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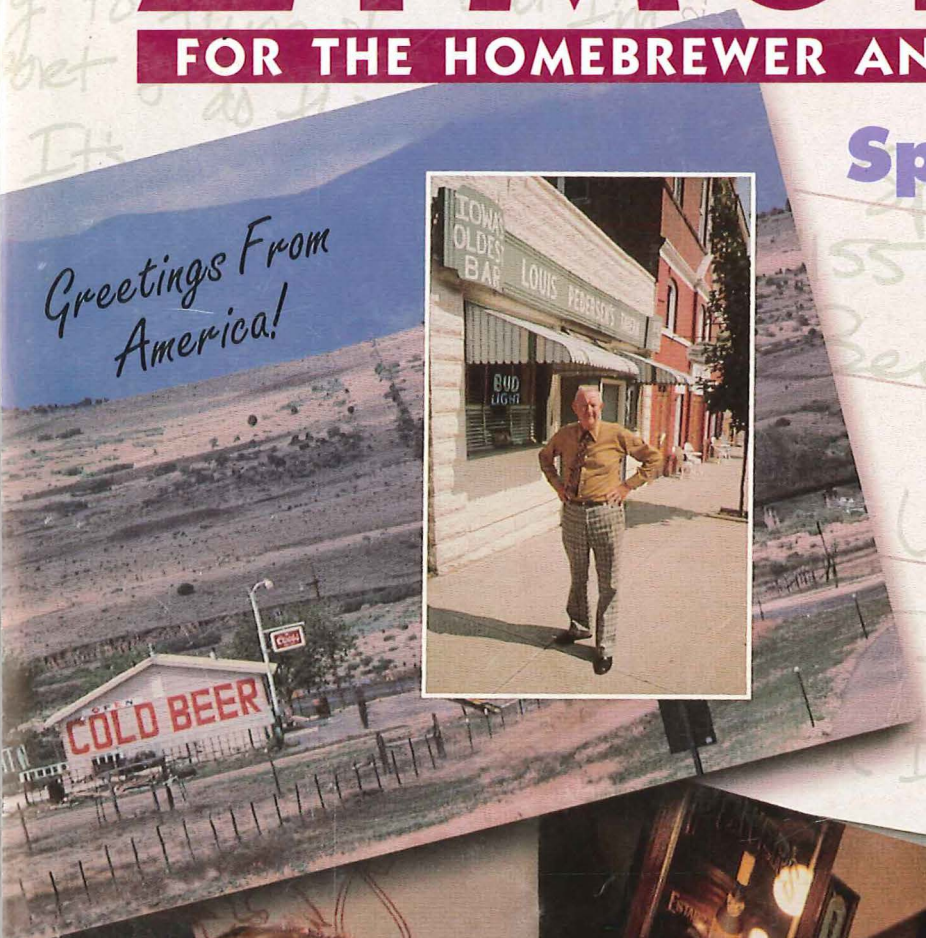
ZYMURGY

FOR THE HOMEBREWER AND BEER LOVER

Special Issue

TRADITIONAL GERMAN, BRITISH AND AMERICAN BREWING METHODS



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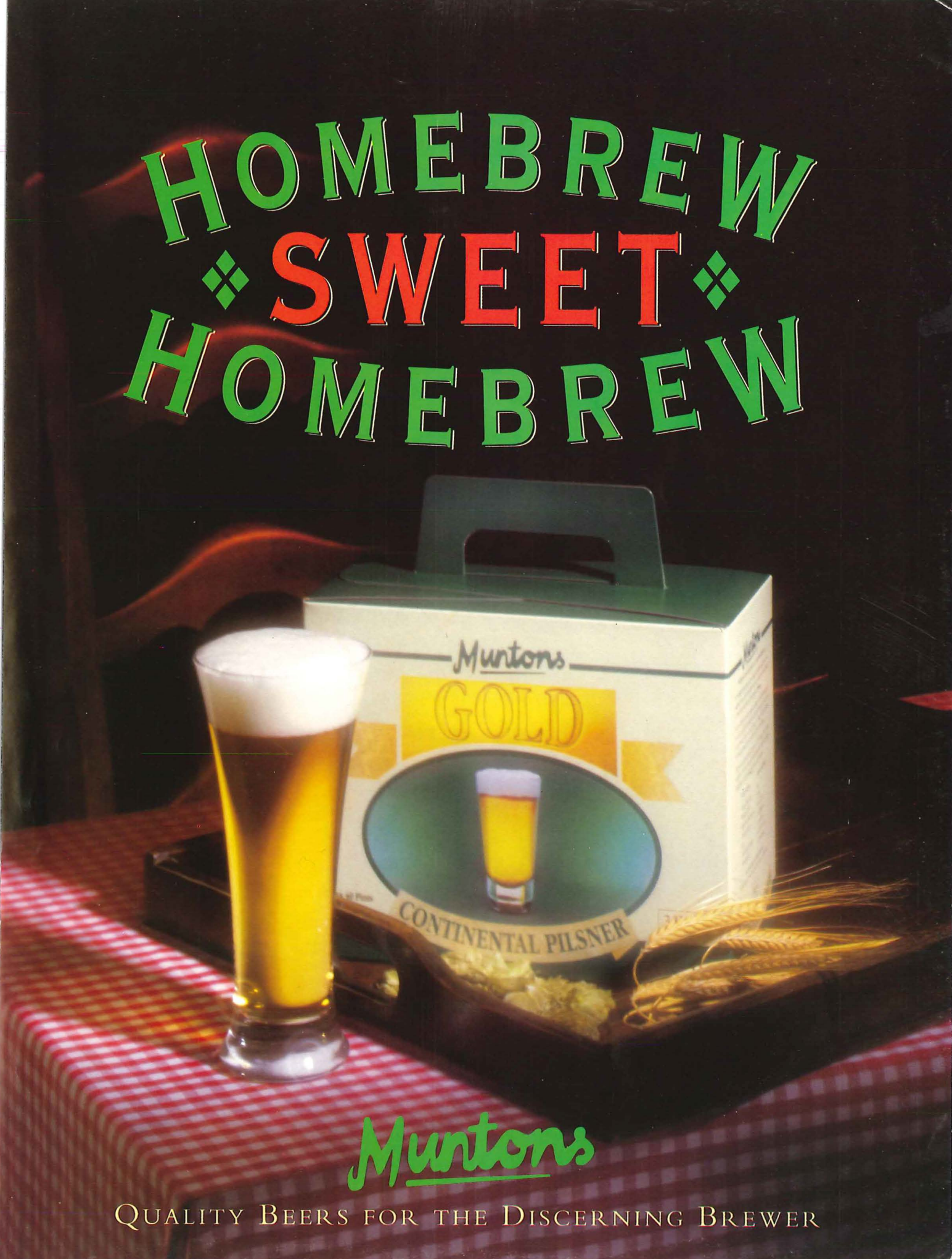

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ZYMURGY

Zymurgy \ zī'mər jē \ *n: the art and science of fermentation, as in brewing.*

VOLUME 16, NUMBER 4

COVER PHOTOS BY MICHAEL LICHTER AND GREG JONES

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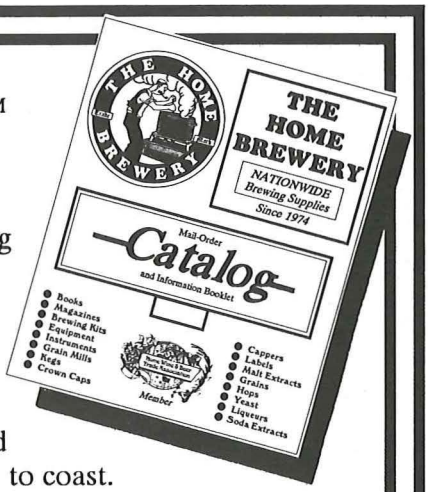

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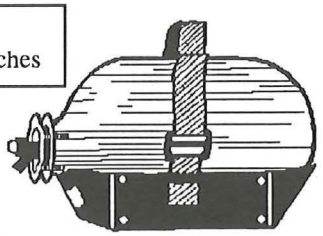

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Introduction

CHARLIE PAPAZIAN
President, Association of Brewers

Cheers, Prosit and Here's Mud in Your Eye!

I'll be the first homebrewer to admit to flagrant experimentation when it comes to formulating and creating brews. It is with all due respect for our European brewing traditions that I concoct the brews I love — apricot-coriander lager, chocolate porter, wheat-honey-"steam" barley wine lager, cactus mead, lambic-style barley wine ale, doppel-alt, Fuggles Pils or a Saaz bitter. These are but a few flagrant flings I've had that seem to fly in the face of British and German traditions.

But please give me a moment to explain.

By cross-breeding ale and lager traditions along with adding a few unique ingredients I don't intend to be discourteous or irreverent. Upon examining my own whys and what-fors, I find I hold a deep regard for the traditions that have borne the modern American brewing scene. I have a high regard for the British and German brewing traditions that have given me the pleasure of learning to make great traditional and not-so-traditional ales and lagers. But at the same time it's my nature to foster the continued evolution of American brewing through my own brewing. I am an American homebrewer and unique, just as you are. It is our nature to reflect and evolve when given the creative freedom and the circumstances to do so.

American brewing today borrows from many brewing customs throughout the world, but no two traditions have had as much influence as the techniques and beers of Great Britain and Germany. The respect I feel as I continue to learn more about the roots of British and German traditions serves as an exceptionally sound foundation from which to evolve.

At the same time, America's unique economy, geographical immensity, frontier spirit and cultural diversity encourage progress and evolution. And I believe that especially with brewing we maintain a high regard for tradition. Beer and brewing in America represent the best of the American spirit. The world watches and emulates us for good reason.

The American brewing tradition continues to evolve, especially at the grass-roots level of homebrewing. Even today as we discover unique brewing traditions of Asia, Africa, the Middle East and our own North and South American Indians, the richness of our brewing diversity will continue to evolve and offer homebrewers endless opportunities to experiment, discover and appreciate.

For one Special Issue of ***zymurgy*** let's pause, reflect and consider how each of us has been uniquely influenced by the two traditions that have produced some of the world's finest beers.

In these pages are but glimpses of our roots. They are not intended to be a comprehensive treatment of the subject by any means. What I'd like you to do, as I have done, is to remember the foundations of our creativity and then take a glimpse at what our writers say regarding our own American tradition. From here you will continue your own spirited journey in the world of brewing, creating new traditions, small and big. Perhaps what is yet to be will be looked back upon by new brewers in the 21st century with similar regard.

GERMAN

TRADITIONAL BREWING METHODS

History of German Brewing

KARL J. EDEN

The art of making beer is almost as old as the history of mankind. We could say: On the seventh day God created people and on the eighth day people created beer to quench their tremendous thirst. I'd guess even Noah had some homebrew equipment aboard his ark.

Once people discovered how to grind grain and bake bread from flour, they were not far from the secret of liquid bread — beer. When the ground grain became moist, it began to ferment. The drink that this process yielded, of course, was not comparable to the beer of today, but it must have been refreshing 6,000 years ago.

Some historical research led us to documents of the Sumerians, living between the Euphrates and Tigris rivers, who some 4,000 years before Christ, recorded the process of preparing beer from barley and emmer. They regularly offered beer to their gods in thanks for the barley harvest. Beer was a common drink at this time, and everybody received at least six mugs of beer a day.

The Babylonians learned the art of brewing from the Sumerians. They turned 40 percent of their annual grain crop into beer and were familiar with 20 different kinds of beer, preparing the lighter ones with cheaper ingredients for the slaves.

We know that bread and beer were basic elements of Egyptian food. Beer brewing was an important branch of industry and a monopoly owned by the government. They needed huge storage rooms to keep the beer cold. That's why they built the pyramids (beeramids). Prince Hammurabi, who ruled from 1730 to 1685 B.C., owned several brew houses and exported beer long distances in terra cotta flasks .

Roman and Greek historians tell us that all the Germanic tribes were zealous beer brewers. Beer was a national beverage. Aristotle, the famous philosopher, was a beer lover. And beer also played an important role in the myths of the Norsemen.

Gambrinus, the Duke of Brabant, was the famous patron saint of beer and brewing. He was an excellent brewer and statesman, opening his conferences with a huge mug of beer. Tacitus, the first historian of the Teutons, recorded that dukes of the River Rhine regularly drank beer before going to the battlefield. Beer was a cult drink all over the Old World. It was offered to the gods and drunk by kings and slaves. The Germanic nations as well as the Caucasians, Goths, Spaniards, Persians, Africans and people of the South Seas all drank beer. You could say beer conquered the world.

In the Middle Ages, brewing beer was like baking bread — it was the business of the housewife. It was common to bring a brew kettle as wedding gift for the bride. Fame and popularity of a city in the Middle Ages was dependent on the quality of the beer, and every city had many breweries.

In subsequent centuries the monasteries, particularly in Bavaria, played a large part in the development of the ancient art of brewing, which later grew in the towns and cities into a notable branch of industry. Monasteries were turned into breweries, the oldest established in 1040 at Weihenstephan is still in operation today. The monks definitely improved the art of brewing. They were the first to use hops because they discovered that hops not only give a distinctive flavor, but also serve as an excellent preservative. Soon almost all monasteries were surrounded by hop gardens. At this time there were about 500 monasteries in Germany and hardly a monastery was without a brewery. Every monk and nun would get seven meals and five liters of beer a day.

Gradually the monks lost their political

ILLUSTRATION BY MATT BROWNSON

power to the nobility, who took over the brewing industry and established laws and monopolies. Princes, counts and dukes built brewhouse after brew house.

The beers of numerous cities, especially the Hanseatic cities, became famous and were transported over land and sea to distant regions. There was the famous city of Einbeck in Northern Germany, whose name meant "One Goat Town." The brewmaster was well-known for his extra strong and excellent beer. Soon it was imported by the Duke of Munich and shipped in huge wooden barrels. Not many people knew how to write or read at this time, so they simply painted a goat on the barrel, identifying the beer from "One Goat Town."

In the towns and communes of large areas of Germany, all sections of the population drank beer as an important element of their daily fare. That is why in many places the quality and price of beer were controlled by the authorities. Even in those days beer was a popular source of tax revenue. The economic and political transformations that occurred after the Middle Ages had serious repercussions on the brewing industry.

In the early 1500s, brewers in Germany and other countries flavored their beer with fruits, roots, herbs and tree bark. Before discovering the bittering effect of hops they used the gall of animals. They beat eggs into the brew and used fish bladders for clarifying. Sometimes people got sick or even died after consuming bad beers made with questionable ingredients. That is why Wilhelm IV, Duke of Bavaria, in 1516 established the purity decree, *Reinheitsgebot*. It was soon adopted by other German states.

The purity law is the oldest law still in effect that deals with the production of food and drink and ensures the purity of a product. In addition to setting the price that could be charged (since changed, unfortunately), it was decreed that beer can be brewed only from barley malt, hops, water and yeast. The *Reinheitsgebot* original text (see sidebar) says nothing about yeast as an ingredient in beer because it hadn't been discovered as the cause of fermentation. Brewers took for granted the wild yeast fermentation they experienced. To enforce this law, the revenue offices checked all stages of the brewing process, to make sure that German beer was brewed from pure, natural substances and marketed as a pure product. Today all breweries in Germany with no exceptions, and some in Luxembourg, Switzerland and Austria, still abide by *Reinheitsgebot*.

GERMANY'S PURITY LAW

Following is the English translation of the Reinheitsgebot (German Purity Law) adopted in 1516, the oldest provision still enforced to protect the consumer.

"We hereby proclaim and decree, by Authority of our Province, that henceforth in the Duchy of Bavaria, in the country as well as in the cities and marketplaces, the following rules apply to the sale of beer:

"From Michaelmas to Georgi, the price for one Mass [Bavarian Liter 1,069] or one Kopf [bowl-shaped container for fluids, not quite one Mass], is not to exceed one Pfennig Munich value, and

"From Georgi to Michaelmas, the Mass shall not be sold for more than two Pfennig of the same value, the Kopf not more than three Heller (Heller usually one-half Pfennig).

"If this is not adhered to, the punishment stated below shall be administered.

"Should any person brew, or otherwise have, other beer than March beer, it is not to be sold any higher than one Pfennig per Mass.

"Furthermore, we wish to emphasize that in future in all cities, markets and in the country, the only ingredients used for the brewing of beer must be Barley, Hops and Water. Whosoever knowingly disregards or transgresses upon this ordinance, shall be punished by the Court authorities' confiscating such barrels of beer, without fail.

"Should, however, an Innkeeper in the country, city or markets buy two or three pails of beer (containing 60 Mass) and sell it again to the common peasantry, he alone shall be permitted to charge one Heller more for the Mass or the Kopf, than mentioned above. Furthermore, should there arise a scarcity and subsequent price increase of the barley (also considering that the times of harvest differ, due to the location), WE, the Bavarian Duchy, shall have the right to order curtailments for the good of all concerned."

Between 1882 and 1918, Germany owned colonies in South West Africa, East Africa and China. Breweries there also had to brew according the purity law until after World War I when Germany lost its colonies and the purity law was no longer enforced. During the

Third Reich, the purity law was extended to all countries controlled by Hitler.

After World War II, the purity law was only valid for West Germany and not for East Germany. Since the reunification in October 1990, the purity law has been in force for all of Germany.

It was not until the beginning of industrial and technical development in the first half of the 19th century that the brewing industry experienced an upswing. The introduction of steam generation and refrigeration in the breweries, chiefly in the large towns, paved the way for greater expansion in the brewing trade. In those days the scientists were pushing forward and opening up new worlds, deducing new knowledge that the breweries put into practice. Within a few decades German brewing methods and skills had achieved the worldwide recognition that they enjoy to the present day.

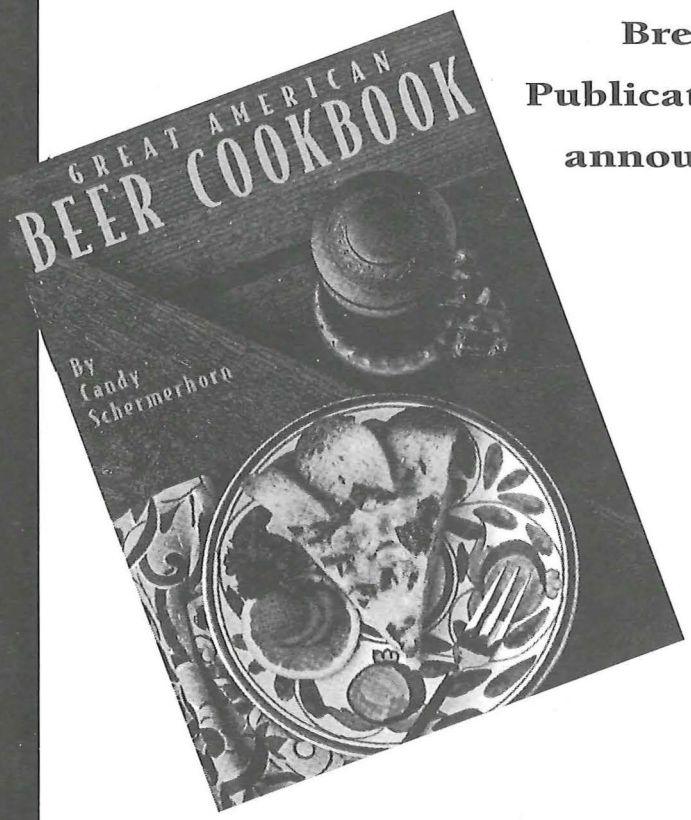
At the turn of the century the German breweries produced a record annual output of 70 million hectoliters of beer. This made Germany the leading beer-producing country in the world. Before World War I, German exports of beer amounted to almost 1 million hectoliters each year. In 1964 Germany's beer production reached 100 million hectoliters.

Nine out of every 10 Germans drink beer (the other one has wine). Some are in the habit of drinking every day because they appreciate their pint or mug of beer, known as a *Molle, Halbe, Seidel* or *Krugerl*, depending on which part of the country you are in. Others partake of this delicious beverage from time to time to refresh themselves, for there is hardly a drink like it. Apart from quenching thirst, it can add friendly warmth and a cheerful note to any informal social gathering. There is no minimum drinking age in Germany. When you are tall enough to put your money on the counter, you are old enough to buy a beer.

In Germany, beer is the national drink. Ever since our ancestors brewed this precious liquid from barley, Germany has rightly been regarded throughout the world as *the* beer country. Hence we can state with confidence that the German national beverage will continue to be closely linked with the customs and habits, culture and history of the nation.

Many a writer has composed a novel while partaking of this noble drink, and many an inventor owes his or her inspiration to the relaxation that beer bestows. How many of the ideas originating in Germany, the land of poets and thinkers, inventors and civil engineers, ensued from animated conversations over a glass of beer?

Formerly there was a very close connection between the brewing of beer and the convivial groups of friends who met to drink together; indeed, people used to brew beer at home for their own consumption. But this art has in recent decades been on the decline. Industrialization and specialization have had their effect on the beer industry and are reasons why people today, while continuing to enjoy their beer as of old, do not always know how this refreshing drink is made. For many, this may be the source of its special attraction, but those who know what beer is, how it is brewed, and who have some knowledge and experience of its preparation will enjoy it much better. There are no secrets in the art of beer brewing because it is basically a process learned from nature. This naturalness and purity have been retained in Germany.



Brewers Publications announces the

GREAT AMERICAN BEER COOKBOOK

by the Brewgal Gourmet

You read her regular column in ***zymurgy***, you've seen her at conferences, now you can have her in your kitchen. Brewers Publications is proud to announce the release of the *Great American Beer Cookbook* by Candy Schermerhorn. Truly a cookbook like no other! All recipes use beer to enhance the flavor of food.

FLEMISH STEW

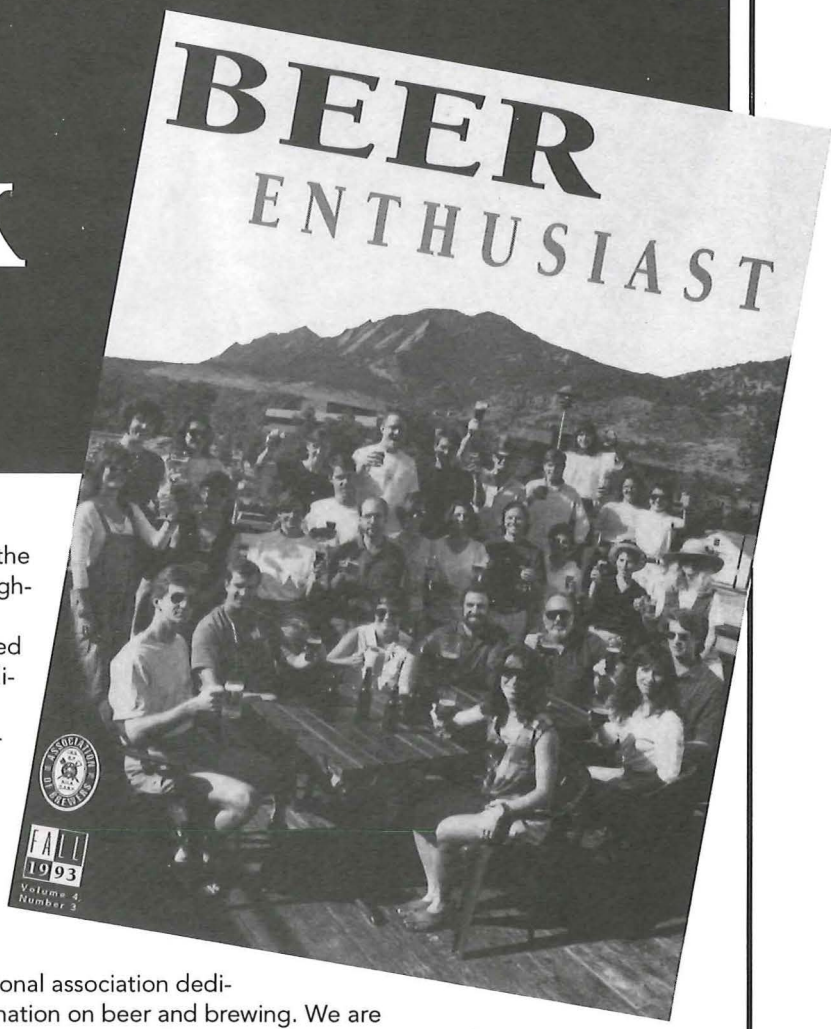
This simple, hearty and satisfying soup is a great hit any time of year. Serve with a salad and hot crusty rolls. Serves 6 to 8.

1/3	cup olive oil or other vegetable oil
5	tablespoons butter
5	large onions, thinly sliced
4	large shallots, thinly sliced
3	pounds boneless beef, cut in 1-inch cubes
1 1/2	cups flour mixed with 1 teaspoon each pepper, salt and paprika
1	teaspoon salt
2	tablespoons flour
2	teaspoons thyme
5	cups beef stock made with onion skins
3	cups Belgian ale
2	cups peeled white potato, diced
2	cups peeled turnip, diced

1. Heat oil in a heavy Dutch oven over medium-high. Dredge meat in the seasoned flour and brown in small batches. Remove from Dutch oven and set aside.
2. Add the butter and when the foam subsides add the onion and salt, cooking uncovered over medium-low until limp and golden.
3. Sprinkle salt, flour and thyme over onions, stirring and cooking for an additional four minutes.
4. While stirring constantly, slowly add stock, beer, meat and the diced vegetables to the onions. Cover and simmer slowly for 1 1/2 hours.

CANDY SCHERMERHORN

Your Brew Will Thank You



There is currently a beer renaissance underway in the United States — it's invading our kitchens, our neighborhood pubs and the minds of the beer drinking public. In order to keep pace with the growing need for information and to spread the word about quality American brewing, the Association of Brewers has produced the most complete and comprehensive catalog of beer and brewing books *found anywhere*. Consisting of more than 50 titles plus back issues of ***zymurgy*** and ***The New Brewer*** magazines, the Beer Enthusiast Catalog will take your brew to another level and expand your understanding of the beer you drink.

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BE16-4

An Overview of the German Brewing Industry

ERIC WARNER

Like the North American brewing industry, the beer market in Germany is extremely dynamic. Looking for trends has been more difficult since the reunification; however, plotting the general trends in Germany is relatively easy: fewer breweries making about the same amount of beer, a brewpub wave in the late 1980s and 1990s and continued growth in the Pilsener, Weissbier and alcohol-free categories.

The number of operating breweries in Germany has declined from 2,106 in 1962 to 1,315 in 1991, according to *Brauwelt Brevier 1993*. The low point was actually reached in 1990 at 1,178, but figures through 1990 include only the breweries in what used to be West Germany. What is perhaps a more telling statistic is the fact that in 1962, 79 percent of all beer produced in Germany came from breweries producing 500,000 hectoliters or less, while in 1991 breweries producing 500,000 hectoliters or more made 60 percent of all beer in Germany.

This growth of the large breweries has come mainly at the expense of breweries producing 60,000 hectoliters or less per year. The number of operating breweries in this size range was cut in half between 1962 and 1990. The total beer produced in what used to be West Germany was pretty consistent at 92 to 93 million hectoliters through the 1980s, but in 1990 (the year of reunification) the total jumped to 104 million hectoliters, and in 1991 it topped 117 million hectoliters.

Like North America, Germany has seen a number of new brewpubs arrive since the mid-1980s, and more than 150 "*Gästhausbrauereien*" have opened since then. The German brewpubs typically serve two to four styles of beer, usually unfiltered. That is one of the big selling points of the new German brewpubs: unfiltered beer is healthier because it still contains yeast. Most of the brewpubs have copper or copper-clad brewhouse equipment and most seem to be selling a lot of beer.

Pilsener continues to be the best-selling beer style in Germany, but sales of Weissbier have been growing most dramatically, particularly in Bavaria, home of this increasingly popular beer style. The most explosive growth has come in the alcohol-free category. One interesting difference between North America and Germany in this regard is that the Germans seem to drink alcohol-free beer because they have to drive afterward, while in America it seems to be more an issue of personal health. Sales of bock and dark beers, unfortunately, continue to decrease.

One other noteworthy trend is that Germany, a country long regarded as an exporter of beer, is starting to import more than it exports. Since the European court ruled in 1987 that Germany couldn't shut out brewers who didn't make their suds according to the *Reinheitsgebot*, the German beer purity law requiring beer to be made only with water, barley, hops and yeast, beer imports have been rising steadily. Most of the imports are coming from other European Community countries like Denmark, Holland, Belgium and Great Britain, but North American beers are having their day as well. Corona has already experienced a rise and fall similar to the one it had in the United States, and even Samuel Adams is brewed under license by a brewery in the Black Forest.

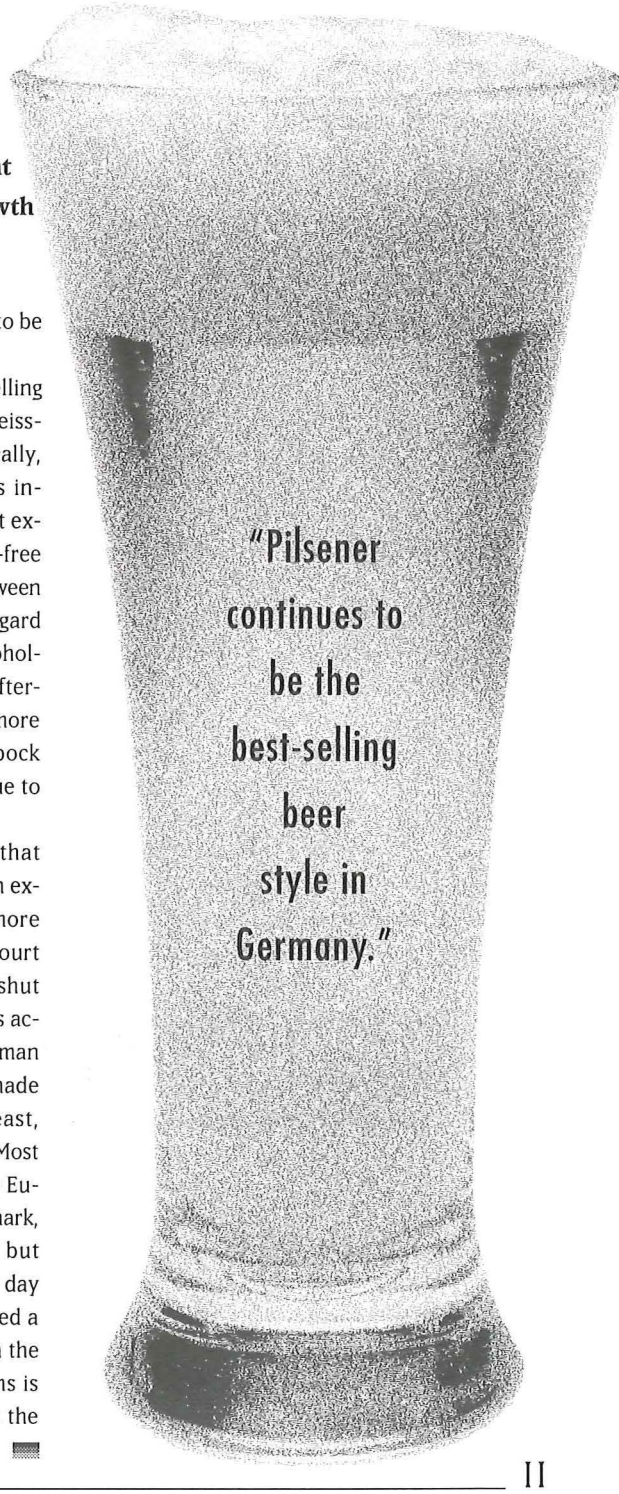

PHOTO BY MICHAEL LICHTER

Malting Techniques

ERIC WARNER

Without pure malt there can't be pure beer. This maxim dictates the way German malt can be made because the *Reinheitsgebot,* or more specifically, the *Biersteuergesetz* (beer tax law), applies not only to how German beer can be brewed but also to how malt can be made. In most other countries a variety of germination stimulants and inhibitors are used in the malting process. Some chemicals also are used to clean raw barley.

German malting practices in the last few decades have focused on how to achieve swift and thorough malt modification without using stimulants, and the technique that has more or less become established in the German malting industry is germination using falling temperatures. The principle is simple. Come out of the steep with a well-aerated and warm product, let the temperature stay warm for the next one to three days, then slowly cool the malt over the next three to five days to avoid overmodification. Production times are reduced if high temperatures are used throughout the germination process, but the barley corn will basically be unhomogeneously modified. What happens is that the endosperm closest to the germ is extremely overmodified, the endosperm in the middle of the barley corn is modified and the endosperm near the tip of the corn is totally undermodified. If low to medium germination temperatures are used, then modification is much more homogeneous but production times are a lot longer. Maltsters, like most of us, like to make money at what they do.

TWO-ROW BARLEY

Germination using falling temperatures achieves a compromise between having quality malt and reasonable production times. In fact, this type of germination yields brewers malt with the most desired characteristics: thorough and homogeneous modification and high enzyme content. Alpha amylase content is actually higher using this type of germination than with any other (assuming no stimulants are used). If germination begins at warm temperatures and the barley has a medium water content, then modification and enzyme development get off to a strong start. When the temperature

TABLE 1
Falling Temperature Germination

Day	1	2	3	4	5	6	7
Steep/Germination	STEEP	GERM.	GERM.	GERM.	GERM.	GERM.	GERM.
Temperature, °F/°C	63/17	64/18	64/18	59/15	56/13.5	56/13.5	57/14
Water Content of Barley	38%	44%	46%	48%	48%	47%	46%

ILLUSTRATION BY MELISSA BRONSON

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Two-row summer varieties of barley are almost exclusively used to make German malt. Again, the *Reinheitsgebot* has a major influence on this because the requirement to use only malted barley precludes the use of adjuncts such as corn or, in particular, rice. While the *Reinheitsgebot* doesn't forbid the use of six-row or other high-protein barleys, the adjuncts that are required with their use are disallowed.

As far as kilning techniques are concerned, the main thrust of research and development focuses on how to kiln using as little energy as possible. Americans gripe about possible energy taxes, but in Europe fossil fuels are much more expensive than in North America. As far as the malts themselves are concerned, the Pilsener type of malt is kilned at low temperatures of 176 to 185 degrees F (80 to 85 degrees C), medium-color Vienna malts are kilned at 185 to 195 degrees F (85 to 90.5 degrees C) and Munich malts can be kilned at temperatures as high as 220 degrees F (104.5 degrees C).

MASHING TECHNIQUES

Before discussing how a German brewery takes that fine chemical-free *Reinheitsgebot* malt and turns it into beer, a few words about malt extracts are worth mentioning. My best interpretation of the *Reinheitsgebot*, or more correctly, the *Biersteuergesetz* (beer tax law), tells me it is illegal to use any type of malt extracts to make beer. This makes good sense because I have never heard of any brewery in Germany that uses malt extracts to make beer.

There is an assumption among homebrewers I know that to make a German-style beer you have to do a decoction mash. This is not universally true. If you want to brew a double bock or a Weissbier then I would say doing a decoction mash would be emulating the mash procedure used by a German brewery to make such a beer. If, however, you want to make a Pils or a Munich-style Helles then you'll probably be better off using some type of infusion mash. You'll

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save yourself a lot of time and will certainly be doing things the way most German breweries do when making these types of beer.

Another article in this issue talks about decoction mashing and why versus why not, so let's not belabor that point here. Suffice it to say that if you're making something other than dark lager or Weissbier an infusion mash is the way to go. Let's say you want to make a Pilsener-style beer. You might want to mash with 3 1/2 times the weight of the grain in water at 122 degrees F (50 degrees C). You might hold a short protein rest of 10 to 15 minutes before raising the mash temperature to 144 degrees F (62 degrees C). At this temperature, beta amylase is most active and, particularly for a German-style Pilsener, a lengthier rest should be observed. After holding this temperature for half an hour the mash temperature should be raised to about 158 to 160 degrees F (70 to 71 degrees C), at which point a 20 to 30 minute saccharification rest should be held. Afterward you want to raise the mash temperature to the mashing off temperature of 168 degrees F (75.5 degrees C) before transferring to your lautering vessel. Even though this is an infusion mash, the only real infusion of water comes at the very beginning when mashing in. The other temperature increases are all achieved by raising the temperature of the mashing vessel.

The step infusion mash process detailed above is almost universally applicable assuming you are using well-modified malt, which is really about the only kind of pale malt you can get at a homebrew shop anymore. If you wanted to make a sweeter or maltier Pilsener, or something like a Helles, export or Märzen, you would reduce the temperature rest at 144 degrees F (62 degrees C) to 10 minutes and extend the saccharification rest to between 30 and 45 minutes. Adding some CaraPils malt or dextrin malt to the grist would also help the cause here. If you wanted to brew a drier Pilsener or something bordering on a North American lager, you might want to extend the beta amylase rest at 144 degrees F (62 degrees C) to 30 or 45 minutes and reduce the saccharifcation rest at 158 degrees F (70 degrees C) to 10 or 15 minutes.

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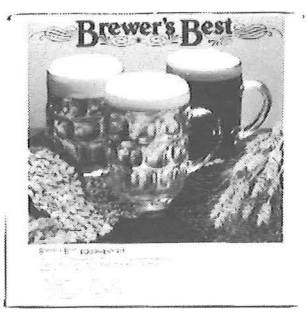

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Lager Beer — A Brief History

WOLFRAM KOEHLER

Humankind has always seemed to like drinks with a kick to them. Some historians speculate that beer, or rather the great grandfather of what we call beer, was the reason civilization took root. The need for brewing grains initiated agricultural ways that replaced the previous nomadic existence.

The oldest "written" recipe for beer dates back almost 5,000 years to the ancient Sumerians. In their tablets we find the production of beer an important part of daily routine, a religious ceremony for complementing their diets with the liquid bread. Of course, those fermented breads had little in common with our sophisticated brews of today without the beer yeast that so influences our final product. They, as well as all brewers for the next 4,500 years, depended on the wild yeast ever present in the air.

The origin of brewing is most likely an accident. Hardened bread soaking in water and probably forgotten started to ferment and when consumed, produced this fantastic euphoria and created a whole new category of food and the need for more and more grain. Soon brewing became a monopoly of the priests, many of whom paid their subservients part of their wages in beer. Beer was recognized as an economic factor and would play an important role throughout history to the present.

All those early brews were ales, spontaneously fermented in warm conditions and consumed when fermentation was finished, or before, when patience ran short. Early ales were often spiced with herbs and roots and brewed with any grain available. Only later did the mixtures become even remotely comparable to what we drink today.

The eighth- and ninth-century brewers knew there must be an outside force responsible for fermentation. The medieval brewers of Europe had an idea that the viscous, cheesy substance on the top or the bottom of their brew was related to the fermentation taking place, although scientific proof wouldn't come until almost the 20th century. Long before mechanical refrigeration the monks started lagering their beer in ice caves in the Alps. Ice-cave lagering enabled the monks to have beer in the summer months. This not only extended the brewing cycle throughout the year, but invented the lager process and its smoother products. They liked what they did and other breweries quickly copied them by building deep cellars stacked with ice from rivers or lakes during the winter to extend the brewing season almost year round. The "gelaeger," the sediment left in the bottom of the fermentation vessels, was reused. These stable yeast cultures later became the strains we use today.

ILLUSTRATION BY JOHN MARTIN

Scientific methods were unable to isolate the microorganism responsible for alcoholic fermentation. Even though many biologists tried to prove a variety of theories to its cause, Pasteur was the first one to come close to the truth around 1850. It was Emil Christian Hansen at the Carlsberg Laboratories, who first isolated a strain of beer yeast and proved beyond doubt that this was the organism responsible for alcoholic

fermentation. In his honor, the strain was named *Saccharomyces carlsbergensis* a name that encompasses all bottom-fermenting yeast strains. The multitude of brewing strains available today have been derived from the methods developed by Hansen. Hansen's methods are also responsible for yeast strain isolation, mutation and adoption for various performance and flavor results. Many of the typical lager beers like Pilsener would not have their characteristic taste without the proper yeast.

The other lager styles developed in different cities because of various types of water.

The city of Plzeň, in former Czechoslovakia, is home to the most popular of all lager styles. The soft water makes its delicate soft palate with a dry hop finish possible. Joseph Groh, a Bavarian brewmaster from Vilshofen, made a radical departure from the predominant dark and sweet beers of the era when he first created this Plzeň style in 1842. Pilsener has since become the dominant beer style in the modern brewing world.

The capital of brewing is Munich where the Munich-style beers tend to be full-bodied and low in hop bitterness. The hard carbonate waters originating in alpine sources nearby produced beers ranging in color from brown to almost black.

Dortmund has hard but mainly non-carbonate water that allows for a beer style between Pilsener and Munich-style, namely export. This is a medium-bodied and medium-colored beer with a solid hop flavor.

Technology has made it possible for brewers worldwide to treat their water and produce any beer style they wish. It is possible to brew Munich in Plzeň, Dortmund in Moscow and both in New Orleans.

Another giant leap for the brewing industry and for the food and beverage industry in general was the arrival of refrigeration. Carl von Linde developed the first refrigerator with the help of brewers in Munich and Vienna. Refrigeration changed brewing forever.

If we try to define lager, we might say it is well-balanced beer, brewed from malt and hops, fermented at low temperatures by bottom-fermenting yeast, carbonated and matured at almost freezing temperatures until properly aged.

Pilsener is by far the most predominant lager today, even though the methods and

results are as varied as the breweries that produce them. The typical hop character is rarely found in the domestic Pilseners of the United States, nor are the lagering times anywhere close to what the Pilsner Urquell required. There are some brewers, especially some micro and pubbrewers, who have reintroduced true Pilseners and other lager styles.

