planned to do, but what actually happened. Also, take careful tasting notes of the finished beer. Based on your tasting, identify aspects of the beer you want to change and brew it again, changing only one variable (or at most a few if they are unrelated). Take good brewing and tasting notes again and taste your first beer side by side with your tweaked beer.

Once you get your beer to the point you want it, brew it again with no changes to see how consistent you are. If you're really serious, you may want to buy the ingredients for two (or more) batches in bulk to really keep every variable as constant as possible.

Brewing and tweaking a single beer gives you experience you can apply to any of the beers you brew. It also gives you a relatively long-term project to tackle and rewards you with progressively better and better beer.

3. Enter A Contest

A little competition can really get the creative fires going. If you've never entered a homebrew contest, this can be just thing to get you — and your burners — fired up.

At a bare minimum, entering a contest will give you some feedback on your beer. In many cases, this feedback will come from experienced homebrewers with educated and discerning palates.

At a contest, you are obviously in competition with others. However, if you enter the same competition every year, you can also compete with yourself to see if you can improve your scores each year.

4. Use an Unusual Ingredient

Malt. Hops. Water. Yeast. The Germans never seem to tire of this for-

mula, but many homebrewers — including myself — do. If I'm known for anything in the homebrewing community, it's the fact that I brew a lot of "strange ingredient" beers. (See, for example, my Jolly Rancher Apple Lambic recipe in the March-April 2005 issue of *BYO*.)

Incorporating an unusual ingredient into a beer is a fun challenge. At a minimum, deciding when to add the ingredient — in the mash, boil or secondary fermenter — requires a little thought. Often, doing some research into the ingredient will shed some light on the best way to incorporate its flavors and aromas into your beer. (Harold McGee's book, "On Food and Cooking," 2004, Scribner) is invaluable in this respect.) Other times, you just need to experiment. In addition, some experimentation with amounts is almost always required.

Incorporating an unusual ingredient into a beer is a fun challenge.

Not every ingredient tastes good when plunked down into a random beer style, but when you finally hit the right combination, you'll love seeing other brewer's reactions change from "You're kidding, right?" to "Hey, this is actually good!"

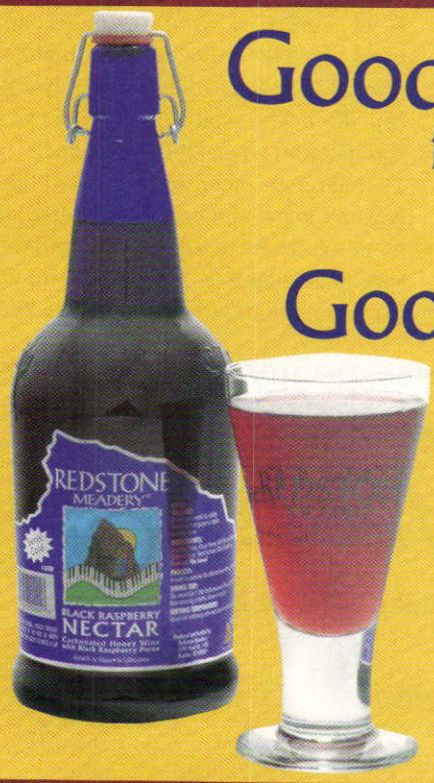
5. Brew For a Big Event

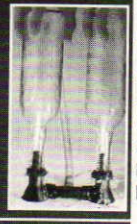
If you're lucky, at some point in your homebrewing "career" you'll be asked to supply beer to a big event. I brewed eight batches of homebrew for my own wedding and had a blast.

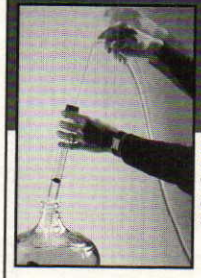
Brewing multiple beers for an event can require some puzzle solving. Figuring out when to brew, rack and package your beers so that you always have buckets and carboys available for the next batch can take some time. You may want to experiment with high-gravity brewing — brewing a bigger beer than your target and diluting it when you bottle or keg — to maximize your output. Likewise, you may want to experiment with parti-gyle brewing or split batch beers to get two different beers from a single brewing session.

Seeing the reaction of the "unwashed masses" to your beer can also be fun and educational. You'll likely be surprised at the number and types of folks who end up huddled around your Corny kegs. These people can often give you good feedback, if you listen to what they are saying.

"Random" beer drinkers most likely won't know any beer terminology, so don't expect them to give you the same sort of feedback a beer judge would. However, noting their likes and dislikes







— and even which keg gets kicked first — can be useful information.

When brewing for a big event, many homebrewers recommend brewing a Kölsch or cream ale to try to win over the BMC (Bud/Miller/Coors) drinkers. I disagree with this approach. Making "fake Budweiser" isn't going to impress the BMC crowd, especially if you've never brewed a light ale before and are just taking a wild stab at the style. Brew the kind of beers you like and are good at making — they're what won you over to homebrew, after all.

6. See How the Other Half Lives

Most homebrewers identify themselves as either extract or all-grain brewers. If you're looking for a change of scenery, try "switching sides."

For extract brewers, brewing an all-grain beer can demystify the process — which is often presented in a needlessly complex fashion in introductory homebrew books.

Conversely, if you're an all-grain brewer, trying an extract beer may open your eyes to the benefits of a quicker brewday. And, you will almost assuredly be pleasantly surprised at the quality of your beer. Brewing an extract beer may even convince you to reformulate some of your beers as extract beers and spend the extra hours doing something else.

7. Teach Someone to Brew

If you really want to understand a subject, try teaching it to someone. Teaching a friend to homebrew will force you to organize your thoughts on the subject. In addition, the questions your friend asks will likely require you to think. When someone knows nothing about a subject, the questions they ask are often "unstructured" and may throw you for a loop.

If you tell your friend that yeast converts sugar to alcohol, he may ask, "If I want more alcohol, should I add more yeast?" Or he may ask something completely bassackwards like, "How do the big brewers get rid of the bitterness in their beers?" Coming up with answers to these questions takes more than just reciting something from your introductory homebrew text (or *BYO*).

8. Make Your Own Signature Beer

Many, perhaps most, homebrewers have their own "signature beer." They might call it their house ale or their go-to beer, but the idea is the same — a beer the homebrewer has tweaked to suit his or her taste buds.

Your signature beer may use an unusual ingredient (as in #4 above), or it may be a "just plain beer" kind of beer. It might, for instance, be an American pale ale with just the right balance of hop varieties, bitterness and flavor hops for you. Or, it might combine aspects of two or more styles, like an Octoberfest dry hopped with Amarillo hops.

Beyond the obvious benefit of providing a brew you enjoy, crafting your own signature beer may encourage you to bend, or even break, the "rules" to get where you want to go. In doing so, you may find out which rules are arbitrary and which are not.

9. Join a Homebrew Club

If you get fired up making homebrew all by yourself, imagine how ballistic you'll go when surrounded by others who share your passion. Homebrew clubs are a great place to get advice on your brewing, bounce ideas off of others and generally just talk about homebrew. Plus, you get to drink other people's beer.

If there is more than one homebrew club in your area, check them all out. One may fit your personality better than another. Most homebrew clubs are filled with fun-loving folks (called homebrewers), who are fun to hang out with.

10. Take A Trip Down Memory Lane

If you really want to kick your desire to brew beer into high gear, consider taking a trip down memory lane — arriving at the reason you started homebrewing in the first place.

When you brewed your first batch, which recipe (or beer kit) did you pick — and why? What were you drinking at the time? What did you want to brew before you knew which styles were easy or difficult to brew? What did you want to brew before you knew about the BJCP guidelines? (Besides dry-hopped pale ales, I was interested in a dark, malty beer called Hexenbrau that I tried once at Boston's Sunset Grill and never found again.)

If you can go back and look at your brewing notebook, the margins of your first homebrew book or plumb the depths of your memory, figure out what it was you wanted to achieve. Then, brew the beer you'd want to hand to your former self if Marty McFly showed up in your driveway with his flux-capacitor-equipped DeLorean. If that doesn't boil your wort, then maybe it's time to take up needlepoint.

BYO *Editor Chris Colby has done eight of these 10 things.*

by **PAUL ZOCCO**

MEAD is an alcoholic beverage made by fermenting honey. In fact, it's sometimes called honey wine. Mead tastes like honey and can be made to be sweet or dry, carbonated or uncarbonated (still). Its appearance is clear and usually very pale, although some types of mead are colored due to other ingredients or use of a dark colored honey (like buckwheat honey).

Composition of Honey

We are all likely familiar with honey as a sweetener. As meadmakers, it helps us to know that honey is around 80% sugars, with glucose and fructose being the most abundant. It also contains other sugars — including maltose and sucrose — in smaller percentages. Honey contains acids, most notably gluconic acid, and has a low pH — ranging from 3.4–6.1 and averaging 3.9. The protein content of the honey and water mixture that becomes mead is less than that of wort, so yeast nutrients are needed to ensure proper yeast health. The water content of honey varies from 15 to 20%, with most examples hovering around 17%. The low amount of water is sufficient to suppress the growth of most potentially contaminating microorganisms.

Plants Make Nectar – Bees Make Honey

Honey is made by honey bees (*Apis mellifera*) and few other species of bees. Worker bees visit flowers and gather nectar, a dilute sucrose solution. In their crop (the sac that holds the nectar), most of the sucrose is split into fructose and glucose by an enzyme called invertase. A second enzyme, glucose oxidase, converts some of the glucose into gluconic acid and hydrogen peroxide. In addition, the body of the bee absorbs some of the water. Upon returning to the the hive, the crop liquid is transferred to other worker bees, who maintain the hive. Hive workers place the liquid in a cell of the honey comb. They then fan the presumptive honey with their wings to evaporate water and cap the cell when the water level drops to about 17%.

The characteristics of honey vary depending on which plants the bees have visited and honey is almost always labelled with a varietal name. For example, orange blossom honey is honey made from bees that visited mostly orange trees. Popular honey types for meadmaking include orange blossom, tupelo, huajillo, mesquite, sage, buckwheat, raspberry, wildflower and clover. (Note that honeys made from the nectar of fruit bearing plants don't taste like the fruit of that plant. Orange blossom honey and raspberry honey do not taste like oranges or raspberries.)

Most times, a meadmaker will use honey varieties that are available locally. These days your neighborhood supermarket may have three or four types of honey on the shelves. In my homebrew shop, I carry at least six types of honey on a regular basis. I stock some special types from time to time depending on my supplier and where he places his hives. I would advise the home meadmaker to explore his locale for unusual honey types. Small farm stands may surprise you with an unusual honey type that no one else has.

Homebrewers Make Mead

With a cursory knowledge of basic sanitation and the right combinations of ingredients, one may produce world class mead at home. The following is an overview of my basic method.

