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October 1995, Vol.1, No.4
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THE HOW-TO HOMEBREW BEER MAGAZINE

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CIRCLE 48 ON READER SERVICE CARD

Microbrewers should have nothing to hide from their customers.

That's why I believe all microbrewers should put a clear, easy-to-read freshness date in a prominent place on their labels. The Institute for Brewing Studies, a non-profit organization, also supports the education of the brewing community on consumer legible freshness dating.

There's an easy-to-read freshness date on every Samuel Adams.

I hope consumers support the following microbreweries. You can help push for industry-wide freshness dating by calling your favorite microbrewery and urging them to include clear, uncoded freshness dating on each bottle. You'll be doing microbrew drinkers everywhere a favor.

Boston Beer Company, Atlanta Brewing, Broadway Brewing, Brooklyn Brewing, Bohannon Brewing, Casco Bay Brewing, Catamount Brewing, Chicago Brewing, Crested Butte Brewery, Frederick Brewing, Lowell Brewing, New Belgium Brewing, New England Brewing, Old Dominion Brewing, Old Marlboro Brewing, Otter Creek Brewing, Pavichevich Brewing, Potomac River Brewing, Redhook Brewing, Spring Street Brewing, Sudwerk Privatbrauerei Hubsch, Summit Brewing, Wynkoop Brewing.

If we have forgotten any breweries that employ consumer friendly freshness labels, please send samples of the labels (so we can include them in any future lists) to: The Boston Beer Company, 30 Germania Street, Boston, MA 02130.

Our industry exists because we take such pride in the quality of our beer. We use better ingredients, and take great care to brew our beers. Don't we owe it to our customers to be honest about the freshness of our beers?

I believe all microbreweries should join the Boston Beer Company and the other microbreweries listed here in insisting on freshness dating.

Anything less would be incomprehensible.

SAMUEL ADAMS
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James Koch

Brewer/President
Boston Beer Company,
Boston, Mass.

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CIRCLE 54 ON READER SERVICE CARD

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Brewers Like Us

The day Neil Armstrong took his "giant leap for mankind" and stepped onto the desolate surface of the moon, I was doing the same thing just about every other seven-year-old in America was doing: watching TV.

My family was vacationing at the time, and there were strict rules to be followed. When on vacation you played in the water. You dug in the sand. You played Whiffle ball. You played board games. The one thing you didn't do—definitely did not—was watch television.

There was no television in the cottage, and none had ever crossed the doorstep—at least while my parents were there.

On this day, though, my father drove into town and rented a black-and-white Philco. It was small, and the picture made us wonder if winter had come early to the lunar plains. But it was a TV, and it worked.

So we watched. We saw the simulation that showed the lunar module nearing the moon. We listened to the astronauts talk to Mission Control. We heard Armstrong utter what has become one of the most famous quotes of modern times.

I knew right then that I would be an astronaut when I grew up.

My parents, although usually supportive, couldn't muster much more enthusiasm than "You can be anything you want, dear." Maybe it was because just a few days earlier a three-hour ride turned into a half-day affair—I had gotten car sick and thrown up all over the back seat. Twice. How would I handle zero gravity?

My interest in the space program continued for a few years, propelled into the mid-1970s by *I Dream of Jeannie* reruns. But it ebbed somewhere between the end of Apollo, when astronauts flew to the moon, and the middle of the Skylab program, when they orbited earth while performing scientific experiments. Heck, I did that every day in school.

This month's cover feature looks at astronauts, rocket scientists, and space shuttle engineers not as heroes but as human beings. I don't know if Neil Armstrong was a homebrewer or if Buzz Aldrin was (must have been, with a name like that). But I do know that astronaut Bill Readdy is. He helped brew a beer from hops that orbited the earth. Billy Kendrick is, and he helps build space shuttles in his spare time. Mac Monroe is, and he can also talk your ear off about Avogadro's Number or Heisenberg's Uncertainty Principle if you prefer.

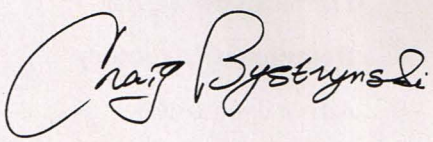
All of these people share a hobby with you, with me, and with a million other people across the country. Some of them brew with extract, some are all-grain brewers. Some prefer the simplicity of kits, while others go out of their way to design great recipes. There's a bond in brewing, and we all share it—whether we're rocket scientists or bank tellers or editors.

Check out the story on page 30 and see if you agree. And remember the next time you watch the space shuttle launch, there are brewers at the controls.

Coming Attractions

There's nothing like the first time. Next month BYO walks you through your first date with all-grain brewing, including step-by-step instructions for your first mash. We'll advise you on equipment and ingredients and offer tips to help you move around the bases.

We'll also help you culture your own yeast and share a great recipe for pumpkin beer. See you then!



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BRING HOME THE GOLD

CIRCLE 53 ON READER SERVICE CARD

Paul Seeger
El Centro, CA

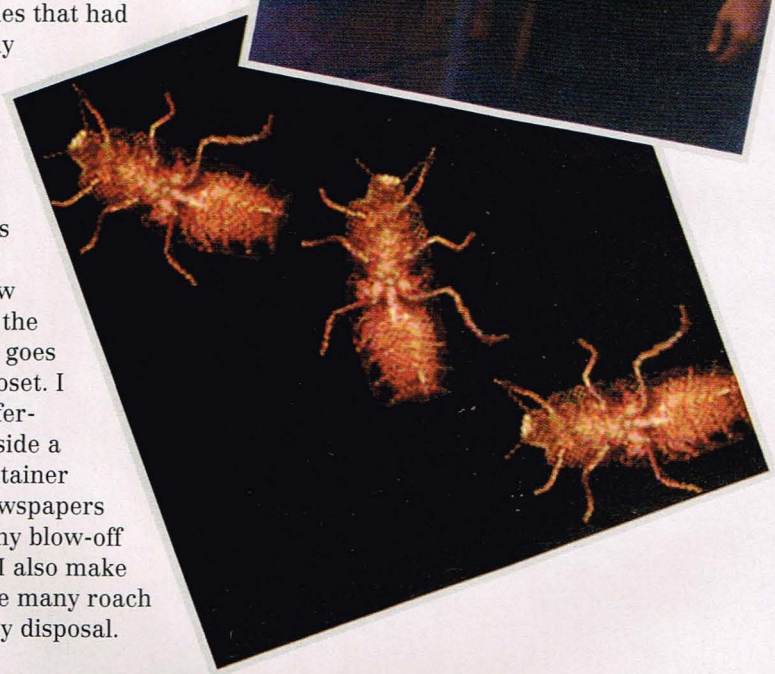
Last summer I brewed a batch of American ale. I placed the fermenter inside the closet to quietly bubble away as I had done several times before. At the time I was experimenting with different types of yeast. When this particular batch began to ferment, it became downright violent. I didn't use a blow-off hose, so my fermentation lock shot off my glass carboy. The foam in my closet made a huge mess. The carpet was a sticky disaster. It smelled good, though.

The next time I brewed a batch I thought I would place the carboy outside, at least until the fermentation subsided to a safe level. The day came and I set everything up. I placed my carboy in the backyard safe and sound and went off to work. The next day I checked on the progress and, as usual, foam was coming out of the blow-off hose and exhausting into a bucket. Some foam was also leaking between the stopper and the glass carboy. Not a big deal—I thought!

Until this point I had only been checking my beer during the day. I arrived home one night and decided to take a peek at its progress. I walked outside and flicked on the light. To my amazement thousands of cockroaches had swarmed all over my glass carboy. Numerous cockroaches were also trapped inside my blow-off bucket, diligently consuming all the beer products they could get their little tongues on. It was truly a disgusting sight to see. Any place that had a speck of beer or foam was occupied by cockroaches. I think I had every cockroach on the block in my backyard. They were loving the stuff. This had apparently been going on nightly since the fermenter had been placed outside. Yuck!

Needless to say, I discarded the batch for fear of contamination by the ever-so-clean cockroaches that had enjoyed my beer before me.

The moral of the story is that every time I brew beer now, the fermenter goes into my closet. I place the fermenter inside a larger container and on newspapers to catch any blow-off products. I also make sure I have many roach traps at my disposal.



***Cockroach** (käk-roch): any of an order or suborder of chiefly nocturnal insects including some that are domestic pets.*

Man Cannot Live...

I recently started homebrewing and as with most of my other hobbies, I went in head first. I bought nine batches worth of ingredients. Of course, I needed about 500 bottles for the brew (eventually), so I started avidly collecting empties.

After a significant portion of our kitchen cabinet space was occupied by stray bottles waiting for empty cases, my wife left the following note:

"Something has got to be done with these beer bottles! There isn't any room for food in the cupboards. If you want to eat again, put them away somewhere!

"Your Wife."

I (of course) moved every bottle in question but left the following reply:

"Beer *is* food!"

—Name withheld

Brewing Up a Swarm

This brew day started out like any other brew day: the recipe planning, the hunt for just the right ingredients, and the set-up of the brewery. On the agenda was a cyser made with six gallons of apple cider and 15 pounds of honey—not exactly a light beer.

I started by heating the apple cider to the point of simmering. About that

Show Off!

Give mom something to paste in her scrap book. Risk becoming a household name. Send your photo/story to Pot Shots, c/o Brew Your Own, 216 F Street, Suite 160, Davis, CA 95616. E-mail: edit@byo.com. Be sure to include your address and phone number.

"Can it really be any good?" a young woman whispered. "Heavens no," Thomas exclaimed. "He's never brewed a drop in his life."

They Laughed When I Told Them I Was Serving My Own Home Brewed Beer, But When They Tasted My Pale Ale! —THE LIBERTY MALT CATALOG

Thomas brought a gift of his latest micro-brew discovery that he wanted everyone to try. I decided that this would be a dramatic moment for me to make my debut. To the amazement of all of my friends, I strode confidently over to my Alephenalia Micro Brewery-Home Brew Kit and began to pull out the professional looking bottles that I had placed there.

"Chuck is up to his old tricks," somebody chuckled. The crowd laughed. They were all certain that I couldn't brew any more than I could make potatoes au gratin.

"Can he really brew?" I heard Thomas' partner whisper. "Heavens, no!" Thomas exclaimed. "He's never brewed a drop in his life. But just you watch him. This is going to be good."

I decided to make the most of the situation. Holding up the wing capper, I explained that I had bottled it just for this occasion. With mock dignity, I drew out a bottle and cradled it in my arms like a great wine. "Is this another of those disappearing ink trips," called a voice from the rear. The crowd rocked with laughter.

Then I began to pour.

Instantly a tense silence fell on the guests. The laughter died on their lips as if by magic. I poured a glass for everyone, even those who exclaimed "I don't like beer." I heard a gasp of amazement. My friends sat breathless, spellbound.

I sampled it myself and for a brief moment I forgot the people around me. I forgot the hour, the place, my fellow imbibers. The little world I lived in seemed to fade—seemed to grow dim—unreal. Only the ale was real. Only the ale and the visions it brought me. Visions as beautiful and as changing as an autumn sunset, with its amber hues, just like my homebrew.

A real Triumph!

As everyone finished tasting, the room resounded with accolades. I found myself surrounded by excited faces. How my friends carried on! Men shook my hand—wildly congratulating me—pounding me on the back in their enthusiasm! Everybody was exclaiming with delight, plying me with rapid questions. Chuck! Why didn't you tell us you could brew like that? Where did you learn? How long have you been brewing?

"I simply followed the complete instructions included with the Alephenalia Homebrew kit," I replied. "And just a short while ago, I didn't know hops from malt.

"Quit your kidding," laughed Thomas, a real beer enthusiast. "You've been brewing for years. I can tell."

"Only since Rosie gave me an Alephenalia Microbrewery for my birthday, less than three weeks ago. I decided to keep it a secret so that I could surprise all you folks." Then I told them the whole story. "Ever heard of **Liberty Malt Supply Company**?" A few of my friends nodded. "That's a home brew shop and mail order catalog!" One of the oldest in the entire country!

"Exactly," I replied. "They have a great program for learning how to brew beers like a professional, the Liberty Way."

How I learned to brew without a teacher.

And then I explained how for years I had longed to brew my own beer. I shared that dream with Rosie and when she saw the Alephenalia Microbrewery in the Liberty catalog, she knew it was the perfect gift for me.

A Complete Catalog!

Pointing to the colorful Alephenalia Micro-brewery carton, I explained, "It contains brewing equipment that can be used over and over to brew beers like the professionals." I told them how pleased I was with Brewer's Companion, a real home brewers bible. The Liberty Pack included with the microbrewery contained enough pre-measured, concisely labeled ingredients to brew five gallons of the Pale Ale. I explained that each of the Liberty packs used the highest quality ingredients, exclusive to Liberty Malt and that packs for each of the classic brewing styles are available.

I proudly told them that I have already begun brewing Weekend Weiss, a Bavarian style wheat beer and Liberator Dopplebock, both promptly received by simply dialing Liberty Malt's own toll free number, 1-800-990-MALT (6258).

Favorite brewing styles

"Lets order Liberty's Pals Pils Pack!" Thomas pleaded after seeing the Liberty catalog. He took another sip and said, "Which weekend is that Weiss going to be ready?"

To order or for a free catalog:

1-800-990-MALT

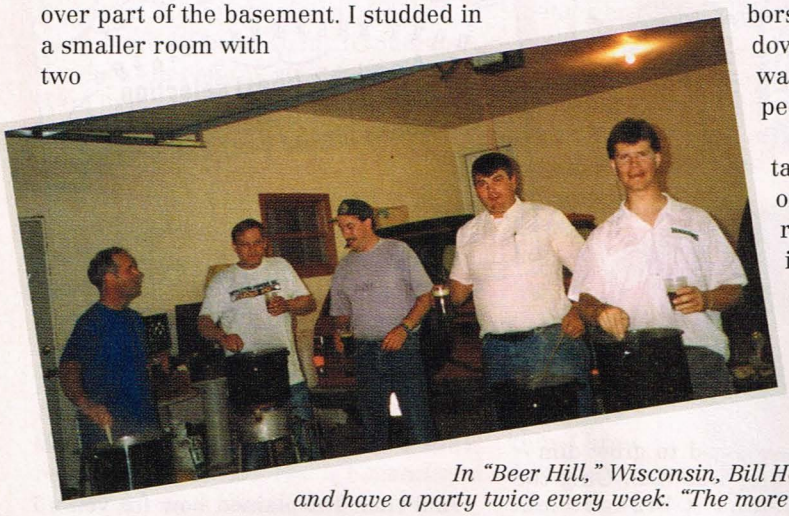
CIRCLE 38 ON READER SERVICE CARD

Bill Haen
Sherwood, WI

I have been brewing for the past four years. Last year I moved to Sherwood, Wisconsin. When my wife and I were looking for a house to buy, one of the requirements was somewhere to put a brew room. The first thing I did when we moved in was take over part of the basement. I studded in a smaller room with two sinks and a floor drain.

When word got out that I brewed my own beer, some of the neighbors were very interested, so of course I showed them how to brew.

Although my homebrew room isn't quite finished yet, it doesn't matter—the how-to-homebrew seminars I've given for my neighbors wouldn't fit downstairs anyway. We had 14 people once.



Everyone I've taught the basics of brewing to really enjoyed it. There are five of us who get together regularly now, and a sixth just did his first brew last weekend. We usually have four kettles going. There's no really fancy equipment, just what we have on hand. We use porcelain pans and canning kettles. I use a burner I made out of pipe from a hot water heater. Two guys use King Kookers. Most of the guys brew five gallons. I usually brew 10. Recently I acquired three empty half barrels, so I'm thinking about going to all-grain.

We've even moved beyond my garage. Whoever has the burner set up outside invites us over and we have a little party. This is a really small town—it has a population of under 1,000—so it doesn't matter who's doing the brewing. We just throw our burners into the back of the trucks and drive over.

Before I moved in, no one had ever brewed before. Now we brew twice a week. They've even nick-named our neighborhood "Beer Hill."

In "Beer Hill," Wisconsin, Bill Haen and his neighbors throw their kettles in their pickups and have a party twice every week. "The more the merrier!" is their philosophy.

---

time my first visitor showed up—an ordinary honey bee. He buzzed me a few times, and I responded with a spray from the hose. He gave up trying to get at my brewpot, or so I thought.

After I had brought the apple cider to a simmer, I added the honey and some cinnamon and began to stir. I noticed that the bee was back...with a few of his friends. In fact he brought the whole gang of 30 to 50 of his friends.

My plan was to slowly stir for 15 minutes, then to run my batch through a wort chiller and pitch my yeast. Not! Trying to stir and do battle with 50 bees is no easy feat. I'd shoot at one with a blast of water and no sooner had he left for greener pastures then another one would take his place. Throughout the showdown I was trying to stir.

While this was going on, a few wasps found some idiot giving away free water from a garden hose.

After 15 minutes of doing battle and trying to make a glorious mead, it was time to chill and carboy my project. Bees and wasps don't give up easily. They certainly didn't give up the fight for the next 12 minutes that it took to chill the mead. While the wort chiller was doing its thing, my wife made the mistake of opening the back door to get me to come away from the fight. When she did, a few of my little friends tried to make themselves at home inside. They carried on the fight against my wife, who was less than pleased to say the least.

I finally finished the mead and managed to clean up without getting in the way of a stinger. I learned a valuable lesson: Make your mead early in the morning before those flying critters start moving around.

— Kyle Carrell
Los Olivos, CA

A Beer at the Pygmy Pub

Two homebrewing cannibals are hanging out drinking a brew they've made from the remains of a circus clown they captured. They sip it, and one cannibal turns to the other and asks: "Does this taste funny to you?"

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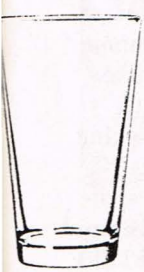

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CIRCLE 55 ON READER SERVICE CARD

Keeping Your Cool

Dear Brew Your Own,

Thanks for the article "Cool Summer Brewing" (BYO, August 1995). Here's another simple idea for cooling your fermenter that I've been using for the past couple of summers. The only equipment needed is a large, heavy-duty plastic tub and six refreezable ice packs.

After you've pitched the yeast, place the fermenter (I use a five-gallon glass carboy) into the tub and fill the tub with cold water. The water should be almost up to the neck of the carboy. To keep the water cold, place ice packs around the fermenter (don't worry, they'll float) and replace the icepacks periodically. That's it!

This arrangement has several advantages. It can keep the water (and fermenting wort) below 70° F even in the hottest weather; and since the fermenter is surrounded by water, the wort is less susceptible to major changes in temperature. If the water gets too warm (over 70° F), change the icepacks or add loose ice. I generally put three large icepacks in the tub and have three in the freezer. I change them once in the morning and once in the evening. To improve insulation, you can put Styrofoam packing material (peanuts) on top of the water or simply cover the tub with canvas or a heavy towel.

Plastic tubs (16 inches high and 20 inches in diameter) can be purchased at Price Costco, B.J.'s, or Wal-Mart for around $10. This system is simple and it works great.

Mark Bagdovitz
Fairfax, VA

Brew—Don't Boil—Your Hops

Dear BYO,

A couple of months ago I was talking with the owner of The Homebrew Shop in Coralville, Iowa, about my new all-grain setup. I was concerned about controlling hop aroma/flavor because my chiller would require much more time to chill the wort than one may want for these last-minute hop additions. (I like to use about two to three minutes for flavor and aroma). He came up with the idea of a hop vessel after the sparge bucket but before the chiller, and mentioned that he thought major breweries did this.

It is really a great idea! Knowing the flow rate of the chiller, a brewer can make a vessel that holds hops such that before the boiling hot wort goes through the chiller it must first pass over these hops. The volume of the hops would be computed so that the hops are never exposed to the hot wort for more than a certain amount of time.

I made such a system and it seems great! The control it gives me is wonderful! Brewers can use a large jar as the vessel. Place objects in the jar to adjust the timing.

I have found that my beer with this system has wonderful aroma—better than the old method of simply throwing hops in at the end of the boil.

Robert Winsor
Keota, Iowa

More Oktoberfest

Dear BYO,

Here's another (basic) grist bill for amber lager (Märzen: Brew Now for Oktoberfest. August BYO).

• 30-40% Munich malt

Over the Top?

Thanks to everybody who wrote in about last month's cover, the guy in the bathtub surrounded by floating bottles. Some people described it as "very funny," "hilarious," and even "weird." Others were less impressed. Among the comments:

• "No self-respecting homebrewer would treat his bottles like that."

• "He should have been using a bottle brush."

• "Green bottles aren't good for homebrew."

• "Couldn't you have used a different model?"

• "Why did you place the bottles that way? Maybe you should mail BYO in a brown paper wrapper."

Our response: mea culpa.

The model is Rick Kleiber, a professional actor whose credits include the films *Hook* (he was the big pirate) and *Ghost*. He wasn't really supposed to be sanitizing bottles; we were just having some fun. And the bottles were floating around at random. We did not place them strategically—we may not be the most mature individuals, but we're not quite that bad. We would not have run the cover we did had we noticed the problem or thought that people would be offended.

Not to point the finger, but it was BYO Marketing Director **STEVE RANK** who designed the cover and oversaw the photo shoot. He *personally* delivered the photo to the printer. The editor, publisher, and other employees of BYO are not to blame!

Just wanted to clear that up, and again, our apologies to all who were offended.

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Play around with your grist bill. Perhaps add a little Munich 20 or Belgian aromatic, cara-pils, more caramel or less. My feeling is to use these specialty malts enough so they contribute to the beer, but don't get in the way.

For hopping use Hallertauer, Select, Mt. Hood, Tettnanger, or Liberty. Remember these are malt-emphasized beers. I would suggest alpha-acid additions of 0.003 to 0.0034 pounds per finished five gallons of beer. Try adding 60 percent of these at boil start and the rest five to 10 minutes before boil end.

Kirby Nelson
Capital Brewery
Middleton, WI

Correction

Due to an editing error, two inaccuracies appeared in the article "Make Mine a Malted," (September BYO). Barley starch is produced when the kernel is formed during the growth of the barley plant on the farm, not during germination on the malting floor as stated. The footnote of the "Brewing Grains" table states "malted wheat doesn't have enzymes and must be mashed with grain that does [have enzymes]." Malted wheat has enzymes—more than most pale malts. The reason for including other grains during a wheat mash is for the husk, since malted wheat does not have a husk of its own. Without husk in the mash bed, lautering would be impossible.

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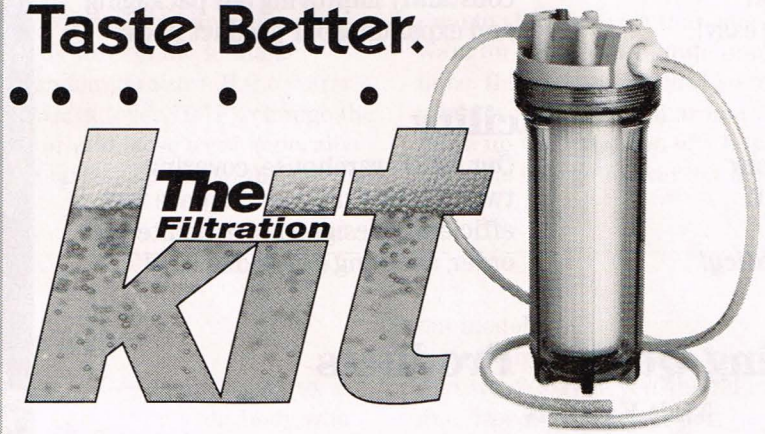

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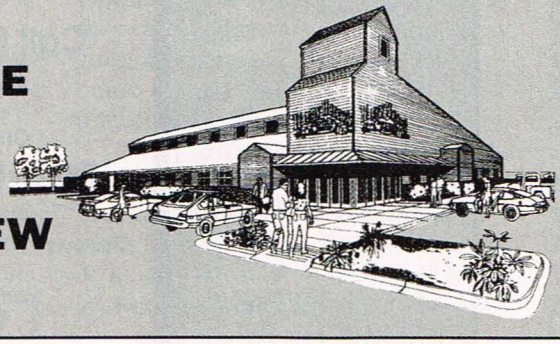

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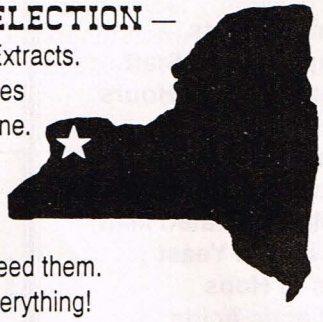

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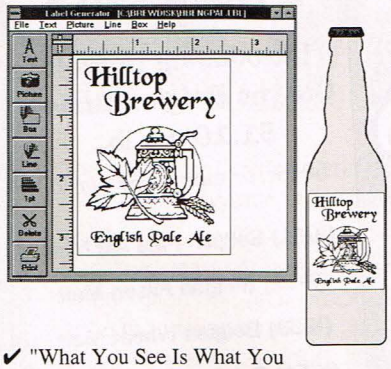

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The Illusion of the Open Fermenters

Mr. Wizard

Oh great wizard, what is the meaning of life without a great beer?