The following recipes for Pilsener and Märzen are true to style, but note that the step mashing system is used rather than the decoction method which isn't required with modern malt types.

CRESCENT CITY BREWHOUSE PILS

Ingredients for 5 gallons

- **3 4/5 gallons of water with no more than 179 mg/L hardness as $CaCO_3$♦**
- **7 1/2 to 8 1/3 pounds of two-row malt**
- **3/4 ounce of Cluster hop pellets, 7.4 percent alpha acid**
- **1/3 ounce of Hersbrucker or Saaz, 4 percent alpha acid**

Mash-in at 122 degrees F (50 degrees C) and hold for 10 minutes. Heat to 147 degrees F (64 degrees C), hold for 15 minutes. Heat to 158 degrees F (70 degrees C), hold for 20 minutes, or until iodine test is negative. Heat to 169 degrees F (76 degrees C), mash down (transfer to lauter-tun) and let rest for 20 minutes. Recirculate liquor until clear. Lauter.

Boil and add Cluster hop pellets. Sparge and run off until desired gravity 1.046 to 1.048 (11.5 to 12 °Plato) is reached. Boil for 90 minutes total, add Hersbrucker 15 minutes before cast out. Remove hot trub and cool to 50 degrees F (10 degrees C), aerate amply. Pitch suitable lager yeast. Ferment at 50 degrees F (10 degrees C) until finished, use counter-pressure or kraeusening to carbonate. Keep at 50 degrees F (10 degrees C) for 24 more hours to reduce diacetyl, cool to 32 degrees F (0 degrees C) and mature for minimum of 21 days.

♦ Call your local water department to find the hardness of your water.

The Art and Science of Decoction Mashing

ERIC WARNER

One of the uniquely German traditions and philosophies about beer-making is the practice of decoction mashing. In contrast to infusion mashing procedures, where the mash temperature is either constant or raised by "infusions" of hot water, a decoction mash procedure involves raising the temperature of the mash by separating or "decocting" a portion of the mash into another kettle, boiling it and then recombining it with the main mash to raise the temperature of the entire mash.

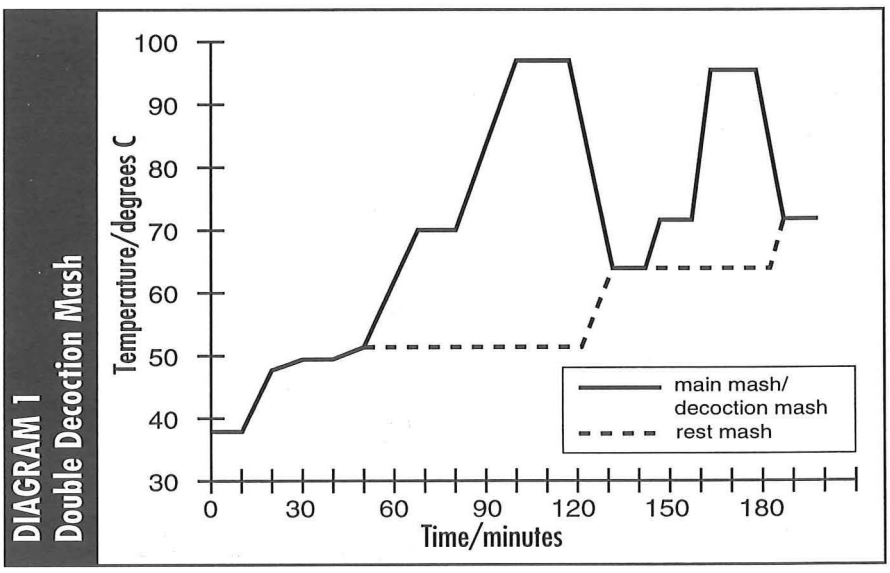
The real aim of decoction mashing isn't oriented around temperature change in the mash, rather it is to accentuate the cytolytic breakdown, or starch conversion, of the malt. Essentially there are two ways to dissolve malt particles into solution and create wort. The first is through the biochemical process of enzymatically breaking down starches into sugars, big proteins into amino acids, etc. The second is to physically decompose starch particles and proteins by subjecting them to the extreme heat. Whereas an infusion mash relies solely on the former phenomenon, decoction mashing uses both biochemical reactions and heat to turn malt into wort.

The question becomes, why decoction mash in the first place? If both infusion and decoction mashing techniques can be used to produce wort, why not use the simpler infusion technique? Boiling the decoction breaks apart starch particles in the mash that would otherwise only be broken down enzymatically. The theory is that a decoction mash should be used with undermodified or enzymatically weak malts. In order for sufficient starch breakdown to occur and reasonable yields to be achieved, the enzymatically weaker, undermodified malt must undergo a decoction mash so the few enzymes present in the mash will be able to do their job more easily.

Decoction mashing also serves to intensify the malty flavor and aroma in a given beer style. A single or double decoction mash is essential for achieving the maltiness that is characteristic of Munich-style dark beer, bock, alt or dunkelweizen. When a decoction is boiled, sugars and amino compounds combine and either directly produce or, through one or more further reactions, produce the substances (melanoids and N-heterocyclic compounds) that give beer a malty aroma and flavor. Of course, the vast majority of the flavor compounds that are characteristic of a dark German beer come from using Munich, Vienna or dark specialty malts that already have much higher levels of malty compounds than pale malts. The point is, you can still make a decent dark beer using Munich malt and an infusion mash program, but to intensify the malty character and get a worldclass Münchener dunkel a decoction mash should be used. By the same token you can use pale malt and do decoctions until you're blue in the face, but you'll never get anything close to a dunkel.

Decoction mashing also deepens the color of the wort and the finished beer, which is again very important for achieving the color desired in a German-style dark beer. One could be quick to point out that this can be achieved by adding chocolate or CaraPils malts to the grist. If color is the sole motive for brewing a dark beer, then I will be the first to concede that point. However, if you take two Munich darks, each the same color and starting gravity but one having achieved its color through a double decoction mash and a 30-minute longer wort boil than its infusion counterpart that achieved its color through specialty grains, the decoction beer will have a much "truer" maltiness.

The most traditional and time consuming decoction mash program is the so-called triple decoction mash. It is seldom used anymore, simply because it is so time-consum-



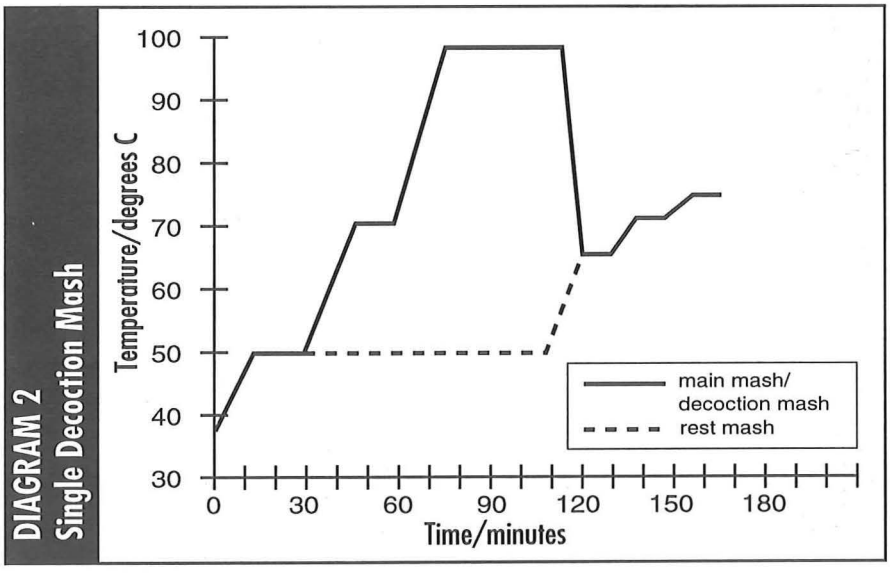
GRAPHS FROM *GERMAN WHEAT BEER* (BREWERS PUBLICATIONS, 1992)

ing (six hours just for the mash!) and energy inefficient. What is still commonly used is the double decoction mash, which only takes three to four hours and should be used to make a bock beer or a dunkel (dark) beer. There are many variations on the theme of the double decoction mash, but Diagram I depicts a double decoction mash procedure that is widely applicable.

The malts are mashed in at about 100 degrees F (38 degrees C) with a water-to-grist ratio of 3-to-1. After the mash-in is completed the temperature of the mash is raised about 2 degrees F (1 degree C) per minute up to about 122 degrees F (50 degrees C). At this temperature a short protein rest of 10 to 15 minutes is held before the first decoction is pulled. This decoction should be thick (concentration of about two parts water to one part grain), so the mash from the bottom of the mashing vessel should be removed, which is most easily and inexpensively done using a slotted spoon. The decoction mash should constitute roughly 40 percent of the entire mash. The decoction is heated at a rate of about 2 degrees F (1 degree C) per minute up to about 160 degrees F (71 degrees C), at which point a 10- to 15-minute saccharification rest is held. The decoction mash is then brought to a boil in 10 to 15 minutes and is boiled for 20 to 40 minutes, depending on the beer style. Boil darker beers longer than lighter ones.

After the decoction mash has been boiled it must be recombined with the rest mash. It is very important for the decoction mash to be added to the rest mash and not the other way around, otherwise the boiling hot decoction mash would destroy most of the enzymes in the rest mash. The decoction mash should be added slowly to the main mash, and the main mash should be stirred while this is being done. All told, it should take about 10 to 15 minutes to recombine the two mashes. Ideally the temperature of the main mash should be at about 147 degrees F (64 degrees C), but if not, the temperature of the entire mash is raised to this level. At 147 degrees F (64 degrees C) the second decoction is pulled and treated similarly to the first: temperature increase of 2 degrees F (1 degree C) per minute up to 160 degrees F (71 degrees C), hold for 10 to 15 minutes, bring to a boil, boil for 20 to 40 minutes and then recombine. The second decoction should have a similar consistency to the first one. After the second decoction has been recombined with the rest mash the temperature of the entire mash should be about 160 degrees F (71 degrees C). This temperature is held for 10 to 15 minutes or until an iodine starch test is negative. The mash temperature is then raised to 170 degrees F (76.5 degrees C) before the mash is transferred to the lauter tun.

The most commonly employed decoction mash today is the single decoction mash, which is well-suited to making dark lagers and Weissbier. Again, there are many variations of the single decoction mash, but Diagrams 2 and 3 depict versatile ones. This single decoction mash starts in much the same way as the double decoction mash: mash-in at 100 degrees F (38 degrees C) and raise the temperature 2 de-



grees F (1 degree C) per minute to 122 degrees F (50 degrees C). At this point a slightly longer protein rest of 20 to 30 minutes is held before the thickest 40 percent of the mash is pulled, brought to 160 degrees F (71 degrees C), held for 10 to 15 minutes, brought to a boil and then boiled for 30 to 40 minutes. Because only one decoction is being boiled in the single decoction mash it is usually boiled a bit longer than each of the decoctions in the double decoction mash. The mashes are recombined to a temperature of about 147 degrees F (64 degrees C), at which point a 10- to 20-minute rest is held, and then the mash temperature is raised to 160 degrees F (71 degrees C). At this temperature a 10- to 15-minute saccharification rest is held (or until iodine starch test is negative) and then the temperature is raised to the mash-off temperature of 170 degrees F (76.5 degrees C).

At this point the question arises, if the whole point of decoction mashing is to compensate for the lack of enzymes in dark malts or under modified malts, then why decoction mash if you're boiling the mashes anyhow? This is the whole reason for pulling the thickest part of the mash and not the thinnest. The vast majority of the enzymes in the mash are in the liquid part of the mash. By pulling the thick part of the mash the enzymes are being preserved and the mash particles are broken down through the boiling process. It is important to keep in mind that the aim of a decoction mash is also to intensify the malty aroma and flavor of a beer, as well as to deepen its color.

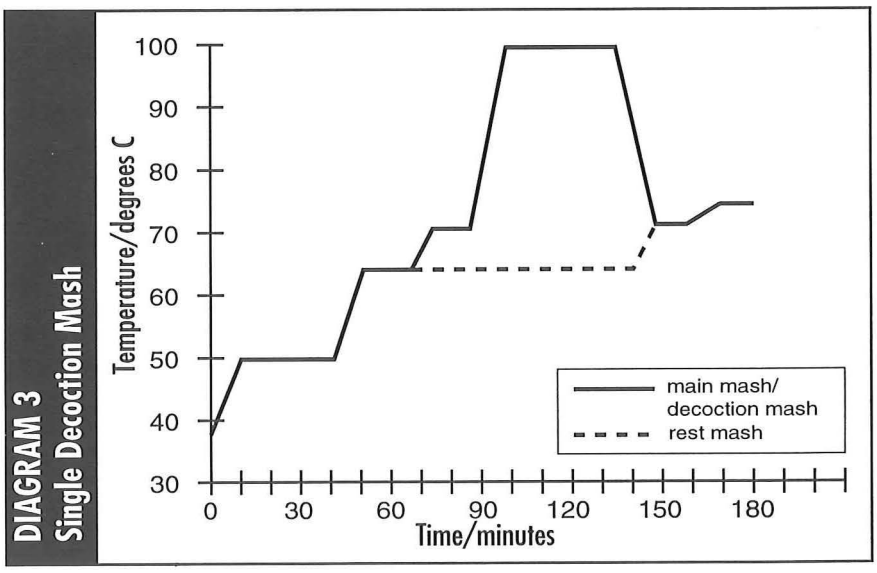
There is no question that decoction mashing is more complex and time consuming than infusion mashing. The practice of decoction mashing has prevailed in part because malts weren't always as homogenous or as well-modified as they are today. Decoction mashing is an art that is slowly disappearing in Germany for a variety of reasons. For one, malt quality is continuously improving, thereby eliminating the need to decoction mash from the standpoint of enzymatic strength of malt. The trend in Germany has been toward lighter, Pilsener-style beers, and because these beers require the use of pale, well-modified malt, a decoction mash program would be both overkill and detrimental to the quality standards (undesirable deepening of color) the European brewing industry has set for such beer styles. Finally, energy isn't quite as cheap in Germany as it is in North America, so decoction mashes have been either shortened or eliminated in German breweries in the interest of energy conservation. Despite these trends, many German breweries still stand by the decoction mash for making dark beers, bock beers and Weissbier and, if your goal is to make a world-class doppelbock, dunkel or Weissbier, then I strongly suggest you do the same.

Here is a classic, Munich-Hefe Weissbier with a grist composition of 70 to 30 wheat to barley. If the proper yeast is used, your beer should be as good as the original.

ISAR WEIZEN

Ingredients for 5 gallons

5 1/8 pounds pale wheat malt



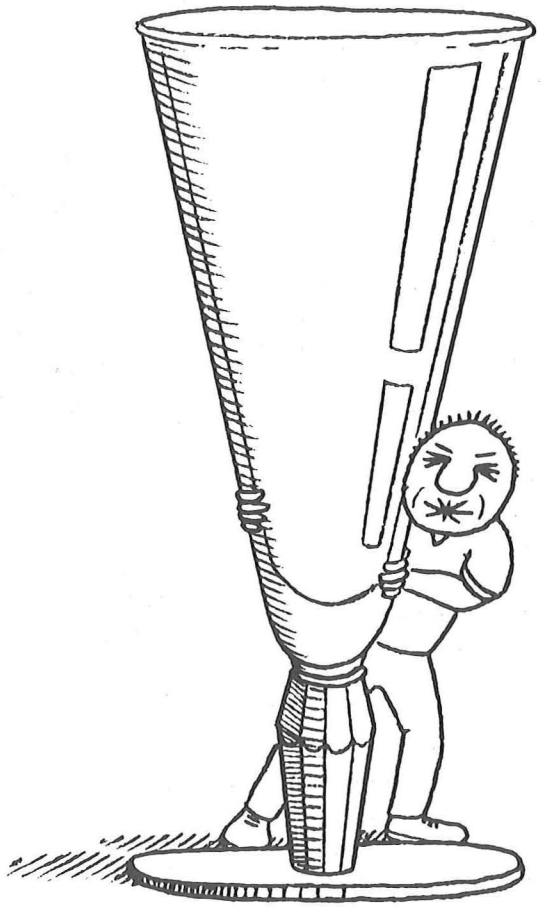
- **2 2/5 pounds (1.1 kg) pale barley malt**
- **2 2/5 pounds pale barley malt**
- **3/4 gram Hallertauer hops (2.6 HBU)**
- **1 4/5 quarts Speise if fresh wort is used, or save 1 3/5 quarts of Speise for priming**
- **3 2/5 ounces liquid Weissbier yeast**
- **1/3 ounce liquid lager yeast**

- **Original gravity: 1.055 (13.5 °Plato)**
- **Apparent degree of attenuation: 82%**
- **IBU: 15**

Mash in 2 7/10 gallons of water at 104 degrees F (40 degrees C) and heat in 10 minutes to 122 degrees F (50 degrees C). Rest at this temperature for 25 minutes and then pull the first decoction, which should be thick and should constitute roughly 40 percent of the mash volume. While maintaining the rest mash temperature, heat the decoction in 15 minutes to 160 degrees F (71 degrees C) and pause here for 15 minutes for a saccharification rest. Heat in 15 minutes to boiling and hold for 20 minutes. Mix the two mashes over the course of 10 minutes. Adjust the temperature to 147 degrees F (64 degrees C) if it is not already at this temperature. Rest here for 20 minutes and then heat in seven minutes to the same saccharification temperature given above or slightly higher. Rest here until the iodine reaction is negative. Heat to 170 degrees F (77 degrees C) in five minutes, hold there for five minutes, then transfer to the lauter-tun. Lauter slowly and carefully to avoid a set mash. If a set mash does occur, or if the runoff is sluggish, use a knife to cut gently through the mash, being careful not to cut through the false bottom. Boil for two hours. Add half the hops at the start of the boil, another quarter at 60 minutes and the final quarter at 105 minutes. After the boil ends, allow the wort to stand for a half hour before cooling to 59 degrees F (15 degrees C). Pitch top-fermenting Weissbier yeast and ferment at 65 degrees F (18 degrees C) until fully attenuated (48 to 72 hours). Rack the young beer off the sediment into the mixing vessel, add Speise and liquid lager yeast, and mix gently but thoroughly. Fill into bottles or other container and condition warm at 68 degrees F (20 degrees C) for five days. Store cold for three to four weeks before serving at 45 degrees F (7 degrees C) with sediment in a Weissbier glass.

Basic Techniques for Formulating Lactic Acid Rests

GREG NOONAN



Brewing has been going on for a long time, so myriad variations in process and technique have developed in centuries past. There are "tricks of the trade" that we, the new generation of American brewers, have barely glimpsed.

For instance, like many neophytes, I have always assumed that the sharpness in the flavor of Guinness was from roast barley. An article published in *What's Brewing* (March 1993) purports that Guinness' predecessor, porter, by definition contained a significant portion of beer "soured" by acetic acid bacteria to accomplish that tartness. Others claim that Guinness uses the technique to this day to acidify the wort in the copper, as well as for the flavor it gives.

This is but one example of a brewing technique that 99.9 percent of brewers haven't previously been privy to. Why? Because the breweries that use old methods are in no rush to share their secrets. Because beer styles have changed and much technique has been abandoned with those lost styles. Because "modernization" and market forces have conspired to standardize processes to those that are most economical and expedient, at the expense of diversity. And finally, because even in the age of information not many of us are multilingual or have the leisure time to devote to researching obscure sources.

As a homebrewer in the 1970s, I read about German sour mashes that were acidulated by *Lactobacillus delbrueckii* bacteria to correct the mash pH. This was nice piece of information, but I had no idea how they inoculated the mash with the *Lactobacillus*. I also pondered how 18th-century brewers could have isolated and maintained such a culture when they didn't even know what bacteria were.

I wrangled with this problem. I ruminated over it and got nowhere. Then inspiration came to me in a flash. I reasoned that there must have been a ready source of *L. delbrueckii* as an inoculant. Where was it? Right there in the malt! I made up a mash at 95 degrees F (35 degrees C), added a handful of uncrushed malt, poured and then pressed it into a vacuum bottle, capped it loosely and placed it in a bucket above the woodstove. Two days later I had sour mash!

In the intervening years I have not encountered much information about acidulating mashes and my own technique has changed only a little. In preparing this article, I asked maltster Roger Briess if he could provide a list of organisms that commonly infested brewers malt. Roger was brief: yes, he could provide such information but what was the point? To produce lactic acid, he pointed out, one simply has to set up the narrow range of conditions that favor *L. delbrueckii*. Why worry about extraneous microflora? Roger agreed that a host of fungi and bacteria commonly occur on malt, but under *L. Delbrueckii's* optimal growth conditions [between 119 and 125 degrees F (48 and 52 degrees C)] they would be depressed and their impact inconsequential.

Roger reiterated the important features of setting up a controlled microbial activity: create the time, temperature and atmospheric circumstances that favor the desirable organism and discourage the activity of other microflora.

ILLUSTRATION BY MARTIN HESS

In fact, lactic acid is far simpler to produce than acetic acid (vinegar). Vinegar is more acidic than the runoff from a lactic acid mash, but the acetic acid bacteria are more tenuous and can take months to acidulate fermented beer into vinegar. *L. delbrueckii* is faster-acting, albeit more weakly acidifying.

The conditions that favor *L. delbrueckii* over other microorganisms that infest malt (and the atmosphere in general) are simple. First, the exclusion of oxygen favors it over aerobes and microaerophiles. Any portion of a lactic mash that is exposed to air during its rest is quickly covered with mold and yeast (most aren't anything close to saccharomyces) and develops a particularly disagreeable solvent-acetone aroma.

Second, most microorganisms thrive in the general range of ambient temperatures of 60 to 90 degrees F (15.5 to 32 degrees C), and relatively few at more elevated temperatures. The *L. delbrueckii* strains are thermophilic (literally "heat loving"), so temperatures above the "normal" metabolic range favor their growth to the exclusion of competing microorganisms.

Third, *L. delbrueckii* is inhibited by the very acid it produces, and although they are not the most aggressive of microbes they still produce the desired results within 72 hours and acidify the substrate only marginally after that time. Consequently, resting for 24 to 72 hours is most favorable for lactic acid production. Under microscopic examination the wort from extended sour mashes shows a host of fungi and bacteria that grow ever more frightening in appearance with increased magnification. None seem to enhance the flavor. After 48 to 72 hours the flavor of the mash is invariably the same. Over a longer time, however, fungi that produce very negative flavors dominate, so there is good reason not to overextend the rest.

To this day the sour mash that we make at the Vermont Pub and Brewery in Burlington, Vt., follows essentially the same method I used in my first experiment. The only change is that we have raised the starting temperature of the lactic acid rest to 120 degrees F (49 degrees C) because the greater heat appears to prevent the growth of competing organisms that are active at 95 or 100 degrees F (35 or 38 degrees C). There are other methods that produce equally interesting flavor variations, but the method we use gives the character we want to impart; that is, lactic acid and DMS.

To make a sour mash, mash-in pale malt equal to 10 to 15 percent of the grain bill two or three days before brewing. Make the mash in an insulated container (a large thermos or a small cooler is just the ticket here) at a saccharification temperature of 149 to 152 degrees F (65 to 66.5 degrees C) to favor maltose and glucose production. After a sufficient rest of one to 1 1/2 hours, cool with cold clean water to 120 to 122 degrees F (49 to 50 degrees C). At this point inoculate the mash with a small amount of reasonably fresh whole malt (about 2 to 5 percent of the amount of malt used in the sour mash), distributing it well throughout the mash and being careful to mix in such a way as to avoid entraining any air in the mash. Then press the mash with a ladle or spoon to force out as much air as possible, tightly cover it with plastic wrap to reduce contact with air and loosely cover the container.

After 24 hours the pH will generally drop to between 3.9 and 4.0 and after 48 hours to pH 3.5. Even after 72 hours, the pH probably

will not drop below 3.3, and in any case the mash should be used at this time. Open the "reactor" and carefully scrape away any yeast or mold-contaminated surface at the edges of the plastic-wrap seal. Ladle the sour mash into your grist as you dough-in your full saccharification mash.

The color of a good sour mash is almost corn yellow, very much like the color of saffron. Any brownish kernels on the surface need to be carefully skimmed away and discarded with the aforementioned yeasts because they give the aroma of eau de rot. But the mash that lies under it gives a truly intriguing aroma — lactic, like sweat, almost citric in its sourness with a strong cornlike aroma of DMS. Truly intriguing, at least to some deranged brewers.

At our brewery we brew Beetlejuice, a Bavarian-style Weizen. Its aroma and flavor are nearly indistinguishable from Spaten Club-Weisse. We use a yeast strain that exudes clove and banana aromatics, but equally important is the fact that 15 percent of the grist is sour mashed for two days. It is a world apart from American wheat beer and we believe that the sour mash is necessary for that true Bavarian character. We also sour mash 10 percent or so of the malt in most of our lighter lagers to acidify the mash and for authenticity of flavor. In combination with an old Bohemian yeast strain that gives a very vinegarlike background flavor, we approach the subtle complexity evident in Bohemian Pilseners. Taste a Pilsner Urquell or a Velke Popovice, and you'll taste a hint of vinegar. It is probably from one of the yeast strains, but it is entirely possible that it is from a low level of acetic acid bacterial contamination as well. It's part of the flavor. Recreate the aroma of lactic acid and of DMS in your mind, and then taste a Pilsener. Way down deep in that incredible cornucopia of interwoven flavors you'll taste sour mash. With the vinegar flavor it combines to sour the beer in a subtle and harmonious way.

There are other methods of souring. At an AHA conference in 1989, accomplished homebrewer Ray Spangler and the brewmeister Hans Bilger teamed up to make a special brew at the Oldenberg Brewery. I sampled it with several homebrewers in the pub. We ordered a round and recoiled in horror at the unmistakable taint of wort infection! In the commemorative brew! It wasn't until the next day that we learned the infection was intentional. The unusual flavor had been achieved by making up a mash at 113 degrees F (45 degrees C), leaving it overnight with air entrained in the mash and open to the atmosphere above (French country Bière des Gardes exhibits a similar unconventional flavor). Once past the assumption that the flavor was "contamination," we all had to agree that the beer was piquant and refreshing — a nice summer refreshment.

You can sour wort using a *Lactobacillus* inoculant, or malt. Charlie Papazian has used this method, and as reported in *The New Brewer* (March-April 1991) it was used in 8 to 15 percent volume in commercial breweries in Bavaria to neutralize up to 178.5 milligrams per liter of carbonate hardness, correct the mash acidity and round out a beer's flavor. If you start with wort at 130 degrees F (54.5 degrees C) or so, you can bubble CO_2 up through it to expel air and create an oxygen barrier above it. The CO_2 will quickly cool the wort to 120 degrees F (49 degrees C) or less.

The New Complete Joy of Home Brewing (Avon, 1991) describes

how a sour mash can be used to produce gueuze and other sour beer styles in a controlled manner by souring the saccharified mash rather than the fermenting beer. The advantage here is that the souring organisms are killed off during the wort boil, rather than being turned loose in the traditional "wild" fermentation where the results are less predictable.

Sour mashing is just one of the mysteries of brewing being explored by the new American brewers and by adventuresome homebrewers. Homebrewers have been the driving force of the craft beer revolution in America, and they will continue to explore and revive forgotten brewing practices that will widen the horizons of beer choice for decades to come.

PILSENER

Ingredients for 5 gallons

- **6 2/4 pounds Pilsener malt**
- **1 1/4 pounds CaraPils malt**
- **2 3/4 gallons soft mash liquor at 190 degrees F (88 degrees C)**
- **3 3/4 gallons soft sparge liquor at 172 to 175 degrees F (78 to 79.5 degrees C)**
- **1/4 ounce Saaz hops (90 minutes)**
- **1 ounce Saaz hops (45 minutes)**
- **1 1/4 ounces Saaz hops (10 minutes)**
- **1/4 to 1/2 ounce Saaz hops (finish)**
- **Pilsener yeast**
- **3/4 to 1 cup glucose (to prime)**
- **Original gravity: 1.048**
- **Final gravity: 1.015**

Between 24 and 48 hours prior to brewing, mash-in 1/2 pound of Pilsener malt with 170-degree-F (76.5-degree-C) liquor to reduce temperature to 150 degrees F (65.5 degrees C). After one hour, add cold liquor and a small handful of uncrushed malt while mixing until the temperature is reduced to 120 degrees F (49 degrees C). Compress into a well-insulated container, tightly cover the mash with plastic wrap and loosely cover the container.

On brew day, crush the rest of the malt, heat the remaining mash liquor to 190 degrees F (88 degrees C). Uncover the sour mash, remove any discolored grains on the surface and record the sour mash pH. Mix the sour mash into the main brew as you mash-in all grains to between 125 and 128 degrees F (51.5 and 53.5 degrees C) using 190-degree-F (88-degree-C) liquor. Rest for 15 minutes while heating the balance of the mash liquor to boiling. With boiling liquor, raise the temperature of the mash to 154 degrees F (68 degrees C). Hold this saccharification temperature for 45 minutes. Sparge with 3 3/4 gallons of 172- to 175-degree-F (78- to 79.5-degree-C) liquor to collect approximately 5 1/2 gallons of sweet wort. The pH in the kettle should be between 5.1 and 5.3. Boil for 90 minutes. Add finishing hops as wort is run from the kettle into the fermenter.

Ferment at 46 to 52 degrees F (8 to 11 degrees C) for 10 to 14 days. Transfer and lager at 39 degrees F (4 degrees C) or less for two months. Prime with 3/4 to 1 cup of glucose and bottle.

Dortmund Adambier

FRED ECKHARDT

Dortmund Adambier, a top-fermented altbier, is of barley-wine strength and aged 10 years. Bickerdyke's *Curiosities of Beer and Ale* mentions a story "by Corvin in *An Autobiography* who relates that when King Frederick William IV of Prussia (who ruled from 1840 to 1861) visited Dortmund, a deputation of the magistrates waited upon him, one of them bearing a salver with a large tankard filled with Adam. When the King asked what it was, and heard that it was the celebrated beer he said, 'Very welcome; for it is extremely warm,' and drained off the contents of the tankard at a draught. The members of the deputation, who were better acquainted with old Adam than the unsuspecting King, smiled at each other, for they knew what would be the result. His Majesty was unconscious for more than twenty-four hours." Well, it makes a good story anyway.

1864 ADAMBIER IN 1897 PROFILE

Original extract: 26.4 percent
Specific gravity: 1.111
Final gravity: 1.035
Alcohol: 7.35 percent w/v, 9.23 percent v/v
Hop level: Unknown, probably it was well-hopped but medium in taste (remember, strong dark beers require heavier hopping).
Color: probably dark
Additional information from Wahl-Henius, *Vol. 2, Page 1289*:
Real extract (dealcoholized extract of finished beer): 13.38 percent
Protein: 0.66 percent
Reducing sugar: 3.61 percent
Lactic acid: 0.36 percent
Inert ash: 0.43 percent
Phosphoric acid: 0.158 percent as sulfuric

1889 ADAMBIER PROFILE

Original gravity: 18.13/1.074
Alcohol: 7.38 percent w/v, 9.27 percent v/v
Final gravity: 0.23/1000.9
Real extract: 3.37 percent
Protein: 0.7 percent
Reducing sugar: 0.66 percent
Lactic acid: 0.62 percent
Inert ash: 0.284 percent
Phosphoric acid: 0.133 percent as sulfuric

ALL-GRAIN ADAMBIER

This all-grain five-gallon recipe was developed with assistance from Alan Sprints and Doug Henderson of the Oregon Brew Crew. Two-row Dortmund-type malted barley was not available, so we suggest substituting a mixture of two-row Klages and pale Munich malt. Brew this as you would a barley wine ale, but finish out as you would an altbier: warm ferment then cold condition for two to three weeks.

Ingredients for 5 3/4 U.S. gallons

- **8.7 pounds Klages two-row malt (50 percent of grain bill)**
- **8 pounds pale Munich malt (33 percent of grain bill)**
- **1.5 pounds Vienna malt (7 percent of grain bill)**
- **3 pounds dark caramel malt 120 °Lovibond (10 percent of grain bill)**
- **1.5 ounces dark roasted barley**

Hops

For bittering:

- **1.5 ounces Tettnanger hops, 5 percent alpha acid (31.5 bitterness units), one hour**
- **3 ounces Tettnanger hops, 5 percent alpha acid (17 bitterness units), 15 minutes**

For aroma:

- **4.5 ounces Saaz hops, 3.7 percent alpha acid (12 bitterness units), five minutes**

Total: 60.5 bitterness units from whole hops, if pellets are used adjust to

alpha-acid bitterness of about 60.
Adjust water hardening to 1100 ppm (60 percent of Burton)
German alt yeast

- **Original gravity: 1.090/22 °Plato. Ferment out as dry as possible**
- **Estimated final gravity: about 1.012 /3.1 °Plato**
- **Estimated alcohol content: about 8.3 percent w/v, 10.5 percent v/v alcohol**
- **Volume in kettle: 5.75 U.S. gallons after boil**

Use a decoction mash, but with an upward step. Mash-in at 125 degrees F (52 degrees C) and settle to 122 degrees F (50 degrees C). Hold for 45 minutes and raise 2 degrees F (1 degree C) per minute to 144 degrees F (62 degrees C). Hold 20 minutes and raise 2 degrees F (1 degree C) per minute to 158 degrees F (70 degrees C). At conversion raise to 171 degrees F (77 degrees C) for mash-off. Kettle volume should be about 7 gallons (26.5 liters).

In a two- or three-hour boil reduce the quantity to 5 2/3 gallons. Of the final quantity save 17 ounces in refrigerator for kraeusen at bottling. The ullage loss will be somewhere around one-half gallon. If you are not a *Reinheitsgebot* nut, you can use Irish moss in the kettle 15 minutes before strike.

Rack and cool. Ferment with alt yeast. Pitch at 70 to 75 degrees F (21 to 24 degrees C). Ferment at 68 degrees F (20 degrees C), and at kraeusen stage lower to 64 degrees F (18 degrees C). Lager at 41 degrees F (5 degrees C) for 21 days, fine if necessary. At bottling or kegging kraeusen with 17 ounces of the original wort you saved in the refrigerator for that purpose. You might add another yeast strain at that point, such as Red Star Champagne yeast. After warming the fermenter, alternately reinvigorate your yeast strain by culturing it a day or so before packaging. The high alcohol content of the wort will make a second ferment in the bottle precarious, so the yeast should be vigorous.

Beer Traditions of Old Germany

FRED ECKHARDT

In medieval Europe after the introduction of Christianity, church ceremonials were still attended by the old indigenous drinking bouts, especially at weddings, which often lasted eight days. In the 9th century, during the reign of Charlemagne, brewing became formalized and associated with convents and monasteries. Hops came into use, probably by the end of that century. It was Norwegian King Haakon I, born in 951, who joined the native "Jule" festival with the Christian Christmas. Haakon also required beer to be brewed, and decreed that the celebration should last as long as the beer supply. Actually, beer almost became a medium of exchange as nobles and peasants alike gave their beer to the church as a means of tithing.

It became common for rulers to "license" certain abbeys to brew beer, and among the first of these to be licensed was the Weihenstephan Abbey, located near what is now Munich. That abbey was established in 1040, 12 years before the city received its charter in 1158. Thus Weihenstephan, today a brewing school, was the first brewery to be licensed in Bavaria.

Once licensing and accompanying fees were declared, brewers immediately concerned themselves with evasion of those requirements. Penalties for evasion or adulteration (making more beer or overbrewing the quantity) were sometimes quite severe. In one city, the law in 1272 decreed "(punishment) by the chopping off of the right hand and banishment for five years, and (the brewer's house to be) destroyed, and the house where such beer was sold confiscated."

By the 13th century the cities had grown (the population of Cologne was 120,000) to such an extent that they too demanded the right to brew their own beer. The Hanseatic League (Hamburg, Cologne and other north German towns) became famous for their beer. Most mansions had breweries, and the city of Einbeck become famous for its rich dark beers around 1256.

In south Germany, Frankfurt was famous for its "brewed wine." The quality of beer was a constant concern of the authorities, and in 1466 Frankfurt passed a new law: "Beer brewers shall sell no beer to the citizens unless it be three weeks old. To foreigners they may knowingly sell younger beer." This is an early example of a codified double standard still practiced today. During that same period elaborate regulations on beer production were set out. "No citizen shall brew more than twice a year and using specific amounts of materials when the beer bell tolls and no sooner." The Germans have always been good at producing regulations!

The citizens of Munich finally received permission to brew in the year 1372, and 21 breweries immediately sprang to life. Vienna started in 1296, but was allowed no import beer, and Duke Albrecht V tried to protect the winemakers of the time by prohibiting beer to be made, except that private houses could brew beer for servants. Prague had permission to brew by the end of the 14th century reign of Emperor Wenceslaus of Germany and Bohemia, and in Prague there soon were 55 breweries with 86 malt houses, 200 saloons and who knows how many churches.

The nobility in the 16th and 17th centuries were noted for their excesses in luxurious eating, drinking, dressing, cursing and fighting — none of which have been matched in our era. The same may be said of convents, monasteries and church practices of the time. Civil and church laws were total failures in regulating these abuses. During the same era, commerce, art and science flourished. Tea and coffee houses proliferated throughout Europe and the use of tobacco was introduced. It was an era of high living for the nobility, at least.

The situation led Martin Luther, no teetotaler himself, to complain: "Our German devil will be drinking, being so thirsty and hell-like that no guzzling of wine and beer will cool it off (and) will ever remain Germany's plague until the day of judgment."

By the late 16th century high taxes and protectionism had ruined north German beer. Brewing was replaced by coffee and hard liquor production. In other areas of Germany the beer improved. In Munich, for example, the city regulated all aspects of brewing, particularly in regard to quality. By 1569 there were 53 breweries and a 68-liter (18-gallon) per capita consumption limit in that city. The regulations were severe. Summer brewing was prohibited and the brew kettles were sealed between April 24 and Sept. 29. This was a sanitation measure to prevent the production of sour beer. In 1566 wheat beer production was prohibited so the wheat could be saved for bread. The citizens

ILLUSTRATION BY JOHN MARTIN

of Munich were able to enjoy foreign beer, however. The beer of Einbeck, which had been better than that of Munich, was copied and greatly improved that city's beer.

By the 18th century and especially in the 19th century, Heidelberg University had become famous for its drinking societies, the *Kneipe Tabelle* (public houses). Each had a president and officers, and a beer code or rules of conduct, the *Bier Comment.* Rules one to 10 were blank, presumably for the Ten Commandments. Rule 11 was, *Es wird fortgesoffen* (keep on drinking)! There were many other regulations, and violations were cause for a fine, which was always drinking one or more *maas* (liter) of beer from huge tankards. There were 27 rules punishable by fine and 12 more punishable by "beer excommunication." The culprit became a *bierschisser*, a beer outlaw. His only relief was to "fight out" because as a beer outlaw he could not participate in any of the activities such as singing, challenging or responding to challenges. He could get very thirsty! The victim had to give notice of a desire to "fight out" through an intermediary because he had no status. The group chose four champions and each was given a tankard while the culprit was given four tankards. At five-minute intervals he had to face each of the four champions and drink a stein with each one. If he survived, he became "beer honorable."

No solitary sipping was allowed, and if caught the culprit had to down a whole liter. Challenges were to be met within five minutes, and the challengee could double the order. Shop or school talk was not allowed either and, if caught, one would be challenged (depending on the seriousness) as a learned-student, a Herr-professor, a Herr-doktor, or even as a pope. The penalties were one, two, three or four liters of beer (following the five-minute rule).

Then there were the formal traditional drinking bouts. The contestants drank three hours without standing. Dress for the occasion was specially tailored watertight yellow leather trousers. The winner had to blow a blast on a ceremonial trumpet at the end of that time. Did I mention the famous Heidelberg dueling societies? That's another story — it must not have been easy being a college student in those days!

History of German Oktoberfest

KARL J. EDEN

Munich's marvelous spectacle starts every year on a Saturday in late September, frolics for 16 days and ends on the first Sunday in October. Oktoberfest begins in a dignified manner with the famous procession of the landlords and brewers. Traditional beer wagons are piled high with huge wooden kegs and drawn by eight to 12 elegantly festooned horses. The parade originates in downtown Munich and ends at the fairgrounds of the Theresienwiese, or Therese's Meadow.

Everyone follows the Lord Mayor of Munich, who is charged with the duty of tapping the first 200-liter wooden barrel of Oktoberfest beer (provided each year by a different brewery) and yelling "*ozapft is!*" (the keg is tapped!).

This event draws more than 6.5 million people from all around the world and packs them in 13 giant beer tents, each seating more than 100,000. Sometimes there are more Yankees than Munich townsfolk.

Why does Munich, the undisputed world capital of beer and beer drinking, host the world's largest and most renowned beer party?

Here are a few barrels of facts on tap. Visitors to Oktoberfest last year consumed more than 750,000 *hendl* (half chickens cooked on spits), 100 oxen roasted on spits, nearly 400,000 pairs of *Schweinswuerstl* (pork sausages), 100,000 *Steckerlfisch* (salty smoked mackerel or whitefish on a stick), 250,000 soft pretzels the size of automobile steering wheels and about 75,000 *Schweinshaxen* (roasted pork legs), while leaving behind 15,000 tons of garbage. But all this food only goes down the hatch if it is swallowed with about 3 million liters of beer — that's more than 790,000 gallons.