Mead is slow in fermentation startup time, overall fermentation time, clarification and aging. A meadmaker must have the patience of a saint. Nothing "mead" is quick. However, the rewards are worth it — trust me.

I generally make 5-gallon (19-L) batches of mead. The meadmaking process takes from six months to a year, so you might as well make a good-sized batch. It takes the same amount of time to make a 5-gallon (19-L) batch as a 1 to 3-gallon (3.8–11-L) batch. My recipe calls for 15 pounds (6.8 kg) of honey for a 5-gallon (19-L) batch. This will make a mead with an original gravity around 1.110 and a final gravity around

MEAD

From **NECTAR** to **NIRVANA**

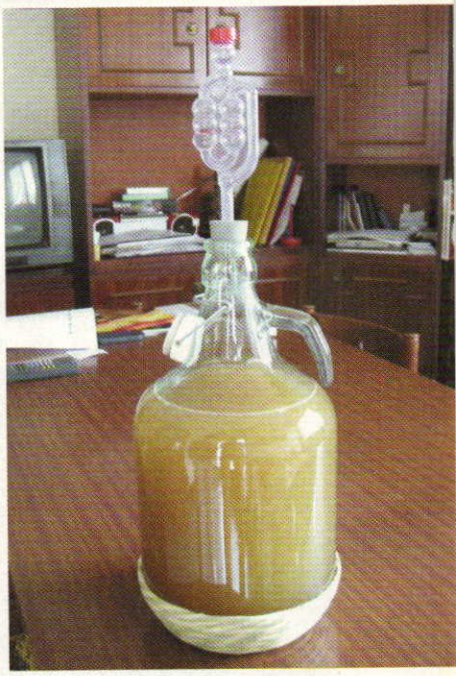


photo courtesy of national honey board

Making mead is easy.
1.) All you really need is honey, water, acid blend, yeast nutrients and yeast. (Some mead makers also add tannin for structure.)
2.) Heat the must (unfermented mead) to 160 °F (71 °C) for 15 minutes to sanitize it. Cool and aerate must before pitching your yeast (preferably from a starter).
3.) Let the mead ferment at 65–75 °F (18–24 °C) for a long time.

1.030–1.035, yielding an alcohol content of around 10% ABV.

Basically, the only equipment one needs is a 5-gallon (19-L) cooking pot (6 or 7-gallon (23–26-L) is better) with a lid, a long spoon for stirring, a large funnel (if using a glass carboy for the primary fermentation vessel) and a sink to immerse the cooking pot in for cooling. Your local home winemaking shop should have all the various other additions and yeasts described in this article.

The following is my basic procedure for a 5-gallon (19-L) batch of still, sweet mead — one of the most popular types of mead. The fermentation of this style stops a little short of completion, leaving a pleasant residual sweetness.

Sanitizing the Must

Place two gallons of water into your pot and heat using medium heat. Add fifteen pounds (6.8 kg) of honey, stirring constantly to avoid scorching. Add the remaining water to a total volume of 5 gallons (19 L). Honey is heavier than water and will sink to the bottom, so keep stirring it until the honey and water mixture is uniformly mixed. Maintain the heat on low to medium and stir every five minutes. This process takes time, so plan on it taking at least an hour to reach 160 °F (71 °C). This is Pasteurization temperature and any bacteria or wild yeasts that may be present in the unfermented mead (or must) will be destroyed. When the temperature has reached 160 °F (71 °C), place the lid on the pot and let it sit for fifteen minutes. After this fifteen minute rest period immerse the entire covered pot into a sink full of cold water. You will have to change the immersion water a few times to keep it cool. A few trays of ice cubes added to the sink will hasten the chilling effect. You must cool the mixture to a temperature below 80 °F (27 °C) before you can pitch your yeast.

(Some meadmakers, especially those who are also winemakers, sanitize their unfermented meads by adding one Campden tablet (or 0.33 g of potassium metabisulphite powder) per gallon (3.8 L) of liquid. Let the unfermented mead sit overnight. Cover the bucket loosely with aluminum foil, so the sulfur dioxide gas — released from the tablets or powder — can evaporate from the mead. Pitch your yeast the next day.)

After the chilling process, transfer the honey and water mixture to a sanitized fermenter. Add one teaspoon per gallon (3.8 L) each of yeast nutrient and acid blend (a mixture of tartaric and malic acids). Use the "complete" type of yeast nutrient, not DAP (diammonium phosphate), which is often labelled "yeast nutrient" in winemaking shops. As an option, you may also add up to 0.25 oz. (7 g) of tannin to add a bit of "structure" to the mead.

Pitching the Yeast

Next, pitch your yeast. My personal preference is for sweet mead, so I

inoculate my meads with sweet mead yeast. Both Wyeast and White Labs make sweet mead yeasts — Wyeast's is labelled 3184 (Sweet Mead) yeast and White Lab's is designated WLP720 (Sweet Mead/Wine) yeast. Wyeast also makes 3632 (Dry Mead) yeast. Other popular yeast choices include wine yeasts such as Champagne yeast, Côtes du Rhône yeast (such as Lalvin D-47), Côte des Blanc yeast (such as Red Star Côte des Blanc) and Steinberg yeast.

Vigorously shake or rock the mixture for at least five minutes to oxygenate the mixture, ensuring a prompt startup of fermentation.

I always make a 1-quart (~1-liter) or larger yeast starter, so my yeast is already at a gallop when I pitch it. A day or two before the meadmaking day, I prepare my starter. Mix a cup of corn sugar with a quart (~1 liter) of water. Boil the mixture for fifteen minutes to sanitize it, then chill to less than 80 °F (27 °C) by immersing the covered vessel into cold water, just as you will do in the mead making process. Pitch your commercial yeast into the chilled mixture. Vigorously shake it up, affix a sanitized airlock and let the starter sit at room temperture until you are ready to use it.

Fermentation

Try to maintain a temperature of 65–75 °F (18–24 °C) throughout primary and secondary fermentation. I recommend affixing a stick-on type thermometer onto the primary fermenter to monitor the temperatures in the primary vessel. The initial fermentation usually starts slowly, but may kick into high gear producing quite a bit of its own heat in the process. The increased fermentation temperature (over 80 °F or 27 °C) may develop some fusel alcohols. If you see this happening, move the vessel into a cooler environment.

After three months in primary fermentation, transfer the contents into a secondary vessel, preferably a glass carboy. Avoid splashing, or oxidation may occur. You will leave the mead in this vessel until all signs of fermentation are finished. This may take an additional six to nine months. One may check for completion by performing a

Mead recipes

Zocco's Sweet Mead

(5 gallons/19 L)
OG = 1.111 FG = 1.033 ABV = 10.1%

Ingredients
15 lbs. (6.8 kg) honey (your choice)
5 tsp. yeast nutrient
5 tsp. acid blend
Wyeast 3184 (Sweet mead) or White Labs WLP720 (Sweet mead/Wine) yeast (make 1 qt./1 L starter)
0.25 oz. (7 g) Sparkolloid (if needed for clarity)

Step by Step
Heat 2 gallons (7.6 L) of water under medium heat. Stir in honey, then add water to make 5 gallons (19 L). Add yeast nutrient and acid blend. Slowly heat to 160 °F (71 °C) and let honey and water mixture sit covered for 15 minutes. Cool the unfermented mead (called must) to 80 °F (27 °C) and transfer to fermenter. Aerate and pitch yeast. Ferment for about three months at 65-75 °F (18-24 °C), then rack to secondary. Let mead condition and clear. Fine with Spakolloid, if needed. Bottle.

Number 9

(Semi-Sweet Orange Blossom Honey Mead)
by Chris Colby
(5 gallons/19 L)
OG = 1.093 FG = 1.023 ABV = 9.0%

This mead is not as sweet (or alcoholic) as a sweet mead, but retains enough sweetness to round out the orange blossom honey's characteristics. The Lalvin D-47 yeast is used by winemakers for fermenting dry or off-dry white wines. I used the "no heat" method described in Ken Schramm's book, "The Compleat Meadmaker" (2003, Brewers Publications) and held my breath, but everything turned out fine. In the no heat method, you don't heat the must, add sulfite or do anything to sanitize the must — you just mix up the honey and water and let 'er rip. You can add more or less acid to suit your own taste.

Ingredients
12 lbs. 9 oz. (5.7 kg) orange blossom honey
4 tsp. yeast nutrients
2 tsp. tartartic acid
2 tsp. malic acid
3 pkg. Lalvin D-47 yeast (dried yeast)

Step by Step
Heat 1 gallon (3.8 L) of water to about 130 °F (54 °C). Pour as much of your honey into a sanitized bucket as will pour on its own. Scoop hot water as needed into your honey container(s) to dissolve the rest of the honey. Use a (sanitized) flexible spatula to scrape the sides of the container(s). Use only as much of the hot water as you need to dissolve the remaining honey. Slowly add filtered tap water to your bucket, stirring constantly with a sanitized spoon, until you reach 5 gallons (19 L). Stir in yeast nutrients. Put 5 oz. (150 mL) of water at 109 °F (43 °C) in a large (sanitized) measuring cup. Proof the dried yeast by adding it to this warm water and letting it sit 15 minutes. Aerate the must, pitch the yeast, seal the bucket and let sit at 70–80 °F (21-27 °C). Let the mead ferment until the rate of fermentation slows greatly (at least two months). Add acids to a 5-gallon (19-L) carboy and rack mead on top of them. If the carboy is not full to the neck, boil some water for 15 minutes, cool it quickly (but without splashing or otherwise aerating) and top up carboy. You may also want to add one crushed Campden tablet if you top up. Let mead sit until fermentation is finished and mead clears completely. Bottle and serve cold.

specific gravity reading, waiting a couple weeks and checking it again. If there is not any change, and the gravity is around 1.030–1.035 (with the sweet mead yeast), then your mead is fermented to completion. The high final gravity is due to the sweet mead yeast's low tolerance to the alcohol produced. The cultured yeast that fermented so well initially actually dies from alcohol toxicity and leaves some unfermented sugars. If you choose to use dry mead yeast or Champagne yeast, then your final gravity will drop quite a bit lower — perhaps as low as 1.020 — due to the yeast's higher attenuation.

Clarifying Your Mead

Now that your mead is fermented out to the style you prefer, sweet or dry, the next step in the process is clarification. Meads are very special and take a lot of time to produce, so getting them to look good is important. A little extra time for clarification may be necessary. Your mead should be brilliantly clear.

If you're lucky as I have been, the mead will probably have cleared itself. Maybe the yeast dropped out on its own, or maybe you left the mead in the fermenter a lot longer than you had planned and it cleared itself. I'm usually so busy I bottle my mead months after it has settled out on its own. If it's in a secondary fermenter, and you don't un-stopper it or fuss with it, then the dangers of oxidation are nil. The mead can wait a few extra months before it needs to be bottled. Time and patience are necessary virtues.