I am confused. I read in all the beer manuals, literature, and magazines that sanitation and protection of the wort from those undesirable wild yeasts and bacteria is extremely important to the quality of beer. I practice "safe brewing" methods. However, I remember visiting breweries in Europe (Heineken in Amsterdam, Schlossquell in Germany, etc.) and seeing the fermentation occurring in huge open vats with dozens of tourists from as many countries traipsing around these breweries. At the Heineken brewery you could actually peer over the edge of the vats. Yet these beers tasted delicious on site in their tasting rooms, with no off flavors from any wild yeasts or bacteria. What is their secret?

John Meyer
Somewhere in Virginia

There is no single secret to fermenting in open vats. The tricks that these breweries use to pull off this seemingly impossible feat all relate to understanding the limitations of the open fermenter.

During fermentation, carbon dioxide evolution creates a protective, positive flow blanket of gas above the fermenter. Also, the yeast head forms a protective barrier that will trap dust and debris and prevent it from making its way into the beer. Most breweries using open fermenters transfer the beer out of the fermenter before the terminal gravity is reached. Transferring a little bit early provides enough fermentables for natural carbonation in a closed vessel and prevents the yeast cap from falling into the beer. Some breweries also skim the top layer of yeast and trub off before transfer. This practice eliminates the transfer of potentially contaminated material into the secondary fermenter.

With the usual attention to cleanliness and sanitary equipment, those are the basic precautions used to manage the open fermenter in a nutshell.

Now Mr. Wizard will speculate on the tourists at Heineken. I would bet a fair amount of cash that Heineken, like most breweries in the world these days, uses cylindroconical fermenters for the bulk of their production volume. These fermenters are closed and are cone-shaped cylinders. The open fermenters you saw were a figment of your imagination.

Just kidding. My guess is that the open fermenters are part of their tourism division. In other words they have a few hanging around so people can see them. After all, seeing a fermentation in an open fermenter is pretty amazing. They probably serve that beer in their tasting room where they can control the quality of it. If my guess is wrong and Heineken has a bunch of open fermenters, then hopefully only one is sacrificed for tourists.

There are many craft brewers who use open fermenters. All of Anchor Brewing Co.'s beers ferment in open tanks, and a portion of Sierra Nevada's do as well. Most of Sierra's beer is brewed in cylindroconical tanks—the four open tanks behind glass are mainly for visual impact.

Sierra also collects the yeast used for bottle conditioning from these tanks, since ale yeast skimmed from an open fermenter is of the highest quality. Needless to say, these breweries don't allow tourists to traipse around their open tanks, because it is a recipe for disaster. I used to work at a German-style brewery that uses open fermenters. The only major problem this brewery ever had with the open tanks was a drunk college kid. This brain child jumped into one of the tanks after sneaking into the fermentation room during a raucous night out. Amazingly, he made it out of the pub without being noticed.

I could go on and on about open fermenters, because I think they're pretty slick. After working with open fermenters, I adopted the philosophy that fermentation is pretty robust. To screw it up you have to be fairly negligent. With this said, just remember that there is a lot to neglect in a brewery. That's why open fermenters should be used with great care.

Mr. Wizard

I have been brewing for about two years now, and I have a question about the classification of beer types. When I break out my homebrew to share with friends, I almost always get the same response: "This is homebrew? This is really great beer! What kind is it?" This is where I get stuck. Most of the beers I have brewed "evolved" from the recipe that came in my kit. I have added additional hops and grains, tried dry hopping and some mashing, and have come up with an excellent full-bodied, highly hopped, dark red ale. I have done my share of reading on styles, hop types, and brewing techniques but still have trouble answering that question. Is there an easy way to classify beer by ingredients or some other

feature? I know most beers are classified by taste characteristics, but I don't have enough time to try all of the different beer styles to see where mine fits.

Mark DeHoff
Baltimore, MD

You have asked one of those questions that pushes my buttons. I am not a big fan of beer styles. Styles seem to generate too much anxiety and bickering. In my opinion beer styles are best used as a brand identifier. If I go to the store and pick up a bottle of Joe's Stout, I should have some idea of its flavor. However, if I'm at your home and you give me a glass of homebrew, then you are right there to talk about it. You can say: "This is my favorite recipe. It started out as a red ale, but I beefed it up with some dry hops to give it a more floral aroma. Then I added some extra malts to give it more body. I call it DeHoff's Special Amber. What do you think?"

That's the real question: What does it taste like? A stylistic identifier does nothing more than suggest what the beer may taste like. The consumer doesn't really know what the beer flavor is until it hits the tongue. If I were you, I wouldn't feel too bad about not being able to identify my beer's style.

Now to answer your question. Beer styles are defined by yeast strain, original gravity, color, bitterness level, hop aroma, clarity, etc. The first tier discriminator is ale vs. lager. Your beer is an ale; that automatically eliminates all lager styles. Next you need to know the original gravity. If the gravity is very high, say over 1.080, you may want to call it a barleywine. Then look at color. Is it amber, brown, black, yellow, or bronze? How bitter is the beer: 15, 25, or 45 IBU? Is it cloudy or clear? This distinction separates hefeweizen from kristall-weizen.

Continue picking apart your beer until you can give it a style. Charlie Papazian wrote a three-part article for The New Brewer in 1992 with the information you're looking for. The series was called "Beer Styles Guidelines" and was printed in the January-February 1992, March-April 1992, and May-June 1992 issues.

To be really good at identifying style, you need to train your palate. This is a difficult and time-consuming job, because you have to drink as many different beers as you can find. Go down to the Brickskellar in Washington, DC, for a stellar selection of beers and beer styles. Spend some time tasting beers from around the world representing different styles. Take your trusty *Pocket Guide to Beer* by Michael Jackson to help pick beers representative of the many styles of the world.

If you do all of this, you will have memories of dozens of beers, tables describing various styles, and a bottle of your prized brew. Now it's time to name that brew! Your beer still may not neatly fit into one of the stylistic pigeon holes. That's okay; just pick one that seems close. After all, a beer style is just a name that describes a group of similar beers.

I like Shakespeare's philosophy on naming. "That which we call a rose by any other name would smell as sweet."

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Mr. Wizard

In the article "Beyond Bitterness: Get the Full Effect from Your Hops" (August BYO), the following statement was made regarding the transfer of hot wort: "...even a little agitation at this stage can plant the seeds for serious oxidation later." I am confused. I thought much of the oxygen lost during the boil needed to be replaced by some means for healthy yeast growth. Thus, a little aeration or agitation at this point would be beneficial.

Scott Jarman
Sumner, WA

This does seem confusing. At the end of wort boiling, most of the oxygen in the wort has been lost and must be replaced. Because oxygen's solubility in wort decreases as wort temperature increases, you won't get much into the solution if you oxygenate hot wort. From a purely pragmatic point of view, the best time to oxygenate wort is when it is cool.

The point made in the article about planting the seeds for oxidation is a reference to the concept of hot-side aeration. Basically, hot-side aeration is the exposure of hot mash or wort to air. Current literature has implicated hot-side aeration as a contributor to oxidation. The mechanism for this is the oxidation of malt fatty acids by malt enzymes called lipoxygenases.

These enzymes convert fatty acids into very reactive compounds known as fatty acid hydroperoxides. Fatty acid hydroperoxides spontaneously decompose into potent aroma compounds and reactive compounds that give rise to more hydroperoxides. Many of the aroma compounds are responsible for the classic oxidized aroma in beer. If these reactions are spawned in mashing, they will continue into fermentation and even into the bottle. The result is oxidized beer. (By the way, this is not the only way to oxidize your beer.)

This is true during mashing because the lipoxygenase enzymes are present. However, if you don't splash the mash around and aerate it, these enzymes won't have access to the oxygen they need to do their business. Since the enzymes are destroyed during boiling, you are safe from their wrath after boiling, even if the wort is hot. This means that splashing around hot wort that came from a gently treated mash should not cause too many problems. In fact many breweries in England aerate the wort during boiling to help precipitate more tannins. This helps to prevent hazes in the finished beer.

At Coors there is a wort chiller made of a series of pipes carrying a cooling solution. The pipes run up and down in an enclosed room. Wort falls over the pipes and runs out of the room through a pipe in the floor. A Coors spokesman said that they are very careful not to aerate the mash, but once they collect and boil the wort they're not too worried about hot-side aeration.

At Anheuser-Busch they use a device called a volatile stripper to remove unwanted volatiles after boiling. This device also exposes hot wort to air. If any beer is susceptible to showing off oxidized characters, Bud and Coors would surely be top candidates. Since I rarely bump into an oxidized

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Bud or Coors, my conclusion is that these practices don't contribute to oxidation.

Be kind to your mash, lauter carefully, boil, and take it from there. Aerating your hot wort after boiling it most likely won't hurt, but it's not going to do a whole lot of good either. The best time to aerate is after cooling. ■

Words from the Wiz

I just got back from the Pacific Northwest, where I saw some very large craft breweries. Among them: Redhook, with its new 200,000-barrel brewery (6 million gallons) a year; and Full Sail and Widmer, with their 250-barrel brewhouses (7,750 gallons per brew). These facilities are very impressive.

As these breweries grow, they are beginning to use technologies previously used by only the most modern breweries. Brewery work is hard, especially without the proper tools. Computers, automatic cleaning, and the like make large-scale brewing feasible and more consistent.

I get mail referring to large domestic breweries as factories. Their products as chemical waste. Their brewers as assembly workers. Does this apply to large craft breweries that use equipment in the same league as big domestics, employ workers with similar backgrounds, and who have the same passion for beer? I don't think this language applies to either brewer; they may make different types of beer, but they are all brewers.

Just be careful when criticizing big breweries simply for being big, because your favorite microbrewery may be the next megabrewery.

Mr. Wizard's Address

Do you have a question for Mr. Wizard? Write to Mr. Wizard, c/o Brew Your Own, 216 F St., Suite 160, Davis, CA 95616. You can also reach him by fax at (916) 758-7477, or e-mail at wiz@byo.com. Visit Mr. Wizard on the World Wide Web at http://www.ns.net/BYO.

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Clear Ideas about Filtration

by Gailen Jacobs

If your beer is thick with extra yeast or cloudy from chill haze, ask yourself one question: Does it taste good? If the answer is yes, don't worry about the less-than clear quality of your homebrew. The three brewing professionals we talked to this month all agree, clarity is only as important as you want it to be. There are methods homebrewers can use to cut back on excessive, overwhelming yeast in the finished project and the possibly damaging effects of chill haze. There are also some ways you can your keep lighter lagers light.

Brewer: Barbara Groom
Brewery: Lost Coast Brewery, Eureka, CA
Years of Pro Experience: Five
Education: Siebel Institute courses and classes at University of California, Davis.

I don't worry about clarity. Clarity really is not a problem, because Lost Coast's philosophy is that we make nice, rugged beers. We're on the coast, in the middle of nowhere, and it's cold. That's the feeling we also put in our beers.

We do filter our bottled beer such as Downtown Brown and Amber Pale Ale, but we don't worry when it's not clear. We also make unfiltered wheat, and we serve unfiltered beers at the bar. Our bottled beers can get chill haze in them, so when they get cold they get cloudy. I just don't worry about it.

More and more I think people accept the fact that beers are cloudy. Unfiltered wheat beers are really popular everywhere right now. People are beginning to realize that you can drink unfiltered beers and it really doesn't make a difference. Actually, I think the cloudy ones have more taste. If you don't filter, you have more hop flavor. More of the proteins are still in there, so you get more of a mouth feel.

For our filtered beers we have a DE filter (diatametious earth filter, a type of sand filter) we use after the beer ferments. Then we carbonate it and bottle it.

To help clarify our unfiltered on-tap beer, our strategy is to age it so anything heavy is going to fall out.

My advice to homebrewers is don't worry about it. I think the only time you have to worry is when you want your beer to be judged. Then it has to be clear.

To avoid excessive cloudiness in your homebrew, use a step mash and have a protein rest around 120° F. That's where your beta glucans (a product of the cell walls of the barley kernel) are broken down. We have a one-step mashing program, so we can't go through that process. We have to live with the equipment we started with.

If you don't filter your beer, you'll have extra yeast causing haze and chill haze. Chill haze comes from the protein chains in beer. These things don't hurt the beer at all. The yeast just settles out.

The only problem we have with sedimentation is that after a while on the shelf, the things that settle out make a cloudy layer on the bottom of the bottle that sometimes turns off customers. It can look really bad. I think that's one of the main reasons breweries try to filter.

Brewer: Eric Warner
Brewery: Tabernash Brewing, Denver
Years of Pro Experience: Seven
Education: Technical University of Munich at Weihenstephan.

Clarity is as important as you want it to be. In our beer at Tabernash, clarity, or the lack thereof, is very important. We make a Tabernash Weiss, which is a German-style hefeweizen, and the lack of clarity is important for that style. Hefe is the German word for yeast, and the yeast in the beer makes it cloudy, which is simply part of the style. For our lager beers, the Golden Spike and the Nargo Lager, clarity is important. It is a defining characteristic.

Clarity is basically determined by two things. There is yeast that affects clarity, and that's what I would define as microbiologically driven clarity. Then there is what I call chemically-physically driven or determined clarity. This is basically proteins, dextrins, polyphenols, or heavy metals

(like iron, calcium, or magnesium) that can react with each other using oxygen and/or light as a catalyst. When you add hot or cold temperatures, these proteins can cause chill haze, which can make a beer unclear.

DE filtration gets rid of the yeast. But we also put in a compound that is basically a silica gel in the filtration process. That removes some of the proteins that would cause the chill haze. The entire filtration process that we use is in accordance with the German Reinheitsgebot. It's really a common practice for most breweries.

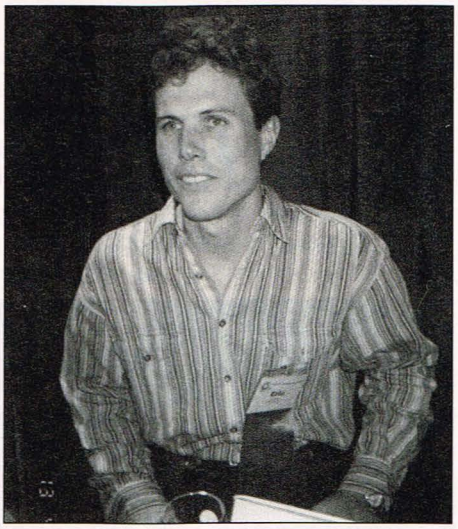
The reason commercial brewers go for total clarity is to control the shelf life of the product. Homebrewers don't really have to worry about that.

There is an argument that yeast can limit the shelf life of a bottled beer. Some people claim that at Sierra Nevada they bottle-condition their beer to add to the shelf life. But I don't know if I totally buy into that.

Bottle conditioning extends shelf life for a while. Oxygen is a catalyst for producing chill haze, and the yeast in the bottle can absorb any oxygen that might have been picked up at the point of bottling. Therefore, there would be less chance for chill haze. But that only works for a while because if the beer is kept warm, like in a floor display at a liquor store or supermarket, the yeast will start to autolyze (decay) or degenerate. That will start producing some funky flavors in the beer.

Homebrewers can control the beer's environment so that clarity as a preserving agent is less important. For homebrewers the importance of clarity depends on the style. Certainly the lighter color the beer, the more sense it makes to go to greater lengths for clarity. In a beer like a stout, there has to be a lot of yeast in it before you're going to notice that it's real cloudy. But in a lighter beer it'll be obvious really quickly.

I know homebrewers who play around with miniature filtration systems. I think that's crazy for homebrewing. To be honest, the best beers are ones that aren't filtered but have undergone a long, cold aging process that will naturally sediment out a lot of the yeast. The little bit of yeast that remains and the proteins that have not been filtered out give a nice-bodied beer. But don't go overboard; too much yeast in



Eric Warner earned a degree from one of Germany's top brewing schools.

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the beer and you just end up tasting yeast.

To cut back on excessive proteins, a good boil is important. You want some protein but not too much. Otherwise, you'll end up with proteins that make the beer bitter. Not in a nice hop bitterness way, but with an astringent, nasty bitterness.

There's not too much to do if you do get chill haze. You might be storing the bottled beer at too cold a temperature. The only solution is to chill the beer and drink it quickly. Once you see the chill haze, it means that time is not on your side. Turning down the temperature will help, but essentially everything that contributes to the chill haze is locked in the bottle. The ideal temperature for storing a bottle of beer is between 36° and 40° F. That's a good temperature for the yeast to hang out, but it won't be too cold to extend it into chill haze.

The best way to get clear enough beer when you're homebrewing is to get out the proteins you don't want. Have a nice long boil, make sure you don't get a lot of trub coming in to the wort that goes into the fermenter, and age the beer at a cold temperature before bottling and/or after it's in the bottle.

The most important thing in homebrewing is to make your beer taste as good as you want it to. Experiment with clarity. The number one thing that's great about homebrewing is that it's a miniature lab. You get to play with all these different variables. If you play around and come up with a beer, say an Indian Pale Ale, that's more cloudy than your buddy's IPA but you like the taste of yours better, then that's all that really matters.

Brewer: Kevin Stuart
Brewery: Dixie Brewing, New Orleans
Years of Pro Experience: Nine
Education: University of California, Davis; BS in fermentation science.

Our beer is brilliant. That's the terminology. Clear beer, or something you can see through, is brilliant. (At Dixie Brewing Co.) brilliant beer is 100 percent important. You have to have brilliant beer, because the public demands it. They don't like to look at a beer and see any type of haze or cloudiness. They will assume it's a bad beer. Brilliance is less important when it comes to wheat beers that are brewed in Germany and at a lot of micros. Those are generally hazy, and that's the style. It's allowed.

If I were strictly a homebrewer, I wouldn't consider clarity important at all. It can be very difficult to filter out everything you want to filter out, and filtration itself on the homebrew level can be a pain in the butt. I really don't think it's that important.

When it comes to entering your beers in competitions, the importance of brilliance is out of the homebrewer's

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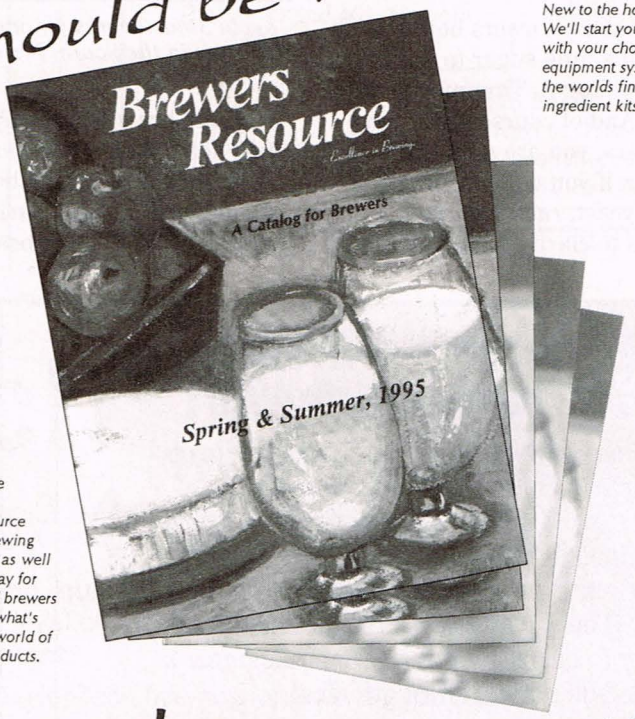

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hands. It depends on the judges' perspectives. If they want clear beer, you had better have clear beer.

You can buy some fairly easy-to-work filtration equipment that doesn't cost a whole lot of money. That's the best way to ensure brilliant beer.

We use some kettle coagulants in our brewhouse. The homebrew equivalent would be something like Spanish moss. We filter our beer twice through DE filters in addition to the kettle coagulant. We do a primary filtration to knock most of the yeast out to clarify it. Then we run it through a secondary fermentation, or polish filtration, with a tighter filter powder to get the beer brilliant.

A lot of homebrewers bottle condition, adding a little sugar to the batch and then bottling it. That puts yeast in the bottle. And of course if you have yeast in there, you are going to have a cloudy beer. If you use just the right amount of yeast, rack your beer a couple of times to clarify it, and keep it

Kevin Stuart works for one of the largest brewers in the South, Dixie Brewing Co.

cold, the brew can clarify on its own. Just don't shake it up too much.

I really don't think homebrewers should worry about clarity. I have judged beers in homebrew competitions, and every time I judge I ask the judges with me how important clarity is. These people (entering the tasting) are not professional brewers. This beer is not going to be for commercial sale. Is it *that* important if this guy has a chill haze in his beer? I think not. There is no consensus, because people don't give me any answer. They say "I don't know." Nobody knows. There are no guidelines for this, especially at a competition. They list what a beer should be, but if it's not brilliant, are you really going to knock this guy down just because it's got a protein haze? Some beers on the market today still have a protein haze in them. Some brewers don't even worry about it.

Nonetheless, it's completely up to the judges in the homebrew competition. Many judges are trying to steer the homebrewer into what could be considered a commercially acceptable beer. If you're thinking along those lines, then yes, you want your beer brilliant. You want to filter your beer. ■

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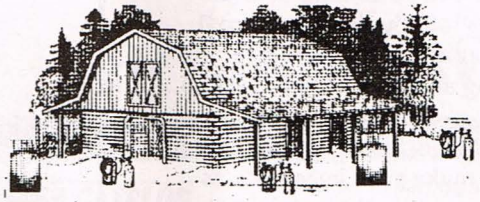

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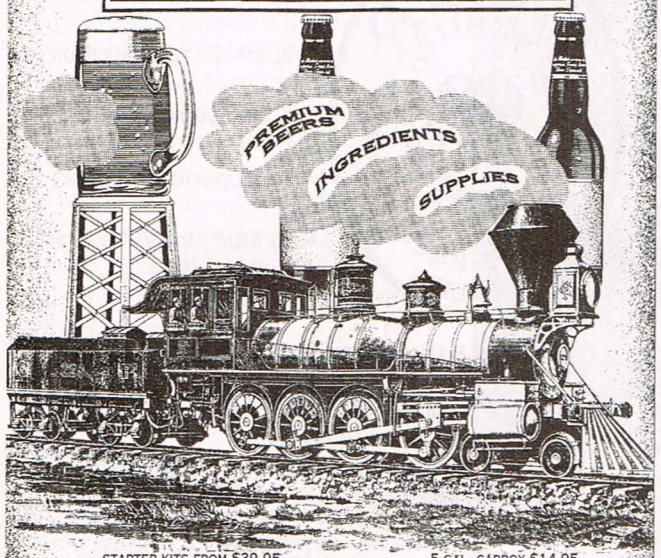

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Make Your American Pilsner a Classic

by Jeff Frane

"American pilsner" is essentially an oxymoron, along with "military intelligence" and "civil war." For whatever you may think of America's fizzy beverage of choice, "pilsner" means "made in Plzen." Or at the very least, "made along the general lines of beers made in Plzen."

Beers made in Plzen are pale, hoppy, malty, flavorful, all-malt, decoction mashed, triple fermented, and lagered for months. So for comparison, let's open a can of Busch (last ad I saw before I sat down). Lessee. Hmmm. Yes. No. No. No. Um, no. Hmmm. One out of eight? Statistically speaking, not a good match.

American pilsners, obviously, are pale, no hops, no malt, not much flavor (lots of gas!), made from a little malt and a little (or a lot) of corn, Congress mash, quick-fermented, and lagered for a couple of weeks. Crisp, dry, pale, gassy, and best served very cold. Well suited for sporting events (just the spectators, unless it's college rugby), burping contests, and lawn mowing. Clean. Very, very clean. In fact if you were to select the one unifying characteristic of all American pilsners, "clean" would be the best possible criterion.

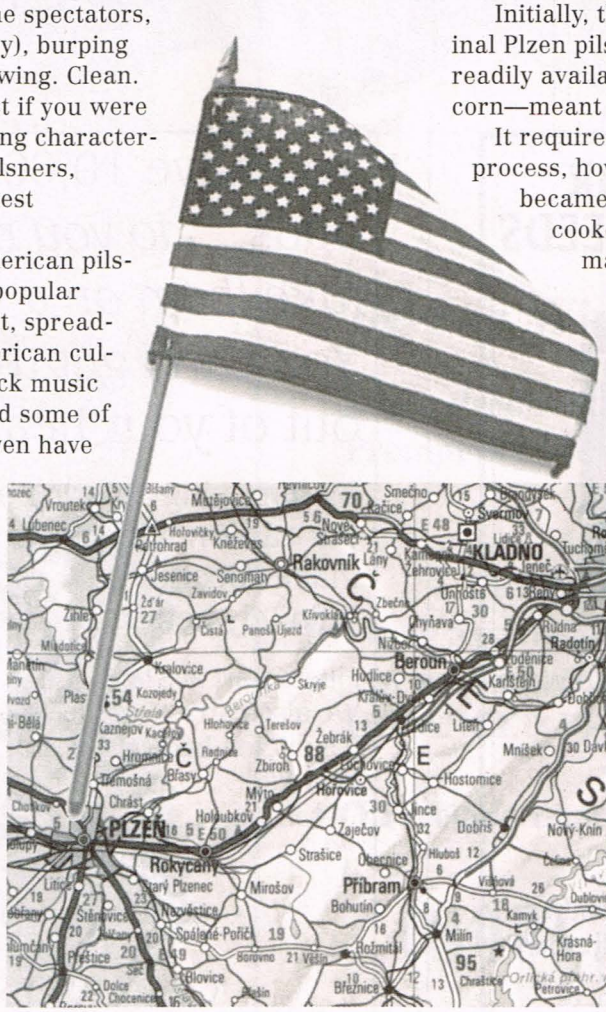
Admittedly, the American pilsner is easily the most popular beer style on the planet, spreading the tendrils of American culture along with bad rock music and running shoes. And some of those drinkers don't even have lawns to mow! Well, who am I to argue with success?