At the 1992 Oktoberfest only about 150 arrests were made for drunkenness, but every day about 50 children were lost by parents. More than 5,000 people were treated at the first-aid station. The crowd took with them a new awareness of German hospitality because they got a free shot of Underberg Schnapps to cure stomach problems.

The origins of this grandiose gathering date to the marriage of Crown Prince Ludwig I von Bayern and Princess Therese von Sachsen-Hildburghausen in 1810. Munich inhabitants were invited to watch horse racing on a meadow named after the bride. The beer served was not what we would call an Oktoberfest beer. At that time only dark beers were brewed in Munich.

It wasn't until 1871 that Joseph Sedlmayr, owner and brewmaster of Spaten Brauerei, brewed a non-traditional beer light in color that acquired quite a following. The Munich citizens urged Sedlmayr to produce an ample supply of this excellent beer which happened to be brewed in the month of March (in German, März). Its popularity caused Sedlmayr to brew ever greater quantities of his Märzen. In the days before refrigeration, "Märzenbier" (March beer) was the last batch brewed before warmer weather made brewing impossible. It had to be strong because the higher alcohol content (about 5.8 percent by volume) prevented contamination from bacteria. It had to be stored in naturally cool mountain caves during the long hot summer months to increase shelf life.

Any leftover beer at the end of the summer had to be consumed in September and October, to empty the tanks and barrels for fresh brews from newly harvested hops and malted barley. Even today the new brew year in Germany starts by law on the first day of October.

Coincidentally, the need to consume the remaining Märzen happened to occur during the now traditional Oktoberfest celebration. Even though this wonderfully flavored amber-colored beer is traditionally brewed in March, it was first offered to the celebrants of Oktoberfest — therefore we drink it in September at the Oktoberfest.

Only once in the history of Oktoberfest was it cancelled — in 1945 after the Allied bombings when beer was used to douse the fires because no water was available. The lord mayor at this time said: "When homes and schools were bombed, that is terrible. When our cathedrals and monuments were bombed, it is a tragedy. But when they bombed our breweries, this is carrying the war too far!"

I was born and raised near Munich, spent three years in school there and worked four years at the famous Paulaner Brewery. I was an annual visitor to no less than 12 consecutive Oktoberfests. I have wonderful memories of beer, food, fun, loud oompah music, yodeling, singing and dripping liter glasses.

I remember a giant tent filled with 10,000 beer drinkers, arms linked, from all over the world swaying in time to the music, singing in 20 or more languages and punctuating the music with mugs held high over their heads. They chant when the band plays "*oans, zwoa, gsuffa*" (one, two, drink)

PHOTO BY CHARLIE PAPAZIAN

and chug-a-lug in unison while the aroma of roasting oxen floats on the breeze.

Waitresses sweep by carrying eight one-liter glass mugs sloshing beer then you strain to lift one of those mugs to your lips. Waitresses weave through the crowds, hawking fresh pretzels threaded on a long stick and white radishes cut in coils and dipped in salt that, when combined with beer, are guaranteed to produce tremendous explosions.

Wander the broad avenues of the meadow for one more reminder why the Oktoberfest has been held here since 1810. Not too far away on a little hill outside the meadow stands the tallest woman in the world, the gigantic statue of Bavaria watching over the spectacle.

After the last call the crowds pour onto the U-Bahn No. U-5, Oktoberfest's own subway line, to carry them to the main railroad station and points beyond. It's noisy and crowded, and everybody is swinging their steins like trophies from the field.

The bright colored lights from the broad avenues and the beer tents cast a rosy glow over everyone. There is really only one Oktoberfest — it's unforgettable and it is held annually in Munich, Germany.

HÜBSCH BRÄU OKTOBERFEST MÄRZEN

This beer, a malt liquor by law in California, is 4.6 percent alcohol by weight. Our Märzen, brewed at Sudwerk Privatbrauerei Hübsch in the old Bavarian tradition, uses five different malts. This complex brew was once made only for Oktoberfest but is now produced year-round to meet popular demand. Actually it is Hübsch's best-selling beer.

A slow, cold fermentation and long maturing process for at least eight weeks are the key to a perfect beer. Hübsch Bräu Märzen has a palatable flavor and a smooth, distinctive body, balanced with an elegant bitterness. A deep amber color and rich creamy head make this beer complete. Hübsch Bräu Oktoberfest Märzen won the bronze medal in its category at the 1990 Great American Beer Festival℠.

For Plzeň brew water use city water purified by a reverse osmosis system with a hardness of almost zero like the water in Czechoslovakia. No gypsum or mineral salts are added. It is important to remove the chlorine with a carbon cartridge filter. All three kinds of hops were imported from Germany, in type 45 pellets. Yeast was strain W-34 bottom-fermenting lager yeast from the yeast bank in Weihenstephan, Germany.

Ingredients for 5 gallons

6	**pounds premium two-row Klages pale malt**
1 1/4	**pound Munich malt**
5	**ounces Carastan malt**
5	**ounces crystal light malt**
2	**ounces crystal dark malt**
1/2	**ounce Perle hops, 8 percent alpha acid (70 minutes)**
1/3	**ounce Hallertauer hops, 8 percent alpha acid (20 minutes)♦**
1/10	**ounce Tettnanger hops, 7.5 percent alpha acid (five minutes)**

Total water = 6 gallons

- **Original gravity: 1.040 (13.5 percent Balling)** ***Editor's note: This yield assumes 81.4 percent efficiency.***

Mash-in at 140 degrees F (60 degrees C) with 4 gallons of brew water. Hold for 10 minutes, heat to 148 degrees F (64.5 degrees C) and hold for 20 minutes. Heat to 153 degrees F (67 degrees C) and hold for 40 minutes or until conversion is complete by iodine test. Heat to 158 degrees F (70 degrees C) and hold for 10 minutes. Heat to 166 degrees F (74.5 degrees C) and hold for 15 minutes.

Start lautering and after first wort is through sparge in two cycles, one gallon each. Boil for 90 minutes. After boiling, let it sit for five minutes to create a hot break. Transfer to a whirlpool or create a whirlpool effect by fast stirring in brew kettle. Let sit for another 20 minutes. Aerate well during cooling then pitch yeast at 52 degrees F (11 degrees C).

Pitching rate for yeast is 31.2 to 1.7 ounces (35 to 50 milliliters) liquid yeast per gallon, depending on activity of live yeast cells and thickness of yeast.

After four to six hours transfer from one fermenter into another to get rid of the cold break. Within 24 hours,it should be at the high kraeusen stage. Cool to 46 degrees F (8 degrees C) and ferment in seven to eight days. Gravity should go down 1.5 percent every 24 hours.

After six days transfer into lagering tank. Create 8 to 15 psi pressure for natural carbonation and lager at least eight weeks. The final attenuation should be 2 to 2.2 percent (degree of attenuation 83 to 85 percent).

HOMEBREW BITTERING UNITS

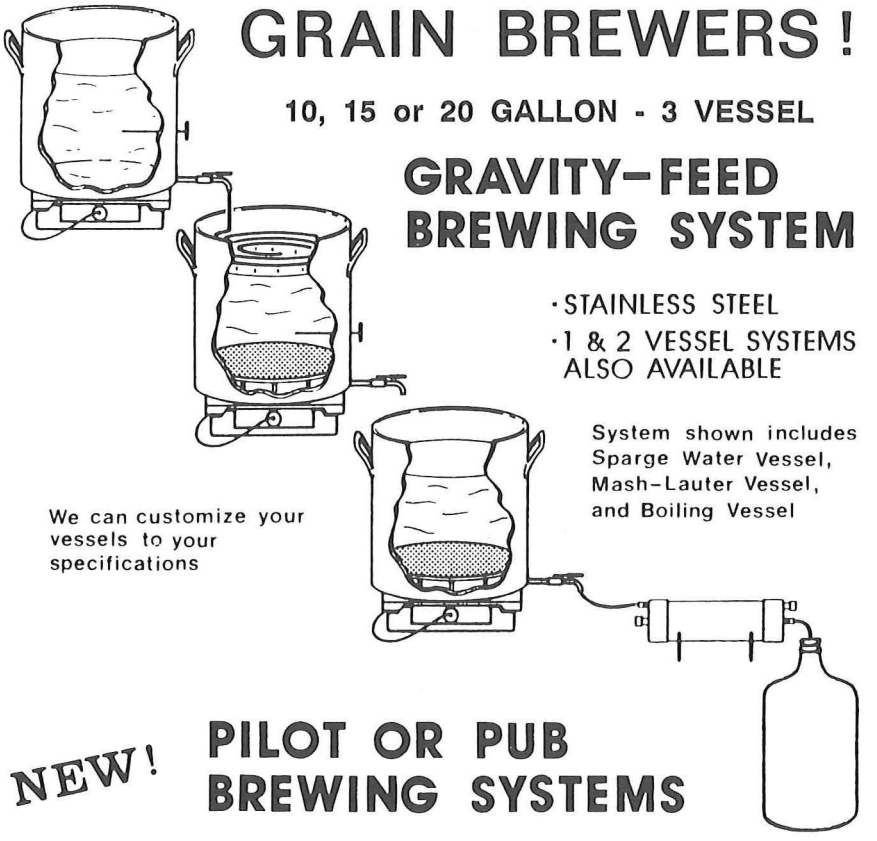
♦ If you can't obtain hops with the same alpha acid ratings, use the following information to calculate the quanitity of alternate alpha hops to use.

Homebrew Bittering Units are a measure of the total amount of bitterness in a given volume of beer. Bittering units can easily be calculated by multiplying the percent of alpha acid in the hops by the number of ounces. For example, if 2 ounces of Northern Brewer hops (9 percent alpha acid) and 3 ounces of Cascade hops (5 percent alpha acid) were used in a 10-gallon batch, the total amount of bittering units would be 33: (2 x 9) + (3 x 5) = 18 + 15. Bittering units per gallon would be 3.3 in a 10-gallon batch or 6.6 in a 5-gallon batch, so it is important to note volumes whenever expressing bittering units.

GRAIN BREWERS!

10, 15 or 20 GALLON - 3 VESSEL

GRAVITY-FEED BREWING SYSTEM



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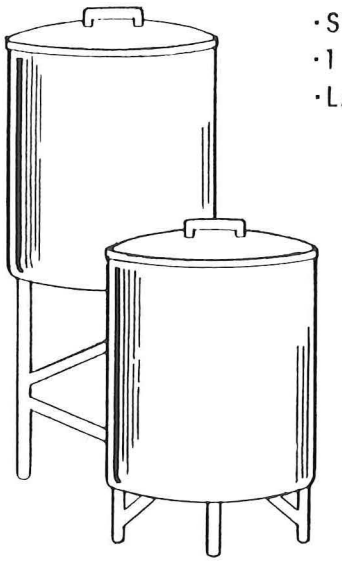

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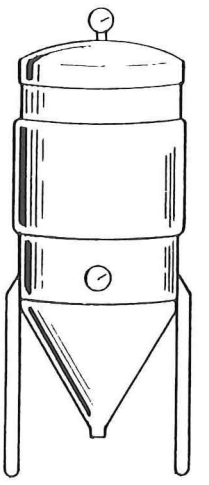

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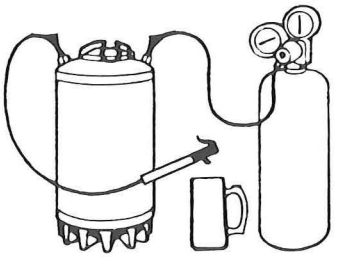

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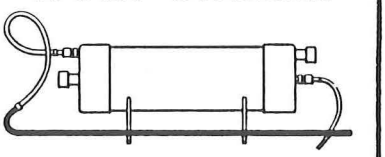

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The Campaign for Real Ale

STEPHEN COX

ENGLISH

TRADITIONAL BREWING METHODS

CAMRA, the Campaign for Real Ale, was founded near London in 1971 to encourage the continued production of real ale.

What is real ale? It is cask ale or cask-conditioned ale, different names for the same thing. Real ale is neither pasteurized nor filtered. It is not ready to drink when it leaves the brewery, but must undergo a second fermentation in the cask to condition and develop flavor.

On the other hand, keg beer, dead beer and brewery-conditioned beer are all names for beer that has been pasteurized. It is served cold and fizzy with added CO_2.

It is in the interest of preserving the traditions of real ale that CAMRA was formed. From the beginning, CAMRA has been a drinkers' organization, dedicated to publicizing and promoting good beer and campaigning against companies that are not up to the mark. We also campaign for the rights of pub customers — in defense of retaining the traditional pub. If this article concentrates purely on the beer, this is through lack of space, not lack of interest!

The Campaign has always been fiercely independent from any commercial interest, no matter how sympathetic. CAMRA has publicans and brewers as members, but rarely in positions of seniority. We do produce books and articles on homebrewing, but mostly as a service to a minority of members. CAMRA's aim has always been getting good beer into pubs and clubs, not actually brewing it for ourselves.

The Campaign grew from a handful of enthusiasts to a national organization with 30,000 members in only a few years. Some of the founding members were journalists, able to promote the cause effectively in print. Our newspaper, *What's Brewing*, was soon a monthly publication, on the attack wherever necessary, and also promoting companies that still produced the real thing. Now we believe it is simply the best paper dealing with pubs and beer in the United Kingdom.

ILLUSTRATION BY MATT BROWNSON

The first *Good Beer Guide* appeared in 1974, listing all the breweries and recommended outlets for real ale. At that time, some counties were surveyed by only one person. But the growing membership of local CAMRA branches soon allowed a proper national survey every year. The *Good Beer Guide* became the country's best selling pub guide, widely respected, and reaching further than CAMRA's paid membership.

The *Guide* attracted enormous controversy, for example, when it told customers to avoid giant brewer Watneys "like the plague." (Watneys was a target because they brewed no cask beer at all and concentrated on the loathsome Red Barrel keg.) The printers panicked at this head-on attack, and we had to tone the comment down, but the resultant publicity was well worth it. Watneys was soon complaining about a slander campaign against them and reporting drops in sales.

Large brewers started off by ignoring the Campaign, telling us that they were in touch with consumer needs and we weren't. Some hinted darkly at a Communist plot against the brewing industry, which our many conservative members found hard to believe.

Soon it became obvious that there was a demand for locally brewed traditional ales. After all, CAMRA would have disappeared without a trace had customers not wanted something different. Those brewers who stuck with real ale through the dark years of keg beer enjoyed a boom in sales. Many regional brewers who had considered selling out threw themselves into brewing again with a vengeance and saw a whole new bright future in front of them.

In 1976, Allied Breweries decided to launch a new cask-conditioned beer. Ind Coope Burton Ale was extremely successful, proving that even a big brewer could brew a decent pint. From then on, it was obvious that cask beer had a future, and even national companies would have to supply it.

In 1979, Watneys, vilified for their lack of cask beers, finally admitted they had it wrong and went back to brewing some real ale.

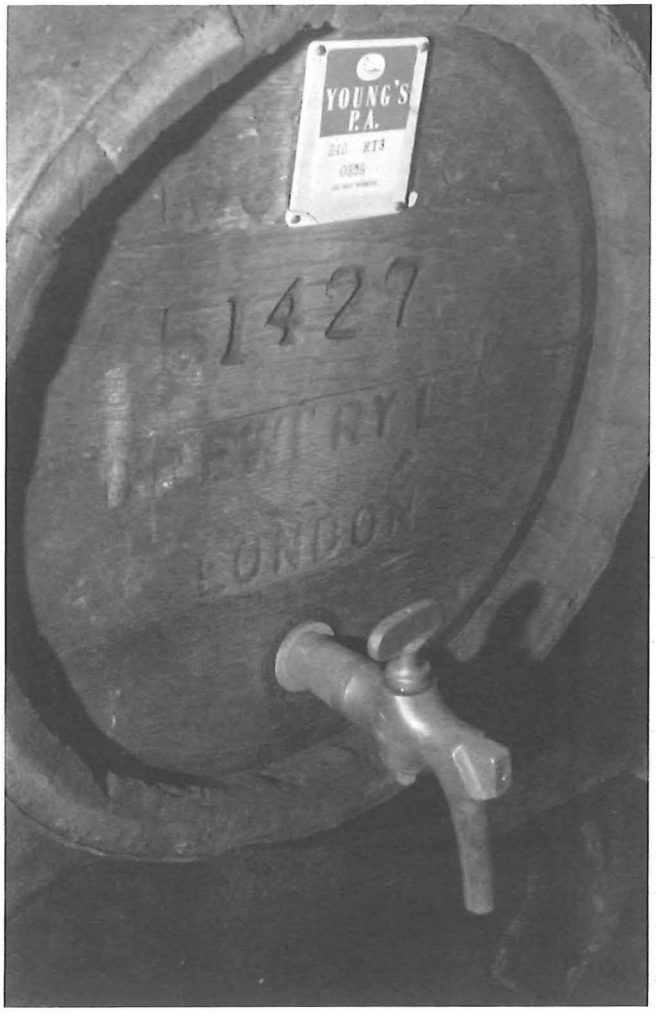


PHOTO BY CHARLIE PAPAZIAN

Our massive success at getting real ale into pubs caused a drop in membership and activism in the early 1980s. However, we always had a wider goal of seeking to preserve the independence of breweries, and campaigning for more rational licensing laws, for example. A round of takeovers, and the growth of lager posed new threats to a diverse brewing industry. The 1990s brought increased interest and concern about traditional beer, the traditional pub and the future of the industry causing CAMRA membership to double.

CAMRA is essentially a voluntary organization, its board of directors and branch committees entirely unpaid. The professional staff runs the membership system, central accounts and much of the research and central lobbying work, but most of the work is still put in by individuals working in their free time. CAMRA is a remarkable organization, with some major achievements under its belt.

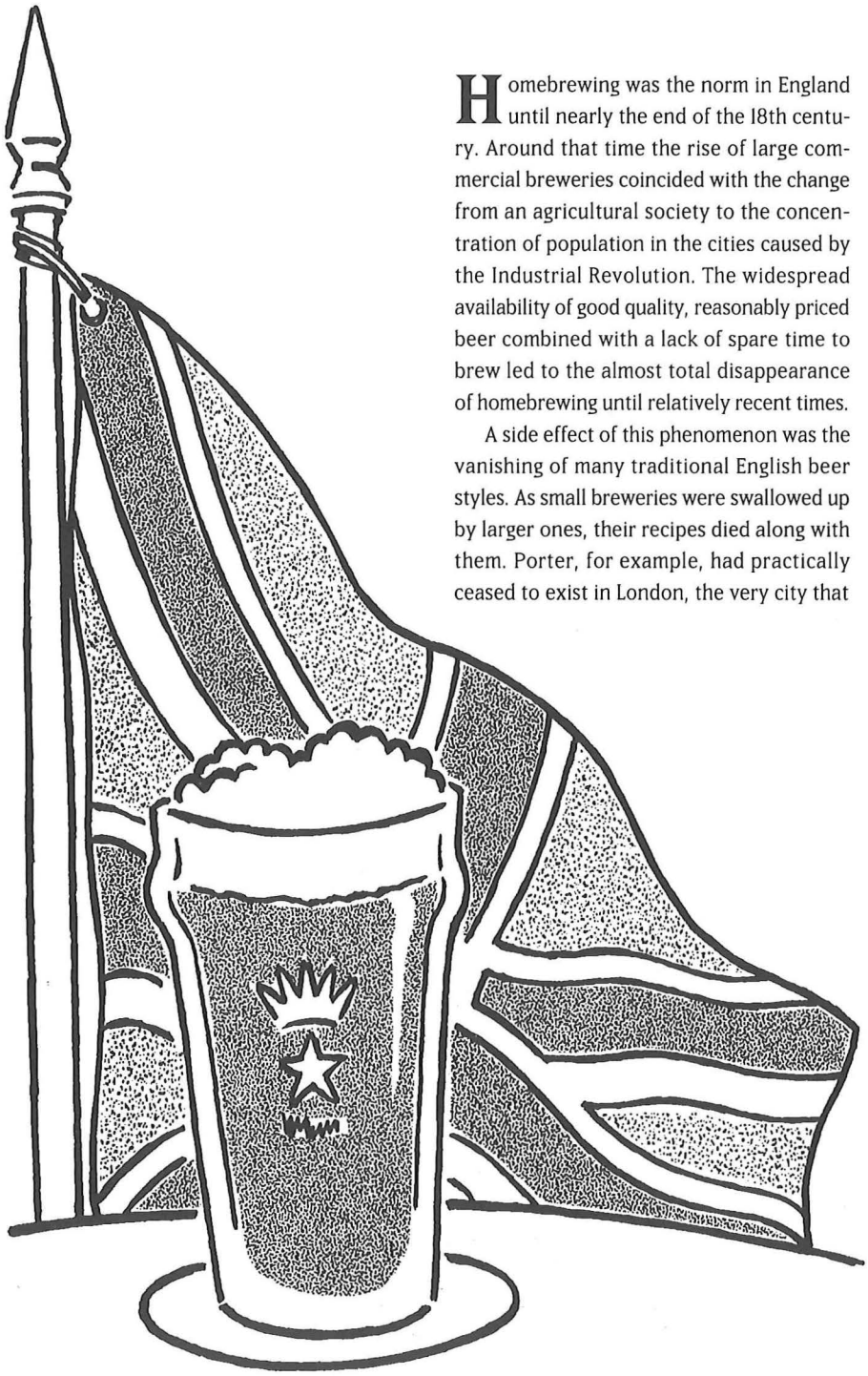
Our 170 branches throughout the country run some 120 beer festivals a year. The events offer customers a chance to taste different beers from all around the country. Branches have lively social programs, produce their own guides and newsletters and, of course, take part in the surveys for the national *Good Beer Guide*. The right to vote pubs into the *Guide* is a jealously guarded prerogative of the branches — and now that the majority of pubs sell real ale, the choice is more contentious than ever.

Perhaps the most obvious test of our success comes from the reference section of the *Good Beer Guide*. That 1974 edition listed a mere 100 or so U.K. brewers. There are now, despite closures and takeovers, more than 200 brewers producing 1,000 different real ales among them.

For CAMRA membership information write 34 Alma Rd., St. Albans, Herts. AL1 3BW, United Kingdom, FAX from the United States 011 44 727 867 7670 or call 011 44 727 876201.

British Homebrewing

ED WESTEMEIER



Homebrewing was the norm in England until nearly the end of the 18th century. Around that time the rise of large commercial breweries coincided with the change from an agricultural society to the concentration of population in the cities caused by the Industrial Revolution. The widespread availability of good quality, reasonably priced beer combined with a lack of spare time to brew led to the almost total disappearance of homebrewing until relatively recent times.

A side effect of this phenomenon was the vanishing of many traditional English beer styles. As small breweries were swallowed up by larger ones, their recipes died along with them. Porter, for example, had practically ceased to exist in London, the very city that invented it! Fortunately, a diligent effort to revive these old styles has been going on for the last 20 years by some remarkable homebrewers.

On a recent visit to London, I was privileged to attend a meeting of the Durden Park Beer Circle as a guest of Geoff Cooper. Cooper is the publisher of *Old British Beers and How To Make Them* (Durden Park Beer Circle, 1991), a summary of the club's 20 years of research into forgotten styles. By coincidence, the author of this remarkable little book, John Harrison, was giving a presentation that evening on the latest results of his attempts to duplicate some of the long-gone English malts through roasting ordinary malt in a home oven. First published in 1976, the book is now in its second (1991) edition. It contains instructions for brewing 60 British beers ranging from pre-1400 unhopped ales to early 1900s oatmeal stouts. There is a good bit of historical information, special instructions for either single or double mash techniques and an appendix on home roasting of malts.

The opportunity to talk with this dedicated group of homebrewers was very rewarding, though much too brief. One of the surprising things I learned is that they have no great concern over what yeast to use, as opposed to brewers here in the United States who endlessly debate the merits of this liquid yeast over that dried yeast. All of their normal styles are ales, and there is a steady supply of high-quality dried yeast available. Although almost all were familiar with the commercial liquid yeasts that many of us prefer, (and many are as comfortable with isolating and culturing yeast strains at home as the most advanced U.S. homebrewers) they generally get good enough results with

ILLUSTRATION BY JOHN MARTIN

dried yeast that it doesn't occur to them to do anything else.

The Durden Park club, being so old and well-established, has certain advantages that are to be envied by American homebrewers. For example, they buy malt direct from the maltsters and they can simply drive a short distance to Kent to buy Goldings and Fuggles direct from the hop merchant. With such top quality and fresh ingredients, it's no wonder their beers are so good. Many of the ales I tasted at the meeting were superb examples of old styles and new ones.

Tasting was done in a very organized manner during the meeting. Starting with the lowest gravity beers, each sample went all around the group and everyone had a chance to taste and comment on it. Working our way up to the higher gravities, some of the old styles had their chance to shine. For me the highlight of the evening was a homebrewed Usher's Stout from an 1885 recipe made with six kinds of malt. Smooth (it had matured for four months), slightly sweeter than I expected and with a truly marvelous complexity, it was the hit of the meeting, proving that these old styles are very definitely worth reviving.

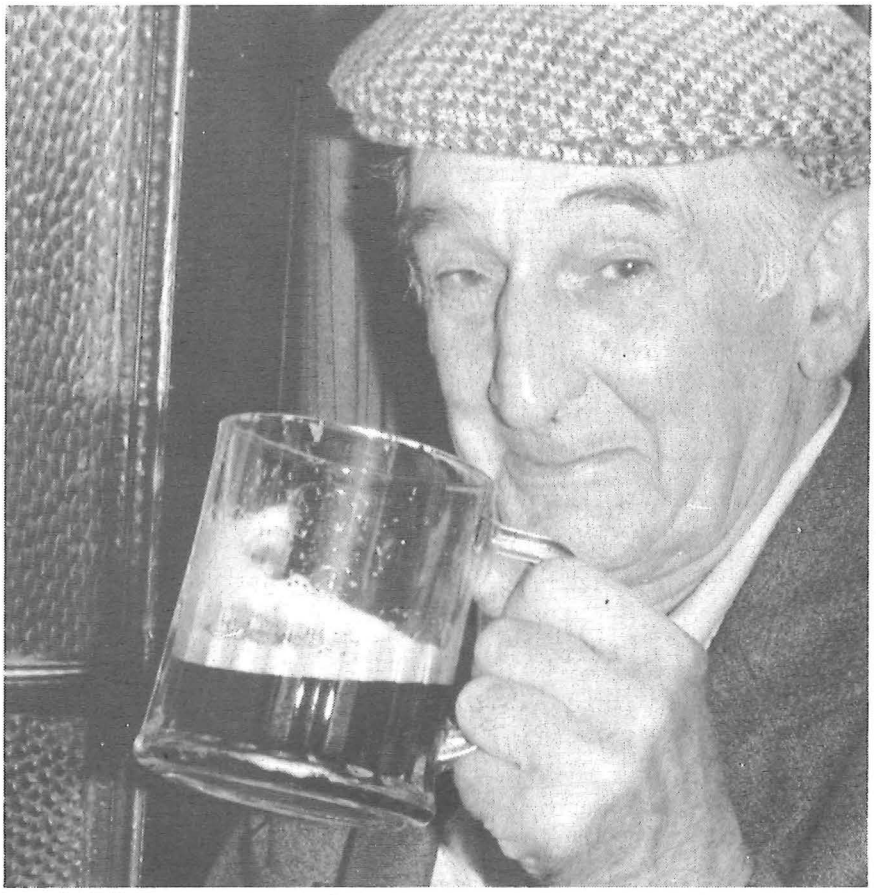


PHOTO BY CHARLIE PAPAZIAN

OLD BRITISH RECIPES

USHER'S STOUT (1885)

A typical full-bodied Victorian stout.

Ingredients for 6 U.S. gallons

18	ounces pale malt
6 1/2	ounces CaraPils malt
4	ounces black malt
2	ounces crystal malt
2	ounces amber malt♦
2	ounces brown malt♦
2	ounces brown sugar
1 1/3	ounce Fuggles hops
0.6	ounces Goldings hops (dry)

- **Original Gravity: 1.056**

Mature for four months.

WHITBREAD'S LONDON PORTER (1850)

One of the Circle's favorite old beers. Smooth, good balance of roast grain and hop flavors.

Ingredients for 6 U.S. gallons

2 1/4	pounds pale malt
7	ounces brown malt♦
2 1/5	ounces black malt
1	ounce Fuggles or Goldings hops
0.6	ounce Goldings hops (dry)

- **Original Gravity: 1.060**

Mature at least four months.

SIMOND'S (READING) BITTER (1880)

A robust, slightly sweet bitter with real character.

Ingredients for 6 U.S. gallons

2.5	pounds pale malt
7	ounces CaraPils or 3 ounces CaraPils and 2 ounces amber malt♦
1	ounce Goldings hops

0.15 ounce Goldings hops (five minutes)
0.6 ounce Goldings hops (dry)

- Original Gravity: 1.062

Mature at least three months.

W. YOUNGER'S ALE NO. 3 (1872)

Pale nut-brown ale similar to a strong mild ale. The most widely drunk of Younger's Scotch ales.

Ingredients for 6 U.S. gallons

2 pounds pale malt
1 1/5 pounds CaraPils malt
1 1/4 ounce Goldings hops
0.6 ounce Goldings hops (dry)

- Original Gravity: 1.080

BREWING METHODS

Use soft or hard water with some carbonates (temporarily hard) for dark beers and permanently hard water for the bitter.

Add hot water to produce a stiff mash at 150 degrees F (66 degrees C), mash for three hours then raise the temperature to 170 degrees F (77 degrees C) for mash-out. Sparge slowly to obtain required volume. Boil with hops for 1 1/2 hours then cool and strain hops. Ferment with good-quality ale yeast. Dry hop with 0.1 ounce Goldings hops per gallon.

♦Amber and brown malts are both roasted (not caramel) malts with colors around 26 °Lovibond (70 EBC) and 56 °Lovibond (150 EBC) respectively.

The British Brewing Scene

DAVID C. HANBURY

Although the beer market in the United Kingdom is roughly 50 percent lager-type beers and 50 percent "other," English beers are usually thought of as bitter, mild, brown ale and stout. All of these used to be brewed, in large and small breweries alike. Infusion mashing techniques were used with relatively warm fermentations and top-fermenting yeast that flocculate on the surface of the fermenter, allowing for easy skimming and collection of the yeast crop. With the considerable increase in quantities of lager brewed, particularly in the bigger breweries during the last 20 years, there are now several traditional English beers brewed with bottom-fermentation techniques, and even some lagers brewed with top-fermenting yeasts.

THE BREWERIES

Since the Romans invaded England in the first century A.D., the brewing of ales — and then beers after the use of hops began in the 16th century — has been concentrating into larger and larger production units as brewing skills, equipment and transport facilities have become steadily more sophisticated. Up to the 1970s, in the United Kingdom there was a general feeling that sooner or later all beer brewed in the British Isles would be produced in about five or six massive beer factories. There is still some fear of that. The resurgence of the homebrewer and the microbrewer during the last 25 years or so has given renewed impetus to the wider beer market to ensure that the variety of beers available for the future remains diverse within the U.K. market.

THE BEERS

The U.K. brewing industry is still dominated by six major companies, some of whom have substantial links with other major players on the world scene, and lager-type beers represent more than 50 percent of the market, but there are signs that the rate of increase of lagers over ales has slowed almost to zero, and that traditional English ales are enjoying a comeback. The general requirements for these bitters, milds and, recently, porters are still low-nitrogen, well-modified malts, infusion mashing and reasonably high hop rates. In the best English bitters, several brewers still insist on using only English Fuggles and English Goldings, but there are many excellent beers brewed using other English varieties as well as varieties grown in Germany, Slovenia, the Czech Republic and the United States.

THE HOPS

Bitterness levels in the traditional English beers are usually quite high, ranging from about 25 EBU through the mid-30s for many bitters to more than 50 EBU for some of the bitter stouts and strong ales or barley wines.

Dry hopping, either with loose whole hops or, more conveniently, in the form of Type 100 whole hop pellets (see Table 1) or with hop oil products, is finding a resurgence of popularity in many cask-conditioned beers and in some filtered beers. English varieties mostly used for dry-hopping are Goldings and Fuggles. Challenger and Target also are popular, with some specialists favoring North-

TABLE 1

Hoplets Type 45 Pellets

Type 45 pellets are similar in appearance and use to Type 90 pellets, but, at processing, the hops are deep-frozen and subjected to mechanical separation of the lupulin-rich fraction of the hop powder before pelleting. The enrichment of the alpha acid content of the final pellets is convenient for some specialist brews, particularly if very high hop rates are required. As the same quantity of lupulin is contained in about half the weight of hop pellets, when compared with Type 90 pellets, there are consequently transport and storage cost savings when dealing with large volumes and long-distance shipment.

Hoplets Type 90 Pellets

Type 90 hop pellets are the most widely used pellet product in large-scale breweries. Conventionally harvested cone hops are re-dried, milled to a powder, homogenized and pressed into small (approximately 7 millimeters diameter) pellets, with a final moisture content of 7 to 8 percent, before packing into oxygen-free gas-tight packs. All the original constituents of the cone hops are preserved in these Type 90 pellets, with usually some increase in utilization of alpha acids in the boil, and greatly enhanced ease of handling and storage of the hop material. Removal of the spent hops after boil is usually achieved by whirlpool or centrifuge separation, along with the hot-break trub.

Hoplets Type 100 Pellets

Type 100 pellets are unmilled cone hops specially selected for quality after harvest. They are usually pressed into half-ounce (14 gram) pellets and packed into oxygen-free gas-tight packs. Originally developed for ease of dry-hopping into casks of traditional English Ales, Hoplets Type 100 pellets are now available in pack sizes ranging from 1,000 pellets down to 10 pellets — particularly designed for the homebrewer. The advantages of having an accurately weighed pellet of whole-cone hops (in a pellet of approximately one-inch diameter), packaged in a foil sachet which preserves all the qualities of the original hops up to the moment of use, must be obvious to all those brewers who value the flavor contribution that hops provide.

down or Whitbread Goldings Variety. Styrian Goldings or Super Styrians from Slovenia also are prized for their dry-hop characters.

For the main bitterness contribution, there are now two schools of thought among British brewers. The first, particularly for the bittering of English ales, sticks to the traditional approach of using only low-alpha English hops (such as Goldings or Fuggles) or a blend of these with medium-alpha hops such as Challenger, Northdown or Northern Brewer for the main boil in the kettle. To achieve an added element of hop aroma in their beers, a few brewers still cast their worts onto a thin bed of fresh aroma hops on the hop-back (the traditional hop strainer). This is, if you like, an extreme example of "late-hopping." The second school follows the modern approach of "alpha is alpha is alpha" and achieves the requisite bittering in the kettle by the addition of high-alpha hops — Target or Yeoman grown in England, Northern Brewer, Brewers Gold or Magnum grown in Germany, or extract or pellets from hops grown almost anywhere in the world, and increasingly from hops grown in the United States. Usually for some major brewers there is a tendency, par-

Sidearm of Fuggles hops with mature cones.

AOB PHOTO FILE

ticularly for ales, to compromise between these two schools of thought.

HOP PRODUCTS

With developments in hop products during the last 20 years, from conventional pellets and extracts in the 1970s, the U.K. brewers have a substantial choice now of how they can make use of whatever hop varieties they choose to suit their beers. Type 90 pellets (see Table I) and CO_2 extracts (along with whole hops in many smaller breweries) still account for the majority of hop usage for purely bittering and general flavoring purposes. Type 45 pellets (mechanically concentrated lupulin, see Table I) have never really taken off in the United Kingdom, but ethanol-produced extracts and to a lesser extent hexane-produced extracts still have a following. Newer formulations of isomerized pellets and isomerized resin extract (IRE) provide for substantial increases in hop utilization in the kettle, with all the existing advantages of conventional pellets and extracts. Oil-rich CO_2 extracts and oil distillations are used for dry-hopping and hop aroma effects. Formulations of late-hop essences are used to provide (relatively expensively) late-hop characters mainly in lager beers. The use of particular products and the choice of specific varieties is still very much in the hands of the individual brewer and is dependent on the design of the brewery plant and the traditional or modern philosophy that the company wishes to follow.

Following are recipes for a few popular U.K. beer styles.

BITTER

Recipe for 6 U.S gallons

- **5 pounds pale malt**
- **8 ounces crystal malt**
- **1 pound corn sugar**
- **2 ounces English Fuggles hops**
- **1 ounce English Goldings hop**
- **2 ounces yeast (top fermenting)**
- **Original Gravity: 1.040♦**

PALE ALE

Recipe for 6 U.S. gallons

- **6 pounds pale malt**
- **8 ounces crystal malt**
- **8 ounces flaked barley or maize**
- **1 pound corn sugar**
- **3 ounces English Goldings hops**
- **2 ounces yeast (top fermenting)**
- **Original Gravity: 1.049♦**

STOUT

Recipe for 6 U.S. gallons

- **5 pounds pale malt**
- **1 pound black patent malt**
- **2 pounds Demerara sugar**
- **12 ounces lactose**
- **3 ounces Northdown♦♦ hops**
- **2 ounces yeast (top fermenting)**
- **Original Gravity: 1.047♦**

BROWN ALE

Recipe for 6 U.S. gallons

- **5 pounds pale malt**
- **8 ounces crystal malt**
- **8 ounces chocolate malt**
- **2 pounds demerara sugar**
- **2 ounces Northdown♦♦ hops**
- **Original Gravity: 1.047♦**

♦ Assuming 100 percent extraction.

♦♦ Ask your homebrew supplier about English-grown Northdown hops.

At Home in a British Pub

Geoff Bruce

My job as a tour guide allows me to visit pubs and breweries regularly. With groups of about 10 people I meander through castles, villages, beautiful countryside and visit the ancient Samuel Smith's Tadcaster Brewery, Theakston's where Old Peculier originated and numerous other pubs. Understand, of course, that I am working. A tough job, I know.

I'm not really a beer expert, but I do know pubs. To many English people, a pub or a "local" is an extension of home and home is a place you frequent when you're not at the pub. In England, many people believe that entertaining is best done in the pub. No need to clean the house in case of visitors — the pub is the great equalizer.

Children are welcome in our pubs and so are dogs. Since dogs are part of life, you take Fido when popping out for a quick one, and with his packet of crisps, he patiently settles under the seat. Once in a while my tavern will call after I have left and forgotten my obedient labrador under the seat.

Pubs are patronized by locals for their whole life unless the beer or the landlord changes. Locals often sit in the same spot with their friends year after year. Life is not passing them by because this is what they perceive their life to be. Newcomers or strangers are told when they are occupying someone's seat and, being British, they understand and move to another stool out of respect for the regular who has sat there for years.

For my tours I select pubs with continuity and interest. In one pub we visit, the fire has been alight for 200 years. As the story goes, a tax collector was murdered then buried under the fireplace. His remains will probably affect the pub and the beer forever. The pub is crowded, hot and beautiful. I often visit on Thursday, which is folk music night. In 50 years, Thursdays will probably still be folk music night. That is continuity.

You can find excellent beers in many countries, but my feeling is that you need to come to the United Kingdom to experience a real pub.

ILLUSTRATION BY JOHN MARTIN

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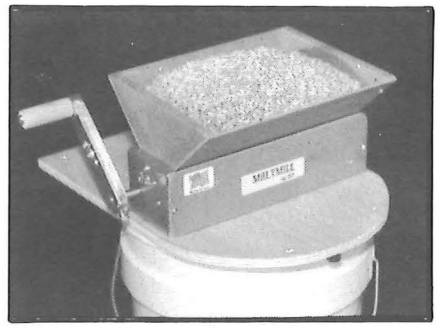

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Cask-Conditioned Ales

JIM BUSCH

England has numerous distinctions to contribute to the brewing world, but none is as unique and important as the tradition of cask-conditioned ales. Cask, or real ale as it is often called, is a special brew served in a special manner, by hand pump from the cellar. Despite what you may have been told in the United States, cask ale is not warm or flat. It is dispensed at cellar temperatures, 54 to 59 degrees F (12 to 15 degrees C), and is naturally, albeit lightly, carbonated. As a result, the mouthfeel is distinct from that of a "gassy" keg beer.

Temperature and carbonation have a great impact on the perception of the beer on the palate, and the combination of the cellar temperature, low CO_2 volumes and often a snappy hoppy aroma and flavor all are blended in the mouth to reveal a distinctly different and satisfying ale. While the spectrum of cask ales can be difficult to generalize, the carbonation, temperature, hoppiness and fermentation products are usually dominant factors in the flavor perceptions of all cask ales. Many cask ales have numerous fruity notes that are created in the fermenter and gradually reduced and blended during the maturation and conditioning periods. The important point is that they are supposed to be there, and that they manifest themselves in varying degrees of complexity throughout the life of the cask. This is one of the wonderful aspects of cask ale — it is living, breathing beer that will change over the week or so between bunging or stoppering and the final pull of the hand pump.

PRODUCTION OF CASK ALES

Cask ales produced in England are top-fermented beers, often produced in open fermenters. Open fermenters are just what they sound like — a vessel without a top. The fermenters often are a large cylinder with a hinged lid. Many are attemperated (chilled) by piping that is submersed in the fermenting wort. Either chilled water or chilled glycol is pumped through the piping, allowing the brewer to control the temperature during the fermentation.