I view any haze at all as unacceptable, so I occasionally have to clarify my meads. The clearing agent I've had the best luck with is called Sparkolloid. I prefer the hot version, in which 0.25 oz. (7 g) of Sparkolloid is boiled in 8 fl. oz. (237 mL) of water for 20 minutes. After carefully adding the still-hot mixture to your hazy mead, a gentle stirring or swirling will mix it in. Be careful if you are using a glass carboy. Add the hot mixture slowly to the carboy, mix it in a bit, and keep adding it so that you don't expose the carboy to hot temperatures that may crack it. The clarification will start in a few hours, but may take a week or two or more to complete. A fine soft pancake of sediment will drop to the bottom of the vessel, eventually packing itself down. Sparkolloid does clear the mead very nicely, but the dropped out sediment is quite loose, and can be stirred up by just a little movement of the carboy. I've heard of some meadmakers adding another clarifier such as Bentonite on top of the Sparkalloid to pack down the soft sediment. I prefer to rack off my brilliant mead very carefully with small diameter plastic tubing. I start the siphon by filling the sanitized tubing with clean water and placing it about halfway down into the mead that you are transferring. Plastic tubing by nature always seems to have a curve in it, sort of a memory from it being rolled up in a coil. Use this curve to your advantage by placing the tub-

ing inside the carboy the mead is in about halfway down. The curved tubing will touch the inside wall of the carboy. Release the pinched tubing to drain the water, effectively starting the siphon action. When the mead starts flowing, place the tube to the bottom of the receiving bottling bucket. Be as careful as you can to avoid any splashing into the receiving vessel that may cause oxidation. As the mead is transferring to the lower, receiving bottling bucket, slowly move the tubing down lower and lower into the sending glass carboy, taking extra caution by not stirring it up or moving the carboy. The tubing should be very visible through the clarified mead. When you get near the bottom, and have a chance of sucking up some sediment, stop the process by pulling the tubing out of the carboy. Don't worry about losing any mead that is still left in the carboy. What I do after the transfer saves every last drop of mead. I pour the entire remaining mead (probably a quart or two including the sediment) into a glass pitcher and cover it with a plastic wrap. I then put the mead sludge in the refrigerator overnight. The next morning, I find a distinct layer of sediment with clear mead on top of it. Carefully pour the clear mead off, as a wine person would do when decanting his wine. You will recover virtually all of the remaining mead.

Bottling

Bottling your mead is simply transferring it into a bottle without splashing. If you want a sparkling (carbonated) mead, add corn sugar at bottling as you would with a bottle-conditioned beer. Though I'm a beer brewer and bottle virtually all of my beers in 12-oz. (355-mL) brown beer bottles, I feel that my meads deserve a more special presentation. I package my golden nectars in special icewine or flip-top bottles. I also label my meads with specially made labels. They're great gifts to fellow meadmakers and brewers.

Types of Mead

The type of mead I have described is a simple mead — basically just a mixture of honey, water and yeast. But, you can add other ingredients to meads. Different mead-based drinks go by different names.

Melomels are meads made with fruits or fruit juices. I've had good luck with fresh raspberry, strawberry, blueberry and black currant added to my base mead. As for how much fruit to add, I feel more is better and I usually add 8–10 lbs. (3.6–4.5 kg) per 5 gallons (19 L) of mead.

Some types of fruit — including raspberry and cranberry — will make the mead more acidic. When adding an acidic fruit, you should skip the addition of acid blend (or at least decrease the amount). Many fruits also add a bit of tannin to the mead. I always use pectic enzyme — ½ tsp per 5 gallons (19 L) — in my fruit meads. I add this when I pitch the yeast.

Cyser is simply basic mead using apple juice or cider instead of water in the mead-making process. Different types of apples as well as different honey types produce various flavors and aromas.

Pyment is another mead style that incorporates grapes or grape juice in the basic mead recipe. Most have a sweet finish due to a high residual sugar content, but can be fermented to dryness if one uses the appropriate yeast. The choice is up to your tastes.

Metheglin, from the Welsh word "Medcylglin" means medicine. These meads are made using various combinations herbs and spices. I like the way cinnamon and cloves accents the sweetness of the honey.

Another style of mead is Hippocras. Named after Hippocrates, the father of medicine, this version of mead uses includes both grapes or grape juice and spices.

A type of mead which may appeal to many homebrewers is Braggot. This medieval drink is made with honey, water and yeast, but has malts or malt extracts added. Braggot can be made with or without hops, depending on your preference.

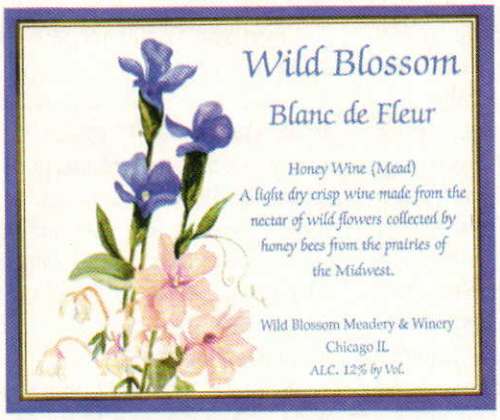
Paul Zocco was the 2003 National Meadmaker of the Year and 2001-2004 New England Meadmaker of the Year.

By **Julia Herz** and **David Myers**

photo courtesy of REDSTONE MEADERY

MEAD Clones

It's been called
The Nectar of the Gods or
The Drink of Love. It's mead.



MEAD, HONEY WINE, NECTAR OF THE GODS.

Is mead the soon-to-be next mainstream beverage? That's not so unrealistic say commercial meadmakers and industry folks from across the globe. Hey, at least we can call ourselves an industry and — with the growth and popularity of sake and cider — we think mead is right on those beverages' coattails. All we need are more commercial producers, more restaurants to add it to their menu and fellow beverage enthusiasts to help spread the word.

So . . . the International Mead Association (IMA) was founded in 2004 as a response to the growing needs of a growing industry. The beginnings of this association are rooted in the coming together of meaderies in Chicago in 2002 for the first International Mead Festival (IMF). (At the time is was called the First International Mead Competition and Planet Buzz! Festival.)

This gathering, organized by beer author Ray Daniels, was the largest collection of commercial mead ever assembled under one roof for a sampling by the public. Each year the International Mead Festival has grown with the 2004 festival having 85 meads from 32 companies representing 7 countries.

After the first year in Chicago, the newly renamed event was purchased by Redstone Meadery and moved to Boulder, Colorado where, in 2006, the 4th ever festival will happen. Since mead is "The Drink of Love," on February 10th and 11th 2006, the serving and judging of the world's largest collection of commercial mead will coincide with Valentine's weekend!

Another one of the unique things about the festival is that many meaderies send representatives to pour their

continued on page 41

clone RECIPES

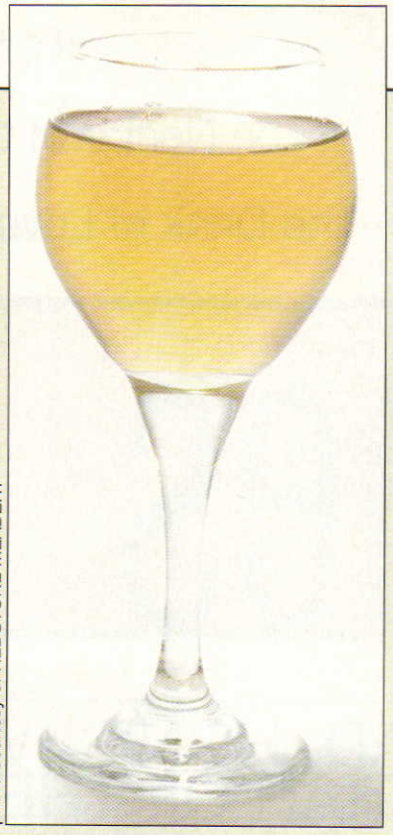


photo courtesy of REDSTONE MEADERY

Rabbit's Foot Meadery Sweet Mead clone

(5 gallons/19L, honey)
OG = 1.110
FG = 1.030
ABV = 12%

The following recipe is for our award-winning sweet mead.

Ingredients
15 lbs. (6.8 kg) wildflower honey
5 tsp. yeast nutrient
5 tsp. DAP
(diammonium phosphate)
5 tbsp. bentonite
2 pkg. Lalvin EC-1118 yeast

Step by Step

Use the finest wildflower honey that you have available. Blend your 15 lbs. (6.8 kg) of wildflower honey with about 2 gallons (7.6 L) of boiling water and stir well. Do not boil the mixture. Add the additional water (2–3 gallons/7.6–11 L) a little at a time until the specific gravity reaches 1.110. You should end up with around 5 gallons (19 L), but you may have a little more or less depending on the density of the honey. For this recipe, you should use two packets of Lalvin EC-1118 yeast. More yeast to start is better. Rehydrate the yeast in a cup of 104 °F (40 °C) water for 30 minutes, then mix it into the honey and water mixture. Pour the contents of the batch back and forth into an additional sanitized fermentation bucket to aerate.

Add 5 tsp. of yeast nutrient and 5 tsp. of DAP. Add 50% of your nutrients now and allow to begin fermenting. The next day you should see signs of fermentation. Add the remainder of your nutrients.

Ferment until the specific gravity reaches 1.030-1.035 and add 1 tbsp. bentonite per gallon mixed into a slurry. Allow this mixture to settle out and the following day stir it up again. Following this, the mead will clear rapidly but still continue to ferment. Watch the gravity for the next few days until it reaches 1.030 and then rack it off the lees (sediment). If you have the ability to filter the mead, go ahead and do it now. Ideally, you would bulk age this mead for a month or two before drinking, but it should be quite nice right away.

Bottle the mead still (without bottling sugar for carbonation) The final alcohol content will be around 12% ABV.

Redstone Meadery Vanilla Bean / Cinnamon Stick Mead clone

(5 gallon/19 L, honey and spices)
OG = 1.102
FG = 1.012
ABV = 12%

One of the traditions I started early in my meadmaking career was producing Winter Solstice Mead. Every December 21st, I make mead. For many years I would make a 10-gallon (38 L) batch leaving half of it traditional and half with either vanilla beans or vanilla beans and cinnamon sticks. I would age it two years and then serve it at the annual Winter Solstice party from a special bottle. Serve 3-6 ounces at a time, very cold or mulled.

— David Myers

Ingredients
8 lbs. (3.6 kg) alfalfa honey
4 lbs (1.8 kg) wildflower honey
1 tbsp. yeast nutrient
or
1 tbsp. extra light malt extract
3-4 whole vanilla beans
3–4 cinnamon sticks
Red Star Montrachet yeast

Step by Step

Bring 4 gallons (15 L) of water up to 180 °F (82 °C) in your kettle and then add 12 pounds (5.4 kg) of honey.