The curious thing about American pilsners is that they evolved at the hands of German brewers. During the 19th century, brewmasters seemingly arrived at Ellis Island by the boatload and spread across the country, starting or joining breweries throughout the East, the Midwest (must have been hundreds in Milwaukee alone), and all the way to the Pacific. Breweries were everywhere. The *Western Brewers' Handbook* from 1905 lists brewmasters residing throughout the region, and the names resound with Munich, Berlin, Dortmund. Well into the 20th century the language of brewing in America was German.

So how did this beer style evolve under men trained in rigid adherence to the Bavarian Purity Law, the Reinheitsgebot? What happened to "malt, hops, and water"? Economics, mostly, and a strong sense of pragmatism.

Immigrant German brewers soon found need to adapt. American malting barley was very different from what they were accustomed to, and it was expensive. American hops, well, American hops stunk (literally).

Initially, the beers must have been as close to the original Plzen pilsners as the brewers could make them. But a readily available source of inexpensive fermentables—corn—meant that beer could be brewed more cheaply. It required an adaptation of the standard mashing process, however—one in which the corn (or rice, which became a signature in some breweries) was first cooked like porridge before being added to the malted barley in the mash tun. The process was particularly well-suited to the American barleys—six-row grains rich in the enzymes necessary to convert the corn starches into fermentable sugars but low in haze-producing proteins.



(A few years ago Portland's Blitz-Weinhard Brewery reintroduced their public tours. On the first day a tour guide informed us that the brewers needed to add a bit of malt in order to convert the corn, which was what beer was actually made from. The marketing director later explained to me that beer couldn't be made without

corn!)

The addition of cereals such as corn and rice had an additional benefit beyond simple economics. It became significantly easier to produce very pale, very clean beers when the brewer wasn't confined to an all-malt grist. It's also significantly easier to produce very crisp, dry beers. Over the years this new approach slowly became the norm. The process of dumbing down American beer accelerated as first regional and then national breweries

1900 Lager (All-Grain)

Ingredients:

- 8 lbs. 2-row lager malt
- 2 lbs. flaked maize
- 2 oz. Northern Brewer hops after 15 minutes
- 1/2 oz. Mt. Hood hops after 75 minutes
- 1/2 oz. Saaz hops after 75 minutes
- 1/2 Tbl. Irish Moss after 60 minutes

Step-By-Step:

My very soft water was adjusted with 4 grams of gypsum in the 3.5 gallons of mash water. Brewers should adjust their water accordingly.

Mash the malt at 130° F and hold for 30 minutes. Add the maize and raise the temperature to 152° F; hold until iodine test is negative (about 45 minutes). Sparge to six gallons and boil for 90 minutes.

Ferment at 55° F for 14 days, then reduce to 37° F over five days. Hold for three weeks. Keg and carbonate.

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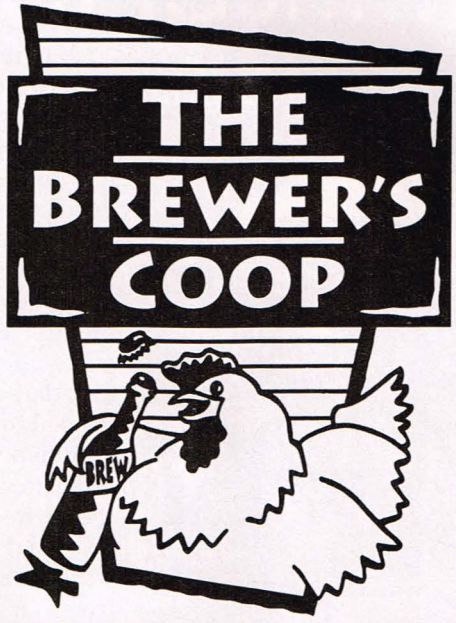

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erased the distinctions that had once been made in beers from town to town.

(Not everyone went along with the plan, however. Al Capone's bootlegging empire got a tremendous boost in Cicero, outside Chicago, where an overwhelmingly Bohemian population not only refused to quit drinking beer during Prohibition but insisted on real pilsner, brewed in Chicago but to the standards of Plzen.)

Clearly the style has continued to change over the years, as marketing geniuses convinced brewery owners that less equals more. Less color, less malt, and less hops meant more sales. It took a concerted effort, and a lot of money, to convince American drinkers that beer ought to be frothy and kind of boring and that they liked it that way.

(Once again, there were pockets of resistance. In the Northeast Ballantine persisted for years in producing wonderful hoppy ales, and in other regions even the lagers clung to the notion that they ought to have flavor.)

In the 1920s H. L. Mencken, a big pilsner fan, complained that Budweiser was "too hoppy." Hard to imagine that he was referring to anything like the current formulation. After Prohibition beer manufacturers increased their efforts to sell more beer to women, and the perception was that they were frightened off by strong flavors. (Ha, never met my wife!)

The truth is that a high hopping rate is the best way to balance the sweetness of corn and mask the

1990 Lager (Extract)

Ingredients:

- 3.3 lbs. Extra-light malt extract
- 3 lbs. 6-row lager malt
- 1 lb. flaked rice
- 2 oz. Mt. Hood or Liberty hops
- 1/2 oz. Mixed noble aroma hops

Step-By-Step:

Crush lager malt and soak with flaked rice for 60 minutes at about 150°-152° F in one gallon water. Sparge and add malt extract. Bring volume to 2.5 to three gallons and boil for 90 minutes. Add to equivalent volume of pre-boiled and cooled water. When temperature is at 70° F, aerate very well and pitch yeast. Reduce fermentation temperature to 55° F and then follow normal fermentation and bottling procedures.

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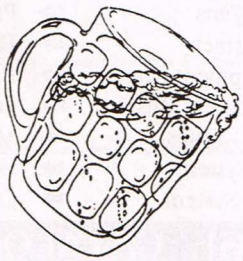

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"niblets" flavor that is so unpleasantly obvious in the cheapest of American pilsners.

Over the years the marketers developed new categories to sell the beer. In a subconscious admission of the degeneration they had encouraged, they introduced "premium" and then "super premium" categories to describe beers with less cereal than the standard brands. (Originally, the term "premium" meant that the brewer could charge a premium price for the beer.) One of the tastiest American pilsners I've tried, oddly enough, was a glass of Weinhard's Light beer (at the brewery taproom). The brewery had reduced the alcohol content of the beer by lowering the percentage of corn in the grist, and the beer was noticeably improved. Then, too, all the Blitz-Weinhard beers are hoppier than most American pilsners.

From time to time I've encountered homebrewers who have taken the attempt to brew American pilsners as a technical challenge. Efforts to reproduce the products of Anheuser-Busch or Miller Brewing require spotless sanitation and technological mastery. While I have no quarrel with either of those admirable goals, I have never felt the need to beat myself up to produce a beer I don't want to drink anyway. I have, however, succeeded in brewing my admittedly dishonest version of an American pilsner from the past. The inspiration for the beer came from whizbang brewer George Fix, who was in turn inspired by the Straub Brewing Co. of Pennsylvania. It has turned out to be my favorite—and simplest—lager.

It is, as I say, dishonest. A true clone would have been brewed from six-row malts, and its bittering hops would have been good old American Clusters. Not having any use for either ingredient, I cheated and used two-row malt and a better kettle hop. Early brewers did use imported finishing hops, so I felt safe in using the perennial pilsner favorite, the Czech Saaz, along with a modern version of the German Hallertau, the American Mt. Hood.

Following Fix's (and Straub's) lead, I've used flaked maize rather than the cheaper corn grits in order to avoid the cooking process and the resulting cooked-corn flavor. The maize adds a touch of sweetness, balanced here by an aggressive hopping rate, and boosts the original gravity while allowing for a crisp dryness. The gravity is way, way out of the standard range for American pilsners (about 1.040), or even real pilsners (1.048), and is virtually in

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bock territory, but has none of the heavy maltiness of a true bock. The maize likewise helps to produce a very pale, very bright beer.

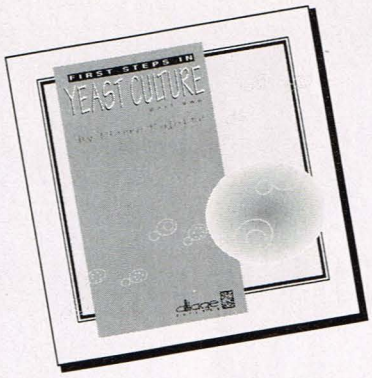
The mash is a simple, two-step infusion. The only demanding part of the whole process is that, as in any good lager, some kind of refrigeration is required for cool fermentation and a short lagering period. The lager yeast was chosen for its ease of use and its quintessential American pilsner character (very clean and neutral).

I like to think this is a pretty good representation of what my grandfather might have stopped in at the tavern for, had he lived in Pennsylvania. Maybe even a little better.

I've also included a very simple extract-based recipe, much closer to the modern American pilsner style than mine. Getting an extract beer to be as pale as that is really tough, but the use of flaked rice should help. If you follow this route, find the palest extract you can. The recipe calls for a mixture of noble aroma hops in the finish. Good choices are Saaz, Mt. Hood or Liberty, Tettnanger, and Willamette.

In either case use plenty of good lager yeast, preferably a liquid culture with a two- to three-quart starter. Aerate well! Ferment as close to 50° to 55° F as possible; if you can lager the beer, you should definitely do so. If you are going to be bottle-conditioning your beer, you will either need to do so after secondary fermentation or re-pitch yeast at bottling time. (There is nothing like having a kegging system if you're going to be brewing lagers.)

If you make the all-grain beer, don't bother entering it in any competitions as an American pilsner. It's got way too much going for it. ■



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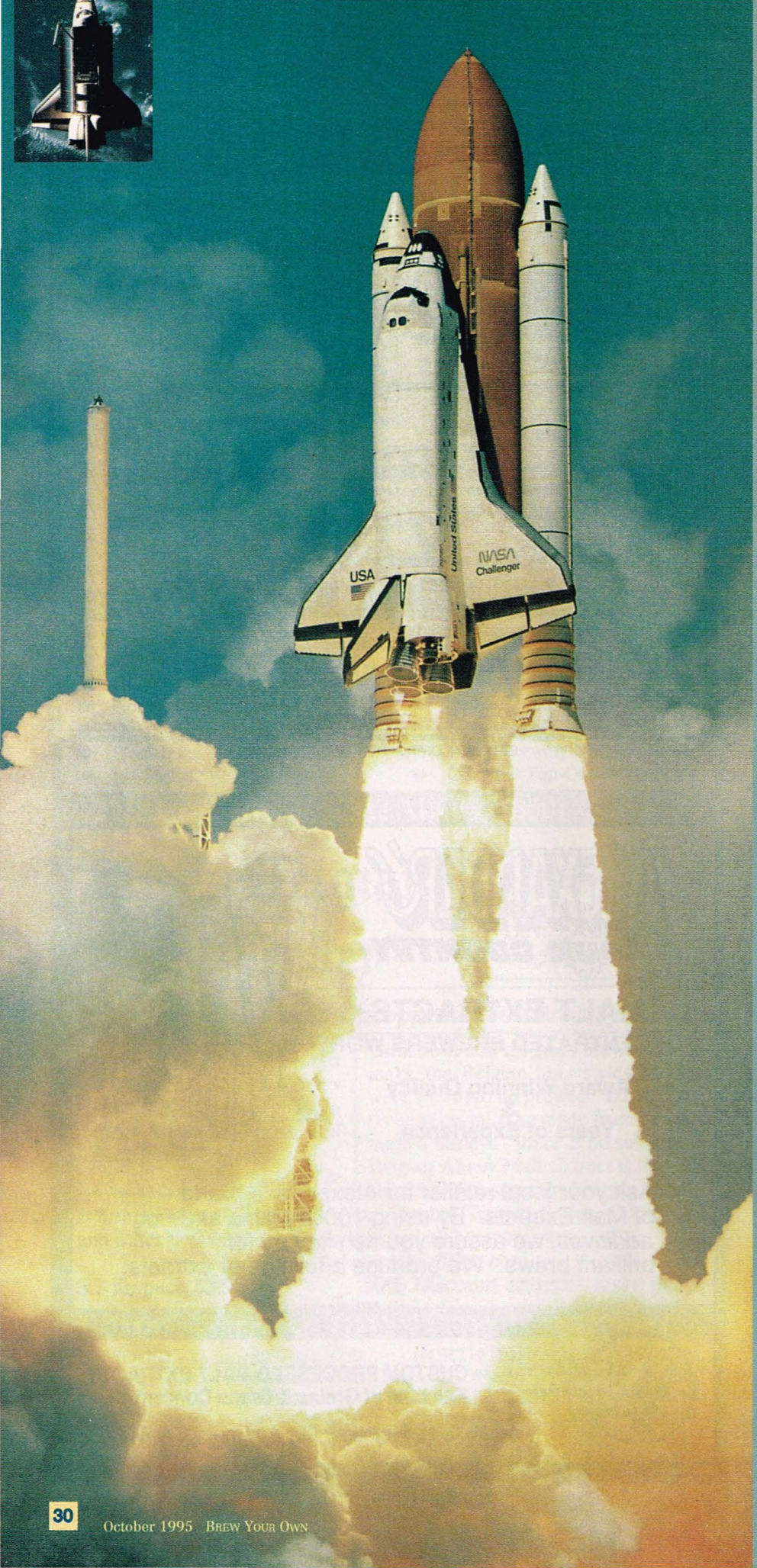


Brewi

by Sal Emma

Three Million Miles, One Great Ale

Bill Readdy is one of those daring, happy-go-lucky astronaut types. The kind we idolized in the film "The Right Stuff." An Annapolis grad and former Navy flyboy—he completed stints aboard the carriers Forrestal and Coral Sea—Readdy was an instructor at the Naval Test Pilot School before joining NASA as a research pilot in 1987.

Readdy (pronounced "reedy") is also a homebrewer with a bent for adventure.

He was among seven astronauts who blasted off in mission STS-42 aboard the Space Shuttle Discovery January 22, 1992. It was Readdy's first shuttle flight. Discovery was carrying 42 official experiments. Experiment number 43 was not so official. Readdy had smuggled aboard a bag containing nine ounces of Cascade hops.

He stowed them in the fresh food locker, where they were discovered by a fellow crew member who almost ate them. You have to remember, space food doesn't always look like food. Fortunately, Readdy rescued the hops from his colleague's gastronomic scavenging.

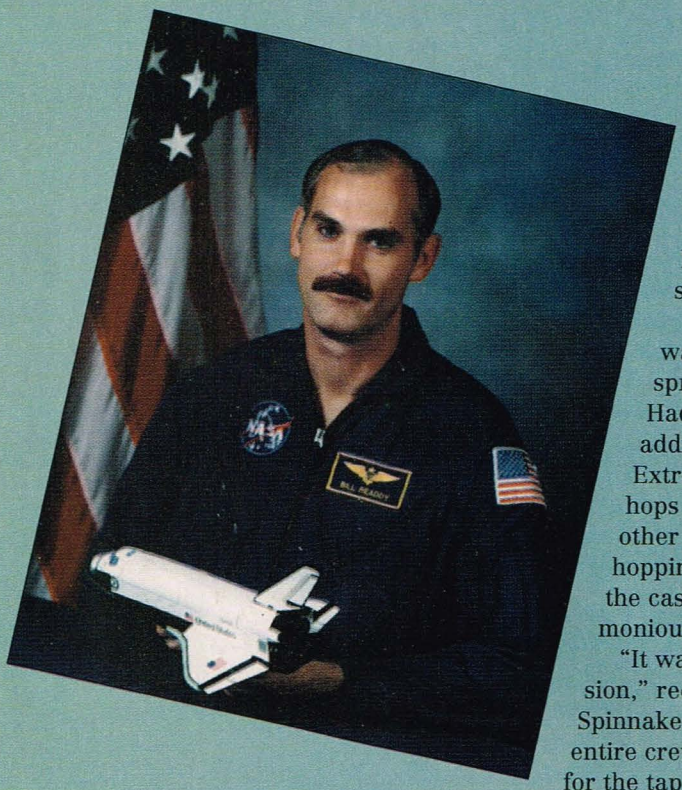
The shuttle's payload was the European Space Agency's IML-1, the International Microgravity Chamber, where experiments would be conducted to measure the effect of weightlessness on people, roundworms, fruit flies, slime mold, wheat seedlings, and other creatures.

The IML, the crew, and Readdy's hops, orbited earth 128 times, traveling in excess of 3 million miles before landing at Edwards Air Force Base, California, January 30.

Space photos courtesy of NASA

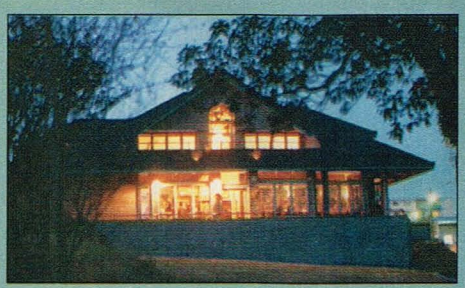
ng in Zero Gravity

Astronauts, Rocket Scientists, and Beer in Space



Space Beer

The Canadian Space Agency played a major role in STS-42. On board was Roberta L. Bondar, M.D., a neurologist hailing from Ontario. And one of the lab's 42 experiments was designed by Dr. John Boyce of the University of British Columbia in Vancouver. Boyce and Readdy are friends. Boyce frequents Spinnakers Brewpub in Victoria, British Columbia, where arrangements were made to brew a batch of ale with Readdy's space hops.



Spinnakers Brewpub, where the conspirators celebrated their clean get away.

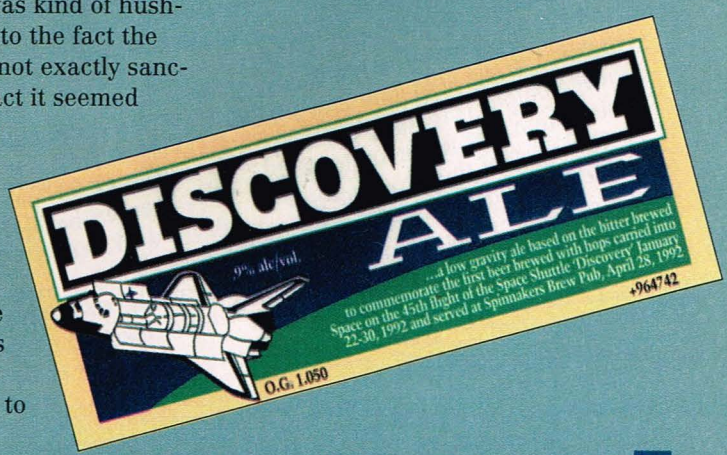
The hops made their way to Spinnakers that spring. Proprietor Paul Hadfield supervised their addition to five barrels of Extra Special Bitter. Half the hops went into the kettle, the other half was used for dry hopping. The ale was racked to the cask on April 10 and ceremoniously tapped April 28, 1992.

"It was a momentous occasion," recalls Simon Foster, Spinnakers comptroller. "The entire crew of STS-42 made the trip for the tapping. The University of British Columbia was their last debriefing stop, so they were all in the area. They had to travel several hours by bus and ferry to get here. We had an open cocktail party, attended by the astronauts, a contingent of NASA and CSA people, and a few others who just happened by," he says.

Readdy pulled the first glass, tasted it, and publicly declared the ale fit for human consumption.

The whole thing was kind of hush-hush, probably owing to the fact the hops experiment was not exactly sanctioned by NASA. "In fact it seemed Readdy and the whole crew got into a bit of hot water over the stowaway hops. I guess NASA figured this sort of thing wouldn't sell in Middle America. The CSA was a lot more easygoing about it. They seemed to have been tickled," says Foster.

Everyone who sampled the ale that night received a special commemorative certificate of authenticity, adorned with a red ribbon. And Spinnakers received a photo of Earth taken from the Shuttle, autographed by the seven astronauts. It hangs prominently at the brewpub for all to see.



Wort Speed: 28,000 Miles an Hour

Add another long, German word to your brewing vocabulary: Oberpfaffenhofen.

No, it doesn't describe the fluid dynamics of sparging through the grain bed. It's not a style. And it's not a way to describe the *je ne sais quoi* quality of your last batch.

In fact it's a village in the south of Germany, near Munich.

Oberpfaffenhofen is the Houston of Germany. From there rocket scientists and other intelligent life forms control Germany's space projects.

So what's that got to do with beer?

In April of 1993 Germany's best and brightest gathered at Oberpfaffenhofen to oversee a series of 90 German-born and -bred experiments aloft on the Space Shuttle Columbia. The German government chartered the shuttle for $150 million as a platform for its $410 million worth of experiments. Americans flew the shuttle, with their usual guidance from Houston, but German scientists at Oberpfaffenhofen controlled the scientific activity aboard Spacelab, housed in Columbia's cargo bay.

One experiment was sponsored by Beck and Co., the brewers. They placed a tube of fermenting wort on the Shuttle. Beck's researchers wanted to see what effect weightlessness and intense cosmic rays would have on the yeast and the beer they made with it.

The experiment consisted of two chambers, one cold, one warm. The astronauts inoculated a tube of Beck's wort with the yeast, then put it in the warm chamber to ferment at exactly 24° C (75.2° F) for 72 hours. Next, the wort was returned to the cold chamber for storage before returning to earth for isolation and more analysis.

One trick of the experiment was dealing with the carbon dioxide produced by the fermentation. It had to be vented to another special chamber, where it was neutralized, just like the carbon dioxide produced by the astronauts' respiration.

Flying inside the shuttle at 28,000 miles per hour, it was the fastest traveling wort on record.

Beck's said earth-based genetic engineering could, in theory, produce similar—possibly more predictable—results. But the people at Beck's don't go for genetically engineering their yeast, in the spirit of Germany's 16th century "Reinheitsgebot" beer purity law. So they decided to ferment some wort in space, expose the yeast to cosmic radiation, and see if any beer-improving mutations cropped up on their own.

Beck's said that plants and animals that are just a little different from their ancestors are created by natural means. This is what led to the diversity of life on earth, including the many hundreds of yeast strains we know today.

In contrast to genetic engineering, Beck's described its space experiment as "gentle technology—making use of intact yeast cells and the forces of nature that already exist in outer space."

After returning to Earth, the yeast was used to brew several test batches at the University of Munich. Becks was shooting for tastier beer, yeast that worked faster, and beer with less hangover effect.

The experiment cost the Bremen-based brewers around $130,000, one of the least expensive experiments aboard the German-chartered Shuttle mission.

NASA National Aeronautics and Space Administration

Captain Saaz and His Space Cadets

Billy Kendrick is an aerospace mechanical technician at the Kennedy Space Center at Cape Canaveral. He is part of the ET-SRB integration group, which mates the space shuttle's ET—the external tank—with the SRBs—the solid rocket boosters.

The external tank is the large, orange tank that the orbiter straddles when it takes off. The tank contains the cocktail of liquid fuels that fire the shuttle's main engines. The solid rocket boosters are the pair of big, white, crayon-shaped tubes on each side. Fired by solid fuel, much of it powdered aluminum, the SRBs' punch—combined with thrust provided by the three main engines—boosts the ship out of Earth's gravity and into orbit.

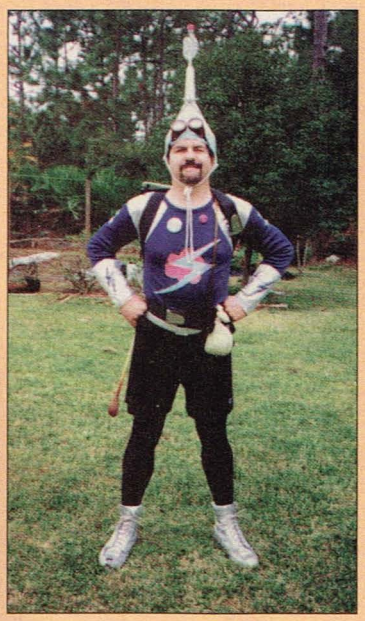
"Our work is a combination of mechanical integration, electrical testing, insulation work, and a host of other odd jobs getting the shuttle ready for launch," Kendrick says.

His team's work usually takes between 11 and 18 days. Unless, of course, woodpeckers are about. The team played a major role in repairing the holes woodpeckers recently bored in the external tank.

When he's not assembling space shuttles, he bangs the gavel at meetings of the Spacecoast Associates for the Advancement of Zymurgy (aka SAAZ), home to many a space techie and rocket scientist.

Actually, he does not do a whole lot of gavel banging, according to Carl Saxer, an Orlando water technician and beer judge who helped the SAAZ club get off the ground. "I'm pretty active in Central Florida Home Brewers, which is a really enormous club in Orlando. I was attracted to the idea of establishing a smaller club over on the beach. We've had a great time, and I am really glad I have gotten involved," Saxer says.