While closed tanks are used in some of the bigger breweries, open fermenters are the traditional technique, and some noted breweries rely on the old Burton Union and Yorkshire Squares systems of open fermentation. Both of these open fermenters are designed so the fermentation effluent or kraeusen is allowed to flow out of the fermenter into a collection area, then either removed or allowed to return to the main fermenter. This technique tends to introduce added oxygen to the fermenter resulting in slightly elevated diacetyl levels in the beer. This generally is not a negative aspect of these beers. The use of open fermentation may seem strange to brewers who go to great lengths to keep out airborne contaminants, but this is not a worry in English brewing. Like all brewers, English ale brewers are very careful to sanitize everything that comes in contact with the cast out wort, especially as the wort drops below 170 degrees F (76.5 degrees C). A clean and sanitized fermenter, in conjunction with clean, healthy yeast pitched with a content of between 6 and 12 million cells per milliliter will ensure a rapid start to fermentation, and the subsequent production of vast amounts of CO_2 that will blanket the fermenting wort, and thus protect the beer from airborne contaminants. Once the fermentation is active, the pH of the beer will drop rapidly from an initial level of 5.4 down to the mid 4 range, and with some strains as low as 4.1. This acidulation of the wort, in conjunction with the large production of CO_2 results in an environment quite inhospitable to most airborne bacteria. The key, as with all brewing, is to pitch an adequate amount of clean, healthy, cultured yeast slurry.

In open fermenters the brewer must skim the yeast head off the beer between days two and three of normal ferments. The trub that rises to the top after day one is removed to reduce particulate matter that can lead to astringency problems. The use of open

A cooper making casks in the Samuel Smith cooper shop.

PHOTO COURTESY OF SAMUEL SMITH, THE OLD BREWERY

fermenters provides an easy method for the observation and skimming requirements of top-fermented ales. With typical top-fermenting strains, healthy white yeast is cropped off during day three or four of fermentation and stored for reuse.

Yeasts collected from healthy ferments can be repitched for hundreds of generations provided the brewery is clean and the brewer is acutely noting fermentation performance. Any degradation in yeast performance should be corrected by replacement of the strain with fresh stock. Fermentation is usually complete within five to seven days at 60 to 70 degrees F (15.5 to 21 degrees C). At this time, the beer is racked into maturation tanks where it can sit for a brief conditioning period. Alternatively, the still beer may be racked directly into the cask. The important point is that the transfer is done with about 1 °Plato (1.004) of residual extract left in the still beer, and between 0.25 and 2 million yeast cells per milliliter of still beer [1]. The residual extract may also be supplied in the form of priming sugars. This is accomplished by preparing a solution of brewers sugar (glucose) at a specific gravity of 1.150 (34 °Plato) and adding to the cask at a rate of 0.35 to 1.75 liters per hectoliter. Cast out wort as well as kraeusen beer can be used, but in the latter case excessive yeast cells may interfere with the clarification in the cask.

As the casks are filled, a fining agent is added to the vessel, usually in the form of isinglass in quantities of one to five liters per U.K. barrel [2]. Isinglass is composed of collagen molecules that carry an overall positive charge. Because yeast will exhibit an overall negative charge, an electrostatic attraction will result, leading to clumping of yeast and isinglass particles and then sedimentation. The process of clarification requires about a day to achieve a "star brilliance" of the beer [3]. Beers with residual yeast levels of 2 million cells per milliliter or more will be more difficult to clarify. Many brewers also add whole hops at a rate of one-half to three ounces per barrel at cask filling time. With the advent of modern packaging in vessels like polypins, some brewers are using hop oil extracts to mimic some of the character found in cask-hopped ales. At this point, the cask ale is ready for transport to the publican's cellar.

MATURATION OF CASK ALES

After the cask is shipped to the local pub it is no longer the direct responsibility of the brewer to finish the conditioning job. This task falls to the publican or cellarmaster. In the old days, it was the cellarmaster's duty to add the finings to the casks as they arrived from the brewery, but this is not common today. Once delivered to the pub the cask is placed onto its stillage and allowed to sit for two to three days. During this time the cask is undergoing the secondary fermentation, or cask conditioning. One day prior to serving, the cask must be prepared for dispense. This is done by driving the hard spile (nonporous wood peg) into the shive (round plug device on top side of cask or the equivalent of a bung on older U.S. kegs). The spile is essentially a primitive CO_2 valve, a nonporous one is used to close the cask for overnight storage while a porous spile is used during dispense to allow a path for air to enter and the beer to be pulled by the beer engine. When the spile is

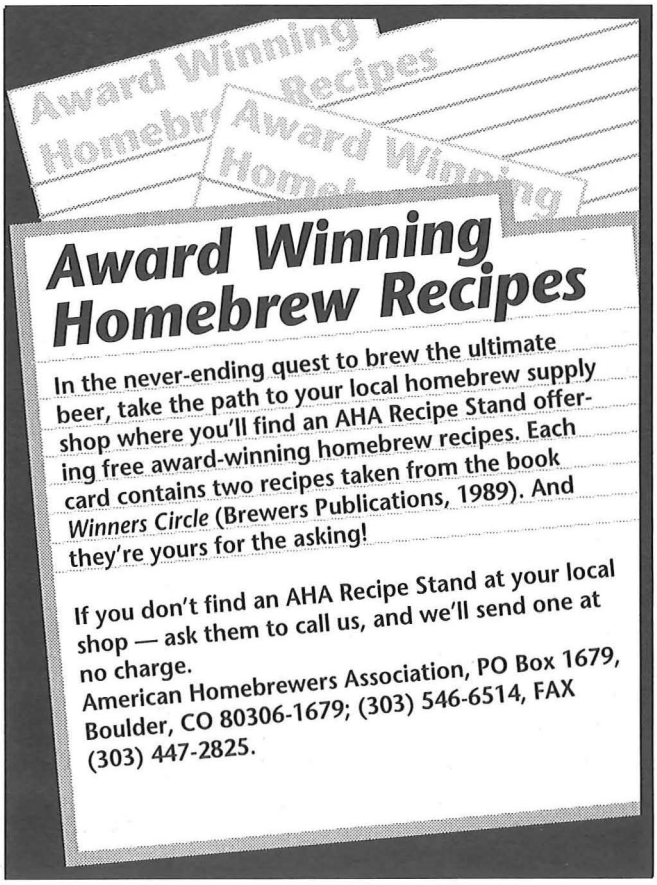
first hammered into the cask, the cellarmaster allows the CO_2 to vent from the cask, preventing levels of CO_2 buildup that would not be welcome to real ale lovers. The final step in tapping the cask is to drive the tap into the keystone (actual port through which the ale is "pulled"). A minimum of one day settling is required to ensure that the tapping process did not disturb too much yeast. The next day, the cellarmaster will sample the beer to determine when it is ready. This is an extremely important part of the process and a major reason why many cask ales are not served at their peak flavor. Some beers require a little more time than others to reach their peak.

DISPENSE OF CASK ALES

When the cellarmaster has determined that a new cask is ready for dispense, the beer line connecting the cask and the beer engine are connected. A beer engine is merely a fancy hand pump that "pulls" the beer out of the cask. As beer is removed from the cask, air bleeds in through the porous spile. It is for this reason that cask ales are best during the first few days of dispense, and are known to become increasingly undrinkable after three or four days. Oxidized beer in any country is not very pleasurable, and casks allowed to sit too long exhibit a strong oxidation effect. In an effort to combat some of the ill effects of oxidation, brewers and publicans have devised several methods of introducing CO_2 into the cask. The least objectionable is the blanket CO_2 method where an extremely small amount (1 to 2 psi) of CO_2 gas is pushed into the cask. Because CO_2 is heavier than air, it will form a "blanket" over the beer, protecting it somewhat from oxygen. Another method makes use of actual CO_2 tanks to push the beer out and mechanical pumps also are used to pull the beer from the cask. Traditionalists despise all methods of CO_2 use to preserve the beer quality, arguing that all result in some form of "gassy" ale. The Campaign for Real Ale (CAMRA), is particularly adamant about only dispensing real ale by the use of a beer engine without blanket pressure.

To this end, CAMRA refuses to list pubs that employ CO_2 systems in its invaluable book, *Good Beer Guide*, published annually. While CAMRA's dedication to tradition is admirable, it may be unrealistic to expect the smallest pub in the furthest region to be able to care for cask ales in the same fashion that the busier pubs can.

If cask hopping is employed, a small strainer device is used to keep the hops in



the cask and out of one's glass. At the tip of the dispensing nozzle, a sprinkler attachment is used to force the beer through several small holes, resulting in a release of carbonation into the beer and glass and a thick head. Cask ales also can be dispensed directly from the cask using gravity. In this arrangement a cask is positioned so the beer outlet is pointing down. By opening the spigot and allowing an air vent, the beer will pour out of the cask by gravity flow. If a soda keg is used in this technique the liquid dip tube would need to be removed or severely shortened. This is an excellent method of dispensing quality beers if the beer is to be consumed in one evening.

BREWING TIPS

The production of cask-conditioned ales is not that different from the normal production of homebrew. In both cases, the beer is naturally carbonated in a closed vessel. The major difference is in the amount of carbonation that is developed. Typical ales and lagers are conditioned to about 2.5 volumes of CO_2, while cask ales are closer to 1.5 to 1.75 volumes. When brewing cask ales, there are two methods to follow:

(1) Let the fermentation complete, then add a small amount of fermentables.

(2) Carefully monitor the fermentation, and when the gravity is within 1 °Plato of terminal gravity, bung the cask. This method is preferred but can be difficult because the brewer must know fairly accurately what the real terminal gravity will be. This technique is simplified by using stainless-steel soda kegs for dispense and carefully venting excess pressure as the cask conditions.

The use of finings can be an additional effort that many homebrewers may not want to bother with. In this case, be sure to use a yeast that is known to be an excellent flocculater. If cask hopping is done, only fresh whole hops or whole hop plugs should be used. Place the hops in a permeable bag, using a sanitized weight to force the bag to the bottom of the cask. If you intend to serve the beer as true cask ale a gravity feed can be employed, but ideally the cask should be emptied in one night.

Historically, India pale ales were of much higher original gravity, but my experience has found that today, these are as low as 1.035 up to 1.045, and merely a hoppier version of bitter. Strong ales are found as "low" as 1.051 original gravity but frequently are in the 1.062

A BRIEF DESCRIPTION OF STYLES [4]

Type	Original Gravity	Alcohol by Volume	Unfermented Matter	IBUs
"Ordinary" bitter	1.031 - 1.045	3.0 - 4.6	27 - 45%	20 - 40
Draft mild	1.030 - 1.036	2.5 - 3.6	29 - 48%	14 - 37
Best pale	1.040 - 1.050	4.3 - 6.6	21 - 43%	19 - 55
Brown ale	1.030 - 1.040	2.5 - 3.6	43 - 55%	16 - 28
Strong ales	1.066 - 1.078	6.1 - 8.4	32 - 44%	25 - 43

range. Note that despite the relatively low alcohol by volume of all but the strong ales, these beers have a lot of unfermented matter that gives the cask ales abundant body and mouthfeel. Unfermented matter is primarily composed of dextrins that normal yeast cannot metabolize. These dextrins will carry over intact into the finished beer. The use of caramel malts (commonly called crystal malt) will always increase the quantity of unfermentable matter in a beer. Caramel malts are routinely used in the production of cask ales. Many brewers create a wort with an original gravity of 1.055 or higher and dilute this into the fermenter by adding boiled and cooled water to result in the 1.035 original gravity. By using this technique, a degree of caramelization can be achieved from the kettle processing that may result in beneficial flavor attributes.

GLOSSARY

Burton Unions - Classic fermentation technique that recirculates the yeast overflow from the fermenter into a collection tank and back into the fermenter.

Isinglass - A fining agent made from the processed swim bladders of fish, primarily the Sturgeon. To use solid isinglass finings, add 30 to 60 milligrams per liter. Blend one minute with sterile water, let stand, blend again and let settle, then pitch. Use rates vary based on gravity, malt bill and process. Run a small test to determine performance in your system. Isinglass also is used in conditioning tanks at the rate of two ounces to one gallon or roughly a 2 percent concentration.

Fining agents - Materials that help clarify cask-conditioned ales. Includes isinglass, gelatin and in the case of protein removal, alginol (negatively charged polysaccharides).

Residual extract - Not to be confused with terminal gravity, residual refers to the amount of fermentables remaining at a certain time. These fermentables will be metabolized by the yeast in suspension given time to do so.

Stillage - A wooden device used to hold the cask in position for dispensing.

Terminal gravity - The final gravity of the beer measured after all of the fermentables are consumed by the yeast.

Top-fermented beers - Beers fermented using a top-fermenting yeast strain, *Saccharomyces cervesae*. Yeasts of this class tend to ferment the wort through action near the top of the fermenter and to rise to the top at the end of fermentation.

Unfermentable matter - Primarily dextrins that normal brewers yeast cannot metabolize. As a result, these body builders are carried over into the finished beer and contribute sweetness, body and mouthfeel. Unfermentable matter can roughly be calculated by reading the terminal gravity. A beer that has an original gravity of 1.040 and an final gravity of 1.010 has 10/40 unfermented matter or 25 percent.

Yorkshire Squares - Classic square fermenters made of slate at the Samuel Smith brewery. Yorkshire squares consist of slate bowl devices that are situated above the fermenters allowing yeast overflow to collect for removal or if left, reintroduction into the fermenter.

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What Makes a Beer British

GRAHAM WHEELER

Unlike most other countries, Britain's mashing practice is relatively uncomplicated because of the quality and types of brewing barley grown in England and the skills of the maltsters.

English two-row barley and the temperate British climate favor a low-nitrogen, and therefore a low-protein product. The best barley is grown on the eastern coast of Britain where light topsoil covers a limestone subsoil low in natural humus and therefore low in nitrogen. The rainfall to sunshine ratio in that part of Britain also is just about perfect for barley growing.

A controlled level of protein is important in brewing beer of good clarity. An excess of protein causes a hazy finished product while too little protein causes the malt to be deficient in enzymes.

The part the maltster plays is important in this respect. The degree of barley germination during malting is critical. If the barley is not allowed to germinate sufficiently, the malt is undermodified. With an undermodified malt much of the starch has not been converted into a soluble form, and a starch haze may be produced in the finished beer. Its fermentable extract and diastatic activity also will be low.

Conversely, if a barley is allowed to germinate too far, the malt is overmodified. The soluble nitrogen content increases thus increasing the possibility of a protein haze in the finished beer. The respiration of the barley and the growth of rootlets consumes energy and therefore substrate, which greatly decreases fermentable extract.

A malt is well-modified if the germination has been just right. With a well-modified malt all the starch is in soluble form so maximum extraction is achieved and the possibility of a starch haze is eliminated. If this malt is made from controlled nitrogen barley, there is enough nitrogenous protein to provide an adequate supply of enzymes and amino acids, but not enough to cause a protein haze.

The use of low-nitrogen, well-modified malt means that complicated mashing regimes are not required in traditional British brewing practice. A simple infusion mash at a single temperature of around 151 degrees F (66 degrees C) is all that is required.

German brewers were forced to cope with undermodified, high-nitrogen malt during the late 19th century and they developed the decoction mash as a consequence.

The classic decoction mash achieves two things: First, it features a protein rest at about 120 degrees F (50 degrees C) enabling the enzyme proteinase to break down excessive high-order nitrogenous substances contained in high-nitrogen malt into simpler substances. This reduces the haze potential. Second, it features the regular boiling of a portion of the mash, which is what decoction means. This boiling gelatinizes the unconverted starch in undermodified malt, rendering it open to attack by the diastatic enzymes. One problem is that this regular boiling of a portion of the mash also destroys some of the available enzymes, therefore the malt must be highly enzymic in the beginning. A highly enzymic malt is also high in protein and could give rise to a protein haze, hence long lagering periods and filtering are invariably used to reduce the haze potential.

None of these processes are necessary if high-quality brewing-grade malt is used in the first place. Traditional British breweries do not have mash cookers or lauter-tuns; just a single mash vessel.

Technically the classic decoction mash is redundant anyway, because any modern maltster who supplied poorly modified malt would gladly hang up his clogs and retire in shame.

The regular boiling of a portion of the mash is unnecessary because we just do not get undermodified malt these days. However, the protein rest period at 120 degrees F (50 degrees C) is not redundant, and to breweries in many parts of the world where high-nitrogen barley is used, it is essential.

Some of the big breweries in Britain are equipped with a high-tech brewhouse and have a temperature programmable mash tun, with which to perform a temperature stepped mash featuring a protein rest at 120 degrees F (50 degrees C). This would permit the unscrupulous ones to use much cheaper food-grade malt, or blend some cheaper malt with their standard grist, but most modern breweries are about as traditional as a microwave oven in any case.

Maris Otter, a variety of English barley, is widely regarded as the best for brewing, but apparently it is under threat by "Eurocrats." Maris Otter is no longer a listed crop because of its low yields and probably because it can only be successfully grown in England. This does not prohibit the farmers from growing it, of course, and fortunately they will continue to grow it, but it just goes to show that even the Englishman's sacred pint is not safe from the meddling maniacs on the other side of the English channel.

Pale malt is the primary ingredient of most British beers, but a darker and more enzymic type known as mild ale malt, is sometimes used as the primary ingredient.

The types of malt used as secondary ingredients are well-known to most homebrewers so there is little point in discussing them in any detail. Crystal malt is the most common secondary ingredient, but amber malt, chocolate malt and black malt are also used when the occasion demands.

Early British beers such as the brown beers of the 1500s and 1600s and porters of the 1700s and 1800s used a class of malt known as brown malt. Brown malt is a smoked malt, usually smoked over hornbeam. The term does not refer to the color that the malt imparts to the beer, but the superficial outward appearance of the malt itself. Early brown beers and porters would have had a characteristic smoky flavor, similar to that of German rauchbiers, a point often overlooked by commentators on porter. Another overlooked characteristic of porter is that it was deliberately soured by the addition of a small percentage of sour beer, providing a distinct winy aftertang much relished by Londoners.

Brown malt was still being used during the 1950s and early 1960s in some famous stouts, but is hardly ever used these days and is almost extinct. It cannot be found in British homebrew outlets.

Cereal ingredients often find their way into English beers, usually in the form of torrified cereals and flakes, with torrified and flaked wheat, maize (corn) and barley being the most common. Unlike American and Australian brewing practices, grits do not find favor in British brewing, because they need to have their starch gelatinized by cooking before they can be mashed. And since traditional British breweries do not feature a mash cooker, grits cannot be used. Torrified and flaked cereals have had their starch gelatinized by heat treatment during manufacture, making them far more convenient for British brewers.

The only exception is wheat flour. The gelatinization temperature of wheat coincides with normal infusion mash temperatures, therefore wheat grits can be used. Wheat flour was commonly used to improve head retention until quite recently, but it

seems to have fallen out of favor during the last few years. Sorghum and rice are rarely, if ever, used in British brewing.

Some breweries use a small amount of sugar in their recipes. Invert cane sugar was the most popular form at one time, but maize syrups are probably the preferred types these days.

Here is a selection of recipes that emulate beers from popular British breweries. All employ a simple, single temperature infusion mash for 90 minutes, followed by a 90 minute boil. The recipes have been designed for 5 U.S. gallons and assume a mash efficiency of 80 percent. All should be fermented using a good English ale yeast, such as Whitbread strain B, preferably in an open fermenter.

BURTONWOOD MILD ALE

Ingredients for 5 gallons

4 1/3	pounds pale malt
7	ounces crystal malt
9	ounces torrified wheat
3	ounces black malt
10	ounces cane sugar
2/3	ounces Challenger hops (90 minutes)
1	ounce Fuggles hops (90 minutes)

- **Original gravity: 1.035**
- **Final Gravity: 1.007**
- **Alcohol by volume: 3.8 percent**
- **Bitterness: 25 IBUs**

Mash 90 minutes at 147 degrees F (64 degrees C). Boil 90 minutes.

WHITBREAD BEST BITTER

Ingredients for 5 gallons

6 1/2	pounds pale malt
6	ounces crystal malt
10	ounces torrified wheat
1	ounce Goldings hops (90 minutes)
1	ounce Fuggles hops (90 minutes)
1/3	ounce Goldings hops (15 minutes)
1/6	ounce Irish moss (15 minutes)

- **Original gravity: 1.040**
- **Final gravity: 1.010**
- **Alcohol by volume: 4.1 percent**
- **Bitterness: 29 IBUs**

Mash 90 minutes at 149 degrees F (65 degrees C). Boil 90 minutes.

TIMOTHY TAYLOR LANDLORD BITTER

Ingredients for 5 gallons

8	pounds pale malt
2	ounces Goldings hops (90 minutes)
1/6	ounce Irish moss (15 minutes)

- **Original gravity: 1.042**
- **Final gravity: 1.010**
- **Alcohol by volume: 4.3 percent**
- **Bitterness: 35 IBUs**

Mash 90 minutes at 151 degrees F (66 degrees C). Boil 90 minutes.

FLOWER'S ORIGINAL BITTER

Ingredients for 5 gallons

5 1/6	pounds pale malt
10	ounces crystal malt
1 1/6	pounds torrified wheat
1	pound cane sugar

- 1 ounce Goldings hops (90 minutes)
- 1/2 ounce Target hops (90 minutes)
- 1/3 ounce Goldings hops (15 minutes)
- 1/6 ounce Irish moss (15 minutes)
- 1/6 ounce Goldings hops (one minute or dry)

- Original gravity: 1.045
- Final gravity: 1.007
- Alcohol by volume: 5.1 percent
- Bitterness: 32 IBUs

Mash 90 minutes at 151 degrees F (66 degrees C). Boil 90 minutes.

HOOK NORTON OLD HOOKY

Ingredients for 5 gallons

- 8 2/3 pounds pale malt
- 8 ounces flaked maize
- 3 ounces black malt
- 1 ounce Challenger hops (90 minutes)
- 1 ounce Fuggles hops (90 minutes)
- 1/2 ounce Goldings hops (90 minutes)
- 1/3 ounce Goldings hops (15 minutes)

- Original gravity: 1.050
- Final gravity: 1.013
- Alcohol by volume: 5.9 percent
- Bitterness: 35 IBUs

Mash 90 minutes at 152.5 degrees F (67 degrees C). Boil 90 minutes.

MOORHOUSE'S PENDLE WITCHES BREW

Ingredients for 5 gallons

- 8 2/3 pounds pale malt
- 6 ounces crystal malt
- 6 ounces flaked maize
- 3 ounces Fuggles hops (90 minutes)
- 1/6 ounce Irish moss (15 minutes)

- Original gravity: 1.050
- Final gravity: 1.012
- Alcohol by volume: 5.1 percent
- Bitterness: 35 IBUs

Mash 90 minutes at 154.5 degrees F (68 degrees C). Boil 90 minutes.

ROBINWOOD OLD FART

Ingredients for 5 gallons

- 8 pounds pale malt
- 1 3/4 pounds malt extract
- 11 ounces crystal malt
- 3 ounces roasted barley
- 1 ounce Fuggles hops (90 minutes)

- Original gravity: 1.060
- Final gravity: 1.016
- Alcohol by volume: 6.0 percent
- Bitterness: 40 IBUs

Mash 90 minutes at 154.5 degrees F (68 degrees C). Boil 90 minutes.

EDWIN TAYLOR'S EXTRA STOUT

Ingredients for 5 gallons

- 6 2/3 pounds pale malt
- 1 1/4 pounds roasted barley
- 1 ounce Challenger hops (90 minutes)
- 1 ounce Hallertauer hops (90 minutes)

- Original gravity: 1.042
- Final gravity: 1.014
- Alcohol by volume: 3.9 percent
- Bitterness: 48 IBUs

Mash 90 minutes at 151 degrees F (66 degrees C). Boil 90 minutes.

British Malting and Brewing Practices

JOHN A. PEACOCK

Barley malt remains the primary source of brewers extract in the United Kingdom and although liquor, hops and yeast strain play an important role in the flavor of the final product, malt is a major determinant of beer flavor and overall quality. So it's not surprising that while annual U.K. beer production levels have fluctuated enormously in this century, the proportion of malted barley to other sources of extract has remained remarkably consistent, as Table 1 shows.

Although in recent years malt prices have become more competitive with those of other common sources of extract, malted barley is not the cheapest source of brewers carbohydrate, as can be seen from Table 2.

Cost is not the reason for this reliance on malted barley. Barley malt has retained its pole position as the principal carbohydrate source quite simply because no other material offers the brewer the enzymes and substrates required to yield sound wort in such a convenient form. It provides the perfect diet for yeast growth, supplying energy in the form of carbohydrates, organic fragments for protoplasm synthesis and the essential growth factors, amino acids, minerals and certain vitamins that the yeast cell cannot synthesize. The added bonus is that malted barley has a husk that plays a vital role in the separation of the worts from the solids in the mash or lauter tun and, perhaps most important, malted barley provides more beer flavor compounds than any other cereal.

Central to the control of malt flavor and hence of the beer produced from that malt, is the kilning process. Without kilning, so-called green malt has always been judged to produce beer of unsatisfactory flavor. Insufficient kilning results in sulfidic and grassy-flavored beers, while extended kilning increases the more desirable flavor and color contribution of the malt. Kilning is therefore part of the malting process and not just a drying procedure.

The kilning of malt can be varied in many ways, with most being dried first then cured at a higher temperature for different periods of time. The enzyme content of the malts is preserved with limited curing periods and the "true malts" so produced, such as lager or pale ale, are capable of converting their own starch and possibly that of other grains to fermentable sugars. As the temperature and time of curing are increased, the enzymes become progressively destroyed while the color and flavor of the resulting "special" or "patent" malts (crystal, CaraPils, chocolate) are intensified.

In general terms higher kilning temperatures give increased malt color and flavor, caused principally by the Browning or Maillard reaction between reducing sugars and amines to form melanoidins.

Kilning, however, costs money. Several attempts have been made by some of the larger U.K. breweries during the last 20 years to cut down raw material costs by using lager-type, higher moisture, lower color and, hence, lower flavor standard malt for the production of ales as well as lagers. Similar cost-cutting exercises in breweries controlled by accountants and/or pure research chemists have involved barley brewing, where the malting process has been completely eliminated. Instead, extract is derived from a barley mash to which commercial enzymes are added. Not surprisingly, the English ales produced by such methods are relatively characterless and have been largely rejected by the public.

TABLE 1
U.S. Tons (in Thousands) Used in the United Kingdom

Year	Malt	Sugars	Solid Adjuncts	% Malt
1914	1,102	184	90	80
1927	598	101	47	80
1932	398	77	31	79
1939	553	111	42	78
1946	558	100	71	77
1970	643	123	55	78
1980	837	146	86	78
1990	774	151	85	77
1991	726	140	80	77
1992	712	121	82	78

TABLE 2
Relative Extract Costs in the United Kingdom

Raw Material	Brewhouse Extract (Number of Liters per Kilogram of Raw Material to Achieve a Specific Gravity of 1.001.)	Relative Cost (Malt = 100)
Malt	291	100
Torrified barley	253	78
Flaked barley	253	77
Torrified wheat	285	68
Flaked wheat	279	67
Wheat flour	279	56
Flaked maize	313	94
Brewing syrups	312	103
Liquid cane sugar	261	105

Since the consumption of pale ales, bitters and milds has stabilized at about 50 percent of the U.K. market, with cask-conditioned beers in particular regaining popularity at the expense of keg beers, it is no surprise or coincidence that the U.K. breweries experiencing the most growth in sales are those that have resisted the blandishments of their accountants, and whose beers consequently afford the most character. Certain of the more intensely flavored sugars such as the inverts are successfully used by a number of the long-established traditional breweries, although seldom at more than 10 percent of the grist. However, by far the greatest rate of growth in the U.K. beer sector during the past two years has been the 200 or so microbreweries, virtually all of which derive their extract solely from quality malted barleys and, in a few cases, a small percentage of wheat flour or wheat malt to improve head retention.

These micros have reminded the British drinker of the long-forgotten fullness of an all-malt brew. Their typical extract derivation for bitters, pale ales, milds and porters is 90 to 100 percent pale ale malt and 0 to 5 percent wheat malt or flour and from 0 to 5 percent crystal, chocolate or CaraPils malts. A number have successfully launched an unusually light-colored ale or bitter of around 12 °Plato, derived from 100 percent pale ale malt (no patent malts). Although refreshing, these beers are deceptively strong when judged by their straw color.

ENGLISH SUMMER ALE

Ingredients for 10 U.S. gallons

15	**pounds Munton and Fison Premium Pale Ale malt**
	or
14 1/4	**pounds Munton and Fison Premium Pale Ale malt**
3/4	**pound Munton and Fison Malted Wheat**
2	**ounces Challenger or Goldings hops at start of boil ("copper up")**
2	**ounces Styrian, Goldings or Challenger hops (in hop back)**
4	**ounces "pressed" yeast (equivalent to 6 to 8 ounces barm or thick slurry) use ale yeast (*Saccharomyces cerevisiae*)**
	Liquor treatment as for English pale ale or bitter

- **Original gravity: 1.048 (assuming 91 percent extraction.)**
- **Final gravity: about 1.011**
- **Alcohol by volume: about 4.8 percent**
- **Boiling time: 75 minutes**

Brewer's specifics

Single temperature infusion mash at 148 degrees F (64.5 degrees C) for 75 minutes. Sparge with treated liquor at 170 degrees F (76.5 degrees C). Pitch at 65 degrees F (18.5 degrees C). Ferment at no warmer than 75 degrees F (24 degrees C) until gravity reaches 1.012 then arrest fermentation by cooling to 55 degrees F (13 degrees C).

The increasing popularity of this new style is unique to the microbrewers, but doubtless will be copied shortly by their larger rivals.

All micros and the majority of the traditional breweries in the United Kingdom operate the single-temperature infusion-mash system where mash conversion and wort separation take place in a single vessel. It is not surprising that most British maltsters and brewers still overwhelmingly use British barley for their processing because the U.K.'s maritime climate, although treacherous to holidaymakers, is ideal for producing high-quality two-row barleys widely regarded as having some of the best malting and brewing characteristics to be found anywhere in the world. Furthermore, new varieties are evaluated very thoroughly over many years before being pronounced suitable for quality beer production. The most commonly used, well-proven varieties at present are Halcyon and Pipkin, offsprings of the famous but now outclassed Maris Otter. Unlike the six-row barley commonly grown in North America, two-row barley produces symmetrical corns of low nitrogen content and equal size that modify more evenly and result in a more homogeneous malt and easier mash conversion and wort runoff.

The word "quality" is much abused nowadays, especially when used to describe uniformity and consistent blandness. Margaret Thatcher reminded us some years ago of the true meaning when she described quality as that which causes the customer to come back — not the product.

The United Kingdom microbrewers have benefitted enormously by understanding this and their success in part stems from their observance of the following rules: (1) You can't make a silk purse out of a sow's ear, (2) don't spoil the ship for a ha'porth of tar and (3) constantly remind your accountant that he or she is only the scorer.

Early British Ale: Bittering, Flavoring and Aroma Ingredients

GARY SPEDDING

Both before and after the advent of hop usage in malt beverages a plethora of ingredients — novel, rare, traditional and abundant — have been used for aromatic purposes and/or for flavoring alcoholic drinks. This article describes long-forgotten hop substitutes and more modern alternatives for complementary flavoring and aromatic substances, focusing on ingredients once used predominantly by British brewers and elsewhere throughout Europe and the United States.

The early brewers' treasury of flavoring and aromatics ranged from the innocuous and the unusual, such as carrot seeds, to secret illegal compounds such as strychnine, opium and other potent mood-altering drugs. Furthermore, in a time when quality control was not possible, some ingredients were used to mask an inferior product. Opium, for example, was an early adulterant in some beers including porter. Cocculus indicus berries, now regarded as very poisonous (some species in this family produce curare), also were used in early porter recipes.

With the information presented here modern brewers may be encouraged to experiment with some lesser known but safe, legal ingredients to achieve unique flavor profiles in their homebrews. Some of these flavors have not been appreciated for 150 years. Through the adventurous spirit of some homebrewers, a judicious combination of novel ingredients might lead to the development of beer flavors that have not yet been tasted.

Two recently published books cover the topic and also provide several old recipes: *An Introduction to Old British Beers and How to Make Them* by Dr. John Harrison and members of the Durden Park Beer Club (Durden Park Beer Circle, 1991), and *The Historical Companion to House-Brewing* by Clive La Pensée (Montag Publications, 1990). Interested readers should consult these excellent works for more information.

HOPS AND HOP SUBSTITUTES

Not many people know that "beers" were originally unhopped malt beverages or "true ales" by definition, that the introduction of hops was fraught with controversy and that hops were once hailed in the United Kingdom as the "wicked weed." A history of hop introduction can be found in *A History of Brewing* by H.S. Corran (David and Charles, 1975). Despite their lack of hops, not all early malt beverages were plain, sweet and malty. Many early ales were highly flavored and rendered bitter by the addition of many other herbs and spices.

To invite homebrewers to try some unhopped "ales" made with hop alternatives listed in Table I, I quote John Evelyn (1620-1706), cited in *Health Plants of the World* by Francesco Bianchini and Francesco Corbetta, (Newsweek Books, 1975). According to Evelyn, "Hops transmuted our wholesome ale into beer, which doubtless much altered our constitutions. This one ingredient, by some suspected not unworthily, preserves the drink indeed, but repays the pleasure with tormenting desires, and a shorter life."

The full list of ingredients used as hop surrogates, or to provide alternative flavor profiles, is quite extensive, and only a few are presented in Table I. Many plants indigenous to the United States have also been used as ale flavoring components. All of these herbs and spices provide the contemporary brewer with quite a range of alternatives.

Many herb and spice ingredients can be purchased from health-food stores. Seeds can be purchased but always make sure they have not been treated with chemicals that could prevent fermentation or cause undesired side effects in the drinker.

If you have any doubts about using an herb or spice for your ales you are advised to check in the herbal literature first and consult with your local health-food store. If the herb is recommended for infusions with teas, then it is probably safe to experiment with it in your beers. I also recommend the following books as a starting point for further information: *An American Herbal* by Nelson Coon, (Rodale Press, 1979), *Medicinal Plants of the Mountain West* by Michael Moore, (Museum of New Mexico Press, 1979) and the *CRC Handbook of Medicinal Herbs* by James A. Duke, (CRC Press, 1991). There is an abundance of other good books concerning the safe modern use of herbs and spices.

USING ALTERNATIVE HERBS AND SPICES

Many brewers long ago believed, perhaps naively, in essential virtues of all the ingredients they used. Heating and extraction processes had to be done just right in order to achieve balance and harmony in the ales and beers produced, much as we attempt to do today with hops and malt balance. Some patient experimentation may be needed to formulate recipes using alternative ingredients in order to achieve truly pleasing beverages.

The early brewing literature states that many hop surrogates (bittering agents) did not provide tannins to "balance" the beer.

TABLE 1

Some lesser known novel ingredients used in old English ale recipes: properties and uses. Note toxic warnings on some herbs listed. Consult an herbologist (check local health-food stores or the yellow pages) for safety and consumption information on all herbs.

Bayberry (*Myrica cerifera* or *pensylvanica*) or wax myrtle plant. The waxy bayberries have been used in early ale recipes (see MUM ale). The astringent leaves of the European M. gale (sweet gale) were used as a hop substitute in producing beer (see bog myrtle).

Betony (*Stachys officinalis*). Also known as hedge nettle and woundwort, this plant has had as widespread a history as any other. It was used by the Romans as a panacea for most diseases. During the Middle Ages the plant was assumed to have magical powers. Described as being hot, acrid and bitter. Use the leaves, which are astringent because of the presence of tannins.

Bog myrtle or sweet gale (*Myrica gale*). Described in a Norwegian treatise on beer and brewing as the most important ingredient of "grut" (see gruit recipe). It added a good strong flavor to the ale and made it heady, that is, helped cause rapid drunkenness (so use sparingly!). The strongly aromatic leaves and stems were used for flavoring (giving a "sprightly medicinal taste") in conjunction with hops, or otherwise together with tansy (now considered toxic and not recommended), yarrow, and St. John's wort. I suggest if you do use bog myrtle that you boil it for only a short time and skim any foam from the boiling wort.

Burnet (*Sanguisorba officinalis*). An herb used in beer recipes. The dried leaves have been used to make tea and the dried rhizome used medicinally.

Carduus (*Carduus benedictus*). Wild field saffron, reported to be identical in bitterness to hops, was therefore a valuable hop surrogate. It was not common in the British Isles but its close relative the milk thistle (*Silybum marianum*) was. The stalks of this plant were the parts used.

Elderberry (*Sambucus canadensis Am., Sambucus nigra E.*). Its purplish-black fruit has a characteristic flavor and has been used in beermaking and winemaking. It is the key flavoring ingredient in the ale ebulum. White ebulum is made using white elderberry berries. Dried elderberry flowers are used in MUM Ale.

Juniper (*Juniperus communis*), a kind of beer is made with these berries in Lapland.

Lavender (*Lavendula vera*). This plant has very fragrant flower tops and might be considered for inclusion in modern beer recipes.

Marjoram, common or sweet **(*Origanum vulgare* or *O. marjorana*)**. Originally cultivated in Europe as a flavoring herb and for home remedies. Because this is weakly bittering it was used primarily in lowland German beer recipes in conjunction with other spices.

Marsh tea, marsh cistus or wild rosemary (*Ledum palustre*). The Germans once added the leaves of this plant to their beer to make it more intoxicating.

Scurvy grass (*Cochlearia officinalis*). Similar to horseradish, it is very pungent and was used in "medicinal ales." The garden variety rather than wild scurvy grass was recommended. The interested brewer will probably have to grow his or her own. I know of no seed source at this time in herbal stores. This plant, which has a high vitamin C content and a slightly acrid and bitter taste, was used in a beverage called scurvy grass ale (see recipe).

Senna or Alexandrian senna (*Cassia senna*). Source of the drug senna, an important laxative and used in early scurvy grass ale.

Yarrow or milfoil (*Achillea millefolium*). Used prior to the advent of hops for flavoring ale and later used together with hops. Yarrow has also been called "meadow hops" and "earth hops" by the Icelanders and "field hop" by the Swedish. Evidently one of the most popular herbs for flavoring beer in the past in various parts of Europe. Take care with this one as it is suggested that, in combination with the alcohol, it can make for very intoxicating beverages.

A reference to this fact reads as follows; "Some tannin must also be added, one pound tannic acid for every 100 pounds hops substituted by the other bitters." I suggest you not worry too much because increased tannin intake in the diet is not necessarily desirable. If you add any hops to these recipes let them carry the necessary tannins. As a general rule, not more than one-third of the hops should be substituted by other bitters. It should also be noted that hops exhibit antiseptic qualities where the other bittering agents often do not. This is clearly something to be considered in handling and storage of these "novel" beers.

Generally, all herbs used in brewing should be dried and not green. La Pensée has gleaned much of the following information regarding the use of flavoring ingredients mainly, I think, from *A New Art of Brewing Beer, Ale and Other Sorts of Liquors* by Thomas Tryon, (Second Edition, Sign of the Temple, 1691). The early instructions say to leave herbs in the warm unhopped wort. If many herbs are to be used they should be placed in the wort separately, never together. The order and times of addition have never been specified in the earlier recipes quoted in the brewers almanacs and treatises, so you are very much on your own here. Some recipes do, however, call for the addition of mixed spices and this is obviously much more convenient. You are advised to infuse for one-quarter to one-half hour only any of the bittering plants other than hops.

EARLY RECIPES

According to beer historian H.S. Corran, "Before hopped beer became customary in Germany, a mixture of herbs, including bog myrtle, rosemary and yarrow, among others, was employed: this mixture was known as gruit, and the product as gruit beer." Similar herbs were also used in England. It sounds as if there were many variations on the composition of gruit, so you have no limits. A recipe for Gruit Ale from the Durden Park Beer Club is presented here. It is an unhopped ale dated circa 1300.

GRUIT ALE

Ingredients for 1.2 U.S. gallons

- **1 3/4 pounds pale malt**
- **1 1/2 pounds CaraPils malt**
- **1 1/2 grams each of myrica gale (sweet gale or bog myrtle) ledum palustre (marsh rosemary) and Achillea millefolium (milfoil or yarrow)**
- **Original gravity: 1.080**

Prepare a stiff mash at 151 degrees F (66 degrees C) and hold at that temperature for three hours. Raise to 170 degrees F (77 degrees C) for 30 minutes, sparge at 179 to 185 degrees F (82 to 85 degrees C). Add the herb mixture and boil for about 20 minutes. This wort should be placed in a carboy or other suitable vessel, filled to the top and fitted with an airlock. Remember that there are no hops to act as preservatives. Ferment as usual and mature for four months.

Edward R. Emerson in his book *Beverages, Past and Present* (1908) wrote, "The British made and do make yet other ales (besides the regular malt and hop ales) some of which are palatable and wholesome." The list he provided included cowslip ale, blackberry ale, horseradish ale, egg ale, cock ale and ebulon (ebulum). We shall leave aside the egg ale and cock ale as these two recipes provide for another story. I present recipes for cowslip and ebulum ale here.

The recipe for cowslip ale, taken from *The London and Country Brewer* (St. Paul's Church Yard, 1742) and printed in Emerson's book, reads: "Take a bushel of the flowers of cowslip, picked out of the husks, and when your ale hath done working (fermenting) put them loose in the barrel (equivalent to dry hopping) without bruising. Let it stand a fortnight (two weeks) before you bottle it, and when you bottle it put a lump of sugar in each bottle." My guess is that a bushel of cowslip was used in a hogshead of wort (65 U.S. or 54 U.K. gallons) as many recipes in these early brewing books were designed for this scale of brewing.

Another fascinating and complex drink consumed in early England was called purl, a beverage that evidently saw much evolution but initially consisted of Roman wormwood, gentian root, calamus aromaticus (now considered unsafe), snakeroot, horseradish, dried orange peel, juniper berries, dried seeds of Seville oranges and a pound or two (I assume in 65 U.S. gallons or 54 U.K. gallons) of galingale (galien-gale root) placed in ale and al-

lowed to stand for some months. This ale sounds quite delicious but from my notes I am not sure of the amount of ale made nor the amounts of ingredients per gallon, but this should provide you with a good starting point.