Cover for 20 to 30 minutes at around 150 to 160 °F (66–71 °C). Now is a good time to start your yeast. For mead, I like to use dry yeast. Take a few packets of Montrachet yeast. Mix with a tablespoon of extra light malt extract. Stir vigorously so as to introduce oxygen.

Primary fermentation most likely will take three to four months. Try to keep the fermentation temperature between 70 and 78 °F (21–26 °C) if possible. After primary, transfer to a 5-gallon (19 L) carboy that already has the vanilla beans and cinnamon sticks in it. Just toss the cinnamon sticks in whole. Cut the vanilla beans into thirds before adding. The vanilla beans in particular need the alcohol in the mead to help extract the flavor. Let it sit for three months or so.

Transfer off the spices. Keep racking until you are pleased with the clarity of the mead. Bottle still (without bottling sugar).

Wild Blossom Blanc de Fleur clone

(5 gallon/19 L, honey, wine and flavorings)

OG = 1.095
FG = 1.005–1.010
ABV = 12%

Ingredients

12 lbs. (5.4 kg) light honey
4 tsp. DAP (diammonium phosphate or good yeast nutrient)
¼ tsp. grape tannin
1 tsp. elderflowers
2 pkg. Red Star Côte des Blanc yeast
¼ tsp. potassium metabisulphite
3 tsp. potassium sorbate
Quick Clear to fine
1 cup honey (to back sweeten)
½ gallon (1.9 L) dry white wine
2 tsp. acid blend

Step by Step

1. Bring honey and water to boiling and cool.
2. Add DAP, grape tannin and elderflower.
3. Mix well to aerate.
4. Rehydrate yeast and pitch.
5. Ferment 15 to 25 days in primary. 30 to 50 days in secondary.
6. Rack and add potassium metabisulphite, 3 tsp potassium sorbate and acid blend. Let stand 10 days.
7. After 10 days add dry white wine, honey to taste.
8. Let stand. Top up with N_2 gas until clear.
9. When clear, bottle.

This mead is best when aged six months or more. Bottle the mead still (uncarbonated).

products, often the meadmakers themselves. Last year 23 producers were represented so mead fans can really garner an incredible education by attending. Also new to the event in 2006 will be an amateur meadmakers competition.

Starting in 2003, an industry meeting was held during the festival to get a better idea of what challenges meaderies were facing. We continued in 2004 with a meeting that was more focused on actually founding an association. Several committees were set up to draft by-laws, further define judging rules, prioritize industry direction, etc.

In 2005, we filed the paperwork to register the Internatiomal Mead Association as a non-profit organization. We (Julia Herz and David Myers) are the founding board members until a final draft of by-laws are put in place and dues are paid. At that point, we will have an election for a full board. The categories of membership and proposed by-laws can both be viewed on-line at www.meadfest.org.

This is an exciting time in the world of mead. There are approximately 60 meaderies in the United States with 250 or so worldwide. Mead is also being produced by another 20–30 U.S. grape wineries and breweries. New meaderies continue to open every year with only a small percentage closing. We estimate that mead sales are growing at around 300% a year and only will continue to get stronger. Just as in the 1980's when the craft beer and California wine movement began to evolve, the diversity and quality of commercial mead products continues to grow and improve.

So go ahead, make some mead and feel good that you are helping satisfy a desire to drink the world's first fermented beverage, plus further a movement — all with one 5-gallon (19-L) batch!

And while you're at it, consider entering your mead into the next festival. To win a medal in this annual event is to be tapped as making some of the best mead in the world.

Entries in the amateur mead competition need to arrive at Redstone Meadery between November 7th and November 21st, 2005. Each entry requires three 12 oz. (355 mL) bottles and costs $6. Meads can be entered in the following categories: Dry Traditional Mead, Semi-Sweet Traditional Mead, Sweet Traditional Mead, Cyser, Pyment, Other Fruit Melomel, Metheglin, Braggot and Other Mead (a category for meads that combine ingredients from two categories or otherwise don't fall neatly into one of the other categories). See the ad on page 50 for details on entering your meads in the 2006 *WineMaker* International Amateur Wine Competition.

See www.meadfest.com for complete festival and competition information and entry forms. Finalists and medal winners will be announced February 11th, 2006.

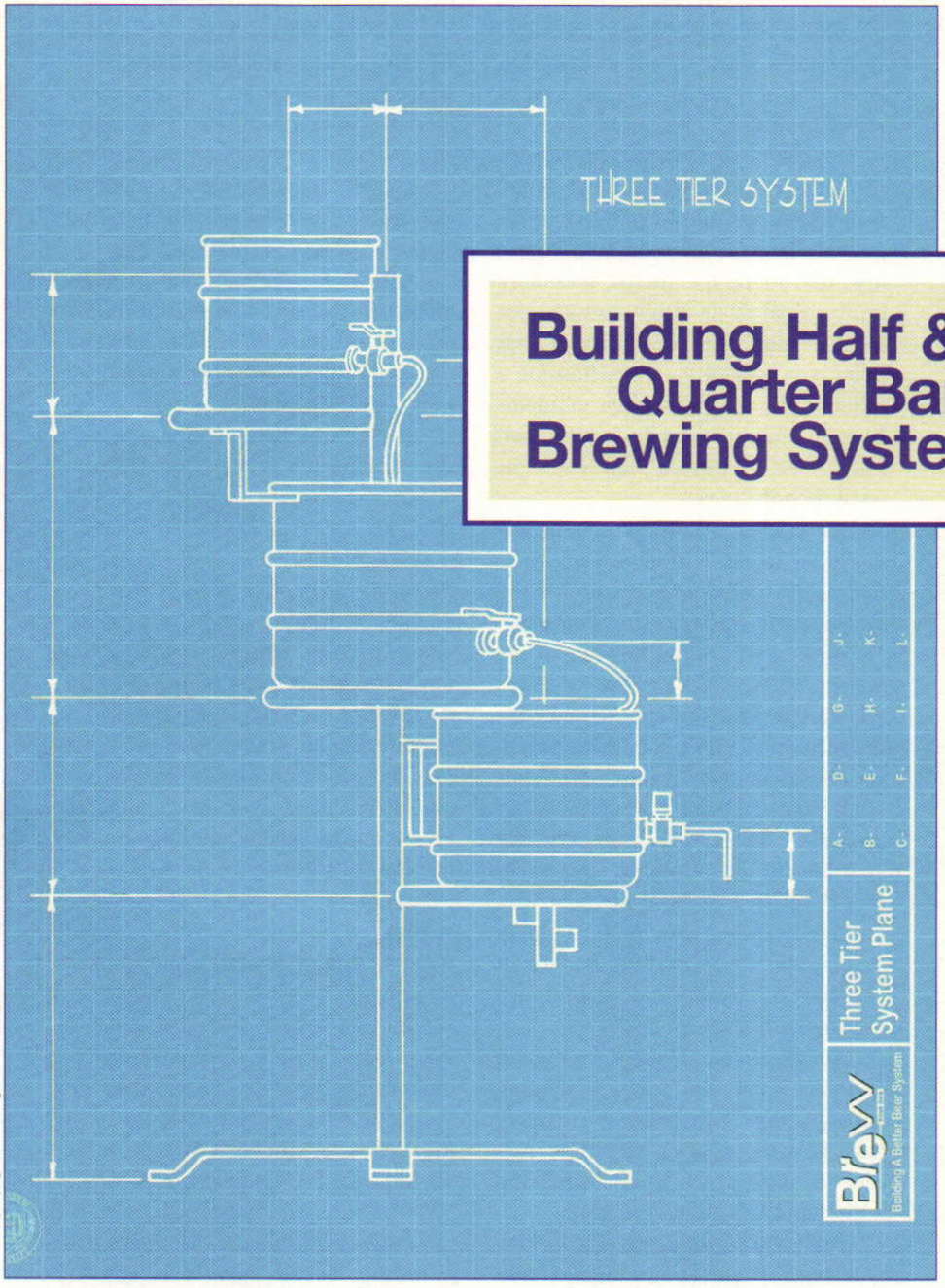
For information on making mead, see Paul Zocco's article, "Mead: From Nectar to Nirvana," on page 32 of this issue for all the basic information on making mead. The meadmakers at Redstone also offer a few tips and encouragements. They say that, when making mead at home, the most important thing is to have fun! Remember to sanitize anything that touches the beverage. Feed the must (the unfermented mead) lots of oxygen. Ferment at least two honeys to give the final product more complexity and add nutrients for the yeast. Heat the must as little as possible so most of the delicate aromatics and flavors shine through. And finally, be patient.

In this article, we also present three clone recipes from commercial meaderies (Rabbit's Foot Meadery, Redstone Meadery and Wild Blossom Meadery). A mead started today should be ready by next summer.

Julia Herz and David Myers are founding board members of the International Mead Association.

THREE TIERS to beer

Building Half & Quarter Barrel Brewing Systems



drawing by gene lattuga

BEING AN AVID HOMEBREWER, I visit lots of brewpubs and breweries. Most brewpubs have seven to fifteen-barrel brew systems that are usually right in plain sight. (A barrel is 34 gallons/129 L.) If you're a homebrewer, determining the function of the individual parts isn't really that complicated. Most of the time the brewer, many times a former homebrewer, will gladly show you the equipment and answer any of your questions. Many pub breweries use three-vessel systems consisting of a hot liquor tank, a mash tun and a boiling kettle. A lot of pipes and valves connect the whole thing together, but it seemed to me that I could build a simplified system based on that set of vessels. It would be just like the pros use, but a lot smaller. Well, now I've done just that — and you can too.

I've built quarter and half-barrel home breweries using commonly found items. The basic design of the system is a central pole with supports for each of the three vessels extending from the central pole. The hot liquor tank rests on the highest support, above the mash tun, and has a propane burner attached underneath it. The mash tun resides on the center support, above the kettle, which is also equipped with a burner. The supports are staggered 120° around the pole to even out the weight.

My material costs are a fraction of similar professionally-built homebrew systems, but I don't figure in my time because projects like this are truly a labor of love.