SAAZ has 50 or so members, many of whom are actively employed in the space industry. Saxer says SAAZ is a very easygoing, informal club geared to the basic needs of the homebrewer. And in spite of the lofty professional specialties of many of its members, he notes, "They're just regular folks. We get together, drink beer, and have a good time. If you



dropped in on one of our meetings, you would never know this group plays such a big role in space exploration."

Saxer, Kendrick, and a host of other Florida homebrew enthusiasts recently sponsored SAAZ's first American Homebrewers Association-sanctioned competition, "Commander Saaz's Interplanetary Homebrew Blastoff." Motto: "You Don't Have to be a Space Cadet to Enter, Rocket Scientists will Judge."

The competition drew brews from around the country, including some from as far away as California. Kendrick's Prickly Pear Mead took Best of Show honors. "I was really pleased that my mead won. I was kind of surprised, because I never expected a mead to win a beer competition," he says.

Kendrick's mead also took a 10th place overall in the melomel category of the AHA's recent national competition.

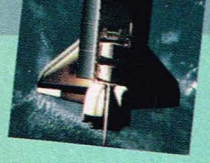
"Billy sometimes claims that his secret is using liquid hydrogen in the wort chiller," says Saxer. "But those who know him know that his real secret weapon is the Commander Saaz space suit he wears when he brews."

Kendrick lives in Cocoa Beach with his wife, Karen, and their two children. "Karen stirs. She likes my mead. And I can always count on her for an honest opinion of any new batch," he says.

Longtime friend and fellow ET-SRB technician Lynn Seelos' "Lynnweiser" took second place honors in the light lager category at the club competition.

Seelos has been in the space business since 1979. He started in research and development, helping build MX and Trident C-4 missiles before joining the shuttle project. He moved around with the shuttle during the redesign that followed the Challenger accident and again when plans were afoot to move the whole launch operation to Vandenburg Air Force Base in California. That plan was abandoned when Vandenburg was closed, and he moved back to Florida. He and Kendrick have been working together almost the whole time.

"Billy got me started. I tasted his beer and thought, 'If he can do it, I can, too.'" Seelos recalls. He is a lager man, using a spare fridge for temperature control. "I like to have a few lagers around at all times. I flip between styles, including American lager, Oktoberfest, Weizen, and others. Most of my recipes are mash-extract."



Homebrewing: Just Another Science Project

Mac Monroe is just your average rocket scientist who makes his own beer.

Monroe is project manager of a tracking facility for ballistic missile defense research. Unmanned rockets are launched regularly in Florida. His team is taking advantage of the schedule to study the missile plume, the pillar of fire that follows the rocket into space.

"I work for a firm you've never heard of, Nichols Research Corp. We don't build a whole lot of gear but rather are involved in aerospace study, analysis, research, software, and simulation," says the Melbourne, Florida, resident.

"Theatre missile defense is the big thing these days—anti-Scud stuff. One of the rockets most commonly used to launch satellites here is the Atlas, an old intercontinental ballistic missile (ICBM) design, very similar in its operation to the Scud of Desert Storm fame.

"The Atlas is powered by a combination of liquid oxygen and kerosene, just like the Scud. So our analysis of the Atlas plume can be applied without too much trouble to Scud defense," Monroe says.

Monroe describes himself as an aerospace engineer who is a "winding down cold-warrior."

"We worried about missile defense a lot more during the cold war. Now, like everyone else in this business, I am retraining."

He learned engineering at the University of Michigan, then stayed as an employee after graduating. That's when he met Roy Nichols, who founded Nichols Research and would later hire Monroe to work for his start-up firm. Monroe was one of 35 employees when he started. Nichols employs some 1,700 today.

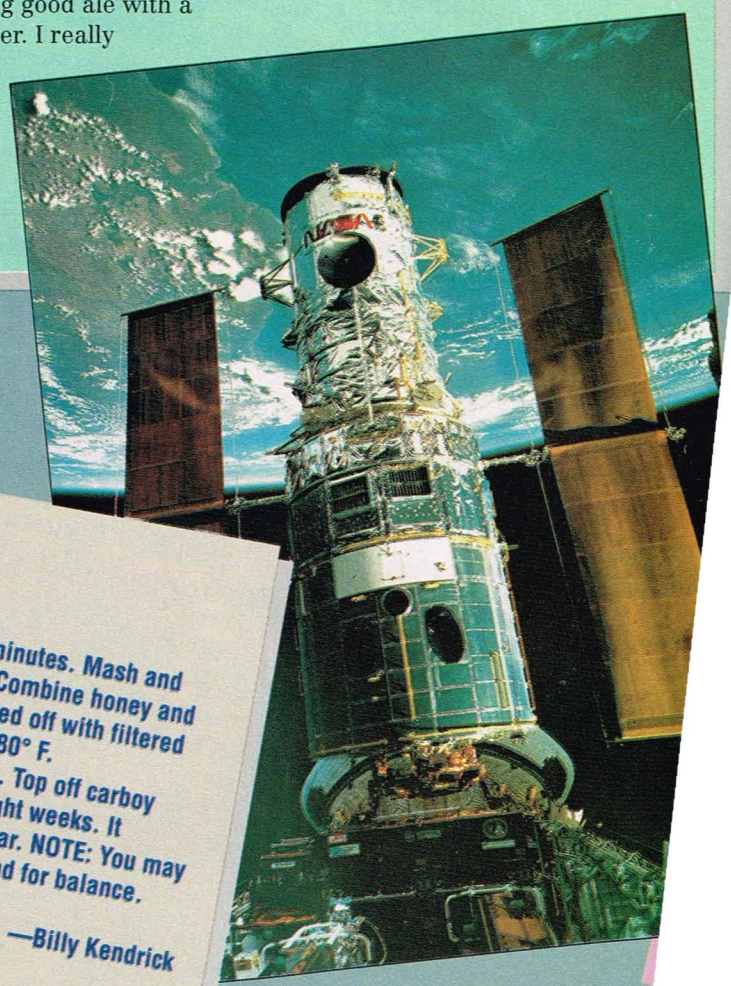
Monroe has been homebrewing "since before it was legal." He says it was economic pressure that led him to it. "I was just married, and we were having our children. I was struggling to support a family. I liked good beer but did not like paying premium prices for it, so I decided to see if I could build some. Fortunately, I was successful."

Monroe is devoted to malty ales. "My brewing activities lean toward the challenge of creating good ale with a strong malt character. I really enjoy Scottish ale but also make pale ales and steam beer. I don't have any temperature-control equipment, so I do not make lager. And living in Florida I don't brew at all during the summer. I like the mash-extract method and hope to try all-grain some day."

Monroe says it's the people in homebrewing he enjoys most. "In my experience homebrewers are friendly, cooperative, and helpful people. I have never met any mean-spirited people in homebrewing."

He once shared that thought with his friend Pat Baker of Underground Brewers in Connecticut. Baker liked it so much that "No Mean Spirited People" became the slogan of his brew club.

Monroe is a certified beer judge and beer judge examiner for the state of Florida. He and his wife, Christine, have four children. "Christine has been known to drink my beer. And she has always been very supportive of all my activities in the kitchen, from baking to cooking to brewing." he says.



Prickly Pear Mead

(for a five-gallon batch)
O.G. 1.140 @ 98° F
F.G. 1.048 @ 76° F

Ingredients:

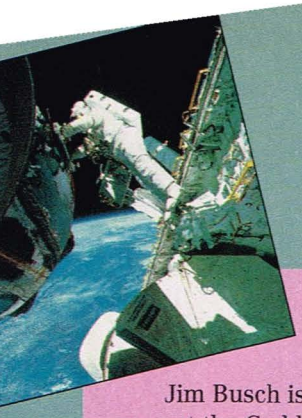
- 20 lbs. mesquite honey
- 115 prickly pears
- Red Star Prise de Mousse Yeast rehydrated
- Filtered tap water

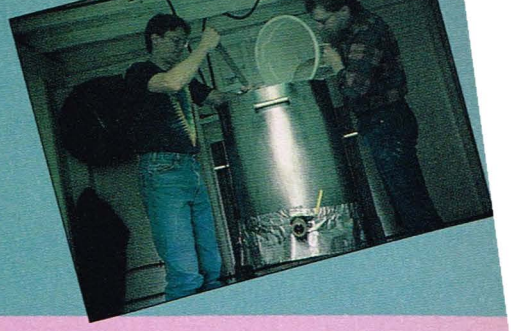
Step by Step:

Singe pears to remove thorns. Cut off both ends of pears, slice, and boil in three gallons of filtered tap water for two hours. Meanwhile, bring honey and one gallon of water to 170° F for 30 minutes. Mash and strain fruit in colander. Combine honey and fruit juice in carboy topped off with filtered tap water. Pitch yeast at 80° F.

Rack after five weeks. Top off carboy with water. Bottle after eight weeks. It should be very red and clear. NOTE: You may want to add some acid blend for balance.

—Billy Kendrick





From Hubble to Hopback

Jim Busch is an electrical engineer at the Goddard Space Flight Center in Greenbelt, Maryland. He works for Computer Sciences Technology and leads a team that develops software to process data from the Hubble Space Telescope.

"I like to think of us as the AT&T of NASA," says Busch. "We receive the raw telemetry from Hubble in real time, archive and process it into a form the scientists can use. We deliver information." Computer Science Technology's main customer is SCIF, known as "skiff," the Science Institute Facility in Baltimore. SCIF links Hubble with the astronomical science community.

Busch says he really loves his work and feels a personal sense of pride and accomplishment whenever astronomers use Hubble to make a new discovery. "Even with the mirror flaw, Hubble was an amazing instrument, making new discoveries nearly every day. Since the NASA repair mission, the images are nothing short of spectacular. NASA really came through," he says.

Busch's employer builds computer systems to process data for a variety of experiments aboard other space vehicles, including the gamma ray observatory, the XTE X-ray satellite, and a group of satellites known as ISTP, which act together to measure the effects of solar radiation on Earth.

Busch grew up in Maryland and earned his engineering degree at the University of Maryland in College Park. "As a kid I was inspired by the NASA accomplishments of the '60s and '70s, especially the Apollo program. I always had my sights set on space science and was lucky enough to catch a break when I landed the job at Goddard," he says. He has been working there for eight years.

He has been brewing since 1988, when he received a kit for Christmas. He has not looked back. "Within six months I was making it all-grain." He has made several trips to Europe in search of great beer. "I spent five weeks there in '91, 18 days in '93, and another 18 days this past spring in Germany, Belgium, Holland, and Britain. I have really fallen in love with Brugge, Belgium, and the Bavaria section of Germany."

Both in Europe and at home he has made friends in the professional brewing community. He even built himself a one-barrel brewery in his backyard that has been churning out homebrew since 1991.

"I'm an ale man. The house beer is my pale ale. I like to experiment with ESBs and other high-gravity English ales. And I have a beer engine now, so I regularly make batches of 'best bitter' for the beer engine."

His palate doesn't stop at UK styles. He brews an occasional weizen and recently started experimenting with Belgian styles. His Grand Cru "Esprit de Boire" was the commemorative beer for the 1995 AHA conference, "Planet Beer."

Busch is especially fond of experimenting with hops. "Recently, I have been sticking with one variety after bittering. Say Fuggles or Styrian Goldings in the kettle, (then) at the finish, dry-hopping. It has really given me and my beer-drinking buddies a chance to learn the perfect profile of each variety. You could spend a lifetime experimenting with hops. But I have to admit, the incredible selection of new malts on the market is also inspiring me to try new things, too."

With all that going on, he still finds time to expand his brewing experience even further. His latest venture is as an investor and consultant to Victory Brewing, a start-up micro and brewpub in Downingtown, Pennsylvania, near Philadelphia. Victory is being organized by veteran brewers Ron Barchet of Old Dominion Brewing in Virginia and Bill Kovaleski of Baltimore Brewing Co.

"We are doing things a bit differently than most. For starters, Victory will be a full-decoction house, producing both ale and lager. And we plan to use whole hops exclusively whenever possible. We are building a hopback," Busch says.

A hopback is a container that holds a bed of whole hop flowers, through which the wort is filtered before pitching. It is an old-fashioned and natural way to remove the kettle hops and provides a secondary benefit of adding additional floral hop character to the finished product.

The team plans a basic lineup including a Märzen, a Dortmunder-style lager, and a strong American pale ale in the 14° to 15° Plato range.

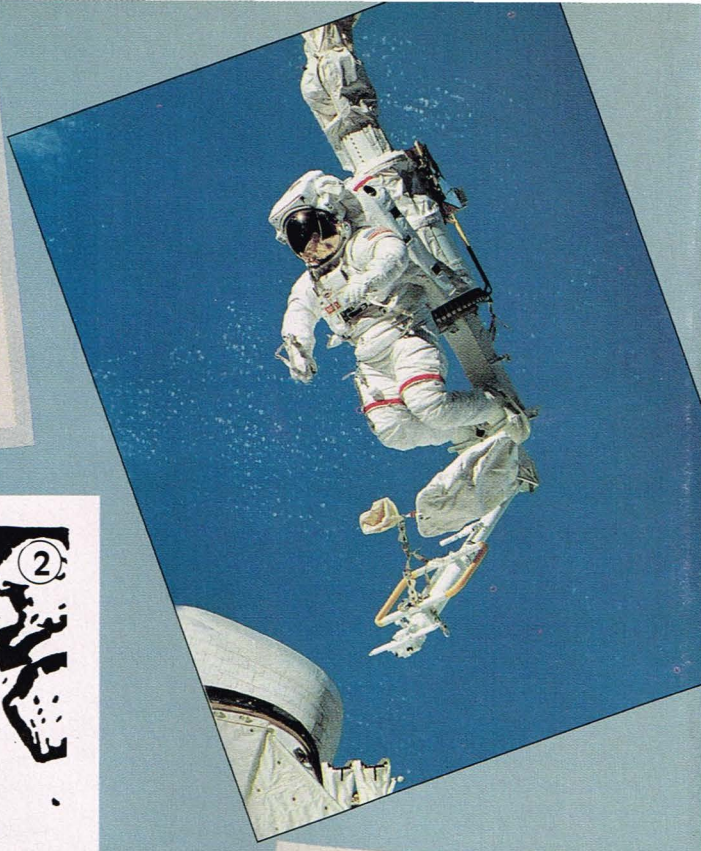
"Our goal is to create a classic American Ale using a lot of caramel malt and a blend of American hops," he says. Specialty and seasonal beers will be added regularly. They plan to bottle and ship right away.

Conversion of an old Pepperidge Farms bakery has been underway since August. Victory's first barrels should be tapped by the end of the year, barring any roadblocks from Uncle Sam or the Commonwealth of Pennsylvania.

Busch is having a ball learning about good beer. "The more you think you know about beer, the more there is to figure out." he says.

Interstellar Alcohol

A group of British astronomers recently switched on the huge James Clerk Maxwell radio telescope atop Muana Kea, Hawaii. They aimed it at G34.3, an enormous interstellar gas cloud. They discovered that the cloud is, by nature, a little tipsy. That is, its main component is ethyl alcohol! Scientists estimate that it would take 400 trillion-trillion pints of beer to equal the volume of ethanol floating around in G34.3. Too bad its 10,000 light years away.



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Lynnweiser

(for a five-gallon batch)

Ingredients:

- 3.3 lbs. premier American rice beer extract
- 1 lb. light dry malt
- 2 lbs. pilsner grains
- 2 oz. wheat grains
- 2 oz. cara-pils grains
- 1 tsp. gypsum (optional)
- 3 oz. Saaz hops plugs
- Wyeast 2007, St. Louis Lager

Step by Step:

Mash grains at 122° F for 30 minutes. Raise temperature to 152° F for one hour. Sparge with 170° F water. Boil liquid, extract, dry malt, and two ounces of hops for one hour. Add to carboy with cold water. Pitch yeast. Let sit one hour and rack wort off of trub. Ferment in refrigerator at 48° F for two weeks. Rack into secondary and add one ounce hops. Ferment in secondary at 34° F for a minimum of three weeks.

—Lynn Seelos

Roll Program Barley Wine

(for a five-gallon batch)
O.G. 1.100, F.G. 1.025-1.040

The Space Shuttle launch sequence is controlled from the Kennedy Space Center. Soon after the vehicle clears the control tower, Mission Control in Houston takes the reigns.

"After they clear that tower, you will hear the commander call 'roll program.'" says Carl Saxer, SAAZ member and spaceflight enthusiast. "That's the culmination of two years or more of preparation, and the moment when the mission officially begins. The commander is often so elated to make that call that you can hear the emotion in his voice. It's very exciting to hear, once you know what you are listening for."

In honor of that special call when the shuttle crew gets permission from Houston to execute its first roll maneuver, Saxer developed a special homebrew, "Roll Program Barley Wine."

"It was so named because if you drink enough, it will give you the same feeling the astronauts get when they execute that first roll," he says.

Ingredients

- 16 1/2 lbs. unhopped light malt extract syrup
- 1/2 lb. crystal malt
- 1/2 lb. cara-pils malt
- 3 oz. Chinook hops (36 HBUs) for 60 minutes
- 2 oz. Cascade hops for 5 minutes
- Wyeast 3021, Pasteur Champagne yeast

Step By Step

Steep grains in 1 1/2 gallons of water at 150° F for 30 minutes. Remove grains and add malt extract. Bring wort to boil and add Chinook hops. Boil for one hour. In the last five to 10 minutes of the boil, add Cascade hops. Strain wort into the fermenter and top off to five gallons. When wort has cooled to below 75° F, pitch the yeast. Ferment near 65° F if possible.

This beer will take longer than normal to ferment due to the very high original gravity. Do not be alarmed if it is still fermenting after a month. Allow it to ferment to completion before bottling. Prime for bottling with 100 grams of corn sugar (barley wines have low gas volumes). This beer will taste horrible at bottling time. At six months it will start to taste pretty good. At a year in the bottle it will taste really wonderful! Be patient; it's well worth the wait. This recipe has won many awards at homebrew competitions across the country.

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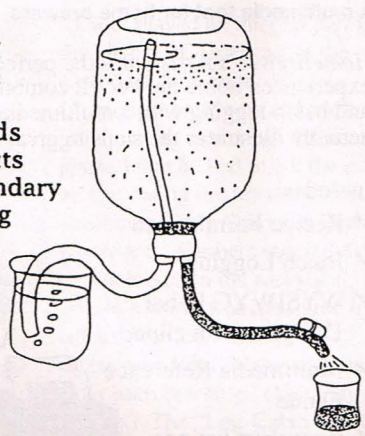

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Homebrewer in the Fire Room

Jim Ballinger is an electrical engineer at the Kennedy Space Center. He works mainly in the "fire room," from which the launch sequence is controlled. He concentrates on the orbiter interface—the main launch control computer system.

"With about 20 other engineers, we stay real busy from the time the orbiter lands at Kennedy—on its own or on the back of a 747 from California—to the time it launches again. We oversee operation of a number of computer systems that keep the process flowing," he says.

"Our biggest challenge is the fact that most of the shuttle's components developed directly from the Apollo program. Our systems and protocols are from an earlier time, but we have to keep them current in today's environment.

"We enjoy our work. And we are very proud to be a part of the space program."

Ballinger started out as a jet mechanic and flight operations engineer in the Navy. After the service he earned his bachelor's in aircraft engineering. His first private sector aerospace job was as a technician with Grumman. "A later promotion at Grumman put me in the position to make a lot of contacts in the industry, and I landed a job at the Space Center." He has been there since 1988.

Ballinger has been brewing for two years. "I have a friend who has been a member of SAAZ for a few years. He got me started after I tasted how good his beer was. I always liked to cook, so it was a natural progression.

"I pretty much stick with kits, adjusting the hops the way I like them. I usually start out with a hop tea, adjusting it until it tastes right, then add the extract and finish the batch. I like to try different yeasts, too.

"I like the German styles best. Oktoberfest is one of my absolute favorites, and I try to keep some of that around as much as possible. Unfortunately, I am always running out of homebrew. It doesn't seem to last very long once it's ready to drink!"

He lives in Port St. John with his wife, Kathleen, and two children.

Author Sal Emma is a homebrewer from Cape May, New Jersey. He hangs out on CompuServe's Beer Forum, where you can find him at 71302,1424.

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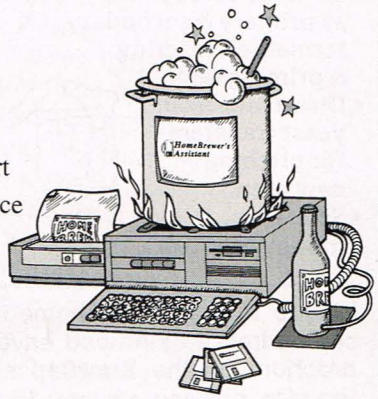

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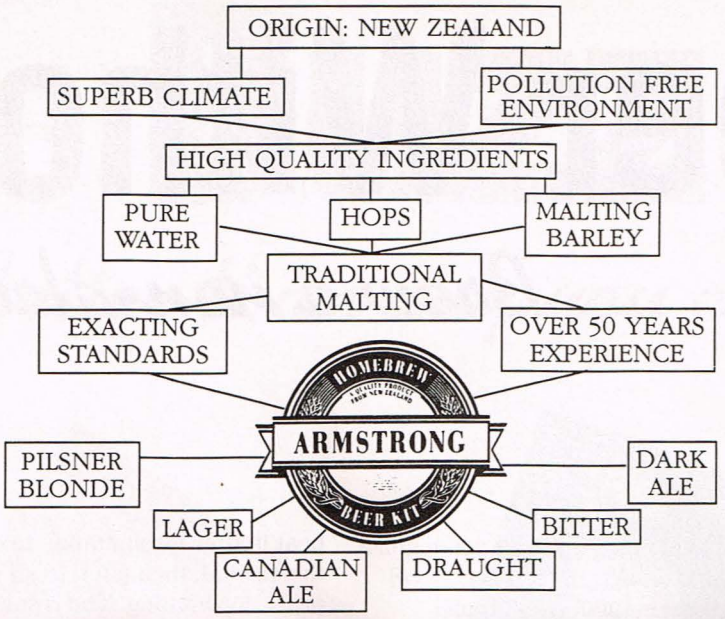

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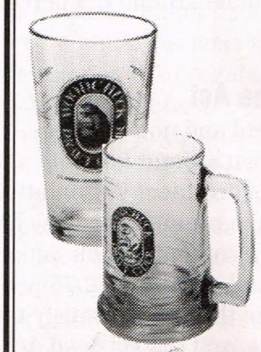
The History of Cider 101

Professor Marmota Monax

Chapter 2: America's Original Politically Correct Beverage



Cider played an integral part in the history of America. In the early 1600's, Samuel de Champlain enjoyed a cider after a grueling day exploring, but complained that he had to cut the cidre with an axe during the intense winters. Hence the term "hard cider" was born. Early Colonists fermented fresh cider as a way to preserve it. Farmers quaffed a quart or two before a day busting their pick in the rocky soil. Often a village's worth was measured by the number of kegs of cider cellared for the winter.

President John Adams calmed his flatulence with a "jill" of cider each morning. (You may know someone who could use this tip.) The "Log-Cabin-and-Hard-Cider" campaign swept President William Henry Harrison into office in a landslide and elevated cider to the first politically correct beverage.

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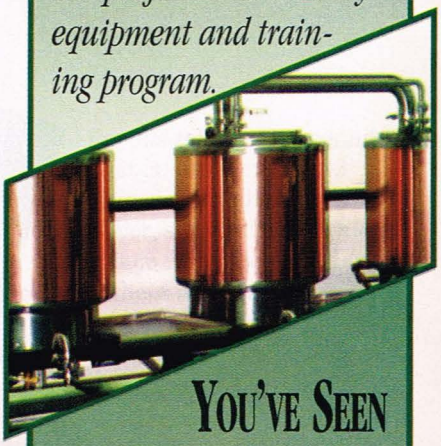

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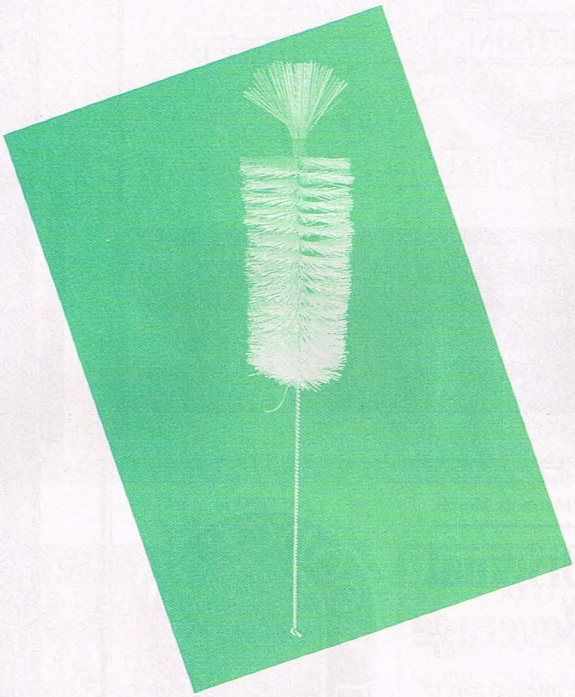


By John Naleszkiewicz

For those times when you're dying for a beer but don't want to get bogged down, you can make a beer that is low in alcohol but high on flavor. You don't even need any fancy equipment. Just a large pot (like your brew kettle) and a way to heat it (like your oven).