One quite famous early and popular unhopped ale was made with elderberries and was called ebulum. An original description of this ale reads: "To a hogshead (65 U.S. gallons or 54 U.K. gallons) of strong wort, boil in one bushel of fully-ripened elderberries, strain off and add yeast when cooled." Ferment in a carboy and let rest for about a year (this was normally done in a cask so you might also add some wood chips for flavoring). The final product should be "a most rich drink." No sugar was added to this during the fermentation, though it is recommended to have an "infusion of hops for preservation and relish." Sometimes a small bag of bruised spices was added to the fermentation vessel. A white ebulum can be made with pale malt and white elderberries. I will leave the final details concerning the hop rate and the spices you might wish to try to your imagination. I'd be interested in sampling your efforts.

A version of ebulum, dating to 1744 and uncovered by the Durden Park group, has an original gravity of 1.085 and uses four pounds of pale malt and one and one-half pounds of ripe fresh elderberries for a one-gallon recipe. It is said to resemble some Belgian fruit beers. They prepare a stiff mash and sparge slowly, collecting the wort until it is 15 degrees below the original gravity. Next they hold this wort in reserve and collect a second run by sparging until the new runoff is 50 degrees below the original gravity. This weaker wort is boiled until it is at 15 degrees below original gravity. The two worts are then combined and raised to a boil. The elderberries are added and boiled for 20 minutes. After cooling, fermentation is done using an ale yeast. The ebulum is matured for at least six months.

A highly spiced beverage with an interesting history and name was called MUM and could not possibly have been left out of this article. MUM ale is an unhopped beverage said to have originated in Germany and to have been popular in London. The recipe I present is again taken from *Old British Beers and How to Make Them.* Harrison describes this as one of the best unhopped ales, dating to the late 17th century.

MUM ALE

Ingredients for 1.2 U.S. gallons

- **3 pounds wheat malt**
- **1 pound pale malt**
- **1/2 pound rolled oats**
- **1/2 pound ground beans♦**
- **1 gram each of carduus, marjoram, betony, burnet, dried elderberry flowers and thyme**
- **1 1/2 grams crushed cardamom seeds**
- **1/2 gram bruised bayberries**
- **Original gravity: 1.080**

♦ Beans have been used for flavoring and as a substitute for the malt base of beers in the past. For example, bitter bean (*Fabia amara*) has been described as being "the most wholesome substitute for hops" with a "pleasant bitter." Use any variety of good-quality dried beans.

Follow the instructions provided with the gruit recipe for mashing and sparging the grains. Then simmer the oats and beans for 20 minutes before adding to the mash. Ferment with ale yeast and after three or four days rack away from the yeast sediment, add the other ingredients and let infuse for 10 days. Strain and allow to clear before bottling. Mature for eight months.

The London and Country Brewer (1742), describes how to make an ale that will "taste like apricot-ale." Out of all the recipes I have found this is the one I am dying to try. As I have not yet had the time to make it I would appreciate your sending me a bottle or two if you ever get around to trying out this recipe. "To every gallon of ale add one ounce and a half of wild carrot-seed bruised a little and hang them in a linen bag in your vessel, till it is ready to drink in about three weeks, then bottle it with a little sugar in every bottle" (prime it as usual, in other words). Following the infusion do not squeeze the carrot seeds as this apparently creates some off-flavors. Use cultivated or wild carrot seeds, but if you can't positively identify the wild variety, known as Queen Anne's Lace, use

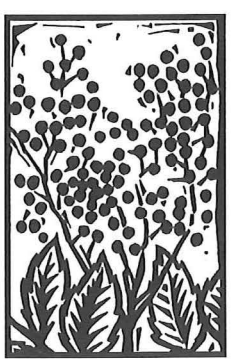


ILLUSTRATION BY GREGORY DYE

commercially available seeds. Somewhat confusingly, elsewhere in the same book is the statement that wild carrot seeds can give a peach flavor or relish, so is this a peach or an apricotlike ale? Try it and let me know. If it works it should be easier than messing around with five to 10 pounds of fresh peaches or apricots.

Finally, I present quite an intriguing recipe for an early beverage called Scurvy Grass Ale. I introduce it in mostly original wording, for historical context, from an early brewing treatise and make a suggestion for modifying the recipe. The rhubarb should add an "agreeable acid flavor." Refer to Table I for details concerning the ingredients.

SCURVY GRASS ALE

Add the following to 3.6 U.S. gallons of unhopped ale wort with an original gravity between 1.085 and 1.100.

1/5 to 2/5	**ounce Alexandrian senna seed♦, freed from the stalks**
1	**ounce rhubarb slices**
3	**ounces cinnamon**
1 1/2	**ounces polypody of the oak♦♦**
1	**ounce each of bay and juniper berries**
1	**ounce each of anise and fennel seeds, bruised**
1	**ounce each of liquorice and horseradish slices**
1/2	**dozen Seville oranges, cut into wedges**
1 1/4	**pounds chopped scurvy grass leaves**

Put all ingredients except the scurvy grass in a bag with a stone to make it sink into three gallons (3.6 U.S. gallons) of ale. Steep scurvy grass in 1 1/2 pints of water to get the juice of garden scurvy grass. Boil to clarify, let stand until cold, add it to the ale and allow to ferment for a day and a night. Stop the vessel with an airlock and let stand six days. Bottle when fermentation has ceased. Again, this ale probably uses a strong wort base (original gravity between 1.085 and 1.100) and requires a long time to mature, so be patient.

♦ Senna is a powerful cathartic (laxative), so use sparingly. I've adjusted the recipe — it originally called for four ounces in three gallons.

♦♦ Polypody is actually the name for a fern, any of a genus Polypodium ferns with leathery pinnatified leaves borne on creeping rootstocks. I am unsure about what this is, or how to get it so you will have to leave it out. Add instead some other bittering agent (perhaps hops) as the polypody was probably used only for its tannin content.

WHY HOP IT?

This article has discussed many alternatives to the use of the familiar hop plant in our malt beverages. We know that different hop varieties provide for a wide range of bittering characteristics in beer and that they also provide a spectrum of aromas. Hops are classified as spicy, floral or fruity, and can be used with great versatility. The world of beermaking, however, seems ready to go beyond hops to the addition of other natural flavoring and aromatic ingredients. Enjoy your experiments, the "spices of your labors" and please share your results with me.

Cheers!

Infusion Mashing

ALAN PUGSLEY AND PETER AUSTIN

Infusion mashing, the simplest form of mashing, is widely practiced in the United Kingdom and in North American microbreweries.

According to the *Dictionary of Beer and Brewing* (Brewers Publications, 1988), mashing is the process of mixing crushed grain with water in the mash tun to extract the malt, degrade haze-forming proteins and further convert grain starches to fermentable sugars and non-fermentable carbohydrates (dextrins) that will add body, head retention and other characteristics to the beer.

The whole process is carried out in three ways; infusion mashing in a single vessel at 149 to 154 degrees F (65 to 68 degrees C) as for ales; decoction mashing by boiling portions of the mash in a separate vessel to raise the temperature from 113 to 168 degrees F (45 to 76 degrees C) as for lagers; or mixed mashing which is a combination of the infusion and decoction methods. This article will address the infusion mashing method.

To undertake an infusion mash, select suitable, well-modified malt. This means the malt prepared at the maltings has to be germinated enough to enable maximum starch-containing cell wall breakdown giving maximum possible free starch exposure for the brewer upon mashing.

The reason for choosing well-modified malt is that the infusion mash system employs a single temperature saccharification rest at 146 to 152 degrees F (63.5 to 66.5 degrees C). Temperature selection in this range is dependent on the wort characteristics required, hence there is no 128- to 130-degree-F (53.5- to 54.5-degree-C) protein rest or high-temperature rest. Well-modified malts are available from most maltsters these days, but the classic malt for this type of mashing is still produced in the United Kingdom. It is important not to mill too closely. The malt should be crushed so the smallest corns are just cracked and no more; therefore the broken husks are in larger pieces and provide good drainage. The crushed malt can either be collected in a grist case or mashed directly.

Because the mash temperature is critical for the enzymic hydrolysis of starch to fermentable sugars, great care must be taken to achieve the correct liquor "strike" temperature. This is the temperature at which coarsely crushed malt will be mixed with the brewing liquor to achieve a final mash temperature in the 146- to 152- degree-F (63.5- to 66.5-degree-C) range as previously indicated. The ideal saccharification temperature is 148 to 149 degrees F (64.5 to 65 degrees C). Higher than this results in the presence of more dextrins, or unfermentable sugars, which give more body to the beer. A lower temperature results in a higher maltose production.

When choosing the strike temperature, factors such as ambient temperature, malt temperature (room temperature is preferable for storage), mash tun size and temperature must be taken into account. However, for the uninitiated, starting off in a new brew house where the pipe run from hot liquor back to mash tun is relatively short, then 160 to 162 degrees F (71 to 72 degrees C) is a good starting point. It is important to sparge this 160-degree-F (71-degree-C) liquor around the mash tun before mashing in order to heat up the cold stainless-steel vessel and reduce the potential for heat loss.

Once a suitable strike has been established you may have to make seasonal ambient temperature adjustments or adjustments to suit wort character, but for little else. Of course the mash tun must be insulated on the bottom and sides in order to keep heat loss to a minimum. During a 1 1/2-hour mash stand you should lose no more than 2 degrees F (1 degree C) across the grain bed.

The actual mashing process should be a simple design to minimize the stirring or knocking of the mash as it enters the mash tun. Such treatment can lead to increased extraction of tannins, high molecular proteins and polyphenols in the malt husks that will give harsh off-flavors in the beer as well as being haze precursors. Initially one-half to one inch of liquor should be added over the false-bottom plates so the falling mash does not block the filtration slots or holes.

Then a Steel's masher can be used where crushed malt falls through a large base tube and meets jets of hot liquor falling into the mash tun. This method is necessary at milling/mashing rates greater than 50 pounds per minute. However, at slower mashing rates a simple mashing ring can be used where the crushed malt falls from the mill/auger delivery tube through a ring, spraying hot liquor in a circumference or a square and thoroughly wetting all the crushed malt. This is very effective and simple.

The volume of hot liquor used to the weight of malt mashed is 34 to 45 gallons per hundredweight, or one gallon per three pounds of malt, depending somewhat on the size of mash tun and brew length. Generally the larger the system the less liquor per hundredweight of malt is used. This is a good guideline to use.

The bed of an infusion mash is generally thicker than that of decoction or programmed temperature mash, and the vessel is designed accordingly. The typical depth of an infusion mash bed is three feet six inches to four feet in most microbreweries and six to eight inches with a 12- to 18-inch diameter brewpot in most homebrew setups. It is the diameter of the mash tun that increases with increased brew length in order to achieve a consistent mash bed thickness.

The actual desired thickness of a mash bed in the micro situation that allows a good runoff is two feet to two feet six inches. The mash, correctly mashed, will float

off the false bottom of the mash tun at a level of eight inches or so, assuming the liquor to weight-of-malt ratio has been adhered to. This is caused by the entrained air picked up during mashing that adds buoyancy to the mash — another good reason not to stir up the mash. In a well-designed system there will be no dry spots of malt, which alleviates any reason to touch it.

During runoff of the wort from the mash tun to the brew kettle the mash can be "worked" by allowing the bed to drop four to six inches before sparging the bed back up again and then dropping and raising again. This should be achieved a couple of times during runoff and tends to give better extraction rates than a constant sparge. This is called "working the mash."

Finally, to allow a good steady runoff of wort from the mash tun the false bottom must be correctly designed. The false-bottom plates will be drilled or slotted with one- to three-millimeter holes countersunk opening downward to allow a good runoff. The total drainage area represents about 11 percent of the false bottom. Wort runoff should be crystal clear and grain-free, assuming the above parameters are met.

To achieve the mashing process described and attain total consistency and good extract is quite hard on a homebrew-sized, five-gallon scale. However, by using the best ingredients, taking care to match the water-to-grain ratio and minimizing the stirring of the mash you should be able to get good results. Homebrewers might consider rigging up a device so the grain will fall through a spray of water, possibly a grain hopper mounted above a spraying ring, both with flow controls, to attain a high-quality mash.

For successful infusion mashing and good extraction from the malt, the following are required:

(1) Use well-modified malt
(2) Store malt at room temperature (60 to 70 degrees F or 15.5 to 21 degrees C)
(3) Use accurate strike hot liquor temperature to achieve 146 to 152 degrees F (63.5 to 66.5 degrees C) mash bed temperature. Remember, lower temperatures result in more fermentable wort with lower final attenuations, and higher temperatures give less fermentable wort and higher final attenuations.
(4) Use a well-insulated mash tun
(5) Employ a consistent mash bed depth of two feet six inches, or six to eight inches for homebrew, in the mash tun
(6) Use an effective malt wetting system
(7) Do not stir up the mash
(8) Use a false bottom with an 11 percent drainage area
(9) "Work" the mash during runoff and sparging by dropping and raising the level.

Now that you have the procedure down, why not try infusion mashing with this simple pale ale recipe.

PALE ALE

Ingredients for 10 gallons

14	**pounds 10 ounces well-modifiied two-row pale ale malt**
12	**ounces 37 to 40 °Lovibond crystal malt**
2	**ounces chocolate malt**
2 3/4	**ounces Cascade hops, 5 percent alpha acid (boil)**
2	**ounces Tettnanger hops, 4.5 percent alpha acid (finish)**
	ale yeast

- **Original gravity: 1.045**

Great British Beer Festival

STEPHEN COX

Stephen Cox, a real-beer drinker since 1979, is the Campaign for Real Ale's campaign manager. This will be his fifth festival as a member of the press and publicity team.

The Great British Beer Festival is an extraordinary event. The 40,000 people who attend it see it as the mecca of cask-conditioned beer. They can choose from 300 different real ales, many of them from small breweries whose products aren't widely distributed. They can literally go on a pub crawl of the United Kingdom without moving more than a few yards.

The Great British Beer Festival is CAMRA's flagship event. It demonstrates the enormous choice and variety we have fought for, and the heritage of brewing we wish to maintain. It is a massive boost for interest in beer and for CAMRA's activities, and is one of our major ways to recruit members.

The Festival seeks to promote the good beer message, show that drinkers are sensible and responsible, promote the Campaign and carry forward any other campaigns of current interest. The focus in 1993 is on threats to the British pub.

Of course none of this serious stuff would work if we didn't know it was fun for the ordinary drinker. We offer not only this best choice of beers, but a range of different foods, a bar selling traditional ciders and perries plus a foreign beer bar. The foreign beer bar concentrates on selling a few of the more interesting European beers, rather than those already widely available in Britain.

There is music or some sort of live entertainment during every session. The Festival has a lively, friendly, relaxed atmosphere and all sorts of people attend. We try, as far as Britain's cranky laws on children allow, to welcome families. There is a room apart from the bar where kids can play, watched by their parents with glass in hand!

The Festival is entirely organized by 500 volunteers who give up holiday to come and work. Their enthusiasm drives the whole event.

The Festival only sells beer in half and full pints. This is partly because British Law requires beer be sold in pints, half pints or third pints — no smaller measures are legal — and partly because CAMRA believes that you have to drink a certain amount of beer to really get to know it. If you haven't felt a half pint warm your tonsils, I don't believe you have tasted the beer properly!

People go to drink, as they do to a pub, as well as to taste. They expect to have a few drinks and chat with friends — it is actually a festival as well as a tasting. It has been suggested that we offer small "tasters" in return for an entrance fee, but that would probably change the atmosphere of the event.

Drinking beer by the thimbleful is not what you expect or want in your local pub. If we only offered tasters I have no doubt that half our customers would stomp off to the nearest pub in disgust. We recommend that individuals who only want to sip get several like-minded friends, buy a half pint at a time and share it with several people.

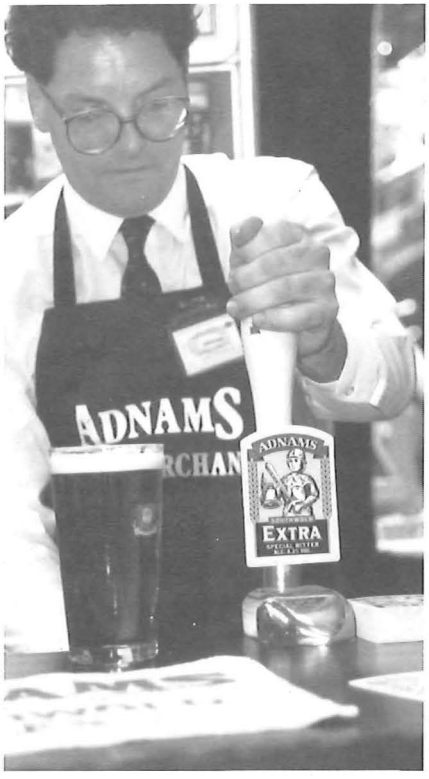
Why do we charge an entrance fee? Simple. When someone offers us 10 days accommodation for 500 staff free and a hall that takes 10,000 people free, we'll let people into the Festival free! In fact, we hold the Festival in August, which is the worst month of the year in terms of temperature, but the best month for finding inexpensive accommodations. Most of the beers are priced similarly to surrounding pubs, despite the fact that they have been shipped farther and in uneconomic quantities.

A massive investment in cooling equipment at the 1992 Festival cracked the quality control problems we had suffered. Of course, cask beer really needs to be stored and served at cellar temperature, 55 to 65 degrees F (13 to 18.5 degrees C). If the beer is too warm, it will be cloudy, out of condition or flat and will not taste right. A room full of 10,000 people in August cannot be kept at cellar temperature, hence the need for cask coolers — devices to keep the beer cool but not too cold.

We don't invite brewers to exhibit. We buy the beer and resell it with any nominal profits going to our national funds. Brewers help with publicity and technical matters,

1993 Great British Beer Festival

PHOTOS BY CHARLIE PAPAZIAN



Adnams' Extra Special Bitter was the grand champion at the 1993 Great British Beer Festival.

but it has to remain our Festival, not a trade-organized event.

We at CAMRA believe that if brewers ran the festival, CAMRA would cease to control the nature of the event, and consequently our campaigning activity might disappear. (Brewers dislike controversy.) The brewers, on balance, tend to believe that the event has more credibility because it is independent.

Then the final selection of beers is made by the volunteer Festival Committee. It can only be a selection of the beers available in the country. Quality control is why we can't stock every beer. Cask beer is sold wholesale in large containers and is perishable. Once a cask is broached, the beer must be sold then and there, or it has no resale value and the brewery can't take it back. If we stocked all 1,000 ales, most of the beer would be wasted, and we would have to at least double our prices. Furthermore, quality could not be guaranteed for many beers. Not every beer can be available at every session, for this reason.

Our guiding principles are positive discrimination in favor of smaller companies, and equally in favor of good tasty beers that national brewers do not promote. We cover the entire country geographically, trying to provide a variety of beer styles. We normally offer each long-established independent at least one beer slot, then try to fit in as many microbrewers as we can. If a brewer wants to launch a new cask-conditioned ale at the Festival, how can we refuse?

The 1993 had Festival more than 300 draft cask-conditioned beers. It also had about 50 bottled and draft foreign beers, with the main emphasis on dark beers and unusual styles in addition to a selection of about a dozen bottle-conditioned British ales. We also sold 50 different varieties of traditional hard ciders. What we say is that you don't get a bigger choice of draft beers in Europe, nor do you get a bigger choice of cask-conditioned ales anywhere.

Details of the 1994 Great British Beer Festival haven't been finalized. No advance tickets are needed, though the Festival sells out Friday night. For more information write CAMRA, 34 Alma Rd., St. Albans, Herts. AL1 3BW, United Kingdom. From the U.S. FAX: 011 44 727 867670; phone: 011 44 727 867201.

AMERICAN

TRADITIONAL BREWING METHODS

The Rise of Craft Brewing

JEFF MENDEL

The events leading up to the birth of the craft-brewing industry began prior to Prohibition. At that time the beer scene was thriving and local breweries served a wide variety of beer styles to loyal local customers. At the turn of the century, more than 1,700 breweries existed in the United States, producing beers of various types for regional consumption. Between 1919 and 1934 the United States government enforced Prohibition, making it illegal to manufacture or sell alcoholic beverages, a movement that forced many brewery closings. Some breweries survived by converting to ice, soft-drink or near-beer production—most simply closed their doors forever.

Following the repeal of Prohibition many breweries were unable to update their equipment and take advantage of the technological improvements in refrigeration, pasteurization and transportation. The newer, more expensive technologies caused many more breweries to close. As a result, an overall consolidation of the brewing industry occurred until fewer than 50 breweries were operating in the United States by the late 1970s.

Consolidation changed both beer marketing and product selection. Brewing was no longer a local business. Success in the U.S. brewing industry became much more dependent on marketing to reach potential customers outside the brewery's neighborhood and across the country. The largest brewers found themselves competing with each other in a greater number of markets. The number of small breweries decreased, because they could no longer compete, or they were purchased by larger companies. As a result, the variety of beers available to the consumer steadily decreased. The surviving breweries evolved into mass producers of a standardized product. Differentiation of product came in the form of different labels, as opposed to different beer styles.

It didn't take long for brewers, many of them homebrewers, with a love for the vast variety of beer styles to realize that a valuable part of the brewing market was being ignored. Hence the opportunity appeared for small, local breweries to rise up again and revive the beer styles that had been lost in consolidation and standardization. Once the large breweries had grown enough to serve a standard product to the national market, the consolidation period was over and a place in the market for

ILLUSTRATION BY MATT BROWNSON

microbreweries was reopened.

Initially labeled "microbreweries" because of the small volume of production (less than 15,000 barrels of beer annually compared to large breweries that produce in excess of 1 million barrels per year), this small sector of the brewing industry has evolved into what is called "craft brewing." While a number of these small breweries has grown beyond the 15,000 barrel mark, they continue to stay true to the styles and flavors that set them apart from the large breweries.

The craft-brewing industry has had a tremendous impact on the preferences of the North American beer consumer. Traced back to its beginnings in the late 1970s when the first microbreweries appeared on the scene, microbreweries and brewpubs have altered the way Americans think about beer.

Why are consumers opting for the craft-brewed beers? The increased preference for these beers is part of an overall consumer trend toward gourmet, handcrafted, locally produced items. In addition to beer, consumers are enjoying gourmet varieties of bread, coffee, ice cream and other goods. The "baby boom" generation, which is in its purchasing prime, is exercising choices different from those made by their parents. Their more affluent upbringing exposed them to finer goods, and the growth in craft-beer consumption is one result.

In the 15 years from the time the first microbrewery opened for business through the end of 1992, nearly 400 breweries opened in the United States with close to 80 percent of them achieving enough success to at least continue in business, if not be profitable. In Canada, more than 125 breweries opened during the same period with close to 60 percent of those operating as of the end of 1992.

From 1988 through 1992, the U.S. craft-brewing industry has maintained an extraordinary growth rate. The number of craft breweries increases by close to 40 percent from year to year. The industry has grown and evolved to the point where terminology has undergone some change.

The term "microbrewery" is still useful and applies to those breweries producing 15,000 barrels or less per year. Brewpubs are a subset of the microbrewery category. Specifically, brewpubs are breweries with on-premise restaurants that sell more than 50 percent of their house-brewed beers on the premises. Those brewery/restaurants that sell more than 50 percent of their beer off the premises to distributors or other retailers are considered a microbrewery. Contract brewing companies are those that own their own beer formulations and have them produced by existing breweries with excess capacity. The contract brewer assumes the role of master distributor, marketing and distributing the product often on a regional basis.

A new category of brewery that has been defined is the "regional specialty brewery." A regional specialty brewery is one that originated as a microbrewery both in terms of volume and product style and, while having grown to a volume threshold much greater than the 15,000 barrels that define a microbrewery, has stayed true to its initial product style. Examples of these breweries are Anchor Brewing Co., Sierra Nevada Brewing Co., Redhook Ale Brewery and Full Sail Brewing Co.

Boulder City Brewing Co. pre-Prohibition.

PHOTOS COURTESY OF THE BOULDER HISTORICAL SOCIETY, BOULDER, COLO.

In the United States, 1992 was a milestone year for the craft-brewing industry as craft breweries combined to produce and sell more than 1.2 million barrels of beer, according to the Institute for Brewing Studies Craft Brew Index. This total represents approximately 0.6 percent of the entire U.S. beer market. In Canada, craft brewers represent close to 1.5 percent of the Canadian beer market.

These statistics illustrate the fact that craft beers, representing a wide variety of styles, flavors and brewing traditions, are a hit with the consumer and are catching the attention of the regional and large breweries who are responding with new all-malt products of their own. In addition, craft brewers as a group are having a profound impact on the sales in the import category nationwide. The peak years in sales for the imports were 1987 and 1988, when sales of more than 9 million barrels were achieved. Since then, microbreweries have grown explosively and import sales have declined by about 11 percent to the current level of 8.3 million barrels of beer in 1992. Craft breweries are helping bring the customers' attention back to domestically produced beer.

Who are the consumers of craft-brewed beers? Certainly homebrewers are the most enthusiastic consumers of these products, often thrilling at the opportunity to taste a commercial version of a beer style they produced at home. Import consumers are also candidates for consuming craft brews. But it is difficult to pidgeonhole the craft-brew consumer other than to say that in general, this consumer is a beer lover. True beer lovers come from all backgrounds and walks of life. These consumers are not necessarily status conscious, and while they are not always brand loyal, they are generally loyal to the craft-brew category, and anxious to try almost any beer that is new and different.

Business was good for the Boulder City Brewery. In 1881 it produced 3,426 barrels of brew.

Extract Brewing: American Style

ROBIN GARR

Who's ashamed to brew from extracts?

There's a certain sense among serious homebrewers that extract brewing is something for beginners. Hang around your homebrew club or drop in on the computerized brewing forums — the Internet Homebrew Digest or the CompuServe Beer Forum — and you'll halfway get the idea that those who don't swear fealty to grain and mash are mere dabblers around the edges of the hobby ... casual plotzers who'll never make *real* beer.

'Tain't so!

Extract brewing earned a bad reputation from some poor-quality homebrew kits marketed a decade ago. A perception evolved that American malts were of higher quality than other available kits, evidenced by the disclosure of ingredients on the label. The "extract tang" was attributed to non-malt ingredients. The heavy use of cane or corn sugar recommended in the kits' instructions and generic ale yeasts often provided did little to elevate this reputation. The truth is that extract brewers today can make competition-quality beers from a dazzling array of quality products and procedures.

Is an extract brewer a real brewer? "You bet he [or she] is," says Roger Briess, fourth-generation proprietor of Wisconsin's Briess Malting Co.

"People say you're not a brewer if you don't go through the whole mash thing," Briess added. "But it's not the fault of the extract. As long as you use the right ingredients, good process control, good sanitation, good care and attention to what you're doing, you can't tell the difference between extract and all-grain."

As evidence of that assertion, a significant percentage of finalists in the American Homebrewers Association National Competitions are extract brewers, says James Spence, AHA administrator.

Of 2,185 entries in last year's competition, just over half (1,101, or 50.4 percent) were brewed from all grain. While there's no denying that all-grain brewers dominated the competition, taking 47 of 71 first, second or third-place awards, extract brewers captured 24 prizes, one-third of the total.

So how does extract brewing come by its bad reputation?

Part of it may simply be snobbery.

"The purist may look down upon those who use brewing processes that eliminate what is regarded as the most romantic aspect of making beer — the mashing and lautering processes of the brewhouse," says Briess.

But, he asks, who has the time?

"I don't consider myself less a brewer by making beer from extract," Briess said. "If I have to brew, I don't have the physical time to do the mashing. With Concentrated Brewer's Wort (Briess' trade name for the extract the company sells to distributors for repackaging), I crank it out in an hour and go on. The proof of the pudding is, how does it taste? Never mind how I arrived at it.

PHOTO BY SUSIE MARCUS

I don't put any garbage in there; I don't put any sugar in. The point is, I'm using pure ingredients."

Until relatively recently, however, it wasn't easy to get high-quality extract for brewing. Although Briess' great-grandfather, Ignatius Briess, was making malt extract at the family's plant in Czechoslovakia in 1910, his market was not the beer industry, but bakers and confectioners who used it in products ranging from pizza crusts and breakfast cereals to candy.

Homebrewers started using baker's extract to make beer only when circumstances forced them to it during the 1920s, the result of punitive taxation on the amber brew in England and Prohibition in the United States. The bathtub brew that our grandparents made got the job done, but it was hardly a quality product. Not designed specifically for brewing, it lacked the optimal sugar profile or enzymes, and offered no encouragement to grandpa to go beyond back-to-the-basics procedures involving bread yeast and cane sugar.

After the repeal of Prohibition in the United States in 1933, breweries reopened, Americans happily went back to commercial beers and homebrewing became a forgotten art. In Britain, the flame stayed alive, but the quality of extracts was little improved.

Even Briess' malthouse in Chilton, Wis., open since 1901 as a major source of barley malt to the commercial brewing industry, saw no reason to make or package an extract for its first 80 years of operation. It was only in the early 1980s that the company decided to set up a small malt-extract line — to serve the food industry, not brewers.

"People asked when we were going to serve homebrewers, but we really had no intention of doing that," Briess said. "We didn't have canning facilities, and we're manufacturers. We didn't want to go into the retail business."

Briess was persuaded to change his mind only after a couple of beer samples made with the company's extract syrup — made more for a lark than a serious business effort — mightily impressed regional brewmasters and participants in a technical conference of master brewers.

Now the company's tiny malthouse at Chilton turns out Concentrated Brewer's Wort in four varieties: golden, amber, dark and wheat. They're not available by retail but go into 50-pound drums to intermediary firms for repackaging.

Although Briess won't name his clients, citing contractual obligations, it is an open secret among homebrewers that the Northwestern Extract Co. line of extract syrups are made with Briess products. And it's no secret that they are fine quality extracts.

How can the homebrewer make competition-quality beer from extracts? It's simple! Here, from fundamental to advanced, are the basic tips I give brewers on the CompuServe Beer Forum:

• Start with quality ingredients.

• If you've purchased a self-contained homebrew kit, I suggest you not supplement the malt with the corn sugar called for in the recipe. Instead, go with *two* cans of extract, making an all-malt brew. You may also want to replace the generic yeast with a name-brand dry yeast .

Those are the fundamentals. Then, to make your beer even better, consider the following procedures and ingredients:

• To avoid scorching the extracts, stir in dry malt extract while the water is still cold. Stir in syrup at the boiling point, but take your brewpot off the heat while you do so. Once it's thoroughly dissolved, turn up the gas and bring your wort back to a boil.

• Avoid prehopped extracts. Making your own decisions about how much and which varieties of hops to use makes brewing more fun and keeps you in control of your beer.

• As you gain confidence in your brewing skills, start using specialty malts to boost the flavor and body of your extract beers. Use up to a pound of crystal malt or smaller amounts of darker grains such as chocolate or black patent, depending on your recipe. Crush them lightly. An easy method is to pour the grains into a gallon-size plastic bag, seal it and run a rolling pin over the bag a few times. [You can also ask your homebrew supplier to grind them.] Place them in a cheesecloth bag, drop the bag into cold water in your brewpot and let them steep as you bring up the heat. When the temperature reaches 170 degrees F (76.5 degrees C), take them out and throw them away. As simply as that you've added a good dose of non-fermentable sugars and color and flavor to your beer before you pour in the extract syrup.

• Experiment with liquid yeast. Although liquids require a bit more attention than dry yeasts (it's best to "feed" them a starter solution a day in advance of brewing), they reward the brewer with added control and a choice of dozens of specific "strains" that commercial brewers use to make the world's finest beers.

• Replace that old spaghetti pot with an eight-gallon model, and start boiling all five gallons of wort for one full hour. This will ensure the most efficient use of bittering hops, maximum sanitation and maximum "hot break," the coagulation of proteins that would otherwise cause haze in your homebrew.

• Buy or make an immersion wort chiller to cool down that five-gallon batch quickly, minimizing your exposure to infection before pitching and maximizing "cold break," further improving the clarity of your beer.

Follow all these suggestions, brew with care, and I'll guarantee your homebrews won't have to take second place to those your fellow brewers make from all grain.

Here are two recipes for good extract

PHOTO BY MICHAEL LICHTER

beers I've made, an extremely simple but tasty recipe that makes an excellent starter for a first-time brewer and a take-no-prisoners brown ale crafted last spring to see me through the last chilly days of a long winter.

TAKE IT EASY ALE

It doesn't get much simpler than this easy brew, fine for beginners or for longtime brewers who want to craft a quick and simple batch. Use your choice of Cascades, Hallertauer or Goldings hop pellets, depending on whether you want your beer to be West Coast (Sierra Nevada), East Coast (Samuel Adams) or British (Bass Ale) style. It won't be an exact imitation, of course, but the family resemblance might give you a better surprise than President Bill Clinton got when his unknown half brother turned up in the news.

Ingredients for 5 gallons

- **2 cans or boxes of high-quality amber extract syrup (7 to 8 pounds total)**
- **2 ounces hop pellets**
- **1 package quality ale yeast**
- **3/4 cup corn sugar for priming**

Boil extracts and half the hops for 60 minutes. Add the remaining hops at the end of the boil when you turn off the heat. Cool, pitch yeast and after fermentation is complete, prime and bottle. It should be ready to drink within seven days of bottling.

SPEEDY BROWN ALE

I call this a Mid-Atlantic brown ale because it speaks with both a British and an American accent. The general procedure and hop varieties approximate a British brown, but the use of aroma hopping is strictly American. It's a robust, flavorful beer that's not for the meek, and it continues to improve in quality after several months in the bottle.

Ingredients for 5 gallons

- **6 pounds Briess Sparkling Amber Concentrated Brewers' Wort or the equivalent in quality amber extract syrup and/or dry malt extract**
- **3/4 pound lightly crushed crystal malt**
- **1/2 pound lightly crushed chocolate malt**
- **1/4 pound lightly crushed black patent malt**
- **4 ounces dark unsulfured molasses**
- **1 cup dark brown sugar**
- **1 ounce Fuggles hop plugs, 4.2 percent alpha acid (60 minutes)**
- **1/3 ounce Eroica hop pellets, 10 percent alpha acid (60 minutes)**
- **1/4 ounce Goldings hop plugs (finish)**
- **1 packet Wyeast Irish Ale yeast (Strain No. 1084). Pitch 24 hours in advance in a cooled starter solution of 1/2 cup dry malt extract boiled in 2 cups water.**
- **3/4 cup corn sugar for priming**

Crush grains, place in grain bag and steep (as described above) until the wort temperature reaches about 170 degrees F (76.5 degrees C). Discard grain bag. Bring water to a boil, remove from heat and add extract syrup, molasses and brown sugar. Return to heat and add the Fuggles and Eroica hops. Boil for 60 minutes. Add Goldings hops at the end of the boil, cool and pitch liquid yeast starter. Prime and bottle when fermentation is complete.

The Lagering of Lagers

DAN GORDON

Lager is the German word for storage. Traditionally, lager beers were aged in a lager cellar to take advantage of the natural insulation qualities. Whether the beer is aged in wooden pitch-lined tanks in a traditional lager cellar or in modern stainless-steel tanks strung in a row suspended from a fourth-floor steel structure, the reasons for lagering are the same. Beers are lagered or aged to allow for important chemical processes that remove numerous off-flavors, saturation of carbon dioxide, refinement of the bitterness and clarification by yeast settling.

During primary fermentation yeast produces an abundance of secondary flavor compounds that are associated with off-flavors in lager beers. The quantity of these compounds can be limited by fermenting in cold temperatures at or less than 48 degrees F (9 degrees C). The secondary products produced during primary fermentation can be classified into two groups of chemicals: those that can be reduced during the lagering process and those that can't. The compounds most frequently associated with off-flavors in lager beers are higher alcohols, esters, aldehydes, acids and diketones.

HIGHER ALCOHOLS

The higher aliphatic alcohols are n-propanol, isobutanol, 2-methyl butanol and 3-methyl butanol. Although not necessarily noticed as flavor components, these undesired alcohols are famous for causing hangovers. High fermentation temperatures and nutrient imbalances caused by brewing with adjuncts rather than malted barley are the primary cause for increased concentrations of these alcohols. Once the higher aliphatic alcohols have been formed, lagering the beer for six months will not help in eliminating their presence. A correctly brewed Pilsener has a low subthreshold concentration of higher alcohols.

ESTERS

Like higher alcohols, esters are produced in undesirable quantities due to higher fermentation temperatures. Esters are the flavor components that are recognized as fruity or melonlike and are represented in beer as ethyl acetate, isoamyl acetate, isopentyl acetate, phenyl ethyl acetate and isobutyl acetate. Gas chromatographs are used in brewery labs to identify these chemicals, but a trained nose can work well too.

ALDEHYDES

Acetaldehyde is produced during primary fermentation up to a concentration of 26 milligrams per liter. During the lagering process the yeast ingests the acetaldehyde. Minimizing acetaldehyde in the final product can be achieved by a combination of cold fermentation with warm aging, choosing a yeast strain that produces less acetaldehyde, aging for longer periods of time, maximizing surface area contact of the beer with the yeast by using a shorter wider tank and avoiding agitation. [Acetaldehyde tends to be increased by aeration during fermentation.] Depending on the type of yeast, the acetaldehyde concentration in the final beer can range from 3 to 15 milligrams per liter with 7 milligrams per liter as an average value.

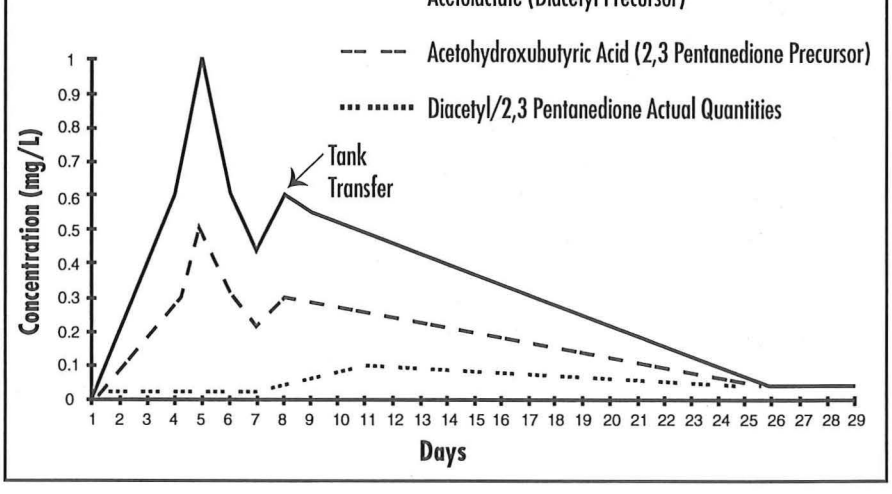
ACIDS

Acid production is an indicator of healthy yeast and good fermentation providing, of course, these are acids produced by yeast and not by bacteria. However, one acid, acetate, is reabsorbed by the yeast during the lagering process. It is generally reduced from the peak concentration of 200 milligrams per liter at the end of primary fermentation to 90 milligrams per liter at the end of lagering. The concentration of acetate is minimized by correctly aerating the wort during cooling, pitching the yeast at a quantity of 15 to 17 million cells per milliliter in conjunction with cold fermentation.

DIKETONES

The most noticeable off-flavor components reduced during lagering are diacetyl

DIAGRAM 1: DIACETYL AND PENTANEDIONE PRODUCTION



and pentanedione. These are flavor components that produce an unwelcome buttery flavor noticeable at concentrations as low as 0.1 milligrams per liter in the final beer. [Diacetyl has a buttery flavor, while pentanedione recalls honey.] It is the primary flavor used in differentiating aged beer from green beer. Pentanedione is not produced in as high a concentration as diacetyl, but has a higher noticeable concentration of 1 milligram per liter and therefore is not as great a concern. Diacetyl and pentanedione are indicated during the fermentation and aging process by their precursor chemicals and acetohydroxibutyric acid. These chemicals change to diacetyl and pentanedione but are reingested into the yeast cell on an ongoing basis. Only when the yeast is removed can one ascertain exactly how much of these components will be left in the final product. The goal is to have diacetyl and pentanedione concentrations lower than 0.05 milligrams per liter in the final product.

This is best achieved during the brewing process with healthy yeast, normal aeration of 8 milligrams per liter of oxygen saturated in the wort, cold fermentation-warm aging and a low yeast pitching quantity. [Avoid introducing air during fermentation and aging to keep diacetyl low.] Warm aging is a process where after primary fermentation the beer is chilled to 39 degrees F (4 degrees C), the yeast removed and the beer allowed to warm up to 48 degrees F (9 degrees C) for two days. The yeast assimilates the diacetyl along with acetaldehyde and acetate much quicker than a single-temperature long, cold lagering period (see Diagram 1).

MECHANICS OF LAGERING

The process of lagering begins with the transfer of beer from the fermentation tank to the lager tank. The reason for the transfer is to remove the fermented beer from the majority of the yeast that has settled at the end of the primary fermentation. After primary fermentation the green beer is chilled to 39 degrees F (4 degrees C) and held there for a couple of days to force the yeast to settle out. The green beer is then transferred to a tank containing unpressurized carbon dioxide. This is necessary to inhibit oxidation. The beer is removed so the yeast can be harvested, but also to prevent the dormant yeast cells from autolyzing and imparting an unwelcome yeasty flavor in the final product. The tank transfer is done either very gently or under a counterpressure of up to 0.5 bar to minimize foaming during the process. For a classical lagering, the beer is held in the lager tank at 39 degrees F (9 degrees C) for a week, then reduced one degree per day until it reaches freezing, then held at freezing for three to six weeks. Often the beer will be held at temperatures slightly below freezing, but only when the beer is lagered for more than four weeks. The longer the lager time and the colder the lagering temperature (but not lower than 27 degrees F or -3 degrees C) the better the head retention of the final product (see Diagram 2).