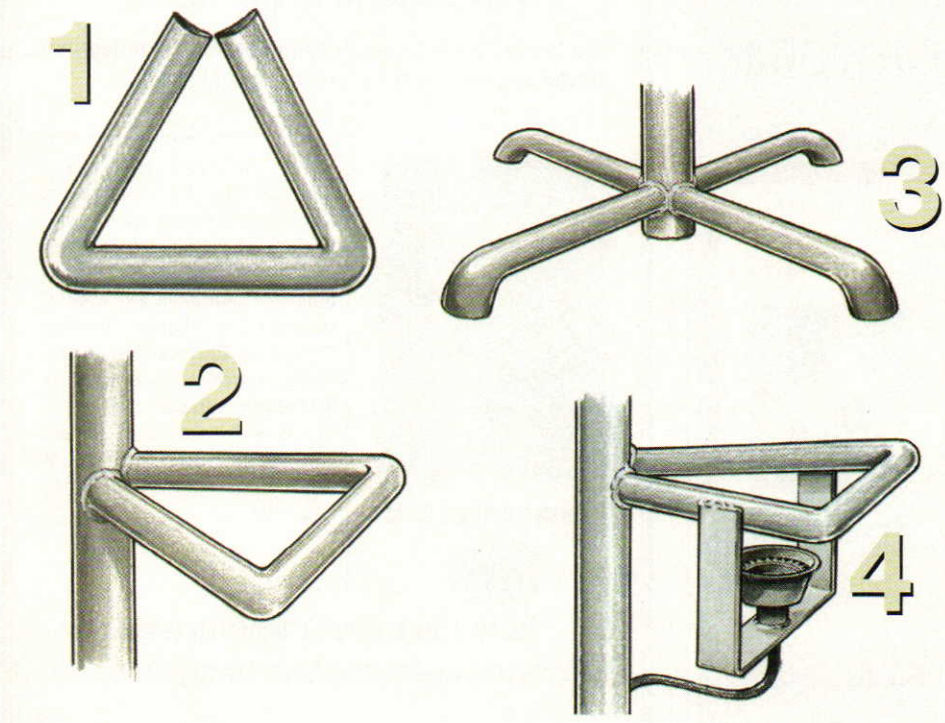
If you plan on building your own brewing system, you must — most importantly — be a tinkerer. It's not rocket science, but you do need a good working design and the desire to build it. Being a home-

photos by paul zocco

brewer, you're likely already a tinkerer and have all the necessary fabrication skills. Everyday hand tools are all that are required for most of the project, but there are some specialized jobs that require professional skills, such as cutting and welding of the stainless steel kegs. Getting to know a dependable welder and plumber is a good idea. Their experience will save you a lot of time and money, and the results will be better.

Resourcefulness in finding the necessary parts is important. Flea markets, junk shops or your own garage are great places to start finding the necessary materials.

A complete list of the necessary materials for my system is given in the sidebar on page 44. Mine was designed with small casters as to make it movable. It had to fit under a 6' 8" (2.0 m) doorway. The frame is six feet (1.8 m) tall without the hot liquor keg in place. The footprint of the bottom supports is around four feet (1.2 m) wide and four feet (1.2 m) deep. The weight of the frame without the kegs is around thirty pounds (14 kg). The details of your system — especially the overall height and spacing of supports — may differ from mine, depending on your needs, but the basic construction plan will work



illustrations by don martin

Assembling your brewery's stand is straightforward.
1.) Bend the supports
2.) Weld the supports to your central pole
3.) Weld the brewery's "feet" to the central pole and
4.) Attach the burners to their supports

by **PAUL ZOCCO**

LIST OF MATERIALS

three half or quarter-barrel Sanke type stainless steel kegs (legal)
one steel tube 4" diameter x 6' long (10 cm diameter x 1.8 m) (for the main spine)
three steel tubes 1 ½" wide x ⅛" thick x 3' long (3.8 cm x 0.32 cm x 0.91 m) (for supports)
two steel tubes 1 ½" wide x ¼" thick x 4" long (3.8 cm x 0.64 cm x 10 cm) (for legs)
— or —
three 3' lengths of 1 ½" steel exhaust tubing (0.91 m x 3.8 cm) (for legs)
four steel casters or wheels
misc. nuts and bolts
170,000 BTU burner castings
two 20-lb. (9.1 kg) propane tanks (home barbecue type)
gas lines, fittings and control valves
three ½" (1.3 cm) NPT brass or stainless steel ball valves.
three ½" (1.3 cm) NPT stainless steel couplings
five bimetal dial thermometers
two false bottoms (one for mash tun and one for boiler)
two magnetically coupled pumps (food grade, optional)
25–50 ft. (7.6–15 m) ½" (1.3 cm) copper tubing (for chiller coil)
copper elbows, misc. fittings
flexible food grade plastic tubing
stainless steel hose clamps
glass boiler-type sight tubes (optional)
lead-free solder
(Note: all frame tubing is exhaust pipe gauge thickness.)

for any similar home-built brewery. Be sure to obtain your three stainless steel half or quarter barrel beer kegs legally. The ten dollar deposit required when you get a commercial keg is only a fraction of what these kegs are worth to the brewery. Most brewers and distributors have a few dented or leaky kegs around they would be happy to get rid of. Straight-sided Sanke kegs are the ones you want.

Choose the brewery size — either a quarter barrel (7.5 gallons/28 L) or a half barrel (15.5 gallon/59 L) system — that is suitable for you. A quarter barrel system will allow you to brew 5 or 6 gallon (19–23 L) batches. With a half-barrel system, you can easily brew up to 13 gallon (49 L) batches.

After finding the kegs, have your welder cut twelve-inch (30 cm) diameter holes into the tops of each keg. A plasma arc cutter works the best. (Or, see the accompanying story on page 48 for how to do this yourself.) The openings should be deburred to prevent

injuries, or later on you'll be brewing with band-aided fingers.

Try to be resourceful. The same welder that you've hired to cut the holes into your kegs can also weld your frame together and the couplings onto the kegs. Plan ahead so when you're at the welding shop, everything gets done. You'll want all the coupling locations marked clearly. They will be needed for attaching ball valves, sight-tubes (if wanted) and thermometers later on in the construction. Other than hiring a welder, you can do everything else yourself.

The spine of the brewery frame is a six foot (1.8 m) long piece of four inch (10 cm) diameter steel exhaust type tubing. If you have access to a tubing bender, the side barrel supports can be made by using one and a half inch (1.3 cm) diameter steel tubing. Your local muffler shop may have a tubing bender to make these up for you. Have him bend each three foot (0.91 m) length of tubing into a triangle with one foot (0.3 m) sides. The open ends of these pieces can be ground to fit and welded onto the main four inch (10 cm) spine. Otherwise you can bend triangles out of a three foot (0.91 m) piece of one eighth inch (0.32 cm) thick, one and a half inch (1.3 cm) wide steel flat stock. These three supports are to be attached to support the hot liquor, masher and kettle. If you use the flat stock, I recommend a reinforcing gusset attached from the outside section of each triangle to the center spine for increased strength. These will also act as attachment points for the burners.

As far as fabricating the legs to support the brewery, one quarter inch (0.64 cm) flat stock can be used. Cut four two foot (5.1 m) pieces of the flat stock, and weld them in a cross configuration. You can notch the bottom of the four inch (10 cm) spine and weld in the cross supports, or simply weld four two foot (0.61 m) long legs in a cross design. You may incorporate your own ideas for the supporting legs, but make sure they are strong enough to carry the weight of the entire system. You can fabricate the base of the stand with four foot (1.2 m) lengths of tubing as

mine is, but make sure that the welds are strong. Also, ensure that the stand sits squarely on the floor.

The frame to support this whole system must be built to hold the weight of the kegs and their contents. Kegs full of mash water; fifteen or twenty pounds (6.8–9.1 kg) of grain and all of the other components may have a combined weight of two hundred pounds (91 kg). Make an extra effort at this building stage. You don't want ten or fifteen gallons (38–57 L) of boiling wort to spill all over the floor or on yourself if the frame collapses.

The frame dimensions and support spacing you choose are important. I've designed these systems to fit into a conventional seven and a half foot (2.3 m) ceiling garage. Gravity is used to move liquids from vessel to vessel. The quarter barrel system's boiling kettle is off the ground enough so you can simply drain its contents into a fermenter. In the case of the half-barrel system — where the boiling kettle is only six or so inches (~15 cm) from the ground — a pump may be needed to move the chilled wort into a fermenter. I've found that when I brew larger (10 gallon/38 L or more) batches on my half-barrel system, there's usually another brewer around helping. When it's time to get the chilled wort into the fermenter, we simply pick up the chilled boil kettle and place it on the middle level of the frame and let gravity do its thing.

170,000 BTU burners . . . produce a very hot flame and get brewing liquor and wort up to temperature quickly.

If your brewing area is in a well-ventilated garage, the system could be built in as a permanent fixture. My system has casters installed so I can move it outside in the driveway.

After a suitable frame has been built, the next step is to attach the burners. My systems use 170,000 BTU burners like the ones you see on those outdoor turkey cookers. They produce a very hot flame and get brewing liquor and wort up to temperature quickly. The manufacturer of these burners also has the accompanying hose, valves, fittings, etc. I recommend using what the manufacturer recommends. It's safer than making up your own gas lines and fittings.

Your system — whether it's similar to mine or one of your own design — must use every possible safety precaution. Dangerous situations may occur when using flammable, noxious gases.

When electric pumps, stirrers, mixers, etc. are used in close proximity to water; the same safety considerations must be followed. Reflected heat from burners, a splash of sparge water, or hot wort near a live electric wire are accidents ready to happen.

Attach your burner castings to the supports so there is about six inches (15 cm) of distance between the bottom of the keg and the top of the burner. You need a wide flame front that reaches and heats as much of the bottom of the keg as possible. Heat efficiency will be lost if the burners are either too close or far away. I attach the castings on threaded steel rods so you can adjust the burner heights, effectively allowing you to tune in your flame to heat most efficiently.

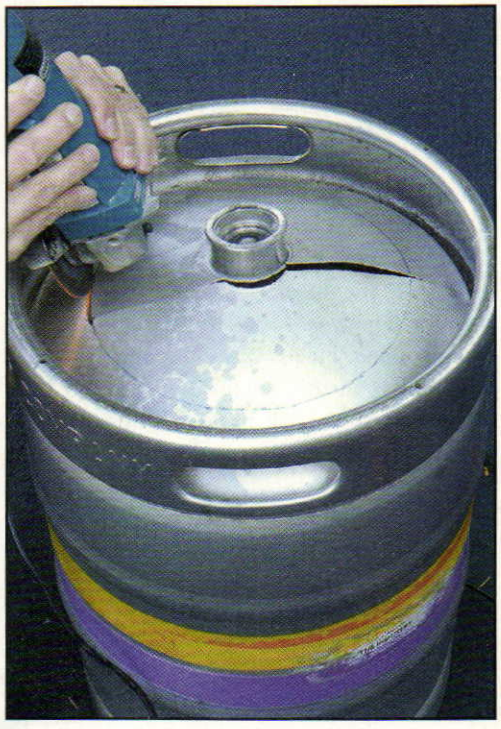
After the two burners are mounted to the supports in the upper hot liquor and bottom boiler positions, attach the fuel lines. My brew system uses a single twenty-pound propane tank split off with two valves, one to each burner. Next, attach the ball valves, pipes and fittings to your kegs. They must be made of brass or stainless steel. Beer is corrosive and would damage and pit regular steel or aluminum components. Heat would affect plastic or PVC. All three barrels will be fitted with half-inch (1.3 cm) ball valves. All these items are commonly found items at your local building supply.