You can turn any beer you make into a non-alcoholic brew. You say you can't find a non-alcoholic stout? Then just whip up a batch of your favorite stout and convert all of it, or just part of it, to a non-alcoholic version. It just takes a few simple, extra steps.

You are in control of the amount of alcohol left in your beer. The basic idea is to brew a batch of you favorite beer, heat it after fermentation to drive off the alcohol, then pitch fresh yeast and prime for bottling. The resulting beer isn't really completely alcohol free, but it can be very low in alcohol content.

The temperature and duration of the heat applied to drive off the alcohol will be one factor in determining how much alcohol is left in your beer.

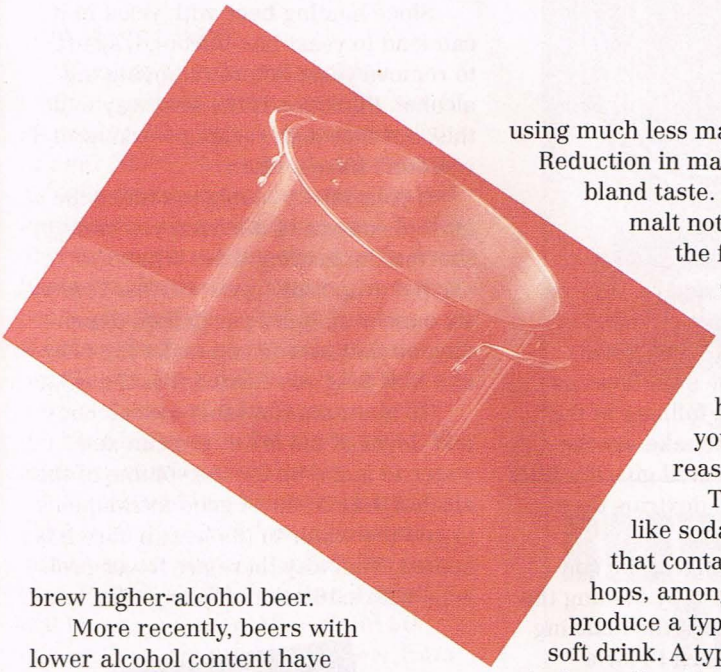
The other factor is the amount of priming sugar used to carbonate the beer. If you use 1/2 to 3/4 cup of priming sugar, it will contribute less than 0.25 percent alcohol to the beer. If you strive to remove virtually all the alcohol, the alcohol content of your finished brew will be less than one percent and most likely will be around 0.5 percent.

Caught in the Act

Low alcohol and non-alcoholic beers have been around for quite a few years. In 1917 President Wilson attempted to pacify the prohibitionists by limiting the alcohol content of malt liquors (except ales and porters) to 2.75 percent. Of course this did not satisfy the prohibitionists, and the Volstead Act was passed by Congress in 1919. Under this new law no brewed beverages could contain more than 0.5 percent alcohol by volume. This led to the brewing of a wide variety of "tonics" as the breweries struggled to stay in business. Once Prohibition was repealed, in 1933, the breweries were again allowed to

the Buzz

beer better than any you can buy.



brew higher-alcohol beer.

More recently, beers with lower alcohol content have become popular because they have fewer calories than regular beer (alcohol is high in calories).

In addition to the low-alcohol beers, non-alcoholic beers have become popular. Even the major US and European breweries are producing and advertising their non-alcoholic lines. This is just fine, but many of these brews taste pretty much like their light-bodied, higher-alcohol brothers. Where can you get a good tasting non-alcoholic beer? The answer is to brew a flavorful non-alcoholic beer yourself.

Make Beer, Not Soda

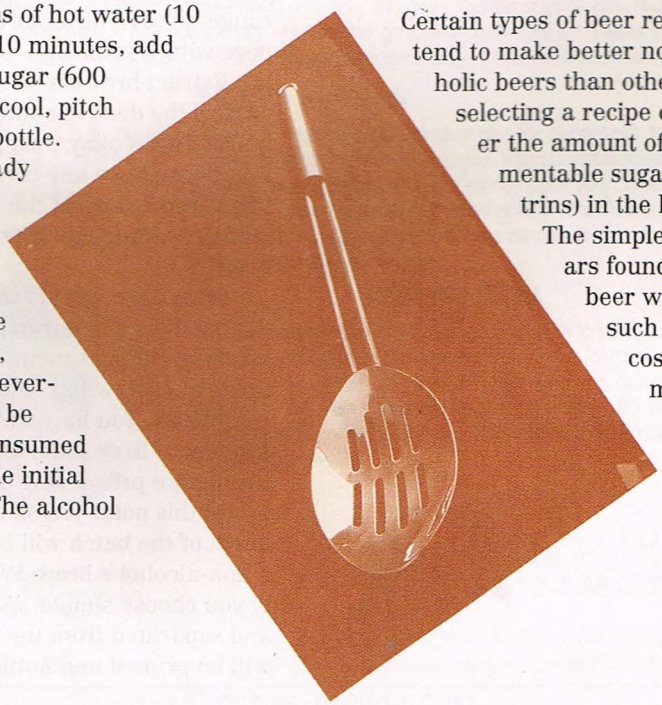
You may guess that non-alcoholic or low-alcohol beers would be made by using much less malt. On the contrary. Reduction in malt results in truly bland taste. Remember that the malt not only contributes to the fermentable sugar content but also to the overall taste of the beer. If you want the beer to have a beer taste, you need to have a reasonable malt content.

There are some beer-like soda kits from Europe that contain malt extract and hops, among other flavors, to produce a type of beer-flavored soft drink. A typical kit is surprisingly small, with only 3.5 ounces (100 grams) of ingredients. You dissolve the kit in 2.6 gallons of hot water (10 liters), boil for 10 minutes, add 1.3 pounds of sugar (600 grams), strain, cool, pitch the yeast, and bottle. The brew is ready to drink in three to five days.

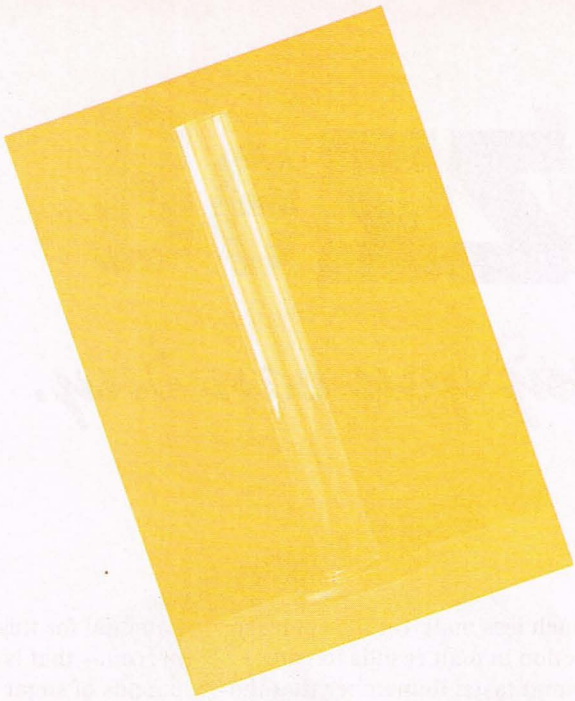
The resulting brew will be a slightly sweet, beer-flavored beverage that should be kept cold, or consumed quickly, after the initial fermentation. The alcohol potential for this mixture is around 1.6 percent—that is, if the entire 1.3 pounds of sugar were allowed to ferment. However, since all the fermentation takes place in the bottles, this would turn them into hand grenades. The mixture would be seriously overcarbonated.

Save the Flavor

A better tasting—and safer—approach is to take an existing beer recipe and use it to produce a non-alcoholic brew. Since the process of converting a beer to a non-alcoholic brew takes place after the initial fermentation is complete, you can convert part of your next batch just to see how it works.



Certain types of beer recipes tend to make better non-alcoholic beers than others. In selecting a recipe consider the amount of unfermentable sugars (dextrins) in the beer. The simpler sugars found in beer wort, such as glucose and maltose, are



readily fermented by common beer yeast. More complex sugars, such as dextrins, are not fermented by beer yeast. These dextrins will not contribute as much to the sweetness as they will increase the fullness of the beer. If you're going to take out the alcohol, you might as well give it a little more body. The more dextrins there are the better.

The dextrin content can be controlled during the mash by holding the grains at the high end of the mashing temperature range (158° F) for a longer period. This causes the starch conversions to stay in the dextrin range, producing a more full-bodied beer with less alcohol.

Extract brewers will not be able to control the dextrin content of the mash. That's okay. Just pick a recipe that doesn't use any corn sugar, since this is used to boost the alcohol content without adding flavor or body to the beer.

Once the recipe is selected, brew the batch as you normally would. (The mashing changes mentioned above are optional.) Allow the beer to ferment completely. You may want to let the fermented beer settle an extra day or two before proceeding to the next step.

At this point you should decide how much of the batch will be converted to a non-alcoholic brew. Whatever quantity you choose should be siphoned off and separated from the quantity that will be primed and bottled normally.

In the conversion process you want to evaporate the alcohol from the fermented beer. The best way to do this is to heat the beer to the boiling point of ethyl alcohol (173.3° F) and hold it at that temperature until all the alcohol is gone (about 30 minutes). If you can, do this in your oven rather than on the stove top. Using the oven gives you more control over the temperature and allows you to heat the beer more evenly. This results in fewer changes to the beer's overall flavor.

Since heating beer with yeast in it can lead to yeast bite flavors, it's best to remove yeast before removing the alcohol. Filtration is the best way to do this, but thorough racking works well if you don't have a filter.

If your intent is only to reduce the alcohol content of the beer, you can shorten the heating time. When the alcohol evaporates, you will lose four to six ounces of liquid per gallon, depending on how strong you make the beer and how long you heated it in the oven.

To maintain the same overall body and flavor of the brew, you can add water to make up for the volume of the alcohol that is lost. A good technique is to add the water to the beer before it is heated. This way there are fewer problems with sanitation. If you prefer, you

Seven Steps to Buzz-Free Beer

1. Choose an all-grain recipe high in dextrin or, for extracts, corn sugar free.
2. Brew as usual and ferment completely.
3. Add water (to compensate for alcohol that will be lost in heating).
4. Heat beer in oven.
5. Taste test for alcohol.
6. Cool.

7a. Bottle or keg with forced carbonation, or

7b. Prime and repitch fresh yeast, bottle, cap, and wait.

can add the water during the priming instead.

Actually, if you want to make a low-alcohol rather than non-alcoholic beer, instead of evaporating the alcohol you can simply water it down.

Many of you are probably cringing right now, but if you started off with a full-bodied beer, this can be a reasonable option. This may well be how many of the commercial breweries produce their low-alcohol beers.

Turn Up the Heat

If you opt for the evaporation method, preheat your oven to its lowest setting. The target temperature is around 180° F. It is a good idea to use an oven thermometer, because it is not unusual for oven settings to vary by 25 degrees or more. Once the oven is preheated to the desired temperature, you can place the fermented beer into a stainless steel or enameled pot (your brew kettle should do nicely for this purpose) and put it in the oven. Leave the beer in the oven for about 20 to 30 minutes, stirring occasionally.

You should be able to smell the alcohol being driven from the beer quite strongly during the first few minutes. Progressively, the alcohol smell will become weaker. After about 30 minutes you can remove the beer from the oven and give it a final stir. You may want to take a teaspoonful, let it cool a bit, and taste it to make sure all the alcohol flavor is really gone. A word of warning, though: Hot, flat beer doesn't taste that great. But the intent is simply to check for any remaining alcohol.

Remember, once you touch the spoon to your lips do NOT use it to stir the beer any more. This is a sure-fire way to contaminate your brew with all sorts of nasty bacteria.

Once you are satisfied that the alcohol is all gone, you can cover the pot and start the cooling process. This is similar to the cooling process that takes place when the initial wort boil is completed. The easiest way is to place the brew kettle in ice water and wait a couple of hours.

During the heating of the beer, the alcohol was not the only thing that was driven off. If your beer had any hop fla-

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vor or aroma before the heating took place, these flavors and aromas will most likely be driven off. The only thing left from the hops will be the bitterness.

The hop aromas will usually be driven off within the first five minutes, while the hop flavors will be gone within the first 15 minutes. But there is a nice bonus to all this heating. Along with the intoxicating alcohol, the higher alcohols—including the headache-inducing aldehydes and aromatic esters—will also be spirited away. Overall, the malt flavor and bitterness from the original beer will remain pretty much unchanged.

Carbonating Your Brew

As you may have realized, the heating of the beer not only drove off the alcohol, it also killed any active yeast that was present.

If you plan to carbonate the beer by using forced carbon dioxide, then this is not a problem. Once the beer has cooled, just bottle or keg and pressurize as you normally would. If you don't have carbon dioxide pressurization equipment, you will have to carbonate the old-fashioned way—by using natural yeast action. This means you will have to add some fresh active yeast along with priming sugar or malt to your cooled concoction.

There are several options available related to how you prime and repitch yeast into the flat beer. The easiest is to prime with sugar or malt and add active yeast to the mixture. Try dissolving the priming sugars in the fermented beer before the beer is heated (the sugar will not be affected by the heat). The advantage is that you reduce the possibility of any bacterial contamination from this addition.

Once the beer has been primed, it is best to pitch actively fermenting yeast to ensure that the yeast will do its job quickly. Poorly activated yeast may take many extra weeks to carbonate your brew. The active yeast can be either an actively fermenting starter (the preferred method), or you can use rehydrated dry yeast.

To rehydrate dry yeast, dissolve it in about 1/2 cup warm water, cover, and let it sit for about 20 minutes before pitching.

Another option is to use the kraeusening method. This involves setting aside a portion of the original wort and using it to make a starter that will also act to prime the beer. If you plan to use the kraeusening method, be sure to set aside about 10 percent of the original wort for kraeusening.

Once the yeast is added to the cooled beer, you should bottle and cap as you normally would.

Now comes the hardest part of all homebrewing—the waiting. You still have to wait a couple of weeks while the beer carbonates. Finally, you will be rewarded with a homebrewed, naturally carbonated, non-alcoholic beer. So the next time you want to have that same great homebrewed taste but not the buzz, try converting part of one of your batches into a non-alcoholic brew. That way you'll be ready for the refreshment without the worries.

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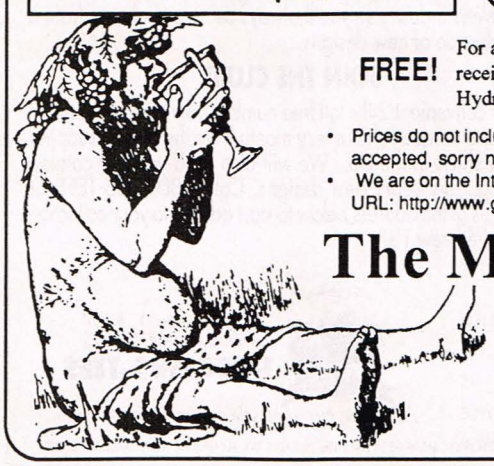

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Unlocking the Laws of Specific Gravity

by Kirk Fleming

The next time you brew a batch of homebrew, take a second to think about how much your beer weighs. A gallon of water tips the scales at 8.3 pounds. You've added malt, hops, yeast, maybe another ingredient or two depending on what you're brewing. So beer should be a lot heavier than water, right?

The answer is, it depends.

Specific gravity doesn't measure weight, but it does measure a related number: density. The density of something is its weight divided by its volume. The density of a gallon of water is 8.3 pounds per gallon, or 8.3 lbs/gal. If a gallon of beer weighs 8.4 pounds, its density is 8.4 lbs/gal. The specific gravity of a liquid is the ratio of its density to the density of water. The specific gravity of the beer is the ratio of the two values, 8.4/8.3 = 1.012. That means any volume of this beer weighs 1.012 times as much as an equal volume of water.

The word 'specific' is used to relate a measured quantity to some unit of mass, volume, or area. Specific gravity (SG) relates the weight of a unit volume of a liquid to the weight of a unit volume of water. Luckily, you don't have to weigh your wort, weigh an identical volume of water, then compare the two. Using a hydrometer, you can directly measure the SG, or "gravity."

What, Me Worry?

You can brew great beer without using a hydrometer, and lots of homebrewers do just that. Still, monitoring specific gravity is helpful. The SG of wort at its creation and as it becomes beer is something like its heartbeat. Careful measurements and notetaking provide a performance history of your malt and yeast and can help you repeat your favorite brews. Gravity values reflect beer styles, let all-grain brewers measure mash performance, help monitor yeast activity, and signal when it's time to bottle.

Two important gravity values are "original gravity" or OG, and "final gravity" or FG. OG is measured after the wort has been boiled and chilled. It indicates how much sugar is available for the yeast. High original gravities make big beers—those having potentially more body, mouthfeel, and alcohol.

The FG is the gravity after the yeast has converted all the sugar it can to alcohol and carbon dioxide. It is usually the lowest gravity the beer will ever have and indicates how much unfermentable material is left in the beer.

Beer recipes usually give expected (target) OG and FG values. A few gravity readings taken during the brewing process help you decide if everything is going well. But don't expect to hit recipe target gravities exactly. Being off a little bit doesn't mean a bad beer, and hitting them exactly doesn't guarantee success, either. Mash temperatures, brand of extract used, and yeast strains all influence your actual final gravity.

Reading the Hydrometer

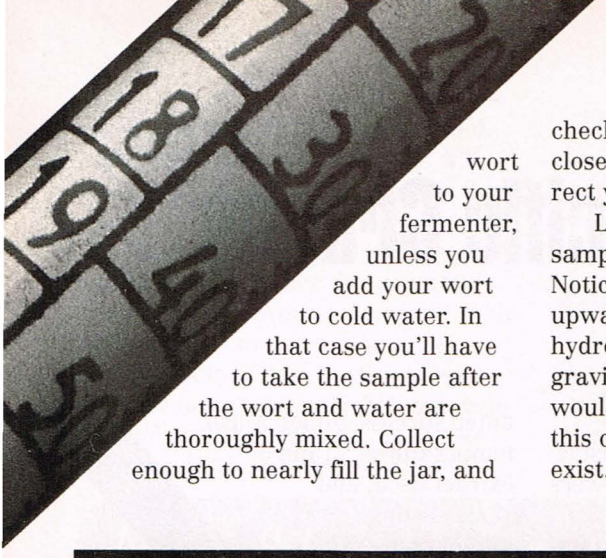
The SG scales of most hydrometers are labeled "specific gravity 60F" or "Sp Gr T:60F." The "60F" printed on the hydrometer means it only reads correctly when the sample temperature is 60° F. SG readings go down as sample temperature increases and go up with decreased temperature.

The numbers range from about 0.980 at the top to 1.160 at the bottom (at the bulb). Brewing gravities are usually greater than one, so it's common to drop the "one point..." prefix. An SG of 1.050 becomes "50 points" or just "50," and 1.009 becomes "9," for example.

The hydrometer is simple. High-density liquids apply more lifting force to an immersed object than lower-density liquids. Compare swimming in the ocean to a pool or lake—the saltwater reduces your perceived weight noticeably. It's the same with a hydrometer—it floats higher in a denser liquid.

Samples of the liquid to be measured are usually poured into a cylindrical tube called a hydrometer jar or sample jar. Often, the jar diameter is only slightly larger than the hydrometer bulb. You have to support the jar perfectly upright to keep the hydrometer centered and floating freely.

Your beer's original gravity will be the first reading you take. Collect a test sample when you transfer the



wort to your fermenter, unless you add your wort to cold water. In that case you'll have to take the sample after the wort and water are thoroughly mixed. Collect enough to nearly fill the jar, and check the sample temperature. If it's close to 60° F, you won't need to correct your reading.

Lower the hydrometer into the sample jar, and make sure it's floating. Notice the liquid surface curves upward, where it touches the jar and hydrometer stem. The correct specific gravity is where the liquid surface would touch the hydrometer scale if this curve (called the meniscus) didn't exist.

Most books recommend reading through the jar, sighting along the flat surface of the sample. This is difficult with some beers and impossible with metal sample jars. Instead, you can put the hydrometer in the jar and fill the jar until about 1/4 inch from the top. The meniscus height is less than one scale increment, so note where the meniscus touches the scale and correct accordingly. With practice it's easy to get readings to within one point (.001).

Many hydrometers include a Balling scale (with units of degrees Plato). This scale shows the weight of dissolved solids as a percentage of liquid weight. This is the scale that most professional brewers use. For example a reading of 10 Plato means every 100 pounds of wort contains 10 pounds of dissolved solids.

It's easy to convert between specific gravity and Plato. For rough estimates, multiply degrees Plato by four to get specific gravity in points. Example: 10 Plato is about 40 points (SG = 1.040). This estimate is best at the low end of the scale (SGs below 40). For accurate conversion of any SG value, use this formula:

SG = 259/(259 - P)

That is, specific gravity equals 259 divided by (259 minus Degrees Plato).

If you're solving for Plato, figure it this way: P = (259 * SG - 259)/SG. Degrees Plato equals 259 times specific gravity, minus 259; then divide that total by the specific gravity. In each of these formulas, use gravity points (40 instead of 1.040).

Tips for Easy Reading

Many brewers use either a glass wine thief or kitchen turkey baster to collect samples from glass carboys. The wine thief looks like a small turkey baster without the bulb. Attach an 18-inch length of 5/8-inch inner-diameter vinyl tubing to the end of the wine thief and sanitize both. Lower the wine thief into the carboy to just below the surface of the beer. Draw on the tubing as you would a straw until you have enough sample, then cover the end of the tubing with a finger. Put the nozzle of the wine thief into the hydrometer jar and release.

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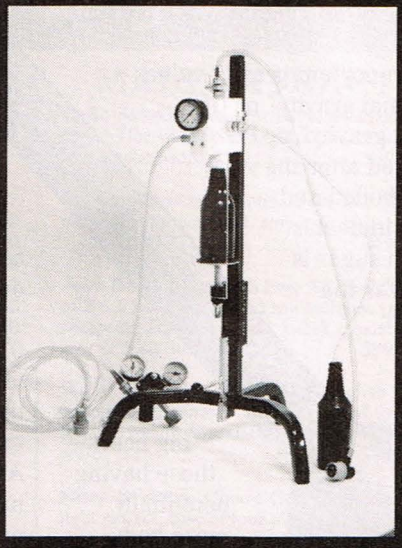

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because they can be used to draw up a larger sample than the common wine thief. Some stores also carry wine samplers built like large syringes, which also work in most carboys.

When you're measuring the gravity of finished or fermenting beer, carbon dioxide bubbles will form on the outside of the hydrometer. The bubbles lift the hydrometer, giving readings that are higher than the actual gravity. A finished beer with an actual gravity of eight can easily read as high as 30! To eliminate the bubbles, pour beer from one glass to another about 10 times. Put this degassed beer in the hydrometer cylinder and spin the hydrometer like a top, between the thumb and forefinger. Stop it, allow it to settle, and take the reading as quickly as possible. It's a good idea to take two or three readings for comparison.

When to Take Readings

Some brewers simply don't take gravity readings. Curious or nervous brewers may take several as fermentation slows down, wanting to bottle precisely when the gravity has stopped changing. You'll have to decide what's best for you, but here are some guidelines.

Take an original gravity reading before you first put the wort in the fermenter. This reading helps you verify that the recipe ingredients did what they were supposed to. The OG of your beer influences its overall character, and you should know what it is. If you're just starting out, you'll want the practice anyway.

Monitor your airlock often to get a feel for the bubbling rate. When you see a bubble only about every minute or two, take a reading. After a few more days take a second reading, and compare with the first. If the two readings are nearly identical, you can bottle. Otherwise, wait another day or two and make a third check.

Unexpected Readings

Low original gravity readings or high final gravity readings can both be very disturbing. A common error is to forget about the sample temperature. An 80° to 85° F sample may feel cool, but it will read two to three points too low. A sample at 90° F will read about four points low. Cooler samples aren't as big a problem. At 30° to 70° F your reading will be less than one point high.

If your original gravity is far from the recipe OG, there are a few potential causes. Maybe you forgot to add in a can of extract. You may have taken your OG reading before adding the wort to your chilled water. Go back through your notes carefully and try to find where you may have made a mistake.

If you didn't make any mistakes and think your thermometer is working, it may be time to check the hydrometer. Measure a 60° F sample of tap water with your clean hydrometer. It should read very close to 1.000. If it's more than just a couple of points off, you may have found the problem.