Cornelius keg counterpressure transfer.

When the brewer does not have the luxury of a long lagering period, an accelerated lagering with minimal compromise of the resulting quality can be achieved. The process involves a warming of the green beer to 48 degrees F (9 degrees C) following the tank transfer. The beer is held at this temperature for two days, reduced one degree per day until freezing is achieved then held at freezing for one week. This permits an accelerated elimination of diacetyl, pentanedione, acetate and acetaldehyde. The only side effect from this process is a head retention that is not as good as the beer produced using the classical lagering method.

The unitank process eliminates the need for separate fermentation and lager tanks. This configuration is based on a cylindroconical construction that permits yeast removal via the bottom cone. Once the yeast is removed, the beer lagers using either the conventional or accelerated lagering process. The two down sides to the unitank process is that a cylindroconical unitank is invariably more expensive than a conventional horizontal lager tank and the vertical construction of the tank leaves a smaller surface area of contact for the yeast and the green beer.

DIAGRAM 2: FERMENTATION AND LAGERING TEMPERATURES

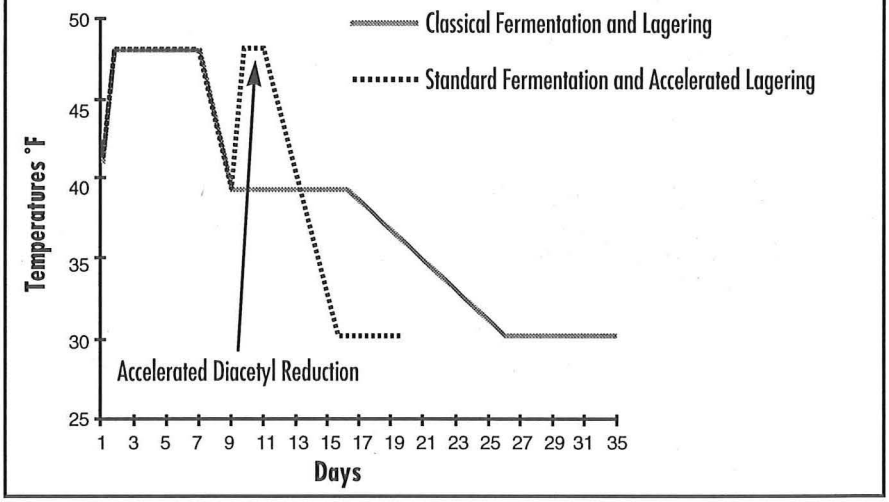


PHOTO BY DAN FINK

Maximum surface area contact of the yeast and the beer is the primary reason for the traditional construction of horizontal lager tanks. Lager tanks have a length generally twice as long as the diameter. The effectiveness of the secondary fermentation that occurs during lagering is largely dependent on the contact area of the yeast and beer. Anheuser-Busch feels so strongly about emphasizing greater surface area contact that they employ beechwood chips piled 2 1/2 feet high on the floor of their lager tanks to accentuate a larger contact area. The yeast settles on the baffled stacked wood chips and therefore has a contact area more than five times greater than the simple tank floor would allow. No other modern day brewery uses this technology.

CARBONATION

The German purity law permits beer to be carbonated using only the carbon dioxide produced during the fermentation and lagering process. The carbonation level of the final product is of key importance to the flavor. Beers lacking in carbonation typically lack in flavor and tend to amplify other flavor defects. Carbonation also prevents the growth of microorganisms and acts as a natural preservative in conjunction with the alpha acids from the hops and the alcohol. There are two ways this can occur. This first method is by transferring the green beer to a lagering vessel at the time when the green beer has reached a residual sugar concentration of about 80 percent of its final fermentation rate and allowing the pressure and carbonation to build up from the continued fermentation of the residual sugar. For example, if the original gravity is 1.048 (12 °P) and you expect the final gravity to be 1.010 (2.5 °P), the net change of the gravity of the beer is 1.038 (9.5 °P). Eighty percent of 1.038 (9.5 °P) is 1.030 (7.6 °P). Subtracting 1.030 (7.6 °P) from our original gravity gives a transferring gravity of 1.017 (4.4 °P). The beer will carbonate adequately in two weeks providing there is less than 10 percent head space in the tank. If there is more than 10 percent head space, you will need to pressurize the tank to around 0.5 bar (7.5 psi) to accommodate the excess CO_2 that will be consumed to pressurize the extra volume and that will not be bound with the beer. The carbonation level of the beer is proportionate to the volume of CO_2 produced during the secondary fermentation, the pressure of the tank and the temperature of the beer. German-style lagers have carbon dioxide levels of about 4.5 grams CO_2 per liter of carbon dioxide which is 2.27 or roughly 86 percent of the carbonation levels found in most American beers.

Kraeusening is another method of carbonation. It involves fermenting the beer out to its final fermentation rate. Then chill the beer to 49 degrees F (4.5 degrees C), remove the yeast and age the beer for a week or two. Add 15 percent of the total volume of beer to be carbonated of green beer at its "high kraeusen" state to the lager tank of fully fermented beer. Bung the tank off at 12 psi to retain the carbon dioxide. High kraeusen refers to green beer that has fermented approximately three days, has a yeast cell count of around 40 million cells per milliliter and a gravity of approximately 8 percent. This provides enough sustained carbon dioxide production to bring the aged product to end product carbon dioxide levels over a period of two to three weeks.

TABLE 1
Carbon Dioxide Levels in grams of CO_2 per kg of beer as a Function of Temperature and Pressure

Temperature	Pressure (Bar/PSI)						
	0.0/0.0	0.1/1.45	0.2/2.9	0.3/4.35	0.4/5.8	0.5/7.25	0.6/8.7
30°F/-1°C	3.2	3.6	3.9	4.2	4.55	4.9	5.2
34°F/1°C	2.95	3.2	3.5	3.8	4.1	4.4	4.7
37.5°F/3°C	2.8	2.95	3.2	3.45	3.7	4.0	4.25

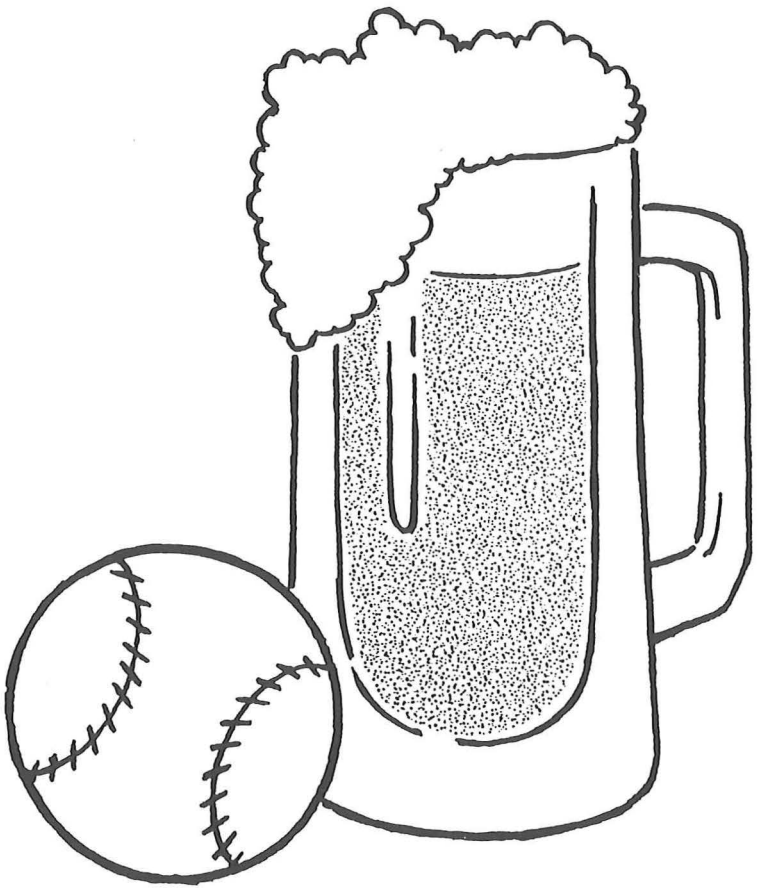
The corresponding pressure levels and temperatures indicate the resulting equilibrium level of carbon dioxide in grams of carbon dioxide per kilogram of beer.

HOMEBREWING APPLICATIONS

Lagering in a Cornelius canister in a refrigerator with a good thermostat permits the homebrewer to achieve lager beer quality equal to good German breweries. Pressure can be regulated easily with a regular CO_2 tank regulator or by using a pressure gauge and manually bleeding off through the pressure pin. To maximize contact area, the Cornelius canister should be stored on its side and then placed upright when reducing the built-up pressure. This should be done daily during the first week of lagering and weekly thereafter.

Step into the Light

ERIC WARNER



Defining the concept of light beer can be challenging. Does light mean pale color, low in calories, low in alcohol content, light flavor or some combination of these? For commercial brewers, the FDA defines a light beer as having 25 percent fewer calories. According to Tom Hill of the Bureau of Alcohol, Tobacco and Firearms, this FDA regulation applies to beers that contain less than 4 percent alcohol by volume. Beers stronger than this come under the domain of the BATF, which defines a light beer as one containing at least one calorie less than the regular beer. At any rate, both of these cases apply only when light is used in reference to calorie content. If the term light or "lite" does imply reduced calorie, then the average analysis data for that beer must be printed on one of the labels of commercially brewed beers.

When brewing a light beer, there are a few technological parameters that should be observed so the beer possesses the body, color, flavor and alcohol content desired.

If the beer is a true-to-form low-calorie, reduced-alcohol beer, then the body of the beer will have to be compromised. Unless alcohol is physically removed from the beer, a balance will have to be struck between reduced calories and reduced alcohol. Lower attenuated beers have less alcohol than highly attenuated beers, but the trade-off is more calories. In other words, if low calorie is to be emphasized, a wort should be brewed that has a high degree of attenuation. If the beer is to be low in alcohol, then a beer with a lower degree of final attenuation should be brewed.

To improve the body and the color of the beer, caramel, dextrin or amber malts can be used in the grist. Because the low starting gravity of light worts translates to low body and fullness in the finished beer, these grains can help to magnify the flavor of the beer. They can be used in varying combinations, but to avoid an obvious specialty-grain flavor, their cumulative total should not exceed 10 to 15 percent of the total grist. It is also recommended that the DMS-precursor content of pale malt being used not exceed 5,000 parts per billion, as a higher DMS-precursor concentration will lead to off-aromas more quickly in beers with a lower starting gravity.

The mash procedure employed plays one of the greatest roles in defining the character of any light beer. If the beer should have a lot of body and malt emphasis, then a wort must be brewed that has a high terminal gravity. Minimizing rests at which beta amylase activity is at a peak will help here, but the saccharification of the mash should be long enough to break down dextrins to the point where a negative iodine reaction is present. If this is not done, the beer will be plagued by starch haze and off-flavors. On the other hand, if a more highly attenuated beer is desired, maltose rests should be lengthy. Although beer with a lower terminal gravity will have a lower dextrin content than beer with the same initial gravity and a higher terminal gravity, the increased amount of ethanol will contribute to the palate fullness of the beer.

A balanced protein breakdown during the mash is also crucial in producing a well-balanced light beer. An extensive protein breakdown may increase the level of amino acids in the wort, but this will be to the detriment of the foam and the ability of the beer to retain it. On the other hand, if the protein breakdown is insufficient, the resulting amino

ILLUSTRATION BY JOHN MARTIN

acid deficit may adversely affect yeast reproduction, fermentation speed and ultimately the flavor of the finished beer.

There are varying schools of thought regarding hop rates for light beers, but rates that yield a bitterness of 15 to 25 Bittering Units in the beer seem to work well. If this rate is exceeded, the beer will begin to taste like hopped water instead of beer. This will be particularly oppressive if bittering hops are used. If less than 15 BUs are present in the beer, the beer will run the risk of tasting too bland. At any rate, only the finest aroma hops should be used because the malty characteristics of a stronger beer won't be there to mask the unpleasant flavor and aroma notes of a higher alpha acid variety.

To compensate for the reduced amino acid concentration in the cooled wort, it's wise to increase yeast pitching rates and decrease the fermentation temperature if a low-gravity wort is being fermented. It is generally recommended that pitching rates be increased by 50 to 100 percent. If this is not done, the concentration of fusel alcohols and diacetyl may be perilously high in the finished beer. Some believe, however, that to compensate for the lack of body in a light beer it is wise to ferment a light lager at 54 to 58 degrees F (12 to 14 degrees C), thus increasing the content of fermentation byproducts that will benefit the body and flavor of the finished beer. To combat the problems of increased acetolactate and diacetyl, kraeusening or employing a diacetyl rest at the end of the fermentation may be helpful. Because the yeast is burdened with a reduced level of free amino nitrogen and zinc, yeasts used for light beers should not be harvested and repitched.

When packaging light beers extreme care must be taken to avoid oxygen uptake. Again, light beers are unable to mask unwanted oxidation byproducts as well as higher gravity beers. A keen nose will be able to recognize an oxidized light beer more easily than an oxidized stout.

H BEER

Recipe by Heidi B. Hammel and Timothy J. Dalton.

Ingredients for 6.2 gallons

8 pounds Briess two-row pale malt
1 ounce American Hallertauer, 3.8 percent alpha acid (60 minutes)
1 ounce German Hallertauer Hersbrucker, 2.9 percent alpha acid (10 minutes)
1/2 ounce German Hallertauer Hersbrucker, 2.9 percent alpha acid (finish)
Wyeast No. 1028 yeast starter
3/4 cup corn sugar for priming

- **Original gravity: 1.040**
- **Final gravity: 1.004**

Mash-in at 129 degrees F (54 degrees C), raise temperature to 160 degrees F (71 degrees C) and mash for one hour. Mash-out at 169 degrees F (76 degrees C) then sparge to collect 7 1/2 gallons. Boil and reduce to 6.2 gallons, force cool and pitch yeast. Ferment 10 days in glass at 68 degrees F (20 degrees C).

This is a dry, crisp refreshing summer beer with wonderful hop aroma. Hop heads should consider dry hopping with additional German Hallertauer hops.

Brewing with Adjuncts

TOBIN L. EPPARD

The use of materials other than traditional brewing ingredients has evolved as a central process for brewing American-style lager beer. Non-malt carbohydrate material, when used in conjunction with malted barley, is a distinctive feature of this delicate style. Development of this practice is a result of economics and product formulation that targets the consumption preferences of the majority of the American public.

Historically, American lager beer is a modified approach to German-style lager beers. American lager beer was born from a traditional German process and reflects the evolution of modern taste preferences for fully mature, clean-tasting beers. The first lager beers were produced in America sometime during the 1840s. At this time various ales, porters and stouts were being mass-produced and lager beer production was somewhat suppressed by the traditional top-fermenting styles. The steady growth of a clean, drinkable and refreshing style has developed as the product of choice for a large part of the American public. The use of cereal adjuncts is an integral part of producing this unique style. The use of adjuncts is not an American invention and is certainly not unfamiliar to the global brewing community. The ancient Egyptians used a small red pea called "dholl" in very small amounts to produce the beer called "hek." Prior to 1880, the Celtic culture used honey and in Ireland parsnips and potatoes were used.

The use of adjuncts typically defines the availability and cost effectiveness of the production of an all-malt beer. As the result of various tax levies, supply shortages (especially in times of global conflict and war) forced brewers to explore and use different sources of carbohydrates to produce their product. Most of these practices, although impractical, have been continued. These styles have become mainstay and, if modified, may be perceived as less desirable by their target consumers. Certain adjuncts create unique flavor characteristics. Wheat beer, oatmeal stout and American lager beer are all examples of the positive flavor notes that can be obtained by the strategic use of adjuncts.

Brewing adjuncts are divided into two general categories. The two types are differentiated by the time at which they are added to the brewing process. Adjuncts can be added either before or during the mashing process (depending on the degree or ease of use at this point) or just before or during the brew kettle boil.

The first category of adjuncts used are added to the brewing process before the brew kettle. These include maize grits, flaked maize, refined starch from maize, rice grits and flaked rice. And to a lesser extent, barley grits, flaked barley, wheat grits and wheat flour. There are other sources of starch/carbohydrate but they are practically never used in the large-scale production facilities. These sources are generally the root starches from potatoes and other tubers.

The second category of adjunct materials are the wort expanders. These adjuncts are syrups or other carbohydrates that have been modified to mimic the carbohydrate profile of the malt wort. These generally are added to the brew kettle and include low, standard and highly fermentable corn syrups, crystalline dextrose, cane and beet sugar and invert-sugar syrups.

Adjuncts added to the brewing process before the copper are primarily used to enhance the carbohydrate profile of the extract and to dilute the nitrogen content of the finished wort. These starch adjuncts can be supplied in three ways: grits, flaked or refined. Grits are the intact endosperm of the kernel without any of the husk or embryonic components. Flaking is accomplished by passing the grits through steam or a microwave heating system, pressing the heated grain through flaking rolls and then cooling. Gelatinization is achieved through the heating process so no boiling is required for brewing use.

Following are the common types of cereal adjuncts used by the major American brewers.

Maize. Yellow maize, supplied as grits, flakes or refined starch, is used widely in the brewing process. The use of grits requires a high-temperature gelatinization process sometimes called cereal mashing, which involves the prolonged heating and boiling of the material to accommodate gelatinization. This process modifies the starch granule, allowing the entire starch content of the adjunct material for glycosidic breakdown by malt enzymes to be used. Flakes can be used directly in the mashing process because they already are gelatinized as previously described. Refined starch is produced from the finest component of the milling process. The substrate is treated to remove all vegetal traces, resulting in a pure starch. This material must go through a cooking/cereal mash process also. Flakes must be treated exactly like grits to fully utilize carbohydrate potential.

Rice. Brewers rice is a recovered component of the rice milling process. About 30 percent of all milled rice designated for table use does not survive the process as a whole kernel. The broken pieces are collected, cleaned and sold to brewers. This fraction is composed of endosperm only. Rice also can be supplied as flakes, which involves a similar process as described earlier.

Several other types of adjuncts are used globally and infrequently in American-style lager brewing, including:

Wheat. Supplied as grits, flour or flakes. Wheat adjunct enhances head retention because of the increased glycoprotein levels.

Oats. Supplied as malted oats or flakes. Oats are not used in American-style lager beer

because they yield poor extract, high wort viscosity and poor carbohydrate profile.

Sorghum. Not typically used because it imparts an unacceptable bitterness to American-style lager beer. This type of adjunct is used in native African beers.

Rye. Not typically used because the extract is poorly fermented and wort viscosity is elevated.

Triticale. Cross between rye and wheat. Not typically used because it produces an extract with extremely high nitrogen content.

Root starches. Not typically used because the public views the use of root starches such as farina (potato starch) as untraditional and unacceptable for the brewing industry.

The other types of adjunct material are those that are added to the brew kettle. Such adjuncts generally are liquid in form and are referred to as wort expanders. A major advantage to using these types of materials is that they are easily handled in bulk form. Adjunct grain materials need handling systems such as conveyors, dust collectors and milling operations. Another advantage is that the carbohydrate component can be controlled and custom manufactured to meet the needs of the individual brewer. Shorter boiling times can be used because of lowered nitrogen content. High-gravity brewing can be achieved when using a small-scale mashing operation. The one disadvantage of liquid adjuncts such as syrups is that they must be stored at about 122 degrees F (50 degrees C). At this temperature the viscosity of the syrup is reduced to facilitate transfer by pumping to the point of utilization.

American-style lager beer is typified by a smooth, drinkable, refreshing product. The production of this style using traditional mashing systems is achieved with high levels of adjunct material. As much as 40 percent of the total dry weight of all ingredients will be some type of adjunct. This brewing process produces a highly stable product that is physically appealing to the consumer.

The goal of the major brewer is to fulfill the needs of the consumer. The production of a lighter lager beer with lower bitterness and moderate malt sweetness of the highest quality requires the use of carbohydrate sources other than malt. Adjunct use fulfills all of these needs and creates a perfect balance between production capabilities and consumer need.

LAWN MOWER LAGER

Recipe by Dave Coy.

Corn and rice are useful in providing fermentables to your wort without adding palate fullness or maltiness. If you are aiming to brew a very pale beer but still want to have a respectable (homebrewer's) starting gravity, I suggest you add up to 20 percent adjunct to your mash, and make sure your base grain is jumping with enzymes (American two-row is fine, but if you're nervous, add some six-row).

Ingredients for 5 gallons of final product (5 1/2 gallons unfermented wort)

6	**pounds American two-row malt**
1 1/2	**pounds short grain white rice or 1 pound brewers corn flakes**
1 1/2 to 2	**ounces Hallertauer, Tettnanger or Saaz hops for bittering (60 minutes)**
1/2	**ounce Hallertauer, Tettnanger or Saaz hops for flavoring (40 minutes)**
1/2	**ounce Hallertauer, Tettnanger or Saaz hops for finish (10 minutes)**
1	**teaspoon Irish moss (15 minutes)**

- **Original gravity: 1.041**
- **Final gravity: 1.004**

Use a step mash. Boil rice or brewers corn flakes in one gallon water for at least 30 minutes. (It will get pretty gummy, but that is what you want — this is called gelatinization.) Add 2 1/2 gallons 140- to 145-degree-F (60- to 63- degree-C) water to the malt, stabilize at 120 to 125 degrees F (49 to 52 degrees C) for a 30-minute protein rest. Slowly stir the rice or brewers corn flakes into the mash to bring to saccharification temperature (148 to 154 degrees F or 64 to 68 degrees C). Hold until starch conversion (30 to 60 minutes). Sparge with 165-degree-F (74-degree-C) water. Ferment at 38 to 42 degrees F (3 to 6 degrees C) with your best lager yeast.

ILLUSTRATION BY STEVE LAWING

Cereal Mashing

TOBIN L. EPPARD

American brewers typically use well-modified malt that has high diastatic power and high nitrogen levels. Adjuncts are used to take advantage of this increased enzymatic power (an excess of enzymes are present to convert additional starches from sources other than malt) and to dilute the adverse effects of high nitrogen levels.

The cereal adjuncts used by the major American brewers are for the most part maize grits, flaked maize, refined maize starch, rice grits and flaked rice. One or a combination of these materials will make up the entire adjunct composition of the mash. If the starch source has been gelatinized previously by the flaking process, then the cereal cooking process is unnecessary. If grits or refined starch are used, an additional process for high-temperature adjunct processing must be supplied.

High-temperature cereal mash cooking is accomplished in a cereal cooker or a cooker mash vessel. This type of vessel is very much like a standard mash tun except it can be sealed for pressure cooking and is typically steam jacketed. About 10 percent of the dry weight of the cereal mash is malt. The cereal grits/refined starch or a combination are mixed with malt. After cereal mash-in, the temperature in the cereal cooker is raised to about 149 degrees F (65 degrees C). The enzymes supplied by the malt component of the cereal mash enhance the liquefaction process by enabling water to penetrate the starch granules provided by the adjunct substrate. The malt enzymes also reduce the viscosity of the cereal mash before boiling. As the temperature is raised by steps to atmospheric boil and then to a pressurized boil, the water-saturated starch granules swell and burst. Therefore the starch granules supply liquefied starch for enzymatic degradation further along in the combined mash process.

During the cereal cooking time, the main mash (100 percent malt) is mashed in and held in the mash tun at about 113 degrees F (45 degrees C). At this temperature proteolysis occurs. The malt mash and cereal mash are timed to complete their cooking and holding processes simultaneously. The two divided components are then combined in the mash tun. The combined temperatures of these two fractions should be about 144 to 153 degrees F (62 to 67 degrees C). At this temperature, the enzymes supplied by the main mash rapidly break down the starch component of the combined mash. When conversion is complete, the combined mash is heated to about 162 degrees F (72 degrees C) for additional conversion and mash-off. The combined mash is then checked for starch conversion and transferred to a lauter tub or mash filter press for extract separation and sparging.

The process of cooking cereal adjuncts makes the entire starch fraction of the adjunct material available for enzymatic degradation in the combined mash. This system takes advantage of the high or excess diastatic power of American malted barley varieties, provides a more economic product by using adjuncts as a source of fermentable sugars and produces a lighter-bodied, clean-tasting, more refreshing style of beer.

TWIST AND SHOUT OATMEAL STOUT

Recipe by Dave Coy.

This Oatmeal Stout is a pretty malty beer, and I have not found it necessary to separate the cereal grains.

Ingredients for 5 gallons of final product (5 1/2 gallons unfermented wort)

- **10 1/2 pounds two-row English malt (I use Hugh Bairds)**
- **1 pound Munich malt**
- **1 pound chocolate malt**
- **1/2 pound roasted barley**
- **1 pound 80 °Lovibond crystal malt**
- **1/2 pound rolled barley**
- **1 pound instant oats**
- **1 ounce Centennial hops for bittering (60 minutes)**
- **1 1/2 ounces Northern Brewer hops for flavor (30 minutes)**
- **1/2 ounce Kent Goldings hops for aroma (10 minutes)**
- **ale yeast**

- **Original gravity: 1.070**
- **Final gravity: 1.011 to 1.020**

Use a single-step infusion. Add four gallons of 180-degree-F (82-degree-C) water to the grains, stabilize at 154 to 158 degrees F (68 to 70 degrees C). Hold until conversion. Ferment with your favorite ale yeast; I like Wyeast No. 1056.

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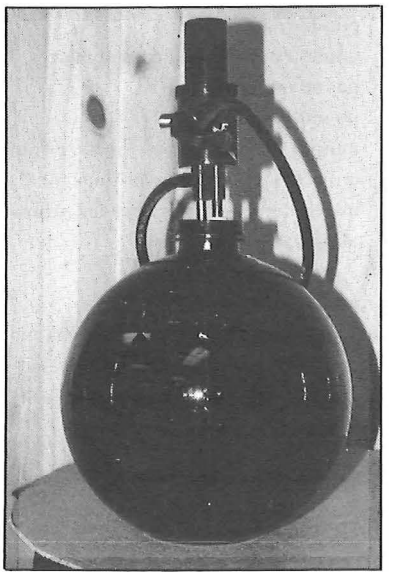

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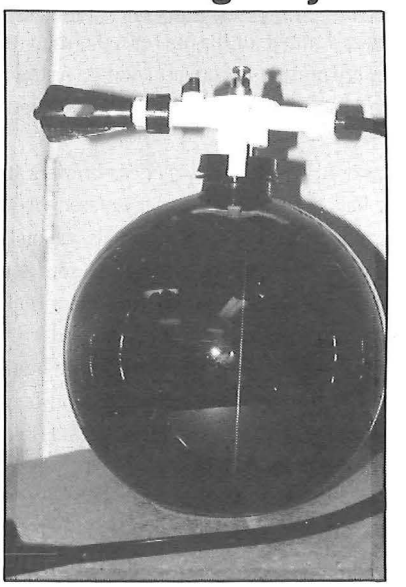

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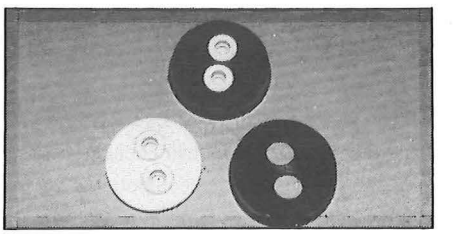

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Malting Science

KEITH GRETENHART

Maltsters have probably been around as long as brewers even though ancient documents refer to brewing, but not to malting. The reason for this is probably that brewing the end product is more glamorous.

There is a wealth of information available to homebrewers regarding styles of malt and the styles of beer that require them. In this article I hope to point out some of the factors involved in the development of the malting industry in the United States — how the direction of the brewing industry has dictated the direction of the malting industry.

Wheat is used in addition to barley malt in some beers, but the use of barley malt is a significant portion of what defines beer. Barley is used in brewing because it provides enough enzymes on its own to break down the starches in mashing, but more importantly, it provides part of the flavor that makes a beer a beer. It is what we have come to expect of beer, just as we expect bitterness from hops.

Any discussion of malt should therefore start with a few words about barley. The quality of the barley is very important to the quality of the malt, and eventually the beer.

Barley is divided into two types, two-row and six-row. These terms refer to the morphology of the head of grain as it grows in the field. Two-row barley has two rows of kernels that develop along either side of the spikelet of grain. Six-row, not surprisingly, has six rows of grain along the spikelet. (Breeding two-row and six-row barley will not give you either four-row or twelve-row barley.) Two-row is grown in the western states. Six-row is grown, for the most part, in the upper Midwest, with some six-row contracted in the West.

There are several quality parameters that are different between two-row and six-row malts. Two-row barley, on average, has lower protein content than six-row. Two-row also has plumper kernels than six-row, and has a higher extract when malted. These three attributes are, in fact, related to one another, but this topic is better left for another article.

Six-row is the predominant barley in brewing for most of the major brewers in the United States. Most is grown in North Dakota, Minnesota and South Dakota. Besides being categorized into two-row and six-row, barley is also divided into feed and malting varieties. Robust is the name of the main six-row variety grown for malt-

TABLE 1

	Total Capacity (metric tonnes)	Total Capacity (U.S. Tons)	Locations
Ladish	550,000	606,270	Jefferson Junction, Wis.; Spirtwood, N.D.
Fleischman-Kurth	350,000	385,808	Chicago, Ill.; Milwaukee, Wis.; Manitowoc, Wis.; Red Wing, Minn.
Froedtert	345,000	80,297	Milwaukee, Wis.; Winona, Minn.
Great Western	340,000	374,785	Vancouver, Wash.; Pocatello, Idaho; Los Angeles, Calif.
Rahr	230,000	253,531	Shakopee, Minn.
Schreier	123,000	141,096	Sheboygan, Wis.
Minnisota	77,000	84,878	Cannon Falls, Minn.
Briess	15,000	16,535	Chilton, Wis.
Anheuser Busch	400,000	440,924	Manitowoc, Wis.; Moorhead, Minn.; Idaho Falls, Idaho
Coors	230,000	253,531	Golden, Colo.
Miller	32,000	35,274	Waterloo, Wis.
Stroh	20,000	22,046	St. Paul, Minn.

ing. Morex and Excel are two other common six-row varieties AB-2601 is a six-row variety used exclusively by Anheuser-Busch. AB-2601 and Morex are frequently the six-row varieties contracted in the western states.

Two-row barley is grown mostly in Montana, Idaho, Washington, Oregon, California, Colorado and Wyoming. Much of this barley used for malting is grown under a contract with the farmer. Coors Brewing Co., for example, contracts with farmers to produce their preferred variety, Moravian III. Anheuser-Busch contracts with growers for AB-1202, a two-rowed variety they use. The most common malting variety grown outside of contracts in these states has been Harrington.

The malting industry in the United States has developed parallel to the brewing industry. Malting has gone through the same changes brewing has since Prohibition. Many of the smaller maltsters went out of business, while many others were bought by competitors. A document dated June 1, 1917, from an organization called the Maltsters Bureau of Statistics indicates that the 33 members of this group accounted for 79 percent of the malt produced in the United States. Today there are only eight commercial malting companies in the United States, and four brewers operate malting facilities in addition (Table I).

The location of the barley production areas outlined above has had some impact on the malting industry. A look at the locations in Table 1 show that many of the malthouses are located in either the Milwaukee and Minneapolis areas, or in Idaho. The reason for this is based on where barley was, and is, grown. Most of the malthouses in Wisconsin were started when it was the center of both barley production and brewing. The Idaho malthouses that have been built more recently — notably in Spiritwood, Pocatello, Moorhead and Idaho Falls — are all in the areas where barley production is currently concentrated. Spiritwood and Moorhead are in the six-row barley area. Pocatello and Idaho Falls are in the predominantly two-row area.

Aside from the decreased number of malting companies in the United States, there also has been a trend toward American maltsters being owned by either larger companies or foreign malting companies. This also parallels what has been happening in the brewing industry.

The major North American breweries sell a relatively narrow range of beer types, and the maltsters parallel this as well. Maltsters in the United States sell mainly what is referred to as brewers malt. This type of malt has a pale color (1.5 to 2.0 °Lovibond), good enzyme level and a sweet, malty taste. All other types are broadly categorized by domestic maltsters as specialty malts.

Dealing in specialty malts is a fairly rare thing for maltsters in the United States, because specialty beers are a fairly small part of the beer market. Briess is the smallest domestic maltster, and they have focused much of their business on producing a variety of specialty malts. Froedtert and Schreier produce a "hi-dried" malt, which has a color in the range of a darker Munich-type, around 15 °Lovibond.

Two maltsters are importing specialty malts from Europe. Great Western imports from Britain where these malts are used for the ales and dark beers found there. Schreier imports specialty malts from Belgium, where they are used for the amazing variety of beers brewed in that country. These malts are generally available to homebrewers through homebrew supply stores. Check with your favorite store for availability, as the malting companies generally do not sell direct to homebrewers.

All these factors, from barley varieties to industry consolidation to mass marketing of beer, have all affected the malting industry. The United States brewing industry has developed into an industry with relatively few players controlling most of the market. Malting companies have developed along these parallel lines because that is where the market is. As the brewing industry continues to evolve, maltsters will continue to evolve with it.

In the last few years, microbrewers and homebrewers have shown an explosive growth. This segment of the market is demanding a wider variety of malts to produce a wider variety of beers. The malting companies have responded to that demand, and all beer drinkers are benefiting from the wider choices now available.

Great American Beer Festival℠

PHILIP W. FLEMING

and Association of Brewers Staff

The biggest beer-tasting event in North America pours into Denver every October and this year was no exception. The 1993 Great American Beer Festival℠ served some 19,000 beer enthusiasts in the 100,000-square-foot Currigan Exhibition Hall. Two hundred breweries from across America supplied 800 different beers from no-alcohol brews and craft-brewed cream sodas to fruit beers, wheat beers, bocks and barley wines. Each Festival goer received a program describing the breweries and the beers offered plus a glass for tasting as many one-ounce samples as they cared to try responsibly.

"The Festival offers the general public the opportunity to truly broaden their beer horizons," says GABF℠ Director Marcia Schirmer. "It is a blend of adventure, diversity and education — a chance to learn more about the breweries that brew these truly fantastic beers. Our goal is to educate the Festival goer about the vast spectrum of beer currently being produced in the United States." The Festival features exhibits that provide information about the responsible consumption of beer as an alcohol-containing beverage as well as information about beer and brewing around the world.

Eleven years ago the Festival was born

PHOTO BY DAVID BJORKMAN

after Association of Brewers President Charlie Papazian returned from judging the Great British Beer Festival. Papazian and several friends gathered to enjoy some of the craft brews that had recently emerged in the United States. The new craft-brewed beers were as good as the "real ale" Papazian had judged in England — and sparked an idea that has showcased American beers since 1982.

The Festival has come a long way since then, when about 200 people tasted 30 or so beers on a hot summer day in the Boulder, Colo., Hilton Harvest House ballroom. Sierra Nevada was there and so was Boulder Beer. It was over in a flash and I was left holding a sticky mug and a tattered program. The next year was outside under a tent at the Harvest House and featured a symphony orchestra and a thunderstorm. The Festival now occupies an exhibition hall and beer connoisseurs from around the country peruse trade-show and merchandise booths as they taste their way through beer heaven.

The Great American Beer Festival℠ also has a Professional Panel Blind Tasting to recognize excellence in brewing by awarding gold, silver and bronze medals to the beers judged as superior representatives of a particular beer style. A panel of 33 professional brewers and qualified judges assesses each beer and selects the best in 32 style categories in a blind tasting. The two-day Professional Panel Blind Tasting evaluates beers on the basis of technical quality and stylistic accuracy. Now in its fifth year, the Professional Panel Blind Tasting is recognized as the American brewing industry's most prestigious tasting.

For those who have never been to a Great American Beer Festival℠, you'll have to find a way to get to the beer-drinkers' heaven on Earth. Only once a year do you have a chance to sample your choice of hundreds of beers that typically aren't available out of their local distribution area — all in one location. With the steady growth of the craft-brew industry, a unique supply of new brews yet to cross your lips are yours to sample for only two days a year. The Festival has become the mecca of beer, and I thank the dedicated brewers who make these beers and the Great American Beer Festival℠ staff for making it possible for me to be still crazy after all these beers.

Mashing Methods and Malt Compared

ASHTON LEWIS

Beer is produced by one of the world's most biologically intricate food processes. Its production depends on the germination of the barley kernel, enzymatic and non-enzymatic chemical changes to brewhouse ingredients during mashing and boiling and finally the myriad transformations that occur during fermentation. It is, however, the transformations that occur in the brewhouse that brewers have the most direct control over. Therefore the three primary mashing styles will be discussed with relation to how these processes can be used to control the changes that occur during mashing. Some of the consequences these mashing regimes have on flavor will be highlighted. To fully appreciate the subject, it is best to begin with a discussion of the nature of a major ingredient of beer, barley malt.

MALT MODIFICATION: WHAT IS IT?

The term modification is used by brewers and maltsters to describe the changes that take place inside the barley kernel during malting. Included in these changes are the formation of alpha amylase, proteases and glucanases, the activation of beta amylase and the breakdown of starch, proteins and cell wall constituents. Depending on the degree to which these changes occur, malts can be termed undermodified or overmodified and may be well- or ill-suited for single-temperature mashes.

If the only issue were ease of wort production, most brewers would prefer malts that could be used efficiently in an infusion mash. Because this is not the only issue, let us consider the complexity of malting. In order to produce a malt that can be used efficiently in either an infusion or decoction system, the malt must be well-modified; that is, as close to being dry wort-in-a-husk as the maltster can achieve. To provide this product to the brewer, the maltster must be willing to increase the processing time and to incur a higher malting loss. This effort, of course, is not free and the brewer is charged the extra costs. Malting loss is caused in part by the germinating grain burning its starch reserves to produce carbon dioxide and energy. Carbon dioxide is waste because it is mass that passes into the atmosphere at the market price of brewer's malt. Malting loss is not insignificant in answering the question of why continental brewers traditionally used decoction mashes and why British brewers traditionally used infusion mashes. Some of the more logical answers to these questions are based on where malting and brewing taxes were levied. Depending on which stage of the malting or brewing enterprise was used in tax determination, the production of either undermodified or overmodified malt would have made the most economic sense. This discussion is not within the scope of this article, but the subject is an interesting one in which to delve further.

A second issue at hand is the effect of malt modification on beer quality. As previously mentioned, proteolysis and amylolysis occur during malting. Well-modified malts have more small protein and starch fragments than do undermodified malts because of the extent of enzyme action that is allowed to occur during malting. The coexistence of protein and starch fragments in malt leads to the formation of colored and toasty-flavored compounds during malt kilning and wort boiling. This reaction is known as "Maillard browning," after the French scientist. Therefore, a well-modified malt will produce a beer with more color and toasted flavors than an undermodified malt, assuming all other conditions are constant.

Now that we know a little about modification, how can an undermodified malt be differentiated from a well-modified malt? The simplest and most basic test is to bite into several malt kernels of a single lot and visually inspect their interiors. If the malt endosperm is easy to crush and has a milky white appearance, you have a well-modified malt. On the other hand, if the endosperm is very hard or has "steely" ends and a granitelike appearance, the malt is undermodified. One easy way to teach yourself how to make this judgment is to compare the endosperm appearances of raw barley and malted barley. Raw barley is the worst-case scenario of undermodification. There are more objective methods used to describe the quality of barley malt, i.e., malt specifications, but visual analysis is sufficient for crude judgments regarding modification.

Hopefully, this brief discussion of malt modification has made it clear that the ease of extract recovery has not been the only concern to maltsters and brewers in deciding which malting and mashing system to use in malt and wort production. Let us now consider how raw ingredient selection influences the brewer's choice of mashing system and how this combination of ingredient and system selection affects beer quality.

CHOOSING INGREDIENTS AND MASHING METHODS

Infusion mashing is the simplest of all mashing methods and is the recommended method for wort production at home, provided a supply of well-modified malt is available. The primary goal of infusion mashing is to convert the starchy endosperm into smaller dextrins and fermentable carbohydrates (glucose, maltose and maltotriose). There is no need for a protein rest at 120 to 122 degrees F (49 to 50 degrees C) because these enzymatic reactions have already occurred during malting. In fact, if brewers desire a greater reduction in protein size, they are more likely to talk to their malt supplier than to include a protein rest during mashing because proteolysis is best achieved on the malting floor.

Starch conversion requires the activity of both alpha and beta amylase. The optimum temperature of activity for beta amylase is between 130 and 140 degrees F (54.5 and 60 degrees C) and that of alpha is between 150 and 158 degrees F (65.5 and 70 degrees C). In traditional infusion mashes, typical temperatures ranged from 140 to 145 degrees F (60 to 63 degrees C). These low temperatures favored the action of beta amylase and allowed for the production of highly fermentable worts. Alpha amylase activity, however, was low at these temperatures. So how did British brewers produce high-quality worts with limited help from alpha amylase? Well, the maltsters inadvertently allowed alpha amylase to reduce starch size during malting so the brewers could save time. Actually, British maltsters were unaware of malting and mashing biochemistry 200 years ago, but the ability to produce wort at 140 degrees F (60 degrees C) was one consequence of the production of well-modified to overmodified malt.