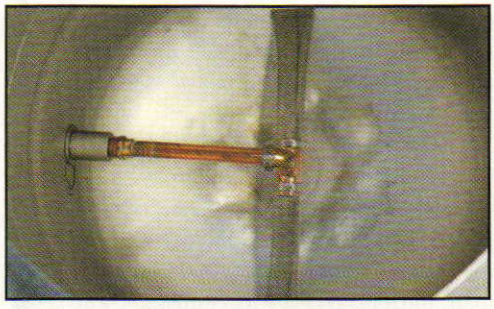
False bottoms are needed in your mash vessel and boiler. Commercially made versions are available that fit nicely inside a Sanke keg. The ones in my systems have a small diameter stainless steel tube that can be attached to the inside welded in threaded coupling. Plumbing it in is simply using the right brass or stainless steel adapters.

With the quarter or half barrel systems I describe here, you can brew up to 6 or 13 gallon (23–49 L) batches of beer. They can be modified later, for example by adding a mash circulation loop and possibly a PID controller. For the do-it-yourselfer, building your brewing system may be almost as fun as brewing beer with it.

Paul Zocco is the owner of Zok's Homebrewing Supplies.

weldless boil KETTLE or MASH TUN





(top): Cut the top with one of the three mentioned hand tools (reciprocating saw shown). (middle): Once the opening is cut, use a grinder, files and sandpaper to smooth the edges. (bottom): Once the weldless fittings are in place, the lauter manifold can be installed.

Every week I get asked; "how do I modify a Sanke keg for use as a boil kettle, mash tun or hot liquor tank?" We tackled this question in 2002, but answered the question with welding. Since most of you do not have welders we decided to create a weldless kettle conversion. We also insisted that it require only common and widely used hand tools.

Obviously the first thing is to obtain a Sanke keg — legally. I bought our keg from a local microbrewery, it had frozen and split. Having a keg open solves a potentially dangerous problem. Normally a spring-loaded ball retains pressure in the keg; you need to release the pressure by pushing down on the metal ball. There is also a keg spear to be removed. Inside, you can see a thin internal snap ring: pry it out using a small screwdriver. Residual pressure can drive that metal tube upwards with strong force. It is crucial, for safety sake, to release pressure before prying the retaining ring loose. It's simpler to leave the spear intact and remove the entire top, as I did. Removing a portion of the keg's top begins with a lid, one you'll use to retain heat as the boil starts, and to cover the vessel once the boil is over, or during the mash. Aluminum lids are available at any kitchen supply store — mine came from my kitchen.

Trace the lid onto a piece of cardboard. Draw a second circle with about ⅛" smaller radius on the same center and cut it out. (The radius will depend on the size of the lip of the lid.) Cut the cardboard template to this smaller diameter. Then cut out the template's center so it can be laid atop the keg top. Tape the template to the surface as perfectly centered as you can. Then mark the keg lid with a marker. Now the fun begins — AFTER donning safety goggles and hearing protection!

Cut Up

Tool options for cutting the keg include three hand tools — a high-speed rotary cutter, a 4" angle grinder and a reciprocating saw with different kinds of blades.

I cut the first two inches with a rotary cutter. This common tool works more rapidly than expected. Due to the low weight of the tool, and delicacy of its cutoff discs, you should make a jig to hold the tool at the proper radius. Several pieces of plywood and a clamp or two should make something useful, though not elegant.

Next I tried an angle grinder. With a light touch, it is rather easy to cut the stainless steel sheet metal. But it's also easy to wander off path. When using either of these grinders, do not try to cut all the way through the metal at once. Rather, stroke a path of at least 4" (100 mm) repeatedly until the metal is cut through. Why? The cutting discs are not flexible and the arc of the circle is too tight—the disc will bind and shatter. Heavy gloves are a good idea — but eye and ear protection is mandatory!

My brew-buddy told me that a reciprocating saw was also a strong cutting method. I rented one and purchased 24-tooth metal cutting blades and some carbide-edged blades. This tool proved the easiest to use. The grit edged blade cuts cleanly, as does the 24-tooth blade. The grit-edged blade is a bit wider and tends to bind, but lasts longer. One carbide bit or three metal cutting blades should get the keg cut. **Note:** If you don't have an opening into the keg, drill a hole or cut a slit cut with a grinder. Unfortunately it's darn hard to drill that hole — See "The Hole Story" below.

Once the keg is cut, check that your lid will fit. It's better to be a bit small than have the lid fall in! Assuming your lid fits perfectly, smooth the rough edges. Your fingers, wrists, and arms will be appreciative. I used the grinder, a round file, and sandpaper to progressively smooth the edges. Need a sanding drum for final polish? Wrap some 240 grit wet/dry sandpaper around a cylinder; I used 3" PVC pipe.

The Hole Story

With the lid accounted for, you're ready to lay out the weldless fittings you've purchased from your local homebrew store. I used a Bazooka T and Sanke adapter, Weld-B-Gone and Weld-B-Gone Thermosight from Zymico. They're sold by many homebrew stores, as are similar fittings. The stainless steel bulkhead fitting features a high temperature o-ring and exterior lock nut that is relieved to hold the o-ring (the second o-ring is a spare.) This kit's stainless close nipple required a ⅞" hole in the vessel.

Before drilling any holes you need to know where it belongs — guessing won't suffice. Assemble your siphon and bulkhead fitting plus any trub filter/lauter manifold you may choose. The siphon tube should be level or pointed downwards. I taped a torpedo level to the assembled siphon and manifold, placed it into the vessel and marked where it belonged. Then I taped a small ruler with its origin at the welded chine where the exterior support ring

by **THOM CANNELL**

photos by thom cannell

After obtaining a keg legally, you can use these tools and parts to convert it into a boil kettle or mash tun.

Tool list: approximate prices.
High speed rotary grinder, or small angle grinder, or reciprocating saw. Rental $20.00
Grinder discs or saw blades. $10
Hand drill motor and ⅛"–⅞" drill bits or step drill bit. $2-75
Cardboard, tape, ruler, scissors, marker. $2
Eye and hearing protection, gloves.
Round file, wet-or-dry sandpaper 120 and 240. $3-8

Parts List – prices approximate
Weld-B-Gone deluxe with ½" stainless barb $40
Bazooka T $20
Sankey Adapter $8
Weld-B-Gone Thermosight $25
Thermometer (not installed) $35
Sankey keg $30

meets the cylindrical keg body (kegs are "beer cans" with welded-on supports top and bottom.) I transferred that measurement (1⅝" for my setup) to the exterior. This marks the center of the hole.

I then put a pointed grinding stone into the high-speed grinder and produced a pilot "dent." This enabled a ⅛" drill bit to penetrate the stainless steel. Then I used a succession of step-drills to enlarge the hole to ¾." Lacking step drills, a succession of drill bits is equally effective, as is a small grinder or round files. I didn't have a ⅞" bit, so I enlarged the hole from ¾" with the high-speed grinder. After cleaning, everything was installed following manufacturer's directions.

That could be the end of conversion, but I chose to add a sight glass and thermometer. It's the exact same procedure, measure, drill and install. What I've learned is this; converting a Sanke into a boil kettle/mash tun/hot liquor tank is not difficult, other than getting pilot holes drilled. Using common hand tools it should take a couple of hours before you're ready to clean and sanitize your completed new vessel. Heck, you could probably brew the same afternoon.

Thom Cannell is BYO*'s regular "Projects" columnist.*

OBTAIN A KEG LEGALLY

There is no way the deposit you paid for a keg of your favorite microbrew is equal to its cost to the brewer (anywhere from $90 to $120). Keeping a keg is theft; there is no way around it. Why not get a keg from local salvage yards? I passed four pallets of Anheuser-Busch and SAB Miller kegs, most were like new. Legal kegs come from out-of-business breweries, damaged kegs, or kegs at the end of their life. There are several well-known distributors of used and reconditioned kegs: Sabco (Ohio), BCI (Tennessee), Tosca (Wisconsin), and a number of local breweries. Some are even reconditioned, burnished and de-dented for a like-new appearance. Check them all out and calculate what your time and effort is worth. No matter what you choose, make sure to obtain kegs legally — theft is a crime!

Transferring Beer

Getting your wort or beer from there to here

Story and photo by **Chris Colby**

In many ways, a homebrewery is simpler than a commercial brewery. One aspect of homebrewing that is typically much simpler is the transfer of wort and beer around the brewery. In a commercial brewery, the vessels — the hot liquor tanks, mash and lauter vessels, kettles, whirlpools, fermenters and bright beer tanks — do not move and in most the wort or beer is pumped between them. (In a few, tanks are on different levels, allowing for transfers via gravity.)

In a small brewery, the pumps may be mobile and connected to the appropriate tank via temporary hoses as needed. In a larger brewery, all the piping may be fixed, with a dedicated pump for every transfer. Commercial brewers need to worry about fluid transfer rates, cleaning fixed piping in place and the potential for overpressure (or underpressure) situations in the piping.

Although we homebrewers (thankfully) have things a little easier in this respect, there are a few things every homebrewer should know about transferring wort and beer. Transferring liquids in a homebrewery should be relatively quick and the transfer should occur without contamination or unwanted aeration.

Transfers by Gravity

In most homebreweries, most transfers occur via gravity. In a 5-gallon (19-L) scale, vessels to be drained of wort or beer often sit above the receiving vessel in the brewing setup. In a vertical 3-tier system, the vessels fit into a frame. For a kitchen brewer, the hot liquor tank may sit on top of the fridge, the picnic cooler mash/lauter tun on the counter and the kettle on the floor during wort collection. In cases where the holding vessel is not "permanently" stationed above the receiving vessel, it can be easily picked up and elevated prior to the transfer.

Spigot

The easiest type a transfer to perform occurs when a vessel has a spigot attached — just open the valve and let the liquid flow. The liquid is usually channeled by clear plastic tubing (such as Tygon tubing) into the receiving vessel. If you are contemplating buying any piece of equipment for your brewery and you have the option of adding a spigot (for example, a ball valve on a kettle), consider it carefully — although it costs more initially, it will save you a lot of time and energy in the long run.

photo by chris colby

With a jumper line attached to the "beer out" posts of two Corny kegs, beer can be transferred without contact with air.

During most transfers, except for the transfer of cold wort to the fermenter, avoiding aeration is a priority. The simplest way to do this is to place the outflow end of the tubing at the bottom of the receiving vessel. Don't let the liquid fall through the air and splash into the receiving vessel or fan down the side the vessel. Keep the tube at the bottom of the vessel and — once the bottom is covered with liquid — keep the end of the tube under the liquid level. When I transfer, I tilt the receiving vessel slightly and place the end of the tubing at the lowest point. This way, the end of the tube gets covered by liquid more quickly (perhaps reducing aeration very slightly).