If you know why you're making an SG reading and understand how it can help you brew better beer, you've advanced one more step toward consistently good beer. ■

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WASH N WE

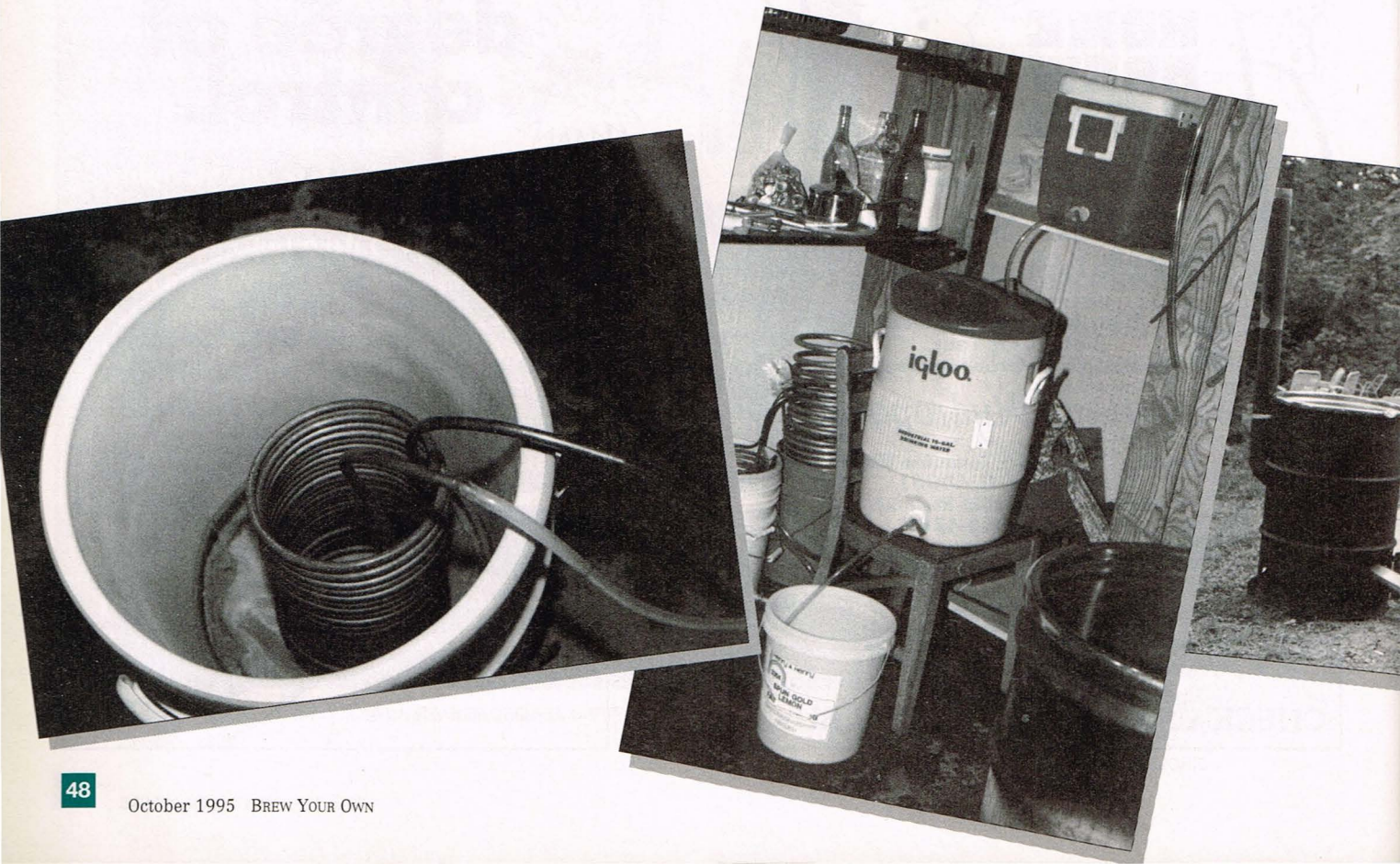
By Dennis Diny

One homebrewer used the tub from an old washing machine to build a 15-gallon brewing system for less than $100. You can, too.

Check it out: A half-barrel brewing system for under $100, including a 22-gallon brew pot made from a washing machine. Impossible you say? Well that's what I have been brewing with for almost two years now, and I absolutely love it.

The heart of the system is the 22-gallon brewpot. It is made from the stainless steel tub of an old Speed Queen wringer washer. Speed Queen was the only brand that offered the stainless steel tub, and it was only available in some models. There are still a few of these machines around, and they show up once in a while in the local salvage yard near where I live.

A resourceful person can get one



AR BREWING

for about $10. Twenty dollars is the most I've seen paid for a whole machine, working or not. For $7 I bought just the tub, which was already removed for me at the salvage yard.

After the tub is taken out of the washing machine, there is a hole in the bottom where the agitator used to be. The only thing left to do to the tub to make it a brewpot is have the hole welded shut. Welding charges vary widely, so call around. The metal is fairly thin, so it is important to have a professional do the job. For $18 I had mine welded at a radiator repair shop. Some warping of the bottom is normal.

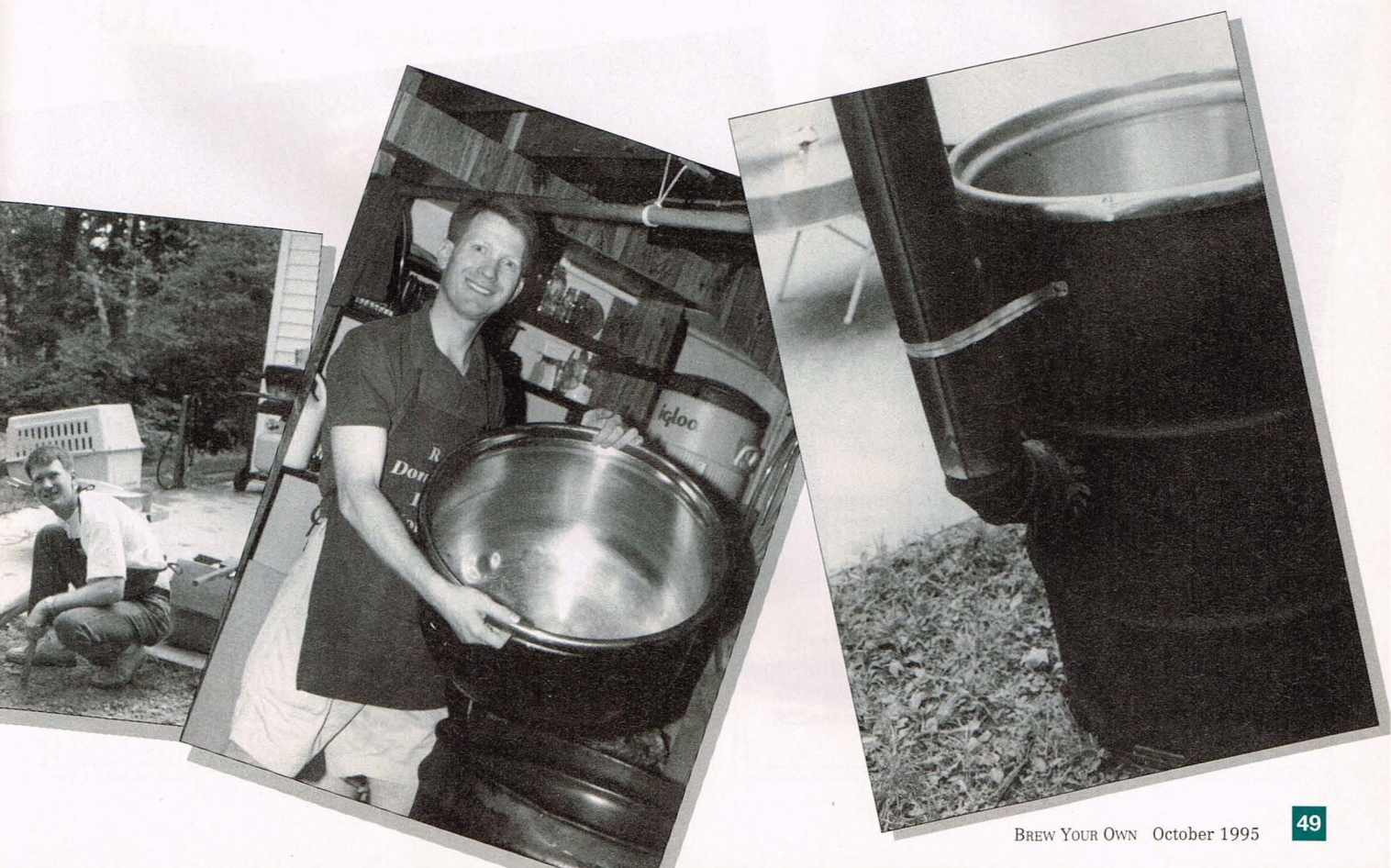
This brewpot is a beautiful sight to behold, especially when you think about all the wort it can boil. However, it will not fit very well on the average kitchen range. To use it for brewing, you must acquire a stand and a heat source. The stand is nothing more than an old 55-gallon drum. Here again, a resourceful person can get an old drum for free. The paper mills here in Green Bay let their employees have them for free when they are available. The kind without a top is preferred.

After the drum's lid has been removed or the top cut out, the brewpot nests perfectly inside. The rolled-over brim on the pot keeps it from sliding to the bottom by covering the upper lip of the drum. The drum serves not only as a stand but as a combustion chamber.

Hot, But Not Too Hot

You can use several heat sources with this arrangement. I have one brewing system indoors that uses natural gas and one outdoors that uses wood. Propane can also be used. Burners from old gas water heaters work great and can usually be had for free. I am using an old natural gas furnace burner, complete with six-volt control valve. I bought it from a heating contractor for $15. He even checked it out and gave me valuable information on how to hook it up and use it.

If you're going to heat with wood, cut a small opening, 10 inches high by 12 inches wide, near the bottom as a door. The piece that was removed can



be re-attached with small strap hinges and #6 sheet-metal screws to function as a door and a damper. Opposite the door and just below the upper rib is where the stove pipe goes. If it is above the rib, it will scorch the wort. Cut a four-inch hole with a sabre saw to hold a four-inch galvanized duct/stove pipe elbow.

To attach the elbow use tin shears to make a series of cuts about 3/4 of an inch long around the non-crimped pipe opening to form tabs. By folding every other tab back 90 degrees, you can insert the straight tabs into the hole in the drum and then bend them back to hold the pipe in place.

Attach two sections of straight duct pipe to the crimped end of the elbow to form a chimney. To keep the chimney from falling over, wrap a piece of wire around the duct and secure it near the top of the drum with a small sheet-metal screw.

This set-up is strictly for outdoor use only! Flames sometimes shoot out the top of the stove pipe like a jet engine and could easily burn down a garage or carport.

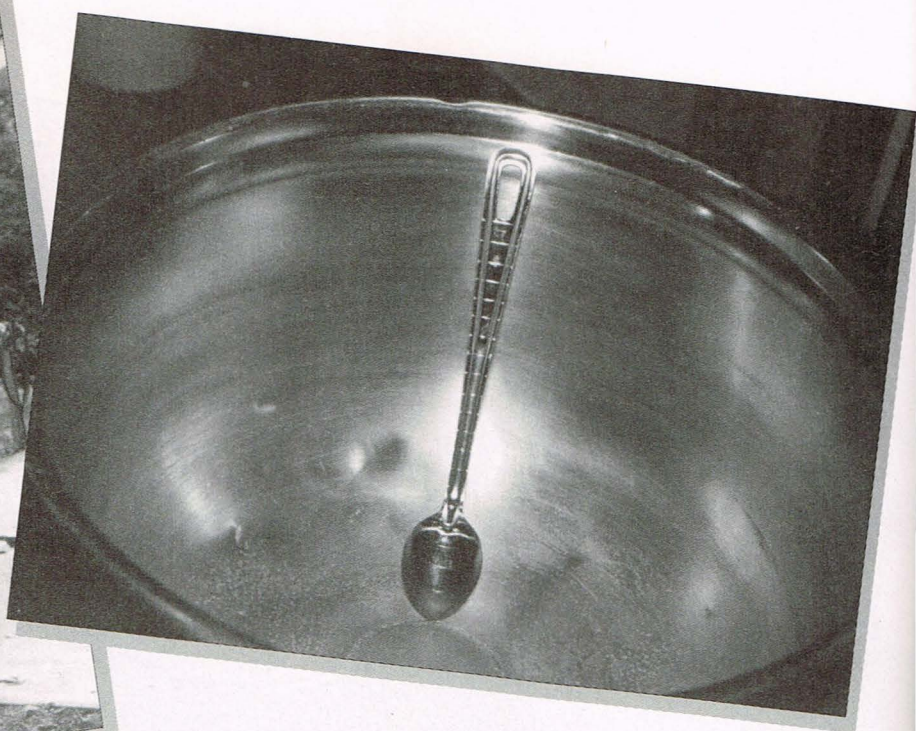
A Tamer Set-up

If you want to brew in your garage, use gas instead of wood as a heat source. Whether you choose natural gas or propane depends on what is most convenient. In either case the stove pipe is attached the same way. As an added convenience and safety measure, it can also be connected to a chimney. If you choose not to attach it to a chimney, only one piece of straight pipe is needed, since there is no smoke. However, the garage door must be left open for ventilation. Brewing indoors can be fatal if proper ventilation and gas hook-ups are not ensured! Consult local code and/or a heating professional for advice on proper hook-up.

Since there are so many different kinds of burners available, I will only describe in detail how I installed mine. Each set-up will be different depending on what materials you're able to find.

My burner is from an old natural gas furnace that actually had five burners mounted in one heating unit. I removed two, since it became too hot with all five.

The assembly now consists of three burners mounted in a metal box 24 inches long, 11 1/2 inches wide, and four inches deep. The box has a six-volt control valve mounted outboard. I cut an opening in the drum with a sabre saw so that the assembly just fit and located it about two inches below the bottom of the pot. Using some of the metal left over from the cut-out opening, I fashioned a shelf for the end of the burner inside the drum. The shelf is opposite the opening and was made by bending the metal 90 degrees



and fastening it to the drum with #6 sheet-metal screws.

With the shelf in place, I simply slid the burner assembly in like a drawer. The burner only goes in about 20 inches, at which point there is a mounting flange. I used a single sheet-metal screw to fasten the flange to the drum. Then I made the gas hook-up with black iron pipe, which is code for my area. Again, consult a heating professional.

Other installations I have seen are nothing more than a water heater burner sitting on a concrete block with a hose running through an opening to a propane tank. The best thing to do with any system is take measurements before removing the burner from its original equipment to see how close it should be to the bottom of the pot.

Don't Skip This Step!

Before the first wort is boiled, the drum must be "burned in" outdoors. Much of the paint burns off the first time and will fill a garage with smoke in a hurry. It also causes "spousal friction" that may get even hotter than the fire (it's not written up in any physics books, but trust me on this one). Be sure to have water in the pot so it doesn't buckle.

A Little Shopping

If you like to build, or have the right connections, a salvage yard is a wonderful place to find neat stuff. I recently heard that old stainless steel swimming pool filters are piling up as scrap. The shells from some of these old filters are about 18 gallons and can be used just like the Speed Queen tubs if they are the right diameter. Also, good salvage yard managers will even help you out if you tell them what your plans are. They may have an idea you haven't thought of. They also like beer, especially homebrew, hint, hint. If you play your cards right, they will even save scrap items for you.

I have put together five pots now and still have three. I was able to make enough from the sale of two to pay for the other three. I use one for making beer and two for making chicken booyah, a type of chicken soup/stew very popular in the Green Bay area.

Put Your System to Work

Brewing beer with the half-barrel brewing system is very easy, and no corners need to be cut. All my mashing is done in a 10-gallon round beverage cooler purchased from a large discount home center for less than $30. The spigot was replaced with a plastic bottling-bucket spigot that cost $3.50 at the local homebrew supply store. The cooler is fitted with a false bottom made from stainless steel mesh found at the salvage yard near the brewpot. The cost: less than a dollar.

The mesh is held in a frame of concentric hoops made from food-grade plastic strips about 1/4-inch thick by 1 1/2 inches wide, like a cross-stitch frame, and is notched and contoured around/over the spigot. The frame is held together with small stainless steel screws and nuts that I bought on sale for 59 cents a pack. The plastic came

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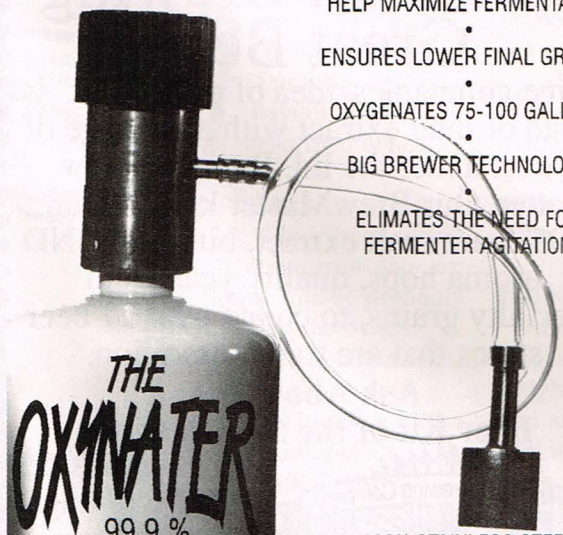

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scrap from a friend's employer.

You're not limited to single-step infusion mashing with a cooler. Step mashing in a cooler is very easy with an immersion wort chiller used in reverse. Mine is made from 45 feet of 1/4-inch ID soft copper tubing tightly wound in a six-inch-diameter coil. Cost of the copper tubing was $15. The wort chiller becomes a heater when you syphon near-boiling water through it. Boiling water may cause steam to get in the line, losing the syphon. That's why near-boiling water works better.

When you need a temperature boost, just open the clamp (from bottling kit) on the syphon hose and let near-boiling water flow through the coil, stirring occasionally and checking with a thermometer. It's quick, it's easy, and it works. The run-off water can be collected in a small bucket and returned to the pot as often as necessary.

Caution: Do not suck start a boiling water syphon.

Collect the "mash out" run-off water in a 48-quart picnic cooler to use as sparge water. That's okay since it exits the coil at about 180° F.

Remove the spigot and replace it with a rubber stopper with a hole. Then push a short piece of copper tubing through the stopper and slip a piece of bottling hose over that to connect to a sparger, which can be made from a piece of copper left over from the immersion coil. Bend the sparger into a spiral and drill it with small holes to equally distribute the water over the grain bed.

To sparge place the picnic cooler on a shelf about 4 1/2 feet high and top off the mash material with more hot water. Then place the round mash tun cooler on an old wooden chair. The run-off wort is collected in five-gallon buckets on the floor. (Five-gallon buckets can sometimes be obtained for free from a bakery, especially if you're a regular customer.)

A piece of bottling tubing directs the wort into the buckets. As the wort is collected, it is poured into the brewpot. To avoid scorching, turn on the burner when about five gallons are in the pot. After the boil use the immersion coil again to cool the wort.

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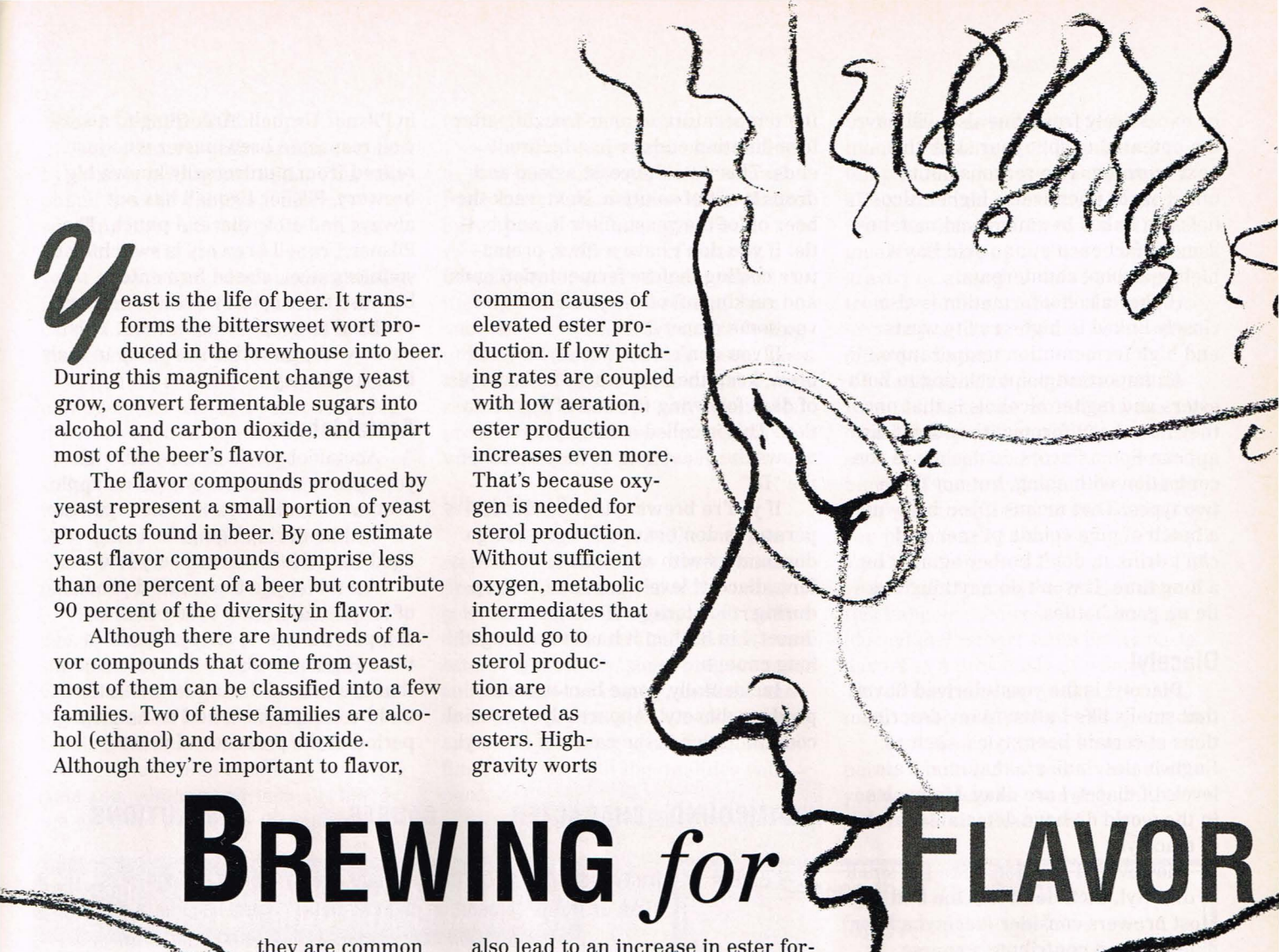

BREWING *for* FLAVOR

Harness the Vitality of Yeast

Part three of a three-part series.

by Ashton Lewis

Yeast is the life of beer. It transforms the bittersweet wort produced in the brewhouse into beer. During this magnificent change yeast grow, convert fermentable sugars into alcohol and carbon dioxide, and impart most of the beer's flavor.

The flavor compounds produced by yeast represent a small portion of yeast products found in beer. By one estimate yeast flavor compounds comprise less than one percent of a beer but contribute 90 percent of the diversity in flavor.

Although there are hundreds of flavor compounds that come from yeast, most of them can be classified into a few families. Two of these families are alcohol (ethanol) and carbon dioxide. Although they're important to flavor, they are common to all beer ingredients. Other families of yeast flavors are described below.

Esters

If your beer seems fruity, solvent-like, or floral, you're probably noticing the esters. Esters comprise a large group of flavor compounds. The solvent-like or fingernail polish aroma, called ethyl acetate, is often overlooked as an ester, but in fact it is the most abundant ester found in beer.

When yeast is growing in beer, the yeast cell produces lipids and sterols. Esters are linked to this production and so are strongest during yeast growth.

Low pitching rate is one of the most common causes of elevated ester production. If low pitching rates are coupled with low aeration, ester production increases even more. That's because oxygen is needed for sterol production. Without sufficient oxygen, metabolic intermediates that should go to sterol production are secreted as esters. High-gravity worts also lead to an increase in ester formation, because they can hold less oxygen than lower-gravity worts.

The last common cause of increased ester production is high fermentation temperature. This is why those brews of summer sometimes smell more like a banana daiquiri than a light lager.

Higher Alcohols

Higher alcohols, or fusel oils, are alcohols that have a higher molecular weight than ethanol (drinking alcohol) and are a natural fermentation product. Higher alcohols are generally described as spicy, fruity, and wine-like.

In heavy beers higher alcohols add some very pleasing and distinctive aromas. The downside to higher alcohols is that they are far more toxic than ethanol. This means that they contribute to that wonderful beer side effect —hangovers.

Higher alcohols, like esters, are tied to yeast growth. If you underpitch your yeast, your finished beer may not only

be excessively fruity but also will have the potential to split your skull the next morning. Two reasons not to underpitch! Chemically, higher alcohols are linked to amino acid metabolism. In fact each amino acid has a higher-alcohol counterpart.

Higher-alcohol formation is also closely linked to high-gravity worts and high fermentation temperature.

An important point relating to both esters and higher alcohols is that once they have been formed, they don't disappear. Some flavors do decline in concentration with aging, but not these two types. That means if you brew up a batch of piña colada pilsner and can't drink it, don't bother aging it for a long time. It won't do anything but tie up good bottles.

Diacetyl

Diacetyl is the yeast-derived flavor that smells like butter. Many descriptions of certain beer styles, such as English ales, indicate that moderate levels of diacetyl are okay. Many ales in the world do have detectable levels of diacetyl.