Today breweries that use infusion mashing generally use temperatures ranging from 150 to 155 degrees F (65.5 to 68.5 degrees C). These higher temperatures are required to allow alpha amylase action because today's maltsters are not in the business of throwing away profits by overmodification and, hence, malting loss. Beta amylase action can still occur at these high temperatures provided there are sufficient enzymes present in the malt and the mash is fairly thick (two to three liters or one-half to three-quarters of a gallon of liquor per kilogram or 2 1/5 pounds of malt).

Key points to keep in mind when considering the infusion mash are the colors and flavors produced during malt kilning and wort boiling. They are a direct result of the use of well-modified malts. These compounds range in color from straw to reddish-brown and have flavors that have been described as toasty, caramel like, buttery and maple syruplike. These characteristics may be important to ales but are independent of the system of wort production. Therefore, if you desire these flavors in your beer, be selective when choosing your pale and speciality malts. If you do not want these characteristics, do not use the infusion system.

One last comment regarding this subject has to do with brewing water. The Maillard reaction is discouraged at a low pH. If you want to inhibit this reaction during wort boiling, a healthy dose of calcium sulfate ($CaSO_4$) to the kettle will lower the wort pH enough to keep color pickup to a minimum. This practice is known as "Burtonizing" because it was originally used to produce pale ales such as Bass in Burton-on-Trent in England.

DECOCTION MASHING AND UNDERMODIFIED MALT

The burning question that will inevitably come up after thinking about decoction mashing is, "Why didn't the Europeans make well-modified malt to begin with instead of developing a mashing procedure that takes all day?" Because the answer to that question has partially been left to history, we will focus on how decoction mashing is well-suited to undermodified malts.

To preface this discussion, I would like to point out that decoction mashing is one of the truly magnificent examples of scientific empiricism. Apparently the brewers who first used this process were using its elaborate, but reproducible, procedure to obtain consistent mashing temperatures without the use of thermometers (they had not yet been invented). It also has been hypothesized that these temperatures were chosen through trial and error because they produced the best finished beer. Whether any of these ideas are wholly correct we may never know. It is known, however, that these techniques were not developed to provide phytase, protease, glucanase and amylase rests, but rather these enzymes were later discovered and were found to have temperature optima somewhere in the range of rests found in the classical triple decoction. In other words, brewing chemists named the rests after the most fashionable topic of the day — enzymes!

Decoction mashing involves beginning the process by mashing in at a relatively low temperature, around body temperature. During the lengthy process, portions of the mash are removed (typically about one-third of the total), boiled for about 30 minutes and returned to the main mash. The mash is allowed to rest undisturbed for 60 to 90 minutes at its resultant temperature. The triple decoction is the classical and most elaborate form of this mashing style and involves three separate times during which boiling of the mash occurs. Triple decoctions, as tra-

ditionally performed, took about eight hours! Keep in mind that lautering, boiling, cooling and pitching had to occur before that wort was cleared from the brewhouse. As brewers became more interested in shorter mash cycles, the double and single decoction were popularized.

Back to the issue of malt modification. In a triple decoction, there are four different temperature rests. These may be 105, 120, 140 and 158 degrees F (40.5, 49, 60 and 70 degrees C). This temperature range allows for further modification of the malt that did not occur during malting. At the first temperature rest, 105 degrees F (40.5 degrees C), the enzyme phytase can remove inorganic phosphate from inositol, thereby reducing the mash pH to between 5 and 5.3. Proteases and beta glucanase are most active around 120 degrees F (49 degrees C). These enzymes reduce the size of proteins and break down beta glucans; beta glucans (from endosperm cell walls) greatly increase wort viscosity and lautering times. The rest at 140 degrees F (60 degrees C) allows for beta amylase action and the gradual temperature increase from 140 to 158 degrees F (60 to 70 degrees C), achieved by slowly adding back the third decoction to the main mash, allows for both beta alpha and amylase action. Remember that well-modified malts already have undergone most of these changes. Therefore decoction mashing can be viewed as a substitute for, or a continuation of, modification during malting.

In addition to enzymatic reactions, two other very important chemical changes occur during decoction mashing. The first is starch gelatinization, accomplished by "cooking" or boiling the mash. Gelatinization of starch is, conceptually, similar to the melting of ice; that is, the highly ordered structure of native starch is lost. Starch gelatinization is absolutely necessary for amylase activity to happen; without it, the starch substrate is virtually unavailable for enzymatic degradation. The gelatinization temperature of barley starch begins at 142 (61 degrees C) and is completed at 149 degrees F (65 degrees C). The second important change not to forget when contemplating decoction mashing is protein denaturation. If low enzyme malts are used in decoction mashes, the enzymes lost during boiling will

severely limit the success of the entire brewing enterprise. Even with respectable enzyme concentrations, traditional decoctions needed to allow 60 to 90 minutes (modern mashes are usually completely finished in 90 minutes!) at each temperature rest for the mash's crippled complement of enzymes to carry out the tasks at hand.

Many brewers claim that decoction mashes produce very different beers than do infusion mashes. Unquestionably, the boiling of malted barley extracts more flavors from the husk than does steeping at a much lower temperature. It could also be argued that mash boiling and wort boiling will lead to more Maillard reaction products than wort boiling alone. One aspect of this argument, however, is the availability of free amino nitrogen (FAN). FAN is a required reactant of the Maillard reaction. Worts made from infusion mashing well-modified malts will tend to have higher FAN levels than worts made from undermodified malts that have been taken through a protein rest. Therefore beers produced from undermodified malts and decoction mashes will have less of the colors and robust flavors associated with this reaction. However, it is very difficult to obtain undermodified malt in today's time-driven world, even in Germany where decoction mashing is revered (you guessed it, even the German brewers have gone to shorter mash schedules). The punch line is: If you want to do a triple decoction with modern well-modified malt, use it to produce heavy beers such as a dunkel, bock or doppelbock where robust flavors are appreciated. If you still think lager-style beer can only be produced by continental methods, use a single decoction.

DOUBLE MASHING AND ADJUNCT USE

The use of brewing adjuncts has been a part of commercial brewing for more than 100 years. Brewing adjuncts may be defined as ingredients other than malt that contribute fermentable extract to wort. Because many of these materials have gelatinization temperatures that are much higher than that of barley starch, they must be treated differently. Worldwide, maize and rice grits are the most commonly used adjuncts and must be gelatinized in a separate process prior to being added to the malt mash. Common adjuncts used in breweries include flaked maize, wheat, rice, barley, various liquid syrups and dry carbohydrate powders. Because these adjuncts can be added directly to an infusion mash or to the brew kettle, they will not be discussed in the context of double mashing.

Unlike infusion and decoction mashing, double mashing was developed with the aid of brewing science. In other words, its temperature rests were chosen because brewers knew exactly what needed to be accomplished when using adjuncts with high gelatinization temperatures. Let's consider the question of why brewers wanted to use adjuncts in the first place. Economics and flavor are the players in this problem. Adjuncts are less expensive and more consistent than malted barley; they are always 100 percent starch. Need we further consider economics? The flavor issue also is straightforward. Beers made with adjuncts are lighter and cleaner tasting than all-malt beers because they have less of the malt compounds responsible for malty flavors; they are flavor diluents. Therefore brewers could economically produce a beer with comparable market prices to all-malt products and one that had lighter flavors that allowed for easier consumption of large volumes. These products were moneymakers!

Double mashing, which in many respects is not too different than a decoction, begins by mashing in two separate mashes simultaneously. The first mash is all malt and is comprised of about 90 percent of the recipe's total malt; this accounts for about 60 percent of the total extract in a typical American wort. The main mash's initial temperature is usually 122 degrees F (50 degrees C) and is commonly referred to as a "protein rest." Research has time and again demonstrated that significant proteolysis does not occur during a brief rest when well-modified malts, which are the norm, are used. The choice of temperature is practical, however, because it cools the boiling adjunct to a very specific and useful temperature, 158 degrees F (70 degrees C). The second mash consists of the remainder of the recipe's malt and all of the adjunct to be used; in this scenario about 40 percent of the total extract. This mash is brought up to 158 degrees F (70 degrees C) and held for about 15 minutes to allow alpha amylase action to occur. This step is critical because it reduces the viscosity of the adjunct mash and prevents it from turning into a puddinglike, unpumpable mess once it has been gelatinized. The adjunct mash is then heated to, and is maintained at, the boil for about 20 minutes. Once boiled, the adjunct mash is then gradually pumped over to the main mash (still holding tight at 122 degrees F or 50 degrees C) and the resultant mash is held at 158 degrees F (70 degrees C) for about 20 minutes. The gradual pump over takes the main mash through a temperature range that allows for both beta and alpha amylase action to occur, thereby producing a highly fermentable wort. The final step is to increase the temperature to a mash-off temperature of around 170 degrees F (76.5 degrees C).

Although this method is fairly simple, there are some specific requirements that must be fulfilled to avoid complications. The first, and perhaps most important, is the enzyme concentration of the malt. Because

40 percent of the extract is derived from an enzyme void source and 10 percent of the malt enzymes are destroyed in the cereal cooker, the enzymes remaining in the main mash need to be at least double the amount required for a traditional all-malt mash. However, because double mashes are usually performed in a much shorter time period than traditional multitemperature mashes, there is even a greater demand for enzymes than simply replacing those lost when substituting an adjunct for malt. The second requirement is a finely ground adjunct that requires special mills in the brewery. If you want to do this at home, I suggest using cornstarch (like would be used for baking) because it is ready for you to add directly to the adjunct mash. The last requirement is that the malt be well-modified. The idea behind double mashing is that if you are absolutely sure that the adjunct starch gets completely converted, the malt will take care of itself. Double mashing can be very rewarding at home if you are a fan of American-style lager. With a little bit of planning, you can make a surprisingly professional-tasting product!

TAKE-HOME MESSAGES

Whenever you are planning a brew, always consider the desired outcome before you start. Once you have a goal in mind, it is then time to select your raw materials and wort-production method. Unless you are completely driven by tradition, give different mashing techniques a try. For example, if you want to mash at four different temperatures to make a pale ale, you may find it easier to achieve your temperature rests with a decoction mash rather than raising your mash temperature by heating the entire mash on your stove. Whatever you decide to do, as long as your mash temperature doesn't exceed 158 degrees F (70 degrees C) by more than a few degrees, you'll be all right. It's OK to be adventurous and have fun if you have a sound plan. After all, homebrewing is about exploring beer by formulating, creating and evaluating it yourself! (Recipes follow.)

LAWN MOWER LAGER

Ingredients for 5 gallons

- **5 3/4 pounds six-row lager malt**
- **1 3/4 pounds cornstarch**
- **1/3 ounce Nugget hops, 12 to 13 percent alpha acid (90 minutes)**
- **1/2 ounce Tettnanger hops (5 minutes)**
- **lager yeast**

- **Original gravity: 1.046, 11.5 °P**
- **Final gravity: 1.008, 2 °P**
- **Bitterness: 15 IBUs**

ALL-AMERICAN PREMIUM

Ingredients for 5 gallons

- **7 pounds six-row lager malt**
- **1 1/2 ounces light crystal malt, 50 to 60 °Lovibond**
- **14 ounces cornstarch**
- **1/2 ounce Nugget hops, 12 to 13 percent alpha acid (90 minutes)**
- **1/2 ounce Liberty hops (15 minutes)**
- **1/2 ounce Mount Hood hops (five minutes)**
- **lager yeast**

- **Original gravity: 1.046, 11.5 °P**
- **Final gravity: 1.008, 2 °P**
- **Bitterness: 22 IBUs**

Use soft water for both mashing and sparging. If your city water is not naturally soft, add 1/2 teaspoon calcium sulfate (gypsum) to 8 gallons of distilled water. Use this water for mashing and sparging.

Both recipes use the double mash method. Use the following procedures for these beers:

Adjunct mash:

Mix 10 percent of the crushed pale malt and all of the cornstarch with 1 gallon of 165 degrees F (74 degrees C) water. The temperature should rest between 150 and 160 degrees F (65.5 and 71 degrees C). Hold the mash at this temperature for 15 minutes. While constantly stirring, increase the mash temperature to boiling and boil for 20 minutes. Water may be added during boiling to compensate for excessive evaporation.

Main mash:

Mash-in remaining pale malt and all of the specialty malt (if required) with 7 quarts of 145 degrees F (63 degrees C) water. The temperature should rest near 140 degrees F (60 degrees C). Hold at this temperature until the adjunct mash has completed its 20 minute boil. Add the boiling adjunct mash to the main mash. This should be done over a one to two minute time period with continual stirring. After mixing the two mashes, the temperature should be near 158 degrees F (70 degrees C). If the mash temperature is less than 152 degrees F (66.5 degrees C), increase the temperature to 152 to 158 degrees F (66.5 to 70 degrees C). Hold at this temperature for 15 minutes or until a negative iodine test is obtained. Increase mash temperature to mash-off temperature of 170 degrees F (76.5 degrees C) and hold for 10 minutes. Transfer mash to lauter-tun and allow 15 minutes for lauter rest. Sparge with 170 degrees F (76.5 degrees C) water until 6 to 6 1/2 gallons of wort is collected (this volume depends on the evaporation rate of your kettle) and boil for 90 minutes. There should be 5 gallons of wort after cooling.

genuine Belgian recipes

BREWFERM®

genuine Belgian recipes

Belgian homebrewers did it for years ...

finally all beerlovers can brew their own favourite Belgian beer !!

PILSNER for 12 or 20 l.
- Starting specific gravity : 1.042.
- Alcohol content : 4.6%.
- Light, blond beer, comparable with the commercial Lager beers (recipe for 20 l.) or the better Pilsner beers (recipe for 12 l.). Low alcohol content.

GOLD for 12 l.
- Starting specific gravity : 1.053.
- Alcohol content : 5,5%.
- A real deluxe pilsner type of beer with a far better taste than the normal Lagers. Also comparable with Scandinavian deluxe-beers.

ABBEY BEER for 9 l.
- Specific gravity : 1.070
- Alcohol content : 8%.
- One of the Belgian specialty beers : the Abbey beer with vinous character due to its high alcohol content. Strong dark reddish brown beer with long keeping properties. Full flavoured taste with a malt aroma. Very thick and long lasting head (lacy).

AMBIORIX for 15 l.
- Starting specific gravity :1.047
- Alcohol content : 6,5%.
- Amber beer with a red copper tint. Slightly acidic palate at first but with a sweet aftertaste. Comparable with the well known beer of Roeselare.

DIABOLO for 9 l.
- Starting specific gravity : 1.071
- Alcohol content : 8%.
- Belgian specialty beer : golden colour beer with a thick and long lasting head (lacy). Characteristic aroma of devil type Belgian beers, soft palate with a slightly sweet aftertaste. Diabolo also compares with triple Belgian beers (Tripple).

KRIEK for 12 l.
- Starting specific gravity : 1.053
- Alcohol content : 5,5%.
- Kriek is the best known of the famous Belgian fruit-beers. Kriek is made by macerating cherries in beer. A slightly acidic and sweet aromatic beer with a red copper tint. Each kit contains pure cherry juice of at least 3 kg of cherries !

OLD FLEMISH BROWN for 12 l.
- Starting specific gravity : 1.060
- Alcohol content : 6 %.
- A dark brown beer with a red copper tint and a slight liquorice aftertaste that also compares with the Dutch 'Bock'-beers. In Belgium Oud Bruin (Flemish for Old Brown) type beers are strong aromatic beers with long keeping properties.

FRAMBOISE for 12 l.
- Starting specific gravity : 1.053
- Alcohol content : 5,5%
- BREWFERM framboise or raspberry beer, is a Belgian specialty. Together with the BREWFERM kriek this Framboise is the only fruit-beer-kit available in the world. Furthermore, these kits contain NO artificial flavors ! Each kit has an equivalent of 2 kilo of raspberries. This framboise beer has a very delicate aroma and is ideal as a refreshing summer-beer or as a surprising apéritif !

CHRISTMAS for 7 l.
- Starting specific gravity : 1.065
-Alcohol content : 6%.
- Dark strong heavy-bodied Belgian beer, sweeter than Abbey style beers. Strong malt flavor and aroma. Christmas type Belgian beers (brewed with top-fermenting yeast) are beers with long keeping properties which get better and better after long maturation period. Thick and lacy head with extraordinary head retention.

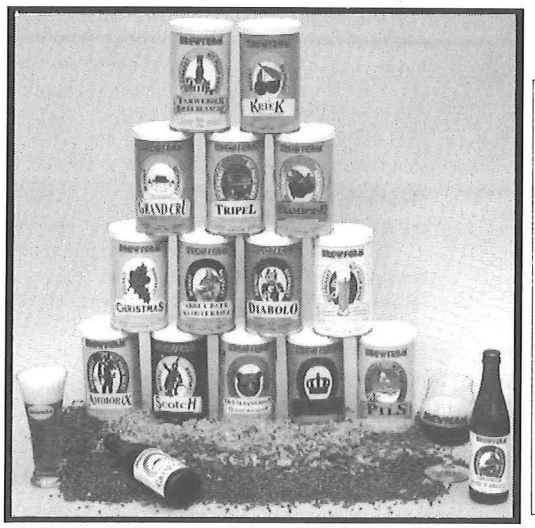
KING for 9 l.
- Starting specific gravity : 1.070
- Alcohol content : 8%.
- An amber beer with vinous character due to its high alcohol content. Sweeter and lighter in colour than Abbey beer. A real beer for dessert with a fantastic taste !

SCOTCH for 9 l.
- Starting specific gravity : 1.050
- Alcohol content : 5%.
- Brewferm Scotch tastes like traditional scotch ales. Halfway between Christmas and Abbey style beers, this Scotch is a mouthfull and malt-accented beer. Good keeping properties.

WHEATBEER for 15 l.
- Starting specific gravity : 1.053
- alcohol content : 5 %
- This is the first wheatbeer kit available ! It is very similar to the well known Belgian 'Witbieren' : very pale, honey-type, opaline colour, low alcohol content, sweet smell and a slightly acidic taste. An old recipe using oat flakes and a secret herb mixture.

GRAND CRU for 9 l.
- Starting specific gravity : 1.075
- Alcohol content : 8%
- The latest addition to the BREWFERM beerkit range. Gold opaline coloured, with strong flavor of grains and even bread. Very little hop aroma. Very mouthfull and even slightly fruit taste with a sweet aftertaste. Also these kits contain wheat malt and a special herb mixture.

TRIPLE for 9 l.
- Starting specific gravity : 1.075
- Alcohol content : 8%
- Triple is a well known deep golden colored Belgian specialty. Due to its high malt contents it has a very pleasant aroma and taste. Mouthful, full bodied and even a bit herbaceous. High alcohol content.



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BREWFERM PRODUCTS, Burg. Heymansplein 45, B-3581 Beverlo - Belgium. FAX +32 11-347359, Tel. +32 11-401408

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Geoff Bruce is host of Actually Quite Nice English Pub Tours. As a sea captain, he introduced passengers to his love of the ocean and the importance of being a part of the environment. He continues on land, initiating his companions to the historic way of life in old villages, castles and, of course, pubs.

Jim Busch is an electrical engineer who develops firmware under contract for NASA at the Goddard Space Flight Center in Greenbelt, Md. An avid brewer since 1988 and an all-grain brewer since 1989, Jim can often be found in the backyard brewery he designed and built in 1992 with Keith Harper. Contact Jim on the Internet at: busch@daacdevl.stx.com.

Stephen Cox was born in Boston, Mass., but moved to the United Kingdom when he was young. He earned a degree in physics and put it to use, naturally, by working for voluntary membership organizations. Stephen joined the Campaign for Real Ale in 1989 as campaigns and communications manager — the Campaign's key spokesperson and advocate.

Fred Eckhardt's beer and saké expertise led him to write newsletters, newspaper articles and numerous books including *Essentials of Beer Style* (Fred Eckhardt Associates, 1989). His newest projects are *Sake (U.S.A.)* (Fred Eckhardt Communications, 1992), *Sake Connection,* a newsletter began in 1991 and a book about northwest microbreweries to be published in 1994.

Karl J. Eden began his brewing career in 1974 when he served a three-year apprenticeship in a small Weizenbier brauerei in Germany. He was a brewer and maltster for four years at Paulaner Brewery in Munich before moving to Africa to supervise the brew house at Namibia Breweries. He earned a Braumeister certificate in Berlin then worked at Dinkelacker Brewery. Karl immigrated to the United States and since 1989 has been brewmaster and production manager at Sudwerk, Privatbrauerei Hübsch in Davis, Calif.

Tobin L. Eppard has degrees in chemistry and biology with an emphasis in microbiology. Toby is an award-winning homebrewer and active member of the American Society of Brewing Chemists. When not homebrewing or spending time with his wife and nine-month-old daughter, he finds time to work as brewing process analysist at Coors Brewing Co. in Golden, Colo.

Philip W. Fleming is one of the lucky few to have attended every Great American Beer Festivals℠. He makes his living as a consulting engineer and is a member of Hop Barley and the Ale'rs homebrew club in Boulder, Colo. Phil has been brewing for more than 11 years and has made many award-winning beers and meads.

Robin Garr, a writer and journalist, has been brewing for five years. As associate "sysop" of the CompuServe Beer Forum, he answers brewing questions online daily and has helped guide hundreds of new brewers through their first and subsequent batches. Robin is a member of the New York City Homebrewers Guild. Brewers can reach him at CompuServe ID 76702,764 or rgarr@panix.com on Internet.

Dan Gordon is the director of brewing operations and chief financial officer for Gordon Biersch Brewing Co., which owns and operates brewery restaurants in Palo Alto, San Jose and San Francisco with a fourth under construction in Pasadena. Dan earned a graduate degree in brewing engineering from the Technical University of Munich, Weihenstephan.

Keith Gretenhart is vice president of sales and technical services at Schreier Malting Co. in Sheboygan, Wis., where he has held a variety of production and quality control positions in the last 10 years. Schreier Malting is the exclusive importer in North America of DeWolf-Cosyns malt from Belgium, which are distributed to homebrewers through homebrew supply shops around the country.

David C. Hanbury is chairman of Morris Hanbury International Hop Merchants, the fifth generation of his family to run the company. Educated at Eton College and Trinity College in Cambridge, England, he served in the British Army before joining the family business in 1971. Morris Hanbury supplies hops and hop products to brewers around the world from offices in Paddock Wood in Kent, England, and Yakima, Wash.

Wolfram Koehler was educated in Bavaria and did his apprenticeship there in three small breweries. He studied brewing science in Berlin VLB, receiving a Braumeister diploma. For six years he worked for the Belize Brewing Co. as head brewmaster, then for Filtrox in Switzerland as a consulting engineer at breweries in Spain, England, Venezuela, Guatemala and Italy. Wolf is now head brewer at Crescent City Brewhouse in New Orleans, La.

Ashton Lewis is working on a master's degree in food science in Michael Lewis' program at the University of California, Davis. As a graduate student he has worked on brewing projects for private companies, helped teach brewing courses and researched beer foam. During his first year at Davis, Ashton participated in the master brewers program, a curriculum that prepares students to take the associate membership examination of the Institute of Brewing, London, and passed the grueling nine-hour examination.

Jeff Mendel is former director of the Institute for Brewing Studies. He is now using his experience from the Institute to open Tabernash Brewing Co. in Denver, Colo., in partnership with Eric Warner. The lager microbrewery is scheduled to open in November 1993.

Greg Noonan is brewmaster at the Vermont Pub & Brewery and author of *Brewing Lager Beer* and *Scotch Ale* (Brewers Publications, 1986, 1993). He has written numerous articles for brewing periodicals including a series on beer styles for *The New Brewer.*

John Peacock is associate director of brewing sales for Munton & Fison of England. He spent 25 years as a trained brewer in various technical and managerial roles with Bass, Allied Breweries and as head brewer with Everards Brewery. He is a senior member of the Incorporated Brewers Guild and a Fellow and Diploma Master Brewer member of the Institute of Brewing, serving on the council and examinations committee.

Alan Pugsley graduated with a first-class honors biochemistry degree from the University of Manchester in 1980. His brewing career started with Peter Austin at the Ringwood Brewery, Hampshire, in 1982. He then helped set up the consulting company Peter Austin and Partners (Contracts) Ltd. Alan moved to the United States in 1986 to help set up D.L. Geary Brewing Co. in Portland, Maine, and was their brewmaster for 2 1/2 years. Alan has been involved in the design and installation of 37 microbreweries and brewpubs worldwide.

Gary Spedding (Ph. D.), a microbiological biochemist, is assistant professor of biochemistry at Butler University in Indianapolis. Born and educated in England, he began homebrewing in Canada in 1985. He enjoys British and Belgian beers and is intrigued by early ale and beer recipes with novel flavoring ingredients. He is a Recognized Beer Judge and former committee member of the Cross Street Irregulars brewing club in Baltimore. Contact Gary via e-mail at SPEDDING@BUTLER U. EDU.

Eric Warner, author of *German Wheat Beer* (Brewers Publications, 1992), completed a degree in German studies at Lewis and Clark College in Portland, Ore., before pursuing a formal education in brewing science in Germany. After earning the Diplom-Braumeister degree from Weihenstephan he worked at Brauerei Widmann and Hofbrauhaus Moy, both in the Munich area, and at Denver, Colo.'s, Wynkoop Brewing Co. Currently, Eric is opening Tabernash Brewing Co. in Denver with Jeff Mendel.

Ed Westemeier has been a homebrewer since 1987. He is secretary and newsletter editor of Cincinnati's Blotarian Brewing League and a member of DRAFT, Dayton's homebrew club. Ed is a Certified Beer Judge and tries to sample local homebrew wherever he travels.

Graham Wheeler, an electronics engineer, started to take homebrewing seriously in the mid 1970s and is now considered Britain's leading authority on the subject. He has written, advised, lectured and broadcast on various aspects of homebrewing, commercial brewing and brewing history. He is author of Britain's definitive homebrewing manual, *Home Brewing — The CAMRA Guide* (Alma Books, 1990), and is co-author of a book of recipes for commercial English ales, *Brew Your Own Real Ale At Home.*

WINNERS CIRCLE

James Spence

The 1993 National Homebrew Competition experienced another record-breaking year with 2,747 entries competing in what has become the world's largest competition of its kind. Homebrewers from around the world compete in 28 categories representing 73 styles. The most entries came from California which had 568 beers and meads judged. In all, 49 states entered, with no entries from West Virginia or Washington, D.C. Entries also came from Canada, Sweden and Australia.

Paddy Giffen of Cotati, Calif., won Homebrewer of the Year, with his incredible Smoked Scottish "Wee" Heavy beer, "Kilts on Fire." Giffen attended the Great American Beer Festival[SM] XII in Denver, Colo., Oct. 8 and 9 as part of his prize.

The Ninkasi Award went to Walter Dobrowney of Saskatoon, Sask., Canada, for his two first-place wins. To top it off, Dobrowney also won Meadmaker of the Year. His win means one of his recipes will be brewed by Pete's Brewing Co. of Palo Alto, Calif., and distributed coast to coast. Plus, Dobrowney will be attending the Siebel Institute of Technology in Chicago, Ill., and the first brewing of Pete's Wicked Winter Brew, all courtesy of Pete's Brewing Co. The Ninkasi Award is given to the brewer who earns the most points in the Competition. Three points are earned for a first place, two for a second and one for a third. Remarkably, Dobrowney's first place wheat beer was one of the three beers remaining in the Best of Show judging, before Giffen's beer was chosen. The herb beer brewed by Richard Mansfield and Mike Smith was also one of the three.

Gabriel Ostriker of Somerville, Mass., earned first, second, and third in the cider category, thereby winning Cidermaker of the Year.

Following in the footsteps of his wife, Tina, who won the award in 1992, Jim Long of Sacramento, Calif., won Sakémaker of the Year.

For the eighth consecutive year, the Sonoma Beerocrats of California won the Club High-Point Trophy. Close behind were the Boston Wort Processors in second, and Colorado's Hop Barley and the Ale'rs in third. The award is given to the homebrew club whose members earn the most points in the competition, and the six annual Club-Only Competitions. Clubs earn three points for a first place, two for a second and one for a third.

Here are the first place recipes from the American Homebrewers Association 1993 National Homebrew Competition. These are all exceptional beers by exceptional brewers. And, remember, they brewed it their way, you should brew it your way. Don't be surprised or disappointed if your beer doesn't come out exactly like these beers did. It's your brew! That's what homebrewing is all about.

BARLEY WINE

Category award sponsored by EDME Ltd., Essex, England

FIRST PLACE
Ray Call
Stockton, California

"Romulin Ale"

Barley Wine

Ingredients for 6 gallons

35	pounds pale malt
1	pound wheat malt
1/2	pound British caramel malt
1/2	pound toasted malt
1 1/2	ounces Chinook hops, 8.3 percent alpha acid (90 minutes)
1 1/2	ounces Centennial hops, 7.1 percent alpha acid (90 minutes)
1 1/2	ounces Kent Goldings hops (30 minutes)
2	ounces Kent Goldings hops (five minutes)
2	ounces Kent Goldings hops (dry)

Chico ale liquid yeast starter
carbonated by kraeusening

- **Original gravity: 1.106**
- **Final gravity: unknown**
- **Boiling time: 90 minutes**
- **Primary fermentation: nine days at 70 degrees F (21 degrees C) in glass**
- **Secondary fermentation: 12 days at 70 degrees F (21 degrees C) in glass**
- **Age when judged (since bottling): 19 months**

Brewer's specifics

Mash grains at 158 degrees F (70 degrees C) for 75 minutes.

Judges' comments

"Aroma is big, malty, fruity, alcohol, some hops, touch diacetyl. Wonderful. Hop bitterness expressed in middle is the only oddity. I wouldn't change a thing."

"Good malt and hop balance. Well-aged and conditioned. Good head."

"Very clean malt, some bitterness in finish, alcohol shows, good balance. Lacks true estery complexity, a little candylike. Very nice effort."

"Rich malty, hoppy flavor. Somewhat astringent but will mellow with age."

"Overcarbonated. A very good, well-aged barley wine. Prime with less or else not at all with long storage time."

BELGIAN-STYLE SPECIALTY

Category award sponsored by Manneken-Brussel Imports, Austin, Texas

FIRST PLACE
BRIAN BLISS
Dallas, Texas

"Ester the Molester"

Belgian Strong Ale

Ingredients for 5 gallons

- 9 pounds 3 'Lovibond pale ale malt
- 1/2 pound 77 'Lovibond CaraMunich malt
- 1/2 pound 25 'Lovibond aromatic malt
- 1/4 pound Special B malt
- 2 pounds turbinado sugar
- 3 1/3 pounds amber extract
- 2 pounds amber dry extract
- 1 1/3 pounds light dry extract
- 3/5 pound corn sugar
- 3 ounces Goldings hop plugs, 5.2 percent alpha acid (70 minutes)
- 2 ounces Fuggles hop plugs, 4.2 percent alpha acid (70 minutes)
- 1 ounce Northern Brewer hop plugs, 7.5 percent alpha acid (70 minutes)
- 1/2 ounce Hallertauer hops, 4.5 percent alpha acid (70 minutes)
- 1/2 ounce Saaz hops (dry)
- Whitbread ale yeast
- 3 ounces corn sugar, 1 tablespoon black treacle (molasses) to prime keg

- Original gravity: 1.100
- Final gravity: 1.029
- Boiling time: 120 minutes
- Primary fermentation: six weeks at 60 to 65 degrees F (16 to 18 degrees C) in glass
- Age when judged (since bottling): five months

Brewer's specifics

Mash grains at 152 degrees F (67 degrees C) for 45 minutes. Wrap fermenter in an electric blanket and heat to between 90 and 100 degrees F (32 and 38 degrees C) for 12 hours after fermentation begins.

Judges' comments

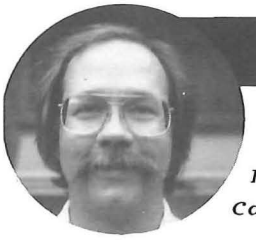
"Interesting beer with a lot going on. Alcohol is there but balanced well with other characteristics to keep it from being too assertive. A bold brew."

"Big malt flavor, some vinousness. Lots of alcohol. Big, chewy, complex. Finishes rather quickly and pleasantly. A beautiful beer!"

"Well-balanced. Lacks some mature vinous character. A little dry in finish. Could be fuller in flavor all around. Needs to be fuller to deal with yeast attenuation."

"Nice, balanced. Rich malt tones. Black currant character."

"Sweet, noticeably alcoholic strong ale with a winy-sharp character in the flavor; long-lasting malty finish."



BROWN ALES

Category award sponsored by Premier Malt Products, Grosse Pointe, Michigan

FIRST PLACE
DOUGLAS BROWN
Redondo Beach, California

English Mild

Ingredients for 5 gallons

- 4 pounds Williams Australian dry malt extract
- 1 pound Klages malt
- 1/2 pound domestic two-row malt
- 3 1/2 ounces black patent malt
- 2 ounces chocolate malt
- 3 1/2 ounces 80 'Lovibond crystal malt
- 5 ounces CaraPils malt
- 7/10 ounce Fuggles hops, 3.1 percent alpha acid (60 minutes)
- Kent English ale yeast, dry
- 1/2 cup dextrose to prime

- Original gravity: 1.034
- Final gravity: 1.011
- Boiling time: 60 minutes
- Primary fermentation: 14 days at 68 degrees F (20 degrees C) in plastic
- Age when judged (since bottling): seven months

Brewer's specifics

Mash grains with 2 1/2 gallons water at 140 degrees F (60 degrees C) for 40 minutes. Raise to 155 degrees F (68 degrees C) for 20 minutes. Sparge with 1 gallon water at 170 degrees F (77 degrees C). Boil 3 1/2 gallons water and extract for 60 minutes.

Judges' comments

"Malt sweetness low, very thin. Needs more maltodextrin for body."

"Nice clean brown. No apparent defects. Body a bit thin."

"More hop bitterness than appropriate for style. Aftertaste is astringent and too lasting."

"Slight astringency, maltiness slightly low even for style. Aftertaste lingers, detracts from enjoying beer."

"Malt character predominates. Slightly sweet, but also a slight astringent aftertaste. Light body, but not inappropriate."

ENGLISH-STYLE PALE ALE

Category award sponsored by Wynkoop Brewing Co., Denver, Colorado

FIRST PLACE
KELLY DUNHAM
Pacifica, California

"Dances With Humulus Lupulus"

India Pale Ale

Ingredients for 5 gallons

- 6 pounds light dry malt extract
- 1 pound dry wheat malt extract
- 1 1/2 pound 20 'Lovibond crystal malt
- 1/2 pound 40 'Lovibond crystal malt
- 1/2 pound wheat malt
- 1/4 pound flaked barley
- 1/8 pound chocolate malt
- 1 ounce Chinook hops, 12.8 percent alpha acid (75 minutes)
- 1/2 ounce Centennial hops, 10.9 percent alpha acid (45 minutes)
- 1/2 ounce Goldings hops, 4.7 percent alpha acid (45 minutes)
- 1 ounce Centennial hops, 10.9 percent alpha acid (20 minutes)
- 1/2 ounce Goldings hops, 4.7 percent alpha acid (20 minutes)
- 1 ounce Centennial hops, 10.9 percent alpha acid (five minutes)
- 1/2 ounce Centennial hops, 10.9 percent alpha acid (dry)
- 1/2 ounce Goldings hops, 4.7 percent alpha acid (dry)
- Sierra Nevada Ale yeast culture
- 1 cup corn sugar to prime

- Original gravity: 1.068
- Final gravity: 1.024
- Boiling time: 75 minutes
- Primary fermentation: 28 days at 60 degrees F (16 degrees C) in glass
- Age when judged (since bottling): five months

Brewer's specifics

Bring wort to boil. Remove grains at 180 degrees F (82 degrees C).

Judges' comments

"Well-balanced flavor. Nicely proper lingering clean hop astringency."

"High hop flavor and bitterness, medium maltiness. Excellent beer!"

"Aftertaste lingers a little long. Great floral aroma."

"Good bitterness, alcohol noticeable, but could be a little more pronounced. Good clean taste. Hop flavor could be greater. Well-made beer."

"Good flavor. Estery. Nice hop flavor and bitterness."

AMERICAN-STYLE ALE

Category award sponsored by Northwestern Extract, Brookfield, Wisconsin

FIRST PLACE
Jack H. Denny
Lenexa, Kansas

"Great Wheat "

American Wheat

Ingredients for 5 gallons

- 4 pounds barley malt
- 4 1/2 pounds wheat malt
- 1/2 pound CaraPils malt
- 1/2 ounce Hallertauer hops, 4.8 percent alpha acid (60 minutes)
- 1/2 ounce Hallertauer hops, 4.8 percent alpha acid (40 minutes)
- 1/4 ounce Hallertauer hops, 4.1 percent alpha acid (20 minutes)
- 1/4 ounce Hallertauer hops, 4.1 percent alpha acid (two minutes)
- EDME ale yeast
- 2/3 cup corn sugar to prime
- Original gravity: 1.046
- Final gravity: 1.020
- Boiling time: 120 minutes
- Primary fermentation: 13 days at 66 to 68 degrees F (19 to 20 degrees C)
- Age when judged (since bottling): 19 months

Brewer's specifics

Mash grains at 122 degrees F (50 degrees C) for 32 minutes. Raise to 145 degrees F (63 degrees C) for 20 minutes. Raise to 158 degrees F (70 degrees C) until conversion. Sparge with 4 1/2 gallons of 165-degree-F (74-degree-C) water.

Judges' comments

"Well-balanced, slight citric flavor but not tart. Fairly sweet but not cloying. Very good beer with no flaws."

"Smooth taste yet looking for the wheat notes. Some diacetyl evident, OK for style. Hops are still neutral, which is OK for style. A fine beer."

"This is a well-made American wheat. The lemony character comes through nicely. A bit of hop character in the nose would add to this."

"Malty flavor comes right out. Good conditioning. I would try a few more IBUs in the kettle. Very nice beer."

"Hint of DMS in aroma. Lots of wheat flavor, low hop bitterness. Slight fruitiness is nice."

ENGLISH BITTER

Category award sponsored by The Brewery, Potsdam, New York

FIRST PLACE
Donna Lynn Johnson and Brian F. Johnson
Palo Alto, California

"Baby's Best Bitter"

English Special

Ingredients for 10 gallons

- 13 pounds Munton and Fison pale ale malt
- 1 pound CaraPils malt
- 1 pound 20 °Lovibond crystal malt
- 1 pound Victory malt
- 1/3 pound Hugh Baird U.K. pale malt
- 1/2 pound flaked barley
- 1/4 pound flaked red wheat
- 2 ounces Perle hops, 7.6 percent alpha acid (45 minutes)
- 1 ounce Cascade hops, 6.5 percent alpha acid (one minute)
- Wyeast liquid yeast culture
- force-carbonated in keg
- Original gravity: 1.047
- Final gravity: 1.012
- Boiling time: 60 minutes
- Primary fermentation: 21 days at 68 degrees F (20 degrees C) in glass
- Age when judged (since bottling): two months

Brewers' specifics

Mash grains at 157 degrees F (69 degrees C) for 90 minutes.

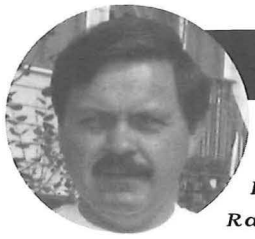
Judges' comments

"Clean, sweet with some bitterness in the finish. Nice bitter."

"Fairly good malt-hop balance. Some bitterness in aftertaste. Rather buttery flavor. Could use a bit more malt. Perhaps a bit too much diacetyl."

"Good malt and hop balance. Nice drinking beer. Good beer."

"The malt profile could come up just a bit, perhaps with less attenuative yeast. Some fruitiness would also be nice."



SCOTTISH ALE

Category award sponsored by Something's Brewing, Burlington, Vermont

FIRST PLACE
James E. Edgins
Highlands Ranch, Colorado

Scottish Heavy

Ingredients for 6 1/2 gallons

- 8 pounds pale ale malt
- 2 pounds mild malt
- 1/8 pound chocolate malt
- 1 pound 60 °Lovibond crystal malt
- 1/2 pound 90 °Lovibond crystal malt
- 1 pound CaraPils malt
- 1 ounce Fuggles hops, 4.2 percent alpha acid (60 minutes)
- 1/2 ounce Fuggles hops, 4.2 percent alpha acid (15 minutes)
- Wyeast European liquid yeast culture
- 1/2 cup corn sugar to prime
- Original gravity: 1.046
- Final gravity: 1.016
- Boiling time: 90 minutes
- Primary fermentation: eight days at 65 degrees F (18 degrees C) in glass
- Secondary fermentation: 13 days at 65 degrees F (18 degrees C) in glass
- Age when judged (since bottling): three months

Brewer's specifics

Mash grains for 30 minutes at 122 degrees F (50 degrees C). Raise to 157 degrees F (69 degrees C) for 60 minutes. Raise to 168 degrees F (76 degrees C) for five minutes.

Judges' comments

"Good malt flavor. Some hop flavor. Slightly bland, which throws off balance."

"Lightly malty, well-balanced with just enough hops. Hint of oxidation."

"Good brew, but no hop bitterness at all. A bit thin on body."

"Malt is good, but flavor seems to be lacking. Beer just seems limp — no real strong flaws, but I can't get excited about it."

"Dull aroma. Slightly yeasty."