Siphon

If your holding vessel doesn't have a spigot — for example, when transferring from a glass carboy — you will need to start a siphon. Homebrewers usually siphon with a racking cane with clear tubing attached. There are three popular ways to start a siphon — by mouth, by filling the racking tube with water or by using a siphon starter device.

Starting a siphon by mouth is simple. Just place the racking cane in the holding vessel, place the outflow end below the vessel and suck on the tube until the liquid starts flowing. Although simple, many brewers eschew this method out of fears for contamination. (Some gargle with vodka before putting their mouth on the tubing, although this likely does little to reduce the levels of bacteria in their mouth.) In practice, starting a siphon by mouth doesn't lead to routinely contaminated beer. However, there are easy methods of starting a siphon that remove this potential source of contamination.

One sure-fire way to start a siphon is to completely fill your racking cane with water. Hold the cane so both ends are at the same level (to keep the water from draining out). Then, in one coordinated movement, lower both ends of the tube. While lowering, the "cane"

end of the racking cane goes into the holding vessel and the tubing is lowered into the receiving vessel (which is, of course, positioned below the holding vessel).

Keep the ends of the tubing at the same level until the cane end is submerged in liquid, then quickly drop the tubing into the receiving vessel. This will prevent water from flowing from the cane into your beer or wort.

You may want to run the first bit of water into a pitcher before directing the stream of beer to the receiving vessel. To do this, let the pitcher fill until the water is displaced from the tubing, then pinch the tubing and move it to the receiving vessel.

There are a couple types of siphon starters that provide another easy way to get liquid flowing. One design is basically a tube within a tube. The device is placed in the holding vessel as a racking cane would be. The brewer then pumps the siphon starter and the liquid starts flowing. The remainder of the transfer occurs via gravity (i.e. you don't have to keep pumping the whole time). Another design involves a marble in a little metal "cage" at one end of the tubing. The marble end is placed in the holding vessel and moved up and down rapidly. When the tube moves down, liquid is forced in to it. When the tube is lifted up, fluid pressure on the marble closes the opening. By rapidly moving the tubing for several seconds, liquid begins filling the tube. Once enough liquid is in the tube, a siphon is started.

Most homebrew shops carry one or both of these siphon starters. The advantage of these devices is that it takes less coordination to start a siphon compared to the filled racking cane maneuver. The disadvantage is that they are a little bit harder to clean.

Pumping wort or beer

Some homebrewers use pumps to move their wort and beer (as well as circulate it in RIMs and HERMS loops). The advantage of using a pump is that liquid can be moved uphill or between vessels at the same level. In addition, most popular homebrew pumps move the liquid faster than it can be drained by gravity. The only real disadvantage is their initial cost. For 5-gallon (19-L) stovetop brewers, a pump is a luxury. For homebrewers making larger volumes of beer, they are handy and for brewers who have horizontal 3-vessel brewing rigs, they are indispensible. (See the November 2003 issue of *BYO* for more on pump types and selecting a pump for use in a homebrewery.)

The most popular kind of pump for homebrewers is a centrifugal pump. One of the most popular is a model manufactured by March that sells for around $130 (US). Their pump is food grade and rated for temperatures up to 250 °F (121 °C), so it can transfer or circulate hot wort. It also has a magnetic coupler, so if bits of grain get lodged in the impeller, the shaft won't break. (The impeller is the spinning

part that "throws" liquid out of the pump.)

These pumps work great, but two common problems do surface from time to time. Centrifugal pumps are not self-priming and the pump will quit moving liquid if there is a large enough bubble in the stream of liquid. Situating your pump at or near the lowest point in the tubing goes a long way towards avoiding this problem. If a bubble forms (or is sucked into the line), it will rise in the liquid up past the pump and the pump will again be primed. Keeping all your fittings tight will likewise help keep air from being drawn into the pump as it works.

The second potential problem is cavitation. It does not happen often in homebrew situations, but it can pit the inside of your pump if it does. Cavitation occurs when low pressure inside the pump causes a "bubble" of liquid vapor to form. The "bubble" collapses and makes a loud sound. (Did you know that audible cavitation occurs in the xylem of trees? It does. Did you know that the Navy is developing high-speed torpedoes that travel inside cavitation bubbles, reducing friction because the torpedo never touches water? They are. Did you know that, during cavitation, the collapsing "bubbles" release photons (i.e. emit light)? They do. Did you know that a Google search for "cavitation" brings up all sorts of factoids that have no relevance to homebrewing? It does!)

If you're recirculating hot wort through a mash and slow flow through the grain bed is making the pressure between the grain bed and pump drop, you might experience cavitation. The usual cures for cavitation are to lower the temperature of the liquid being pumped, raise the pressure on the input side or slow the speed that liquid is being pumping. When brewing, the first two are not options, so slowing the pump is what you need to do. One way to slow the pump is to restrict the output. Most centrifugal pumps sold for homebrewing use can withstand a little back pressure, but check your owners manual to make certain before you try it with your pump. To restrict the output of your pump, just use a tubing clamp on the outflow tubing.

Pressure transfers

Cornelius ("Corny") kegs are a popular method for storing and serving beer. However, they can also be used as fermenters with the proper fittings attached. An advantage of using a Corny keg as a fermenter is that beer can be transferred between Corny kegs via CO_2 pressure with no exposure to oxygen during the transfer.

Let's say you have a full Corny keg you've used as a secondary fermenter or lagering tank. Clean and sanitize a receiving keg and fill it with water. Connect your CO_2 tank to the receiving keg and push all the water out through a tap. Now you have an empty keg filled with CO_2. It's best keep the keg weakly pressurized, around 3–5 PSI.

Next, connect your CO_2 tank to the Corny with beer in it, keeping the pressure the same as in the receiving keg. Make a "jumper" line by attaching two "beer out" fittings to a length of tubing. (These are usually black on ball lock/Pepsi kegs.) Attach the jumper line to the "beer out" posts on both kegs (the posts that connect to the spear that extends to the bottom of the keg). To transfer the beer, release the pressure from the receiving keg. The simplest way to do this is to attach a "gas in" fitting (usually grey for Pepsi kegs) to the "gas in" post and let the keg vent. (This is why you want only a small amount of pressure on the keg.) Beer will move up the spear and out of the first keg and down the spear and into the second keg. Remove the connectors once the keg is full and there you have it— a transfer in which the beer is not exposed to oxygen. (OK, a tiny amount will diffuse into the receiving keg against the flow of CO_2 out the keg, but not much.)

If you are transferring beer from a secondary fermenter to your serving keg, the first little bit of beer transferred will be very yeasty. The pickup tube will suck in yeast sediment at the bottom of the secondary fermenter and transfer it to your serving keg. To eliminate this, just watch the tubing and disconnect the jumper line once the beer changes from cloudy to clear. Connect your CO_2 tank and a cobra tap to the receiving tank and blow out the yeasty beer. Then reconnect your setup and transfer the clear beer.

If you attempt to transfer fully carbonated beer this way — perhaps from a 5-gallon (19 L) or larger Corny keg to a 3-gallon (11 L) keg — you may experience problems with foaming. As the beer that has been stored under serving pressures enters the receiving keg at low pressure, CO_2 can break out of solution. The solution is to make the initial pressure in the receiving keg equal to the pressure the holding keg has been kept at. Then, release the pressure very slowly so the receiving keg is only a few PSI lower than the holding keg. (You won't know what the pressure is unless you have a gauge on the receiving tank, but you can judge the relative pressures by how fast beer is flowing through the jumper tubes.)

The best way to do this is to attach some tubing to the "in" fitting that is serving as a vent. Either clamp the tubing in such a way that the pressure is released slowly or keep the tubing clamped shut and periodically let out little bursts of CO_2. Watch the jumper tubing and let out another burst of CO_2 when the beer flow stops. You can also do the stop and start method using the pressure release valve on the receiving keg, though this may cause excessive wear and tear. If you take care in transferring your wort and beer, the final beer transfer — from your glass to your mouth — should be very enjoyable.

Chris "Cavitation" Colby is the Editor of BYO.

Make a CP Bottler

. . . and bottle carbonated beer from a keg

Story and photos by Reg Pope

For most homebrewers who brew long enough, kegging eventually becomes part of their process. The primary advantage of kegging is that only one packaging vessel needs to be cleaned and sanitized as opposed to dozens. However, in addition to that, there is a certain convenience factor. Kegs are perfect for the moderate term storage needs of the homebrewer, as well as home bar dispensing and picnic applications. Still, there are some occasions — such as contests or homebrew club meetings — for which we might wish to have bottled homebrew. The counter-pressure filler is a device which allows brewers to transfer conditioned beer from a keg to a bottle. This transfer occurs under pressure, which minimizes the loss of carbonation that would occur by simply running beer from a tap into a bottle or growler.

My counter-pressure filler was assembled with parts costing a total of $28 obtained from a neighborhood plumbing supply store and assembled in less than an hour.

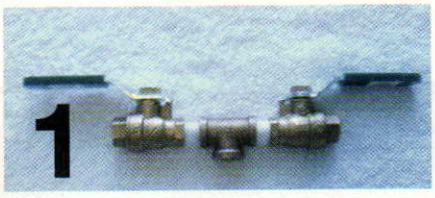
The long central tube delivers CO_2 to the receiving bottle. This purges the air from the bottle and allows for its pressurization. It also delivers the carbonated beer. This is accomplished by opening and closing the valves in the proper sequence, and by using a venting assembly, which is a sort of sleeve that fits over the central tube and is fitted with a stopper that seals the bottle so it retains the 4-6 PSI of pressure used during bottling.

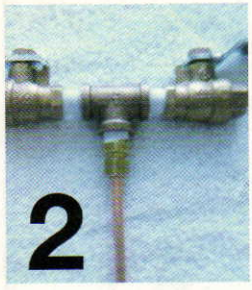
Assembly begins with the upper part of the unit. All threads are coated with teflon tape. The two ball valves are connected to the sides of one of the tees using the brass nipples. (See photo 1.)

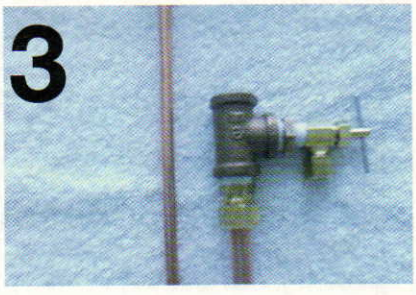
The ¼" threaded to ¼" compression fitting is connected to the bottom of the tee and the length of ¼" copper tubing is connected to that. (This is shown in photo 2.)