However, if you don't like the smell of diacetyl, then don't feel too bad. Most brewers consider diacetyl a beer defect. It can contribute a coarse, dirty flavor to lighter beers that should be crisp and clean. It also satiates the palate. This may mean that after a few sips, you feel full and don't want more beer. If you don't like finding yourself not feeling like another sip, you might not be a big fan of 'D' (that's what beer snobs call it so they can murmur to their friends: "Do I smell 'D' in this?").

Diacetyl in your beer begins from a precursor substance secreted from yeast during fermentation. The precursor breaks down outside of the yeast cell into diacetyl. This is normal. If the yeast is still present and not dormant, it will absorb the diacetyl and convert it into an innocuous compound. However, if the yeast is removed from the beer or goes dormant before the diacetyl can be absorbed, the finished beer will have diacetyl.

Since most homebrew is unfiltered, diacetyl is not frequently found in it. If you want diacetyl in your beer, a surefire method is to immediately lower the temperature to near freezing after fermentation ends or just before it ends. This puts the yeast asleep and drops it out of solution. Next, rack the beer off of the yeast, filter it, and bottle. If you don't have a filter, premature cooling (before fermentation ends) and racking off of the yeast will give you some diacetyl.

If you don't want diacetyl in your brew, keep the beer warm for a couple of days following the end of fermentation. This is called a diacetyl rest. It allows the yeast time to mop up all of the "D."

If you're brewing lager, cold temperatures don't cause the yeast to go dormant as with ale strains. Therefore, diacetyl levels continue to drop during cold storage. If a lager has diacetyl in it, then it hasn't been aged long enough.

Incidentally, some bacteria also produce diacetyl. Apparently, bacterial contamination is the cause of diacetyl in Pilsner Urquell. According to a very well respected brewmaster who just retired from a universally known big brewery, Pilsner Urquell has not always had a big diacetyl punch. The Pilsner Urquell brewery is switching to stainless steel, closed fermenters because their open, wooden ones are too hard to keep clean, he said. This battle with sanitation shows up in their beer as diacetyl.

Acetaldehyde

Acetaldehyde is associated with young beer and imparts a green apple aroma. Like diacetyl, acetaldehyde levels decline during aging. In a properly aged beer the levels are very low.

Acetaldehyde is a natural product of fermentation and is one of those compounds that is always found in beer. Higher levels are found in beers that are roused during fermentation and beers that have had a short aging period in the presence of yeast.

COMPOUND	CHARACTER	CAUSES	SOLUTIONS
Esters	fruity, solvent-like or floral	low pitching rate, low aeration, high fermentation temperature	pitch enough yeast and keep fermentation temperature low
Higher Alcohols	spicy, fruity, wine-like	low pitching rate, high-gravity worts, high fermentation temperature	pitch enough yeast and keep fermentation temperature low
Diacetyl	butter	yeast removed or dormant before diacetyl absorbed	keep the beer warm for two days following fermentation
Acetaldehyde	green apple	beer roused during fermentation, short aging period	properly age the beer
Sulfur	rotten eggs	excessive yeast growth or inadequate venting during secondary fermentation	pitch enough yeast, moniter fermentation temperature, use separate cold break before fermentation, use carboy airlock or bleed the pressure in soda keg

Sulfur Compounds

The primary sulfur aroma secreted by yeast is hydrogen sulfide. This compound has the dubious honor of smelling like rotten eggs. Its appearance in beer is linked to excessive yeast growth and hence underpitching, fast fermentations, cold-break trub carried into fermentation, and inadequate venting during storage.

The first two causes are easy to manage: Pitch enough yeast and keep the fermentation temperature in check. Cold trub has a high quantity of sulfur-containing amino acids which, when broken down by yeast, release hydrogen sulfide. This is one of the reasons for a separate cold break before fermentation begins.

The last cause, venting during storage, is the most critical. Since hydrogen sulfide is very volatile, it can easily be vented during storage. If you use a carboy with an airlock for aging prior to bottling, then the airlock will allow the hydrogen sulfide to escape. If you use a soda keg, you must periodically bleed the pressure to release the sulfur aroma. If you don't practice one of these methods, have hydrogen sulfide in your beer, and bottle it, then your frosty mug of homebrew will smell like a frosty mug of rotten eggs. Yuck!

The good thing about diacetyl, acetaldehyde, and hydrogen sulfide is that they can be removed from beer once they've formed. If you are feeling unlucky because your beer tastes like a butter-baked green apple drizzled with rotten eggs, cheer up! Just age it with proper venting, and everything may turn out as you originally planned.

What Next?

To capture the yeast flavors you want in your beer, pay careful attention to the most important factor: yeast selection. Yeast, like people, all behave differently. Some strains produce more esters than others, some produce more sulfur, some are earthy smelling, and some are very neutral. Check out the article on choosing yeast (page 56) to fined a strain with the qualities you need.

Once you have yeast in hand, it's up to you to manipulate its performance. Pitching rate, fermentation temperature, and wort aeration will affect the manner in which your chosen yeast behaves. Feed it a different meal by changing the wort's original gravity or alter the amino acid spectrum by adding a bunch of sugar, rice, or honey, and your yeast will produce different flavors.

Yeast are like people in another way, too. Someone working in the yard on a hot day will smell different than on a cool day. Feed the same person a bunch of garlic and smell the change. Your yeast will react to the conditions you place it in and the way you treat it. What ever you do, don't let a bunch of yeast make it into your bottled beer. If this happens, the yeast can autolyze (decay) and impart some pretty nasty flavors to a previously excellent beer. This is the cause of "yeast-bite." You might more accurately call it yeast rot.

Next time you brew, keep these points in mind. Just remember that you are in control, even though the yeast does all of the work.

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Water, malt, hops, and yeast. Those are the basic ingredients that make beer. As brewers, we all know where to get these basic ingredients when it's time to brew. Turn on the faucet for water and go to the homebrew store for the rest.

Where did these materials come from before the faucet and homebrew store? The water came from the water authority following filtration and chlorination. The barley farmer delivered the malt at the malt house, and the hops came from the hop farmer. But what about the yeast?

The yeast probably came from a yeast supplier who got it from a brewery. This brewery got its yeast from a yeast supplier who got it from a brewery. Perhaps that brewery got it from another brewery. If the yeast came from a brewery that got it from a brewery, then where did the first brewery find the yeast?

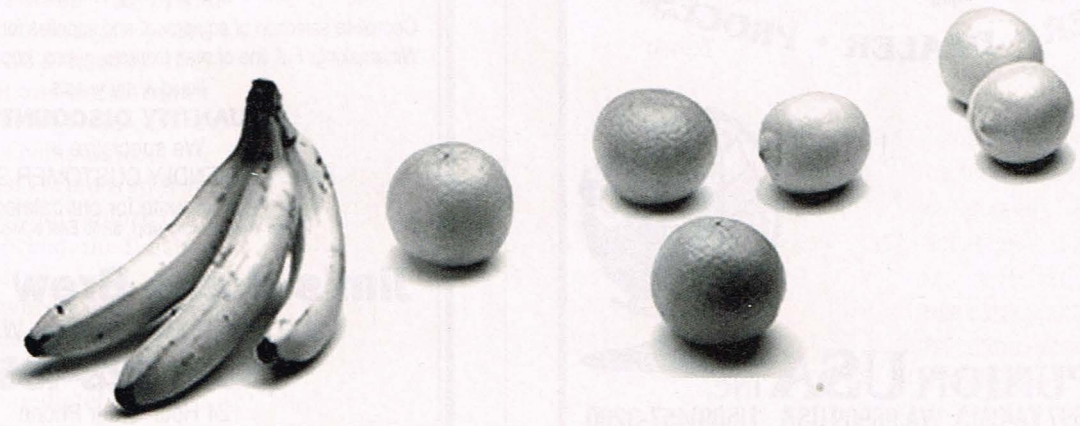
Brewer's yeast doesn't exist in nature. It only exists in breweries. It is the common thread linking today's brewery to the breweries of the past. Since the early ages of the brewery, some 8,000 years ago, brewers have been passing around yeast cultures. During this time yeast has changed quite a bit. The typical yeast cell will divide about four times during a brewery fermentation. Each division is considered a generation, since yeast divide by asexual reproduction. If the yeast is used weekly, this is about 200 generations per year.

Humans have one generation every 20 years or so. In one human generation there are about 4,000 yeast generations. Back to the dawn of the brewery that's about one million yeast generations, give or take 50 percent. It's equivalent to four billion years of human evolution. Yeast have had ample opportunity to adapt to brewery life since they were first grabbed from Babylonian skies to ferment wort.

So brewers use this single-cell organism that has been passed around in brewing circles for the last 8,000 years. During its visit at the many thousands of breweries throughout history, yeast has laid down its roots. Since these cultures were nourished and reused in their host breweries over time, individual brewers ended up with unique yeast strains. Today, there are thousands of yeast strains out there that are special because of the environment in which they were allowed to flourish.

So What Do You Call It?

Most brewers would probably prefer to call their strain what it is. If it came from Whitbread in London, it should be called Whitbread yeast. If it came from Whitbread



Strains

back in 1880 and mutated into another strain in John's Brewery, then maybe it should be called John's yeast. Unfortunately, the world isn't that easy.

To begin with, brewers have been sneaking yeast out of their neighbor's brewery for as long as they recognized the significance of yeast. John's Brewery certainly wouldn't advertise that it used Whitbread's yeast if the transaction hadn't all been above the fermenter. Even if it were, brewers have egos and want their own strain of yeast. So, many breweries do use the same strain but give it different names.

For yeast suppliers the story is a little different. If you owned a yeast lab and had in your possession a slant of yeast from Anheuser-Busch, you probably wouldn't print in your catalog "Anheuser-Busch Lager." You'd be begging for litigation. You might, however, give it a code name hinting at the origin but not being too obvious. Maybe you'd call it Missouri Lager.

Homebrewers occupy this unusual place in the history of yeast—surrounded by strains of yeast but with few people saying where the yeast originated. What you must rely on are descriptions of yeast: fermentation performance, flavor profiles, and vague names hinting at their origins.

A Change Is Coming

Yeast cultures are typically stored by yeast labs on slants. A yeast slant is a tube of solid yeast-growth medium with yeast growing on top. Yeast cultures are purified, and a single colony is carefully streaked onto the slant. This practice ensures that all of the yeast cells growing on the slant originated from a single parent cell.

Since slants eventually dry out and the yeast dies, they have to be periodically replaced by repeating the streaking process. The idea is to preserve the integrity of a particular yeast strain. Since very little growth occurs in this process, muta-

Yeast Strains for Ale

	Dry	Semi-Sweet
Crisp	American Micro. Ale # 1 Brewtek CL-10 Old German Ale Brewtek CL-400 Kölsch Brewtek CL-450 German Ale Wyeast 1007 American Ale Wyeast 1056 London Ale G. W. Kent A03 Canadian Ale G. W. Kent A07	British Draft Ale Brewtek CL-160
Slightly Fruity	British Pale Ale # 1 Brewtek CL-120 Irish Dry Stout Brewtek CL-240 Canadian Ale Brewtek CL-260 Irish Ale Wyeast 1084 G.W. Kent A05 British Ale Wyeast 1098 London Ale Wyeast 1028 Kölsch Wyeast 2565 English Ale G.W. Kent A09	British Real Ale Brewtek CL-150 Classic British Ale Brewtek CL-170 Australian Ale Brewtek CL-270 Saison Brewtek CL-380 European Ale Wyeast 1338 Belgian Wit Wyeast 3944 Australian Ale G.W. Kent A01 Düsseldorf Ale G.W. Kent A06 Belgian Wheat G.W. Kent W52
Fruity	Belgian Ale #1 Brewtek CL-300 Belgian Ale #2 Brewtek CL-320 Belgian Ale #3 Brewtek CL-340 Belgian Ale Wyeast 1214 American Ale G.W. Kent A02 British Ale G.W. Kent A04 Trappist Ale G.W. Kent A08	British Micro. Ale Brewtek CL-110 London ESB Wyeast 1968 Scottish Ale Wyeast 1728 Weihenstephan Weizen Wyeast 3068 Bavarian Weizen G.W. Kent W51

tions occur very slowly compared to their development in a brewery, where yeast growth is rapid.

Here's the dilemma. If a person took a sample of John's yeast 10 years ago, brought it into a laboratory, and carefully maintained it, the laboratory should still have a sample of John's yeast as it existed 10 years ago. If John's Brewery continued brewing as usual and did not use a meticulous yeast management protocol for the 10 years, then the two yeast samples would be different now. Why? Because John's yeast had many generations in the brewery and most likely mutated along the way, since mutations are a common fact of yeast life.

Bear this in mind when you buy a yeast culture. Minor differences between the strain of yesteryear and today may or may not be apparent. If they are, take joy in reaching back to an older generation of a familiar yeast.

Evaluating Yeast

Forget the name, the lineage, and how you got it; it's time to evaluate your yeast. There are only two species of brewer's yeast: *cerevisiae* (ale) and *carlsbergensis* or *uvarum* (lager). The species gives a rough indication of fermentation temperature.

Secondary considerations relate to flavor and physical performance. Is it fruity or crisp? Does it ferment the wort dry or leave residual sweetness? Sweetness is tied to the attenuation characteristics of the yeast. Does the strain leave a little diacetyl (buttery flavor) behind, or does it smell of cloves? These descriptions indicate the type of beer for which the yeast is best suited.

Physical performance relates to speed of fermentation and flocculation characteristics. Some yeast ferment fast and furious, while others take a slower pace. Some yeast drop to the bottom of the fermenter like a rock when done, and others stay in solution. These are flocculation characteristics.

Once you see a yeast you find interesting, give it a try. Look at each strain this way: Some brewer found this particular yeast strain worthwhile, so there must be something good about it or we wouldn't have it today. If you give it a try and don't like it, figure the brewer that cared for it had different preferences in beer. What else can you say? Brewer's yeast is just another domesticated beast.

LAGERS

BrewTek:

Original Pilsner: Sweet, underattenuated finish, subdued diacetyl character. Use in any lager with big, malty palate.
American Megabrewery: Smooth, clean-tasting. Use for light, clean lagers.
American Microbrewery: Clean, full-flavored, malty finish. Very versatile.
Old Bavarian: Well-rounded with citrus undertones. Use in German lagers.
N. German: Clean, crisp, traditional character. A strong fermenter.
East European: Smooth, rich, creamy character. Big malt flavor, clean finish.
California Gold: Also Calif. Lager (GW Kent), Calif. Common (Wyeast). Malty finish. Highly flocculent.

Yeast Strains for Lager

	Dry	Semi-Sweet
Crisp	N. German Brewtek CL-660	Original Pilsner Brewtek CL-600
	Pilsner Wyeast 2007	American Micro. Brewtek CL-630
	Danish Wyeast 2042	East European Brewtek CL-680
	American Wyeast 2035	Munich Wyeast 2308
	Czech Pilsner Wyeast 2278	Bavarian Wyeast 2206
	Pilsner Lager G. W. Kent L31	Bohemian Wyeast 2124
		Bavarian Lager G. W. Kent L32
		Munich Lager G. W. Kent L33
		Amsterdam Lager G. W. Kent
		European Lager G. W. Kent
Slightly Fruity	American Megabrewery Brewtek CL-620	Old Bavarian Brewtek CL-650
	St. Louis Lager G. W. Kent L34	California Common Brewtek CL-690 Wyeast 2112 G. W. Kent L35

Wyeast:

Pilsner: Medium flocculation, sturdy and simple. A classic American strain.
Munich: Smooth, well-rounded and full bodied with medium flocculation.
Danish: Rich. Soft, light profile accentuates hop character. Low flocculation.
Bavarian: Rich, full-bodied, malty flavor with medium flocculation.
American: Bold, complex, woody. Slight diacetyl flavor. Medium flocculation.
Bohemian: Ferments clean, malty. For Czech pilsners. Medium flocculation.

GW Kent:

Pilsner Lager: Light in flavor and body. Medium flocculation.
Bavarian Lager: Medium-bodied, clean, malty sweetness. Medium flocculation.
Munich Lager: Medium-bodied, smooth, soft, a hint of sulfur when fresh.
St. Louis Lager: Round, crisp, clean, medium bodied. Medium flocculation.
Amsterdam Lager: Clean, crisp, all-purpose dry yeast. Medium flocculation.
European Lager: Dry lager yeast. Medium attenuation and flocculation.

ALES

BrewTek:

American Microbrewery Ale #1: Smooth, clean, strong fermenting ale yeast.
British Microbrewery Ale: Complex, oaky, slightly under-attenuated finish.
British Pale Ale #1: Bold, citrusy. Accentuates mineral and hop flavors.
British Real Ale: Woody, almost musty. Typically underattenuating.
British Draft Ale: Full bodied, well rounded. Touch of diacetyl.
Classic British Ale: Use in draft bitter or porter, high-gravity worts.
Irish Dry Stout: Slightly woody character. Vinous, almost lactic character.
Canadian Ale: Clean, strong-fermenting. Use for light ales, porters.
Australian Ale: Malty, bready, nutty character. Honey-like finish.
Belgian Ale #1: Clove and fruit flavors. Ferments well in high-gravity worts.
Belgian Ale #2: A traditional Trappist strain for doubles and triples.
Belgian Ale #3: A classic Trappist character with esters of spice and fruit.
Saison: Smooth, full, mild esters. Used in French and Belgian ales.
Old German Ale: Smooth, mild. Strong fermenter. Use for Alt and wheat beers.
Kölsch: Clean, well-attenuated flavor.

Wyeast:

German Ale: Ferments dry, crisp. Extremely rocky head. Low flocculation.
Irish Ale: Slight diacetyl and fruitiness. Great for stouts. Medium flocculation.
European Ale: Full-bodied, complex. Very malty finish. Dense, rocky head.
British Ale: Slightly tart, well-balanced, Ferments to 65° F, medium flocculation.
American Ale: Finishes soft, smooth, clean. Low to medium flocculation.
London Ale: Bold, crisp, some diacetyl production. Medium flocculation.
London ESB: Rich, malty character. Highly flocculent.
Scottish Ale: Highly flocculent. Ideally suited for high-gravity ales of all types.
Kölsch: Hybrid of ale and lager characteristics. Crisp finish, low flocculation.
Belgian Ale: Abbey style for high-gravity beers. Medium flocculation.
Weihenstephan Weizen: Clove, vanilla, and banana. Low flocculation.
Belgian Witbier: Tart, slightly phenolic. Medium flocculation.

GW Kent:

Australian Ale: Complex, woody. Australian origin, medium flocculation.
American Ale: Very fruity aroma, soft, smooth flavor when fermented cool. All-purpose, low flocculation.
London Ale: Very dry with a hint of diacetyl. Medium flocculation.
British Ale: Ferments dry with sharp finish. Use for pale and brown ales. Medium flocculation.
Düsseldorf Ale: Full body, complex flavor, spicy sweetness. German Altbier.
Canadian Ale: Light bodied, clean, fruity. Feremented cold. High flocculation.
Trappist Ale: Malty, fruity, phenolic overtones. High flocculation.
English Ale: Clean, fairly neutral, soft estery finish. A vigorous fermenter.
Whitbread Ale: Dry yeast. Smooth, fruity. For pale ale. High flocculation.
Australian Ale: Dry. yeast. Complex, woody. Medium flocculation.
Bavarian Weizen: Spicy, clove-like. Medium flocculation and attenuation.
Belgian Wheat (Wit): Moderate esters, mild, spicy phenols. Soft finish.

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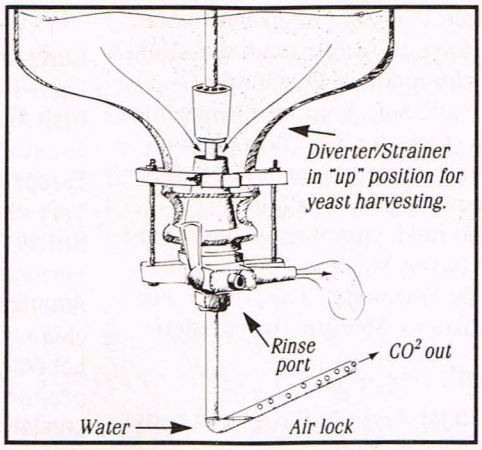

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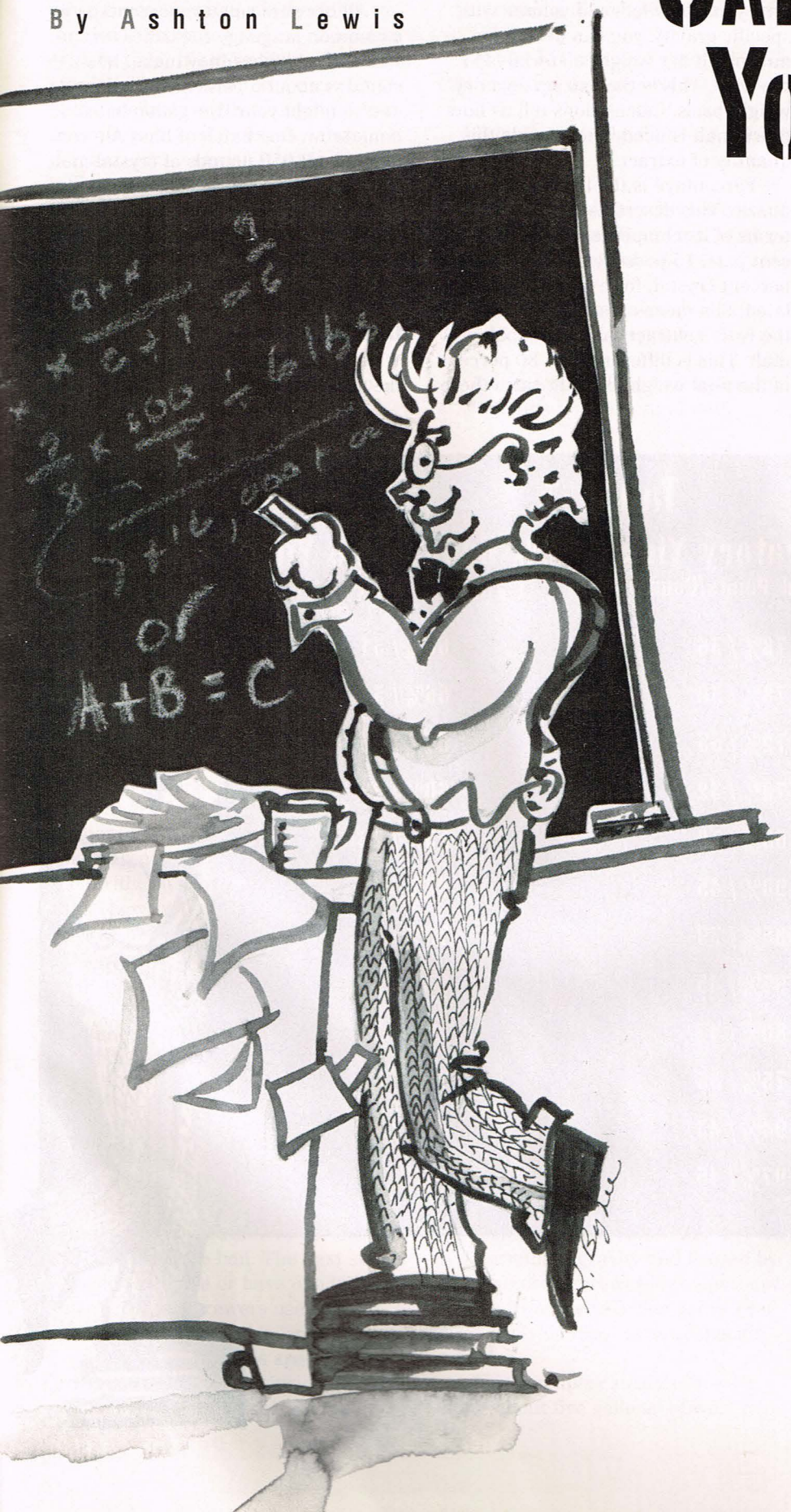
CIRCLE 58 ON READER SERVICE CARD

Calculating Your Brew

By Ashton Lewis



Do the Math and Create Your Own Recipes

When it comes to calculating recipes, homebrewers fall into two groups.

Some take the Zen approach, adding a bit of crystal, a touch of chocolate, and then enough pale malt to make up the seven or so pounds of malt needed for the brew. If all turns out as imagined, and the operative word is imagined, they end up with five gallons of wort at some unknown gravity.

Zen brewers are easygoing, and everything about this method is fine. The only problem is that it's impossible to know how the beer is going to taste from one batch to the next.

Other brewers demand a more exacting method and use calculations. They're number crunchers. If they want five gallons of wort at 1.048 specific gravity made up of 6 percent crystal malt, 0.25 percent chocolate malt, and 93.75 percent pale malt, that's what they're going to get.

Formulating a brew is like composing music. Choosing the style sets the ground rules for your composition. You need to get the gravity and flavor in a certain range to hit the style. But you don't have to compose a classical symphony. You can also treat your composition like jazz, placing more emphasis on elements than style. Use your imagination to come up with the color and flavor—the chord progression, in a sense—and then use your knowledge

of raw materials to make the beer.

This is where calculations come in handy. Use calculations to determine the grain bill, mash water temperature, water salts, and hop weights, and to estimate beer color.