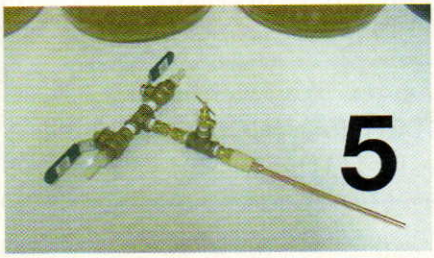
The venting sleeve is constructed by attaching the ¼" threaded to ⅜" compression fitting to one side of the remaining tee. The ⅜" tubing is connected to that and cut. It doesn't need to be any longer than a couple of inches. Tape the threads of the bushing and insert it in the center of the tee. Again, treat the threads of the needle valve and screw it into the bushing (as is shown in photo 3. Photo 4 shows the assembly before the needle valve is attached to the tee.)

The remaining ¼" threaded to ¼" compression fitting attaches to the other end of the tee. Before doing so however it must be reamed out. This









1. The ball valves, which control the flow of carbon dioxide and beer into the unit, are connected to a tee.

2. The central tube is connected via a compression fitting to the tee.

3. The venting sleeve and needle valve are attached to their tee.

4. The needle valve prior to attachment to the tee (note the bushing).

5. The finished counter-pressure bottling unit.

Parts list:

¼" bronze tees (2)
¼" brass ball valves (2)
¼" OD copper x ⅛" MIP angle needle valve (1)
¼" brass nipples (2)
¼" X ⅛" brass bushing (1)
¼" threaded – ¼" compression fitting (2)
¼" threaded – ⅜" compression fitting (1)
¼" copper tubing (16 inches)
⅜" copper tubing (6 inches)
¼" barbed fittings (2)
Rubber stopper (1) sized to fit bottle or growler

Tools list:

Wrenches/pliers
Tubing cutter
Drill with ¼" bit
Teflon tape

Total cost as shown: $28 (US)

fitting is designed to affix to the end of a length of tubing and there is a small lip of material inside the fitting that butts up against the end of that tubing. This lip must be removed using the drill to allow the fitting to "float" over the ¼" tubing.

Once assembled, the venting sleeve slips over the ¼" tubing of the main body and is secured with the ¼" threaded to ¼" compression fitting.

The ¼" tubing extends out and through the ⅜" tubing and is cut to the appropriate length to reach within an inch (2.5 cm) of the bottom of the bottle being filled. The stopper is placed on the ⅜" tubing, moved as far up (toward the compression fitting) as it will go, and cut to a length just below the bottom of the stopper. If it's too long, it will suck beer out of the bottle during venting.

Add ¼" barbed fittings for the "beer in" and "gas in" lines, tighten all fittings, and assembly is complete.

Theory and use of the filler is described in detail in the November 2002 issue of *BYO*, but the basic process is as follows:

Once the unit is sanitized, close all of the valves. Connect poly tubing lines to the barbed fittings on the filler from your CO_2 bottle and keg of conditioned beer. Place the filler on the clean bottle with the stopper snugly in the neck. Open the needle (bleeder) valve, then open the "gas in" valve. Allow CO_2 to flow into the bottle and out the bleeder for a few seconds to purge the air from the bottle. Close the bleeder valve and allow the bottle to equilibrate to dispensing pressure (4-6 PSI). Close the "gas in" valve. Open the "beer in" valve. If everything was done correctly up to this point, nothing will happen.

Slowly open the bleeder valve. The idea is to release just enough pressure from the bottle to allow the pressure in the keg to move beer into it, but not enough to allow a sudden degassing of the beer. Control the pressure release carefully by opening the valve only as much as necessary and by closing it periodically as required. When the bottle is filled, close the valves, gently break the seal of the stopper, remove the filler, and cap the bottle.

It takes some practice to coordinate the steps and keep the pressures in all of the vessels where it needs to be to facilitate the process, and even with such practice there will still be a little carbonation loss. It will be far less however than it would be if the filler had not been used. Ensuring that the beer (and the bottles) are well chilled will help as well. This unit is designed as an economical alternative to the common (but more pricey) stainless steel versions. Although stainless is preferable, this is adequate for infrequent use and, in the author's tests, didn't contribute to any significant degradation of beer quality during short exposure times.

Reg Pope of Nampa, Idaho, is a former food scientist and homebrewer of 11 years.

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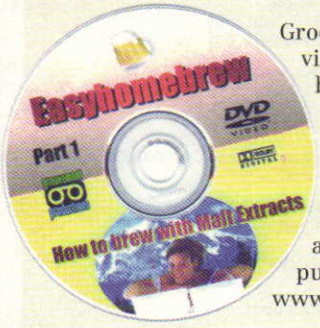
BREWER'S log

Groovemont Productions releases homebrew DVDs



Groovemont Productions has released two new videos that allow hobbyist and would-be brewers the opportunity to learn hombrewing visually. The first DVD "Easyhomebrew part 1: How to brew with Malt Extracts" covers the basics of homebrewing. The second DVD ventures into the area of all-grain brewing with a focus on German beer styles brewed according to the *Reinheitsgebot* (German beer purity laws). For more information, visit www.easyhomebrew.com.

Sabco introduces the "Chill-Wizard"

Sabco Industries has introduced a powerful new wort chiller by the name of "Chill-Wizard." The chiller is constructed in a compact, easy to clean and portable package. The chiller uses an efficient pump, a stainless chiller, and a stainless 1-micron bubbler stone. All valves and the thermometer are arranged in a "Clean-In-Place" (C.I.P.) environment with ground fault protection and portability. Dependent upon the input water temperature, the chiller can cool approximately 10 gallons (38 L) of boiling wort to 68 °F (using 58 °F water) at 5 gallons per minute flow rate. The retail price of the product is $659.95. For more information, visit Sabco Industries online at www.kegs.com/fsi.html.

The Octopus Tap™

This innovative, patent-pending adapter is easily inserted between the existing hand-pump (Bronco Pump™) and lower beer shank. Made from rust proof, milled 303 stainless steel or 4 Port Noryl Plastic, the Octopus Tap™ can be attached to most kegs to allow for the simultaneous pour of four beers at once. The product retails for $24.99 for the adapter and 4 hoses, faucets and washers (or $59.99 fully assembled with the Bronco Pump™). For more information, visit www.octopustap.com.

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Story and photos by Alba Cid • Somerville, Massachusetts

Mead: **a beverage of ancient origin, containing fermented honey, traditionally given to newlyweds for their honeymoon...**

Jan and Alba Cid drew on their family heritages to brew the recipe for their Wedding Mead.

Accordingly, when my husband and I learned more about the tradition of mead, we decided to incorporate it into our wedding. We wanted the day to be unique and truly ours.

If you had known me from way back, in some ways, you would have found it surprising. See, in college, I didn't drink beer. I had tried beer at one of my first parties where a tasteless brew was being served and I never had it again. I didn't like it whatsoever. So, I swore off beer entirely and didn't have it for years.

However, my now-husband Jan, like a good stereotypical German, is crazy about beer. When he came into my life, he kept having me try different beers that he drank and . . . wow! I did like a number of beers! I particularly liked some of the darker, malty brews.

We were also having fun with food. We both enjoyed cooking and playing in the kitchen together was a lot of fun. We made elaborate dinners and served nice wines — or beer — to go along with them. Jan is an excellent chef in the kitchen and he made me an incredible dinner the weekend that he proposed to me.

So, I asked him, if you like cooking, and you like beer, why don't you try brewing? He was hesitant. I persisted, but he was not convinced. He had tried some bad homebrews, seen exploding bottles and was afraid that was the nature of the hobby.

I insisted, "Maybe you can do it better!" I got him some information about brewing and we finally went to a local brewing shop to buy the equipment. It was shortly thereafter that we together made our first-ever batch, which came out quite drinkable.

Jan has continued to brew and learned to enjoyed it very much. I also gave him more brewing texts to encourage him to experiment. So . . . when the time came to get married and Jan read about mead, its origins and meaning, he wanted to feature it in our wedding day.

My husband and I got married in December of 1999. We were both in graduate school, living on small graduate stipends. We were also living in different cities while in graduate school and planning a wedding proved quite a challenge. This is partly why we decided to marry in December — it was more difficult to get together, and get everyone else together, at other times of the year.

Our wedding and the mead incorporated a lot of our family's cultural heritage. For example, my Spanish heritage encouraged Jan to incorporate orange blossom honey into the mead. Orange blossom flowers (*flor de azahar* in Spanish) show up often in Spanish love poems, which may speak of their scent and sweetness. The

cultural relevance and symbolism in the orange blossom, matched with the honey's light body made it perfect for our mead.

I got to work on the mead as well. I was not in town to help when Jan made the brew, but I created the labels by hand and put them on the bottles to hand out at the wedding.

To further embellish our bottles, and to give our guests a way to remember our special day, my grandmother, an avid crocheter, made little snowflake ornaments for each person in attendance. Remember, the wedding was in December! The night of the wedding, while setting up the tables for dinner, we put a bottle of mead at each place setting, and around each bottle's neck went a crocheted snowflake.

That night our friends and family raised their glasses to us. Jan and I together held one chalice during the toast. Everyone saw our cultures, backgrounds and feelings during the celebration, through this sparkling wedding mead: brewed, bottled, labeled and decorated to reflect us. We had a few bottles left that night and we have opened one on each of our anniversaries.

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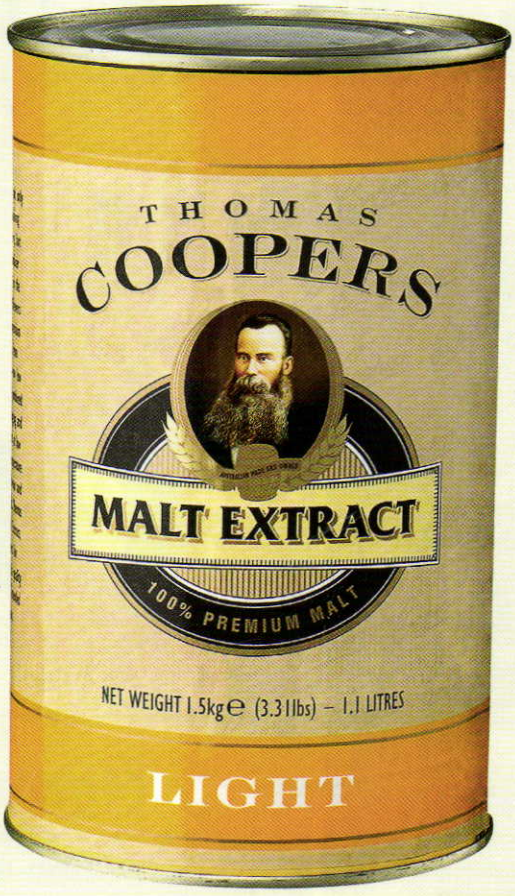

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