Extending Your Powers of Observation

If you take a cup of wort and look at it with your brewer's eyes, you see some things differently than the rest of the world does. The first thing to notice is volume. Volume tells how much wort there is, and how much beer there will be in a couple of weeks. Dunk a hydrometer in the wort; you now know the specific gravity, an indication of the solids content. If you combine your knowledge of volume with specific gravity, you can determine how much dry weight material is in the wort. This is the extract on a dry-weight basis. Calculations tell us how much malt is needed to provide this quantity of extract.

Percentage is the last piece of the puzzle. This describes the extract in terms of its component malts: 80 percent pale, 15 percent Munich, and 5 percent crystal, for example. Translated, this means that 80 percent of the wort's extract came from pale malt. This is different than 80 percent of the total weight of malt, since these ingredients each have their own unique extract yield.

All brewers can use percentage as a common language regardless of the size of the batches they make. Bass Ale contains about 5 percent crystal malt, and so might your five-gallon batch of homebrew. One batch of Bass Ale contains about 950 pounds of crystal malt in a 400-barrel brew. That number is not so handy, since you need to know the extract yield of their brewhouse to make sense of it.

Defining Yield

Extract yield is nothing more than the amount of a particular malt

Table 1

Raw Material	Laboratory Yield (% and Points/Pound)	85% Brewhouse Yield (% and Points/Pound)
Pale malt	78% / 36	66% / 31
Munich malt	78% / 36	66% / 31
Crystal malt	72% / 33	61% / 28
Chocolate malt	70% / 32	60% / 28
Black malt	65% / 30	55% / 26
Rice	98% / 45	83% / 39
Wheat malt	85% / 39	73% / 34
Dry malt extract	97% / 45	97% / 45
Malt syrup	80% / 37	80% / 37
Honey	75% / 35	75% / 35
Brown Sugar	94% / 43	94% / 43
White sugar	97% / 45	97% / 45

extracted in the mash. This number is also important for wheat, rice, or any other source of extract. The standard method of reporting yield is called laboratory yield. It's the weight of material extracted in the mash as a percentage of the original weight of the malt. For example pale malt is usually about 78 percent extract (as is)—that is, including the malt's moisture. This means that a pound of pale malt yields 0.78 pounds of extract in a laboratory mash.

An alternative system says that pale malt has a yield of 36 points per gallon (as is). In other words one pound of the material will make one gallon of wort with a specific gravity of 1.036. Laboratory yields are considered theoretical, since the extract source (the grain) is milled very fine for testing purposes. Since these materials are milled differently for use in the brewery, theoretical yields are higher than brewery yields.

Brewery yields, or brewhouse yields, depend on the brewery equipment. So to really use calculations effectively you need to determine your brewhouse yield. In general, however, don't get too worked up about your yield. Just know what it is.

Some homebrewers take great pride in their yields, but a high-yielding brewhouse doesn't necessarily make better beer. You might save a little money, but since homebrewing doesn't require all that much grain to start with, the savings are small. Most homebrew systems will have yields ranging between 75 percent and 90 percent of theoretical yields. Table 1 lists typical yields for frequently used sources of extract. Note that the materials not mashed are unaffected by brewhouse yield.

Points Per Gallon

To calculate a brew you need to define a few parameters. For starters pick a target specific gravity and target volume. These parameters pertain to the wort after the boil. The next step is to design a recipe or have one in hand. Since few homebrewers use percentages, you may have to invent one.

Some typical recipes are provided in Table 3 to give a little insight into the percentage game. For this example run a calculation for five gallons of 1.048 wort comprised of 5 percent crystal malt and 95 percent pale malt.

Step 1: Determine the total specific gravity points needed for this wort.

Total Points = 5 gallons * 48 points = 240 points

Step 2: Calculate the points coming from crystal malt and the points coming from pale malt.

Points from crystal malt = 240 * 0.05 = 12 points (5 percent of 240)

Points from pale malt = 240 * 0.95 = 228 points (95 percent of 240)

Step 3: Calculate the weights of crystal and pale malts needed. To do this you need to refer to Table 1 for the yields of crystal and pale malt. Use the numbers from the third column, since they take the brewhouse yield into account. The crystal malt yield is 28 points per pound, and the pale malt yield is 31 points per pound.

Weight of crystal malt = 12 points ÷ 28 points/pound = 0.43 pounds or about 7 ounces of crystal malt.

Weight of pale malt = 228 points ÷ 31 points/pound = 7.35 pounds or 7 pounds, 5 1/2 ounces of pale malt.

That's it. Now your ready to start brewing. While you're brewing, you can take a little time to reflect on high school math class. You may have hated it then, but now you're using what you learned to make beer!

Calculating A Brew The Metric Way

You can also use the metric system to calculate your brew. To do this you need to use degrees Plato in addition to specific gravity. Plato is another way of determining gravity and is used by all commercial brewers (except those crazies from the UK). See Table 2 for Plato equivalents of various specific gravities.

This example calculates for 19 liters (about five gallons) of wort with a specific gravity of 1.048 or 12° Plato using 5 percent crystal and 95 percent pale malt. Yields of the crystal and pale, respectively, are 61 percent and 65 percent.

Step 1: Calculate the weight of extract required for 19 liters of wort with a gravity of 1.048 or 12° Plato. You must use both specific gravity and Plato.

Weight of extract = 19 * 1.048 * 0.12 = 2.39 kilograms of extract

Step 2: Calculate the contribution of crystal malt and pale malt to the total extract.

Extract from crystal malt = 2.39 Kg

Table 2

Specific Gravity	Plato Equivalent
1.008	2
1.016	4
1.024	6
1.032	8
1.040	10
1.048	12
1.057	14
1.065	16
1.074	18
1.083	20
1.092	22
1.101	24
1.110	26
1.120	28
1.129	30

* 0.05 = 0.120 Kg (5 percent of 2.39)

Extract from pale malt = 2.39 Kg * 0.95 = 2.27 Kg (95 percent of 2.39)

Step 3: Calculate the weights of crystal malt and pale malt needed. To do this divide the extract attributed to the malt by the extract yield in column three of Table 1. The yield for crystal malt is 61 percent and the yield for pale malt is 66 percent.

Weight of crystal malt needed = 0.120 Kg ÷ 0.61 = 0.197 Kg or 197 grams.

Weight of pale malt needed = 2.27 Kg ÷ 0.66 = 3.44 Kg.

Converting 197 grams to ounces by dividing by 28 gives 7 ounces and converting 3.44 Kg to pounds by multiplying by 2.2 gives 7.6 pounds. Notice these are about the same as with the points-per-pound method.

At this point you're probably thinking of using the points-per-gallon sys-

Table 3
Some Typical Brews

Pale Ale
OG = 12-14° Plato
6% Crystal malt
5% Dextrin malt
89% Pale malt

Brown Ale
OG = 11-13° Plato
3% Chocolate malt
12% Crystal malt
10% Dark brown sugar
75% Pale malt

Pilsner
OG = 12° Plato
100% Pale malt

Stout
OG = 12-16° Plato
8% Black Barley
4% Chocolate malt
10% Crystal malt
78% Pale malt

Weizen
OG = 11-13° Plato
50% Pale malt
50% Wheat malt

American Lawnmower
OG = 12° Plato
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tem because it is easier and are wondering why anyone would use the metric method. The answer is because malt suppliers report lab yields as a percentage. The information in Table 1 took many calculations that have not been shown to get to points per pound. To quickly convert an extract yield as expressed as a percentage to points per pound, multiply the percentage by 0.46.

Calibrating Your Brewhouse

The most important item in these calculations is knowing the actual yield of your system. A good way to determine your brewhouse yield is to brew a pilsner using 100 percent pale malt, then follow the steps below. With this information in hand, you can adjust the yield of any ingredient if you know its theoretical yield.

To calibrate your brewhouse, start off with a guess as to its yield. If you guess 85 percent (that's what's in Table 1) and calculate the weight of pale malt needed to produce five gallons (19 liters) of 1.048 wort, you'll come up with about eight pounds (3.6 Kg) of malt.

Use this weight of malt to mash, lauter, and boil as you normally do. At the end of the brew, determine your wort volume and its specific gravity. Be sure to correct the gravity for temperature. Assume you got 5.5 gallons of wort at 1.048. For starters collect less wort next time, because the target volume was missed. The gravity is fine, but what is the yield? To do this you must calculate back.

Step 1: Calculate how many points were actually produced.

Points produced = 5.5 gallons * 48 points = 264 points

Step 2: Calculate the yield obtained from the pale malt.

Yield = 264 points ÷ 8 pounds = 33 points

Step 3: Calculate the brewhouse yield by comparing the yield obtained in your brewhouse to the laboratory yield of pale malt. Remember that you can convert 78 percent (pale malt's lab yield) to points per gallon by multiplying by 0.46 (about 36 points).

Brewhouse Yield = 33 points ÷ 36 points * 100 = 92%.

This means that your system extracted 92 percent of the theoretical yield. To calculate the yield of other materials, all you need to do is multiply the theoretical yield by 0.92 and you have the yield figure that you need for your calculations. If you want to use the metric system, back calculate your yield in a similar fashion.

Words of Wisdom

Use brewing calculations to express your creativity and to free yourself from brewing other people's recipes. If you brew enough using percentages, you will be able to express an idea for a new brew as a recipe based on your experience of the various malts in the brewing world. ■

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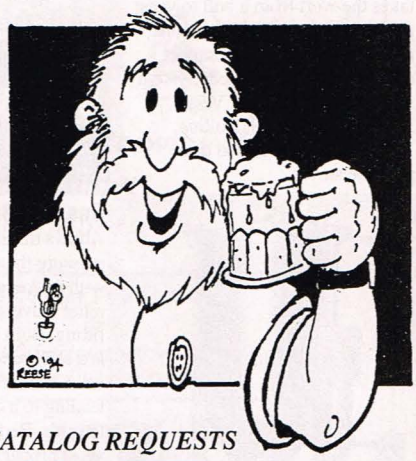

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Busting Tradition on Chicago's North Side

by Steve Johnson

Chicago . . . the name conjures images of skyscrapers on Lake Michigan, swank apartments on the Chicago River, ghettos, gangsters, stockyards, miles and miles of rusting machinery, and factories belching smoke. Chicago is a tough place to survive, whether it be for builders, manufacturers, gangsters, or (you guessed it) brewers.

Although it was home to more than 55 breweries just before Prohibition, the last one turned out its lights in 1978. In the late 1980s breweries began to sprout anew. But these fledgling enterprises have not found Chicago to be fertile ground, and only a few have taken root. With a failure rate of 40 percent for breweries, almost triple the national average, Chicago has been outdistanced by places such as Portland, Maine, and Eugene, Oregon, which have both more breweries than Chicago and a success rate of 100 percent.

Golden Prairie Brewing Co. is one of the few breweries that has been able to thrive in this tough market. Ted Furman, owner and brewmaster of Golden Prairie, says one reason the city is so tough on brewers is that Chicago is not one big beer market but a lot of little markets. Rather than a melting pot, the city remains a collection of ethnic neighborhoods—Polish, German, Hispanic, African-American—that have maintained their individuality.

After talking to Furman and tasting the Golden Prairie brews, I think I understand why his brewery has survived while others have failed. First, Furman's beers are clean tasting. The pains taken to keep every aspect of the brewing and packaging operation as clean as possible show in the beer. This is in sharp contrast to other Chicago breweries that did not survive.

Second, Furman makes beers that have a clearly individualistic character. "I don't brew to a style," he says. "I think styles were derived in regions of the world where one or two ingredients were plentiful, and that's why a style emerged. Nowadays, we have the opportunity to pick and choose ingredients from all around the world. I view it more as cooking. I prefer to make a beer that is well balanced rather than use a lot of a variety of hop that grows two miles from here. I use ingredients in nontraditional ways and use nontraditional ingredients."

He uses unusual ingredients such as honey, ginger, and maple syrup. How the brewer combines and balances the flavors makes the difference between a great brewer and one who is assigned to the dust bin of brewing history, and the Golden Prairie beers are more than memorable. Of the thousands of brands of beers I have sampled, the vast majority slowly fade from my memory bank. But I can remember Golden Prairie beers like I drank them yesterday.

The third reason the brewery is still going strong was its steady, well monitored start. In its early years Golden Prairie was practically a one-man company, with Furman acting as president, brewer, distributor, and marketer. In this way he was close to every aspect of the operation. If something went wrong, he knew about it and fixed it.

Furman's career in brewing started many years ago as a hobby. In 1988 he worked his way into the position of assistant brewer at Sieben's, Chicago's first brewpub. When Sieben's closed, he began working on plans to open his own brewery.

Financing for the new brewery was the hardest nut to crack. The big break came on Furman's wedding day. He served his homebrew at the wedding reception and one of the guests, David Bouhl, was so taken with it he offered to help finance the brewery. Eventually his bride, Laura Elliot, provided the rest of the financing.

Equipment was acquired catch as catch can and included a 100-gallon kettle purchased from a company that

STEVE JOHNSON

When the brewery relocated earlier this year, Furman updated his equipment and system. Golden Prairie now has a seven-barrel brewhouse and 14-barrel fermenters.

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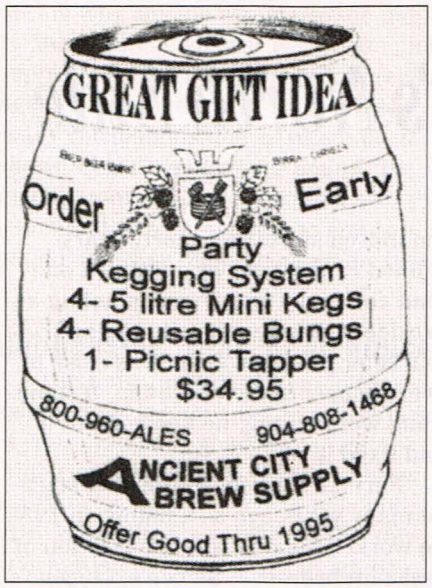

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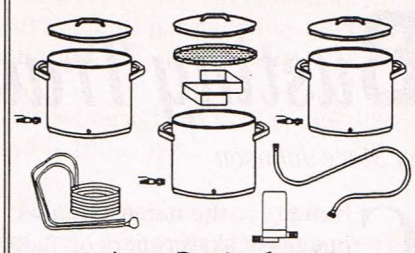

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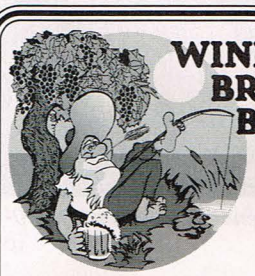

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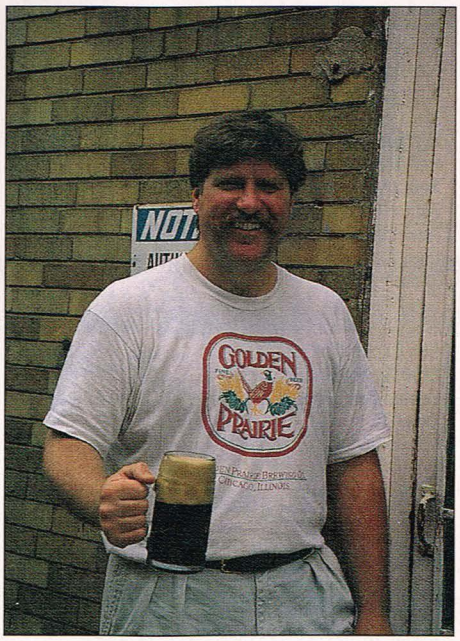
was going out of business, a leaky 85-gallon pot that was cast off by the Siebel Institute, and two 90,000-BTU wok burners discovered at a hardware store in Chinatown. The brewery went into production in October of 1992 on West Webster Street on Chicago's north side.

In the spring of 1995, the brewery expanded and moved to Elston Avenue, a little north of the original site. The brewery now occupies the site of the old Brand Brewing Co., which closed when Prohibition took effect. Furman has moved up to a seven-barrel brewhouse and 14-barrel fermenters made by Cross Manufacturing. Currently there are about 35 draft accounts, 90 percent of which are within a two-mile radius of the brewery, but distribution should expand in the near future.

I visited the brewery in June of this year. With a name like Golden Prairie Brewing, I was hoping it might be located in the middle of a field of barley but was really not very surprised when I found it in a grimy, industrial neighborhood. Having moved to their new location in recent months, they hadn't even put up a sign yet. Furman gave me precise directions for finding the brewery. When I parked the car in the alleyway between two ancient factories, I wasn't sure I had found the right place until I spotted his smiling, mustachioed face



STEVE JOHNSON

"Nowadays, we have the opportunity to pick and choose ingredients from all over the world," says Ted Furman.

and a Golden Prairie T-shirt.

Due to the recent move, the brewery was not ready to receive visitors. Much of the new equipment was not hooked up, and production had fallen behind. They were all out of their mainstay beer, Golden Prairie Ale. However, there was some fresh Golden Prairie Honey Ginger Beer and one keg of the Golden Prairie Maple Stout.

The Ginger Beer is made with two-row pale malt, fresh grated Hawaiian ginger, and clover honey. It was beautiful to look at, with a bright, deep gold color and a very fine head, which left a fine, white lace on the glass. The aroma was pungent, with a spicy, almost hot, ginger character. On the palate it was pure ambrosia, with a wonderful, mellow balance of fresh ginger and malt that finished crisply.

The Maple Stout was opaque black with a tall, tan, and tight-beaded head. The nose was very roasty, as was the palate. In the mouth it was complex yet smooth, with a dry roastiness and notes of both coffee and chocolate. It was both chewy and long.

After trying his beers I finally understood why Ted Furman's wedding guests got so excited. By October Golden Prairie Brewing should be ready to receive visitors. It is located at 2536 N. Elston Avenue (tel. 312-862-0106), across the street from Don's Restaurant Supplies. Please call in advance. ■

STEVE JOHNSON

In the early days, Golden Prairie relied on scavenged equipment such as two 90,000-BTU wok burners found in Chinatown.

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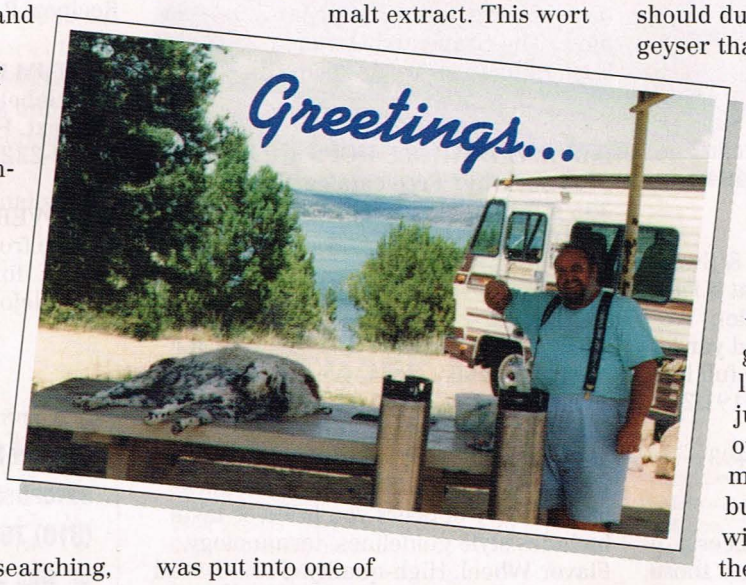
One for the Road

by Tom Sushinski

Retirement is being able to brew beer whenever, wherever, and however I choose. I choose to brew beer while traveling in my motorhome across a good part of British Columbia, Canada. Simplicity was the guiding factor in my plans for roadbrewing. Working within the space limitations of my RV and the tolerance of my wife precluded an all-grain, three-tier, gravity-feed brewing system. So I opted for the opposite extreme—kit beers.

I decided to use a keg system for storage—how could I relax and enjoy a homebrew if I was worried about the hassles of bottling on the road? The problem was that the RV refrigerator could not accommodate both my beer and food. So what's the problem you may ask? If you're married, you know what the problem is. If you're not married, ask someone who is. I needed to get another refrigerator for my RV that would keep my beer cold while traveling, fit into my RV, and not break my retirement beer budget.



After several months of searching, I finally found a used refrigerator for $50. It held a Pepsi keg and my CO_2 bottle, and there was room in the freezer compartment for blue ice. The blue ice helped keep the beer cold when we were not plugged into electrical power. When we were without electrical hookups for several days, I ran the generator until the refrigerator cooled back down. I could monitor the temperature by using an indoor/outdoor thermometer with one end inside the refrigerator.

I drilled a hole in the top corner of the fridge and slid a beer outlet hose through. I fitted a rubber stopper and a plastic spigot to one end and attached a keg connector to the other. The hose was long enough so I didn't even have to get out of my chair to fill my glass.

I made my first batch of roadbrew in a parking lot in Telluride, Colorado. It was the first day of the bluegrass festival, and a pretty good rain was coming down. There were yellow wild flowers covering the ground around the little pond just beyond the parking lot. Mountains rose in the background. It was a perfect place to make my first roadbrew. I heated water in a small pot on the gas stove and added the malt extract. This wort was put into one of the kegs and filled with water. I pitched the yeast immediately. There was no way to control the fermentation temperatures, but I was fortunate to have temperatures between 55° and 75° F throughout most of the summer.

My roadbrew process used three Pepsi kegs: a dispenser, a secondary fermenter, and a primary fermenter. When I finished a keg of beer, I would make another batch as soon as it was convenient. Generally there was a 10-day period for each stage. Ten days for primary is a bit long but overall, with the type of beer I brewed, 20 days from pot to glass was just right.

During all transfers I purged air from the tanks with CO_2. The absence of air kept the beer from oxidizing. All transfers were keg to keg through sterilized hoses and connectors so airborne beasties couldn't enter my beer.

I've had only one problem: When I attempted to make the first transfer from the primary to the secondary, the beer didn't transfer. I unscrewed the fitting that holds the tube and whoosh! A beer geyser erupted from the tank and the outlet tube shot into the air like a headless arrow. Everything seemed like it was happening in slow motion. I remember wondering if I should duck out of the way of the beer geyser that was raining down on the top of my head, or should I try to catch the outlet tube so it wouldn't hit the ground? At the same time I noticed the excellent hop aroma (Cascade) of this beer.

I opted to catch the tube and then recap the tank. I was drenched with this great-smelling beer and was laughing hard at what had just transpired when I figured out what had happened. I normally use Coke kegs at home but they were just a wee bit wide for my fridge, so I used the smaller Pepsi kegs that my son brought back from college. I didn't cut the Coke-keg-size tube off at the bottom, and yeast clogged the tube. Once I cut an inch off the tube, I had no further problems.

I brewed seven batches of great ales on the road that summer. All of them were excellent despite using only kit beer and a simple brew process that did not include the addition of hops, grains, or other adjuncts (I did use all malt and fresh yeast). I didn't even boil the wort! Having a completely closed system with everything sterilized was the key. The Canadians that shared my beer loved it. In fact one of them said that it was the best beer he ever tasted. ■

Thanks

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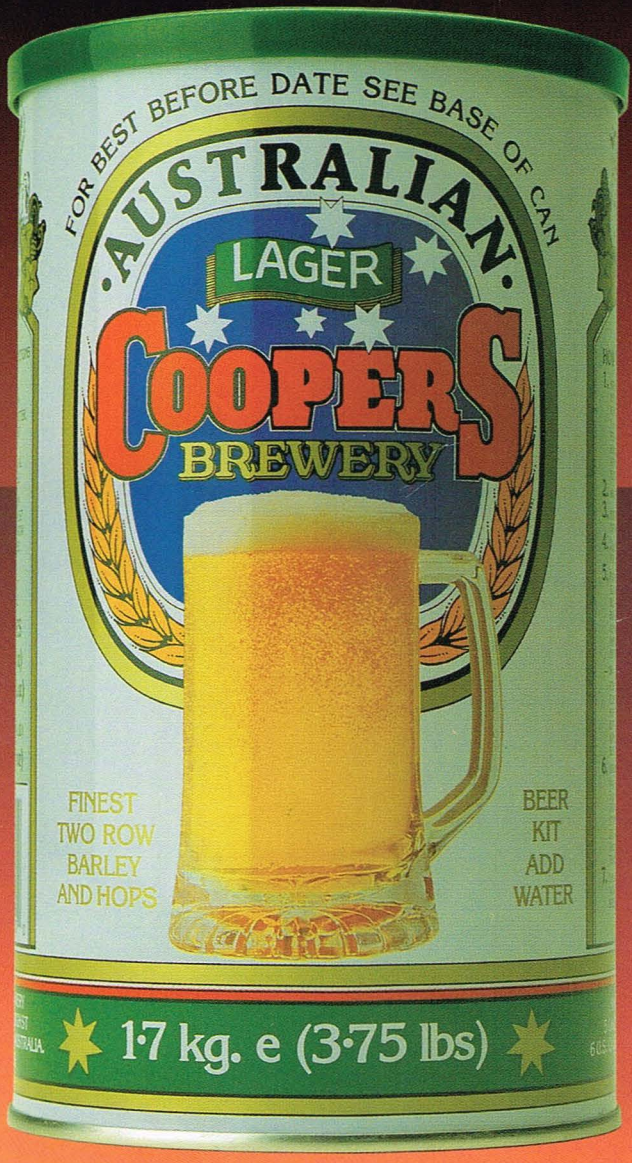

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