PORTER

Category award sponsored by The Cellar, Seattle, Washington

FIRST PLACE
MARVIN CRIPPEN
Seattle, Washington

"Fiery Apparel Porter"

Robust Porter

Ingredients for 5 gallons

8	pounds two-row Klages malt
1	pound Munich malt
1/2	pound crystal malt
1/2	pound chocolate malt
1/2	pound roasted barley malt
1/2	pound black patent malt
1	ounce Eroica hops, 11 percent alpha acid (60 minutes)
1/2	ounce Cascade hops, 6 percent alpha acid (15 minutes)
	Wyeast No. 1084 liquid yeast culture
1	cup dextrose to prime

- Original gravity: 1.065
- Final gravity: 1.018
- Boiling time: 120 minutes
- Primary fermentation: 10 hours at 67 degrees F (19 degrees C) in glass
- Secondary fermentation: 10 days at 72 degrees F (22 degrees C) in glass
- Age when judged (since bottling): three months

Brewer's specifics

Mash grains at 153 degrees F (67 degrees C) for two hours.

Judges' comments

"Yum! Only flaw is that the degree of roasty bitterness is more appropriate for stout than porter."

"Need more malt complexity and sweetness. Overall, well-balanced. Could boost chocolate and crystal."

"Fruity overtones impact this batch. Yeast could be source of fruitiness."

"Good sweetness. Nice balance. Could use more black malt."

ENGLISH AND SCOTTISH STRONG ALE

Category award sponsored by Wine and Hop Shop, Denver, Colorado

FIRST PLACE
RAY CALL
Stockton, California

"Mason Is Wee Heavy"

Strong Scotch Ale

Ingredients for 5 gallons

- 14 pounds pale malt
- 2 pounds Munich malt
- 4 pounds British crystal malt
- 2 1/4 pounds toasted malt
- 1/4 pound Special B malt
- 1/2 ounce Cascade hops, 6.7 percent alpha acid (60 minutes)
- 1 ounce Northern Brewer hops, 7.1 percent alpha acid (60 minutes)
- 1 1/4 ounces Saaz hops, 4.9 percent alpha acid (60 minutes)
- 1/2 ounce Tettnanger hops, 4.5 percent alpha acid (15 minutes)
- Chico ale liquid yeast culture
- Original gravity: 1.085
- Final gravity: unknown
- Boiling time: 90 minutes
- Primary fermentation: nine days at 70 degrees F (21 degrees C) in glass
- Secondary fermentation: seven days at 70 degrees F (21 degrees C) in glass
- Age when judged (since bottling): nine months

Brewer's specifics

Mash grains at 155 degrees F (68 degrees C) for 75 minutes.

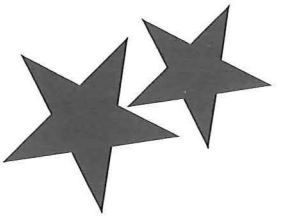
Judges' comments

"Wow! Very rich, almost berrylike. Blackberries, dark cherries. Smokiness doesn't carry through, but it doesn't matter — this is very well-made."

"Sweet malt dominates. Good balance. Alcohol evident. Slightly coarse roast character on the perceptible edge. Could be balanced by a bit more bitterness."

"Clean, smooth with malt dominating. Nice low carbonation. Pleasant lingering aftertaste. Diacetyl comes through ever so slightly."

"Malty rich. Nice alcohol presence. The hop is there but it shows late as is appropriate."



STOUT

Category award sponsored by Alternative Garden Supply, Streamwood, Illinois

FIRST PLACE
DAVID AND MELINDA BROCKINGTON
Seattle, Washington

"New Stout II"

Foreign Style

Ingredients for 5 gallons

- **9 pounds English pale two-row malt**
- **3 pounds roasted barley**
- **1/2 pound 40 'Lovibond crystal malt**
- **1/2 pound black patent malt**
- **2 ounces Goldings hops (60 minutes)**
- **Wyeast No. 1084 liquid yeast culture**
- **3/4 cup corn sugar to prime**

- **Original gravity: 1.060**
- **Final gravity: 1.016**
- **Boiling time: 60 minutes**
- **Primary fermentation: 15 days at 65 degrees F (18 degrees C) in glass**
- **Age when judged (since bottling): four months**

Brewers' specifics

Mash grains at 155 degrees F (68 degrees C) for 60 minutes.

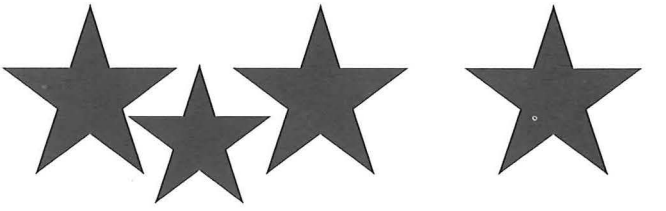
Judges' comments

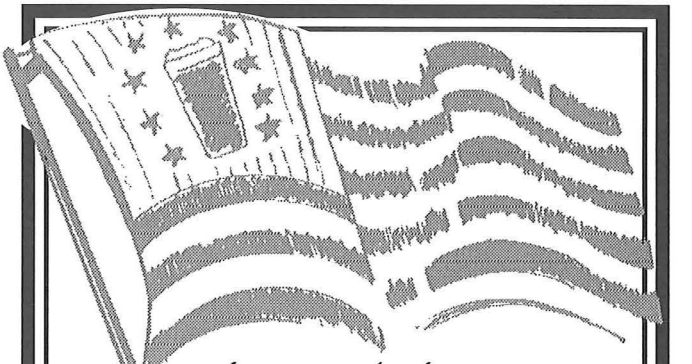
"Roasted flavor not quite there. No strong off-flavors."

"Very good! Work on conditioning to fix the head."

"Malt evident, but needs more hops. Slightly out of balance to sweet side."

"Malty flavor. Perhaps just a little too sweet in the finish."





The American Homebrewers Association

POIGNANT PORTER
Club Only Competition

Relive the brewing past of our forefathers by sending your club's best Porter to the "Poignant Porter" club only competition. Entries are due Dec. 6, 1993. Three bottles per entry, one entry per club. Please use AHA Sanctioned Competition entry forms and include the $5 entry fee. All clubs registered with the AHA are eligible and encouraged to participate.

Send all entries to: Poignant Porter, c/o American Homebrewers Association, 736 Pearl Street, Boulder, CO 80306. If you have any questions, please call James Spence at (303) 447-0816.

Who knows ... had this competition been available in 1750, ol' George may have been this country's brewing father instead of founding father.

BOCK

Category award sponsored by Yakima Valley Hop Growers, Yakima, Washington

FIRST PLACE
Ron Kribbs and Rick Skillman
Naples, Florida

"S-K Trubulator"

Eisbock

Ingredients for 15 gallons

40	pounds Klages two-row malt
2	gallons Alexanders amber extract
5	ounces Hallertauer hops (60 minutes)
3	ounces Tettnanger hops (15 minutes)
	Wyeast Munich liquid yeast culture

- **Original gravity: 1.130**
- **Final gravity: unknown**
- **Boiling time: 60 minutes**
- **Primary fermentation: eight months at 38 degrees F (3 degrees C)**
- **Secondary fermentation: four months at 38 degrees F (3 degrees C)**
- **Age when judged (since bottling): three years, five months**

Brewers' specifics

Mash grains at 158 degrees F (70 degrees C) for 60 minutes. Kraeusen with wort.

Judges' comments

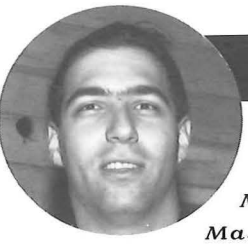
"Full body. Great for style. Rich and smooth. Would benefit from more alcohol 'warming.' Thanks for entering this beer!"

"Good malt sweetness and alcohol to back it up. Great effort."

"Explosive malt flavor; lingers long, capped by the expected alcoholic rush at end. Outstanding. Tasty and sweet. This is an outstanding beer."

"Nice malt/alcohol balance. Creamy and full. This is a very well-made beer — be proud."

"Rich malty sweetness with nice warming alcohols behind it. Nice sweet finish. Mild esters in flavor. Very nice. Excellent brew."



BAVARIAN DARK

Category award sponsored by Crosby and Baker, Westport, Massachusetts

FIRST PLACE
Jay Hersh
Medford, Massachusetts

"Drunkel"

Munich Dunkel

Ingredients for 3 gallons

2	pounds Ireks two-row Pilsener malt
1 1/2	pounds Ireks Munich malt
3/4	pound Ireks Vienna malt
1/2	pound aromatic malt
1/4	pound CaraPils malt
1/8	pound chocolate malt
1/2	ounce Tettnanger hops (90 minutes)
1/2	ounce Styrian Goldings hops (five minutes)
	Wyeast No. 2206 liquid yeast culture
	force-carbonated in keg

- **Original gravity: 1.046**
- **Final gravity: 1.015**
- **Boiling time: 90 minutes**
- **Primary fermentation: four weeks at 48 degrees F (9 degrees C) in glass**
- **Secondary fermentation: 12 weeks at 32 degrees F (0 degrees C) in stainless steel**
- **Age when judged (since bottling): two months**

Brewer's specifics

Mash grains at 130 degrees F (54 degrees C) for 30 minutes. Raise to 152 degrees F (67 degrees C).

Judges' comments

"Good job. Good malt character, but could use some more. A little heavy on the roasted malt. Slightly bitter, drying finish detracts. Clean."

"Sweet malt balanced with hops. Quite a bit of hops in finish. Slightly astringent. Very well-made beer."

"Nutty, toasty flavor of malt blends very well with hops. Might be just a tad bitter, but very nice."

"Initial semisweet chocolate flavor dries out because of strong hop character. Needs a little more of the complex maltiness found in some beers of this style."

DORTMUND/EXPORT

Category award sponsored by Briess Malting Co., Chilton, Wisconsin

FIRST PLACE
Robert Henke
Whitefish Bay, Wisconsin

"Von Schnookulas Export"

Dortmund/Export

Ingredients for 5 gallons

6	pounds two-row malt
1 1/2	pounds rice
1 1/4	ounce Cascade hops, 5 percent alpha acid (60 minutes)
1/2	ounce Saaz hops, 4.4 percent alpha acid (five minutes)
	Wyeast No. 2042 liquid yeast culture
3/4	cup corn sugar to prime

- **Original gravity: 1.040**
- **Final gravity: 1.012**
- **Boiling time: 90 minutes**
- **Primary fermentation: 10 days at 55 degrees F (13 degrees C) in glass**
- **Secondary fermentation: 14 days at 50 degrees F (10 degrees C) in glass**
- **Tertiary fermentation: seven days at 35 degrees F (2 degrees C) in glass**
- **Age when judged (since bottling): five months**

Brewer's specifics

Boil rice for 45 minutes prior to mashing. Mash grains at 120 degrees F (49 degrees C) for 45 minutes. Raise to 140 degrees F (60 degrees C) for 45 minutes. Raise to 155 degrees F (68 degrees C) for 90 minutes. Raise again to 170 degrees F (77 degrees C) for 20 minutes. Sparge with 4 gallons of 180-degree-F (82-degree-C) water.

Judges' comments

"Very clean, with good hop flavor and balance. Very good aftertaste. Nice conditioning."

"Light and soft, quite clean with nice conditioning. Needs to have just a bit more hop assertiveness and a bit more body."

"Slightly light in color. Clean flavor, very pleasant. Malt-to-hop balance is slightly light for style. Excellent — I love it."

MUNICH HELLES

Category award sponsored by L.D. Carlson Co. (Formerly Wines Inc.), Kent, Ohio

FIRST PLACE
DONALD J. WEAVER
New Freedom, Pennsylvania

Munich Helles

Ingredients for 5 gallons

3	pounds Klages two-row malt
1 1/2	pounds lager malt
1 1/2	pounds Munich malt
1 1/2	pounds CaraPils malt
1 1/2	ounces Saaz hops, 3.1 percent alpha acid (45 minutes)
1/2	ounce Saaz hops, 3.1 percent alpha acid (20 minutes)
	Wyeast No. 2308 liquid yeast culture
3/4	cup corn sugar to prime

- **Original gravity: 1.045**
- **Final gravity: 1.012**
- **Boiling time: 90 minutes**
- **Primary fermentation: 26 days at 42 to 60 degrees F (6 to 16 degrees C) in glass**
- **Secondary fermentation: 16 days at 43 degrees F (6 degrees C) in glass**
- **Age when judged (since bottling): four months**

Brewer's specifics

Mash grains at 124 to 127 degrees F (51 to 53 degrees C) for 30 minutes. Raise to 147 to 155 degrees F (64 to 68 degrees C) for 60 minutes. Raise to 168 degrees F (76 degrees C) for five minutes. Sparge with 5 gallons of 168-degree-F (76-degree-C) water.

Judges' comments

"Sweetness is out of style. Warm fermentation qualities. Cool your ferment down a bit, maybe change yeast."

"Very good flavor and balance. Pretty darn close to commercial examples of style. Seemed to have just a bit of a soapy aftertaste, oxidized?"

"Tasty malt character well-balanced with tingly conditioning. Sweetish at first but dries out in aftertaste."

"Nice maltiness, but fades too quickly, astringent. Fusel alcohols are objectionable. Nice drinkable beer."

CLASSIC PILSENER

Category award sponsored by California Concentrates, Acampo, California

FIRST PLACE

STEVE AND TINA DANIEL

League City, Texas

"League City Pils"

German

Ingredients for 5 gallons

- **8 pounds Harrington two-row malt**
- **1 pound German light crystal malt**
- **1 pound Vienna malt**
- **1 pound domestic six-row malt**
- **2 ounces Tettnanger hops, 5 percent alpha acid (90 minutes)**
- **1 ounce Styrian Goldings hops, 4.9 percent alpha acid (15 minutes)**
- **homemade No. 308 yeast starter**
- **force-carbonated**
- **Original gravity: 1.049**
- **Final gravity: 1.012**
- **Boiling time: 90 minutes**
- **Primary fermentation: 14 days at 50 degrees F (10 degrees C) in stainless steel**
- **Secondary fermentation: one month at 32 degrees F (0 degrees C) in stainless steel**
- **Age when judged (since bottling): unknown**

Brewers' specifics

Mash grains at 151 degrees F (66 degrees C) for 90 minutes.

Judges' comments

"Dry, crisp, good hops and balance for style, slight buttery flavor, nice lingering aftertaste."

"Some initial sweetness, not quite enough bitterness to balance. Needs more hops in aroma."

"Not well-balanced — malt does not remain but there is a lingering bitterness."

"Light malt. Hops do not quite fit the category. Unbalanced for category."

"Good malt flavor could use a bit more hops to balance. Should finish a bit drier and crisper. Also just a bit fruity."

AMERICAN LAGER

Category award sponsored by Coors Brewing Co., Golden, Colorado

FIRST PLACE
Gene Muller
Westmont,
New Jersey

"King Bee Cream Ale"

Cream Ale/Lager

Ingredients for 5 gallons

- 4 pounds Mountmellick light malt extract
- 2 pounds Northwestern Gold malt extract
- 1/2 pound light German crystal malt
- 3/4 ounce Cascade hops, 5.5 percent alpha acid (20 minutes)
- 3/4 ounce Cascade hops, 5.5 percent alpha acid (dry)
- Wyeast American ale liquid yeast culture
- 3/4 cup corn sugar to prime

- Original gravity: unknown
- Final gravity: unknown
- Boiling time: 60 minutes
- Primary fermentation: four days at 60 degrees F (16 degrees C) in glass
- Secondary fermentation: seven days at 60 degrees F (16 degrees C) in glass
- Age when judged (since bottling): 14 months

Brewer's specifics

Steep grains for 15 minutes.

Judges' comments

"Nice light color, but could be lighter. Maybe a bit heavy with the hops. Clean, with very slight off-flavors."

"Dryish, husky astringent character. Nice chewy beer with appropriate malt-to-hop balance and crispness for style. Nice job!"

"Nice round flavor. Very nice job."

"Sweet. Dries as it finishes. Well-balanced and drinkable."

VIENNA/OKTOBERFEST/MÄRZEN

Category award sponsored by F.H. Steinbart Co., Portland, Oregon

FIRST PLACE
John E. Janowiak
Adelphi,
Maryland

"Dominion Day Oktoberfest"

Märzen/Oktoberfest

Ingredients for 5 gallons

- 6 2/3 pounds Bierkeller malt extract syrup
- 1 pound amber dry malt extract
- 1/2 pound 10 'Lovibond crystal malt
- 1/2 cup chocolate malt
- 1 ounce Cascade hops, 5.5 percent alpha acid (60 minutes)
- 1 ounce Hallertauer hops, 4.5 percent alpha acid (30 minutes)
- 3/4 ounce Tettnanger hops (one minute)
- Wyeast No. 2206 liquid yeast culture
- 1/2 cup corn sugar to prime

- Original gravity: 1.047
- Final gravity: 1.014
- Boiling time: 60 minutes
- Primary fermentation: 11 days at 45 to 50 degrees F (7 to 10 degrees C) in glass
- Secondary fermentation: 10 days at 45 to 50 degrees F (7 to 10 degrees C) in glass
- Tertiary fermentation: 15 days at 35 to 40 degrees F (1 to 4 degrees C) in glass
- Age when judged (since bottling): 11 months

Brewer's specifics

Steep grains until boil.

Judges' comments

"Clean maltiness, low hop bitterness, low hop flavor, could use a touch more malt grainy character. Keep an eye on fermentation temperatures to prevent esters."

"Some fruitiness, esters. Very good beer. Malt could use a boost."

"Clean. Malt flavors on subdued side. Hop level appropriate. Excellent beer."

"Good beer, nice balance. Seems to be missing a lot of lager character."

GERMAN-STYLE ALE

Category award sponsored by The Beverage People, Santa Rosa, California

FIRST PLACE
Bill Yearous
Galt, California

"Alt 2 B-A-Law"

Dusseldorf-style Altbier

Ingredients for 5 gallons

- 8 pounds two-row malt
- 2 pounds Munich malt
- 1 pound crystal malt
- 1/2 pound CaraPils malt
- 1 pound wheat malt
- 2 ounces chocolate malt
- 1/2 ounce Northern Brewer hops, 7.1 percent alpha acid (65 minutes)
- 1/2 ounce Cascade hops, 5.7 percent alpha acid (45 minutes)
- 1/4 ounce Cluster hops, 6.8 percent alpha acid (30 minutes)
- 1/2 ounce Cluster hops, 6.8 percent alpha acid (25 minutes)
- 1/4 ounce Cluster hops, 6.8 percent alpha acid (20 minutes)
- 1/2 ounce Saaz hops, 3.7 percent alpha acid (seven minutes)
- 1 ounce Saaz hops, 3.7 percent alpha acid (five minutes)
- 1/2 ounce Saaz hops, 3.7 percent alpha acid (three minutes)
- EDME dry yeast
- 3/4 cup corn sugar to prime

- Original gravity: 1.051
- Final gravity: 1.017
- Boiling time: 75 minutes
- Primary fermentation: five days in plastic
- Secondary fermentation: 60 days in glass
- Age when judged (since bottling): three months

Brewer's specifics

Mash grains at 158 degrees F (70 degrees C) for 60 minutes.

Judges' comments

"Medium malt, low to medium bitterness. Needs more bitterness."

"Malt predominates. I taste a little hint of chocolate! Nice dry finish and hops. Great beer, no major flaws. The chocolate detracts, might try a lower Lovibond malt."

"Dryness appropriate. Clean hop bitter finish. Could use a little more complexity."

"Slight clovelike flavor, not unpleasant. Malt good. Well-rounded altbier."

FRUIT BEER

Category award sponsored by The Purple Foot, Milwaukee, Wisconsin

FIRST PLACE
Gene Muller
Westmont, New Jersey

"Spike's Raspberry Imperial Stout"

Classic-style Fruit Beer

Ingredients for 5 gallons

- 6 pounds Williams dark malt extract
- 3 3/4 pounds Munton and Fison amber malt extract
- 1/2 pound Klages malt
- 1/2 pound Vienna malt
- 1 pound crystal malt
- 1/4 pound Munich malt
- 1 pound chocolate malt
- 1 9/10 pounds frozen raspberries
- 4 pounds rice extract
- 5 ounces lactose
- 2 ounces Perle hops (60 minutes)
- 1 ounce Northern Brewer hops (60 minutes)
- 1 1/2 ounces Nugget hops (30 minutes)
- 1 1/2 ounces Hallertauer hops (dry)
- 2 ounces Tettnanger hops (dry)
- Vintner's Choice Pasteur Champagne yeast
- 3/4 cup corn sugar to prime
- Original gravity: unknown
- Final gravity: unknown
- Boiling time: 60 minutes
- Primary fermentation: seven days in glass
- Secondary fermentation: 21 days in glass
- Age when judged (since bottling): five months

Brewer's specifics

Steep grains for 15 minutes. Steep raspberries for 20 minutes at end of boil.

Judges' comments

"Berries very subtle. Could use slightly more berries to make it in this class."

"Chocolaty and milky. Sherry flavor of imperial stout. Raspberry flavor subtle — should be bigger for category."

"Stout character good. Alcohol evident. Fruit missing. Very drinkable, lacks fruit."

"More fruit is needed. Slight sweetness nice."

HERB BEER

Category award sponsored by Marin Brewing Co., Larkspur, California

FIRST PLACE
Richard Mansfield and Mike Smith
San Jose, California

"Hallelujah Hallepenjah Pilsner"

Classic-style Herb Beer

Ingredients for 5 gallons

- 10 pounds Ireks German Pilsener malt
- 1 pound flaked wheat malt
- 1 1/2 ounces Saaz hops, 3.1 percent alpha acid (60 minutes)
- 1 ounce Saaz hops, 3.1 percent alpha acid (30 minutes)
- 1/2 ounce Saaz hops, 3.1 percent alpha acid (10 minutes)
- 6 deseeded jalapeño peppers (10 minutes)
- Wyeast Danish lager liquid yeast culture
- 3/4 cup corn sugar to prime
- Original gravity: 1.048
- Final gravity: 1.010
- Boiling time: 60 minutes
- Primary fermentation: five days at 50 degrees F (10 degrees C) in glass
- Secondary fermentation: 10 days at 45 degrees F (7 degrees C) in glass
- Age when judged (since bottling): unknown

Brewer's specifics

Mash grains for 30 minutes at 125 degrees F (52 degrees C). Raise temperature to 148 degrees F (64 degrees C) for 90 minutes. Raise to 169 degrees F (76 degrees C) for mash-out. Sparge with 170-degree-F (77-degree-C) water.

Judges' comments

"Good chili flavor. Not as bold as aroma. Good crisp base beer, well-balanced. This beer teased me with its aroma and bright appearance, but disappointed me by not being very hot. Need more heat from chilies."

"Low pepper heat — some builds after a while. Hop bitterness low for style. Dry, hoppy character not really there. Not a strong Pilsener."

"Pretty subtle — very tasty. Peppers not at all overpowering. Needs more hop character for Pilsener."

"Great pepper flavor without too much heat. Finishes a little astringent."

SPECIALTY BEER

Category award sponsored by Beer and Wine Hobby, Woburn, Massachussetts

FIRST PLACE
Ron Page
Middletown, Connecticut

"Chocolate Chambord Stout"

Classic-style Specialty Beer

Ingredients for 4 1/2 gallons

- 7 1/2 pounds pale malt
- 1 1/2 pounds wheat malt
- 1/2 pound crystal malt
- 1/2 pound chocolate malt
- 1/2 pound flaked barley
- 1/4 pound Hershey's® cocoa powder (30 minutes)
- 4 AAUs Cascade hops (60 minutes)
- 4 AAUs Perle hops (60 minutes)
- 1 tablespoon Chambord liqueur per bottle at capping
- forced carbonation
- Original gravity: 1.051
- Final gravity: unknown
- Boiling time: 60 minutes
- Primary fermentation: three weeks at 65 degrees F (18 degrees C) in stainless steel
- Secondary fermentation: six weeks at 35 degrees F (1 degrees C) in stainless steel
- Age when judged (since bottling): unknown

Brewer's specifics

Mash grains at 152 degrees F (67 degrees C) for one hour. Use chocolate in boil for 30 minutes.

Judges' comments

"Nice balance. Long-lasting aftertaste."

"Nice chocolate-raspberry flavor with bitter aftertaste of hops and raspberry. Nice balance!"

"Delicious raspberry-vanilla flavor. Slight charcoal flavor. Should have more hop bitterness for a dry stout."

SMOKED BEER

Category award sponsored by Jim's Homebrew Supply, Spokane, Washington

FIRST PLACE AND HOME-BREWER OF THE YEAR

PADDY GIFFEN

Cotati, California

"Kilts on Fire"

Smoked Scottish Wee Heavy

Ingredients for 5 gallons

- 4 pounds smoked Pilsener malt
- 4 1/2 pounds Belgian Pilsener malt
- 5 pounds amber dry malt extract
- 1 pound CaraVienna malt
- 3/4 pound Special B malt
- 1 pound Munich malt
- 1 pound British crystal malt
- 1/4 ounce Chinook hops (60 minutes)
- 1/4 ounce Chinook hops (30 minutes)
- 1/4 ounce British Blend hops (30 minutes)
- 1/2 ounce Liberty hops (30 minutes)
- Wyeast No. 1084 liquid yeast culture
- forced carbonation

- **Original gravity: 1.088**
- **Final gravity: 1.038**
- **Boiling time: 60 minutes**
- **Primary fermentation: 11 days at 65 degrees F (18 degrees C) in glass**
- **Secondary fermentation: eight weeks at 65 degrees F (18 degrees C) in glass**
- **Age when judged (since bottling): four months**

Brewer's specifics

Mash grains for 85 minutes at 154 degrees F (68 degrees C).

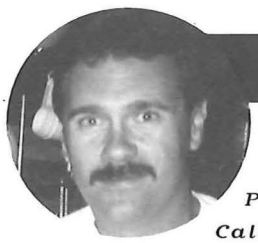
Judges' comments

"Strong malt and smoke flavors. They blend well together. Very drinkable smoked Scottish wee heavy, but you do have to sip it!"

"Very malty, nice smoke. Heavy! Puts hair on a chest. Nice job. I could only drink a half pint of this."

"Great malty flavor backed with fine smoke intensity. Superb in every respect. What a taste experience. On to the best-of-show."

"Excellent Scottish heavy. Sweet with good smoke character. Alcohol evident, but balanced."



CALIFORNIA COMMON BEER

Category award sponsored by Anchor Brewing Co., San Francisco, California

FIRST PLACE

DENNIS BELL

Pleasant Hill, California

"Existential Steam"

California Common Beer

Ingredients for 5 gallons

- 9 1/2 pounds Klages two-row pale malt
- 1/4 pound CaraPils malt
- 1 1/2 ounces Northern Brewer hops, 8 percent alpha acid (60 minutes)
- 1 ounce Cascade hops, 6 percent alpha acid (five minutes)
- 1 ounce Northern Brewer hops, 8 percent alpha acid (dry-hopped for five days)
- Wyeast No. 2007 Pilsener liquid yeast culture
- 3/4 cup corn sugar to prime

- **Original gravity: 1.040**
- **Final gravity: 1.005**
- **Boiling time: 60 minutes**
- **Primary fermentation: four days at 55 degrees F (13 degrees C) in glass**
- **Secondary fermentation: seven days at 55 degrees F (13 degrees C) in glass**
- **Age when judged (since bottling): unknown**

Brewer's specifics

Mash grains for 60 minutes at 150 degrees F (66 degrees C).

Judges' comments

"Needs more body. Nice job! Could be a tad darker."

"Good flavor profile — nice pungent hop character. Dry, could use a bit more residual malt flavor. Nice clean beer."

"Dryish finish, low malt character, balanced bitterness. Lacks rich body."

"Toasted malt flavor with a bitter aftertaste. Taste is just a bit on the thin side. Dry. A well-made beer."

"Malt comes through up front nicely but not quite enough for style. Didn't miss by much, though. Need to balance bitterness with a tad more malt."

WHEAT BEER (ALE)

Category award sponsored by American Homebrewers Association, Boulder, Colorado

FIRST PLACE

WALTER DOBROWNEY

Saskatoon, Saskatchewan, Canada

"Old Boots"

German-style Weizen/Weissbier

Ingredients for 5 gallons

- 5 1/2 pounds wheat malt
- 3 1/4 pounds two-row barley
- 1/2 ounce Hallertauer hops, 2.9 percent alpha acid (120 minutes)
- 1/4 ounce Hallertauer hops, 2.9 percent alpha acid (50 minutes)
- 1/4 ounce Hallertauer hops, 2.9 percent alpha acid (15 minutes)
- Brewers Resource CL62 yeast culture
- 1 4/5 quarts wort to prime

Original gravity: 1.050

- **Final gravity: 1.012**
- **Boiling time: 120 minutes**
- **Primary fermentation: seven days at 62 degrees F (17 degrees C) in glass**
- **Secondary fermentation: 12 days at 62 degrees F (17 degrees C) in glass**
- **Age when judged (since bottling): four months**

Brewer's specifics

Use a single decoction mash as outlined in *German Wheat Beer* by Eric Warner (Brewers Publications, 1992). Mash-in at 104 degrees F (40 degrees C) and heat to 122 degrees F (50 degrees C) for 25 minutes. Pull decoction of about 40 percent of the mash volume. While maintaining the rest mash temperature, heat decoction to 160 degrees F (71 degrees C) for 15 minutes. Raise decoction temperature to boiling for 20 minutes. Mix the two mashes, adjust and hold temperature at 147 degrees F (64 degrees C) for 20 minutes, then raise temperature to 160 degrees F (71 degrees C) until conversion. Heat to 170 degrees F (77 degrees C) and sparge.

Judges' comments

"Gushed when opened. Clove up front then transforms to a sweet finish. Some vanilla and cinnamon flavors too."

"Main problem is gushing. Otherwise nice, well-balanced. Good clean cloves with just a slight sweetness on the finish."

"Foamed over like crazy on opening. Nice aromatics."

"Gusher, but no off-aromas. Slight sweet aftertaste, not overpowering for a wheat beer."

TRADITIONAL MEAD

Category award sponsored by Havill's Mazer Mead Co., Wilmington, Delaware

FIRST PLACE AND MEADMAKER OF THE YEAR

WALTER DOBROWNEY

Saskatoon, Saskatchewan, Canada

"Amber Glow"

Still

Ingredients for 5 gallons

18 1/2 pounds clover honey
Lalvin EC-1118 dried yeast
3 teaspoons Andoviin yeast nutrient

- **Original gravity: 1.120**
- **Final gravity: 1.012**
- **Primary fermentation: two weeks at 65 degrees F (18 degrees C) in glass**
- **Secondary fermentation: 4 1/2 months at 65 degrees F (18 degrees C) in glass**
- **Age when judged (since bottling): 13 months**

Judges' comments

"Nice honey. A little hot (high alcohol for body). Very nice."

"Appropriate sweetness. Warming alcohol. Some higher alcohols — a little hot."

"Medium-sweet honey up front. Complex middle with nice finish. Slight sherry character, perhaps a bit oxidized."

"Warming, alcoholic. Good honey expression. A little sweet for a medium. Slightly sour."

MELOMEL, CYSER, PYMENT, METHEGLIN

Category award sponsored by National Honey Board, Longmont, Colorado

FIRST PLACE

GORDON OLSON

Los Alamos, New Mexico

"Peach Mead"

Still

Ingredients for 5 gallons

17 pounds blended clover honey
11 pounds pitted puréed peaches
Red Star Prisse de Mousse dried yeast
stabilizing tablets

- **Original gravity: unknown**
- **Final gravity: 1.008**
- **Primary fermentation: three weeks at 69 degrees F (21 degrees C) in glass**
- **Secondary fermentation: three months at 64 to 68 degrees F (18 to 10 degrees C) in glass**
- **Age when judged (since bottling): nine months**

Brewer's specifics

Boil 12 pounds of honey for 15 minutes. Add peaches and hold at 160 degrees F (71 degrees C) for 15 minutes. After three weeks, rack off fruit and add 3 pounds of honey boiled with one gallon of water for 15 minutes. After five additional weeks (specific gravity is 0.994), rack again and add 2 pounds of boiled honey with stabilizing tablets.

Judges' comments

"Sweetness works with honey and fruit. Strong alcohol."

"Definite peach aroma. Sweet. Medium acidic finish. Well-made and clean."

"Sweet. Earthy undertones. A little out-of-balance. Peach is subtle."

"Soft kiss of peach and very delicate honey in support. Delicious! Soft finish — like a kiss. No harshness in finish at all."

CIDER

Category award sponsored by Lyon's Brewery of Dublin, Dublin, California

FIRST PLACE AND CIDERMAKER OF THE YEAR

GABRIEL OSTRIKER

Somerville, Massachusetts

"Still No. 1"

Still

Ingredients for 5 gallons

blended regional apple juices
wild yeast

- **Original gravity: 1.055**
- **Final gravity: 1.005**
- **Primary fermentation: one month at 60 degrees F (16 degrees C) in plastic**
- **Age when judged (since bottling): unknown**

Judges' Comments

"Very clear, no sediment. Nice apple aroma. Good color. Body could be a hint bigger, but it is very nice. Nice sweet flavor balanced well with acidity. Nice aftertaste. Great job. Makes you want to drink more."

"Good fill with no sediment. Apply nose. Brilliant pale yellow. Well-balanced. Slightly thin-bodied, but not a big flaw. Very good cider. Slightly sweet, would be good with dessert."

FIRST PLACE
AND SAKÉMAKER
OF THE YEAR
JIM LONG
Sacramento, California

"Ichiban"
Saké

Ingredients for 3 gallons

10	pounds short-grain rice
1 1/2	pounds rice koji
2	gallons and 1 1/4 quarts water
3/5	teaspoon wine yeast nutrient
1 1/4	teaspoon Morton salt substitute
	yeast culture from Hakusan Saké, Napa, Calif.
1	package finings

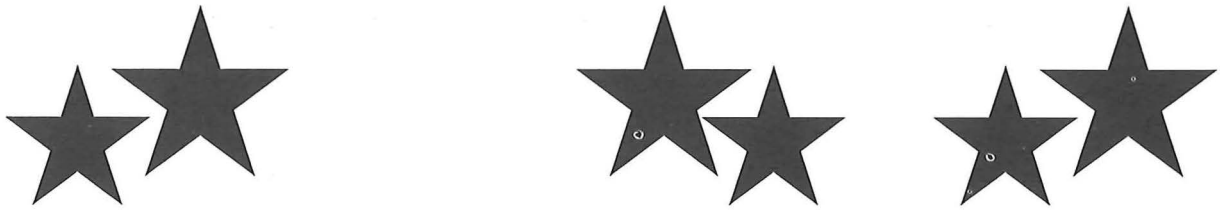
Brewer's specifics

Standard saké brewing uses three steps; moto (yeast mash), moromi (main ferment) and yodan (stabilizing step). In the moto step, a "yeast starter" is made and gradually built up during the moromi step with three additions of rice, water and koji over a four-day period. Yodan is a final addition of water that adjusts the alcohol content of the saké. A secondary ferment is used to mature the final product. For specific saké brewing techniques, refer to ***zymurgy*** Fall 1982 (Vol. 5, No. 3). A saké newsletter published by Fred Eckhardt is available from The Saké Connection, PO Box 546, Portland, OR 97207.

Judges' comments

"By far the best. Delicate. Good clean nose, no heavy acidity."

"Excellent flavor. Good balance. Very pleasant."



BY JAMES SPENCE

1993 HOMEBREWER OF THE YEAR

PADDY GIFFEN

Award sponsored by Munton and Fison of England.

Paddy Giffen is an advanced homebrewer who brews on an electric stove using two five-gallon enamel canning kettles and a food-grade plastic bucket with a sparging bag/vegetable strainer for a lauter-tun. His winning "Kilts on Fire" smoked Scottish wee heavy is a half-extract and half-grain recipe. "I don't really have room for any more equipment in my place," says Giffen. "I do mostly single infusion mashes, except for wheat beers, where I do a protein rest as well." He uses fresh Wyeast liquid yeast packages with starters for each batch. After a few trouble-free years of sanitizing with the standard one ounce of bleach per five gallons of water and a half-hour soak, he has switched to iodophor because it's easier and quicker. He doesn't rinse after sanitizing. Ferments are at room temperature in his Northern California home.

Giffen started homebrewing about eight years ago in Berkeley. An acquaintance of his father-in-law gave him his first taste of homebrew. While working in a government shipyard, Giffen started brewing with Dale James and Kevin Cox, both employed at Butterfield Brewery in Fresno. He bought supplies at Wine and the People in Berkeley and used James' equipment to brew extract beers. "They were all pretty good," says Giffen, "We had a few bad batches, but that's about it." After graduating in computer science, Giffen worked in the field for two years after moving to Sonoma County. "I didn't like either one of the computer jobs I had, and right about then the recession hit. Byron Burch offered me a job at The Beverage People in Santa Rosa. I had previously taken Nancy Vineyard's advanced homebrewing class."

Giffen now works full time at The Beverage People. He believes the network provided by the Sonoma Beerocrats and the people he meets in the shop have contributed to his successful brewing. "I taste a lot of other homebrews which helps me detect flaws in my own beers. As a Beer Judge Certification Program judge, I have really become familiar with different beer styles, which also helps me formulate recipes."

Giffen has won at least one award in each of the seven years he has been competing in the National Homebrew Competition. In 1990 and 1993 he took best-of-show at the Home Wine and Beer Trade Association's National Competition. He has also won at the California State Fair Competition.

"The best advice I can give to brewers is to brew clean beer. If you brew clean beer, you'll enjoy brewing and drinking it and you'll improve your brewing." Giffen also believes that homebrewers should taste and study as many beer styles as they can, and that the best way to do this is through the Beer Judge Certification Program. "Homebrew is the freshest beer product brewed to style there is," says Giffen."As a judge you really learn what goes into a style of beer."

Giffen lives in Cotati, Calif., with his wife, Leslie, and 16-year-old son, Seamus. He recently began brewing with Marin Brewing Co. in Larkspur, on a part-time basis. He'd like to work in the commercial brewing industry at some point.

1993 NINKASI AWARD WINNER AND MEADMAKER OF THE YEAR

WALTER DOBROWNEY

Ninkasi Award sponsored by Pete's Brewing Co., Palo Alto, Calif., and Meadmaker of the Year Award sponsored by Havill's Mazer Mead Co., Wilmington, Deleware

"One of my first batches of beer was an all-grain batch from one of Dave Line's books," says Walter Dobrowney, "It was kind of scary. I did extract batches for a year or two after that until I got better. Before that, it was sort of a hassle." Dobrowney has the distinction of being this year's Ninkasi Award winner and Meadmaker of the Year. In addition, his first-place wheat beer was one of the three remaining in the best-of-show competition before the judges chose Paddy Giffen's smoked Scottish wee heavy.

A trip to England in 1986-87 first roused Dobrowney's interest in homebrewing. The variety of beer styles in the pubs was much more extensive than was available in Saskatoon, Saskatchewan, Canada, where he lives with his wife and five children. "I wasn't really familiar with other beer styles because they haven't been available where I live," he says. "I brought back a couple of homebrewing kits from England and that's how I got started." Dobrowney was especially interested in the wide range of flavor profiles he could find in one style of beer. Pale ales and bitters in England can taste much different from pub to pub.

The main reason he entered the National Homebrew Competition was to "see how close I was shooting to styles." He entered a total of 16 beers and meads. "Up here, there aren't many opportunities to have others taste your beer."

Dobrowney is especially excited about winning the Ninkasi Award

because, as part of his award, he worked with Pete Slosberg of Pete's Brewing Co., in Palo Alto, Calif., to develop a recipe for Pete's Wicked Winter Beer, of which about a million bottles will be distributed coast to coast. "I had a recipe already that we based the final choice on. Since then, I've brewed a batch to see how it'll come out." Pete's Brewing Co. also had Dobrowney present at the first brewing of the beer in September. He also receives, compliments of Pete's Brewing Co., a two-week course at the Siebel Institute of Technology in Chicago. "The Siebel course will open up a lot of new areas for me," said Dobrowney.

Brewing mostly in the winter, Dobrowney adjusts the temperature in his fermentation room simply by opening and closing a window. A freezer big enough for 12 kegs keeps his beer well-lagered. He brews with stainless-steel pots and propane burners, a home-built lauter-tun and an immersion wort chiller. Now he brews primarily all-grain batches, using single-infusion mashes and step mashes depending on the style of beer he's brewing. Extracts are sometimes used to boost the gravity of stronger beers. He enjoys barley wines in the wintertime, but during the summer he drinks light, low-gravity lagers. Pale ales, Oktoberfests and Viennas also are among his favorite styles. He's experimented a lot with wheat beer brewing. "I've tried sour mashing three or four times, but it's difficult to get consistent results." He's currently experimenting with lambic-style brewing.

Dobrowney's meads are made from unfiltered honey supplied by a local beekeeper. Honey is used in his household in place of sugar. "We don't have any sugar in the house, so we're always using honey for something," he said. "I've also used honey that my mom has brought from Edmonton." The traditional mead that won best of show was only his second traditional mead. Other meads have used herbs and fruit. Dobrowney boils the honey for five to 10 minutes, skimming the surface to remove the solid material, then cools and ferments the must. He brewed his first mead in 1989, a ginger mead from a recipe in Charlie Papazian's *The Complete Joy of Home Brewing* (Avon, 1984).

The 37-year-old homebrewer believes maintaining consistency in his brewing procedures has helped him a lot. He also reads a lot. "The number of books and publications has really increased in the past few years," he says. "The biggest help to me was Greg Noonan's book (*Brewing Lager Beer*, Brewers Publications, 1986). It has almost everything you need to know." Without access to a homebrew club, Dobrowney reads as much as he can to improve his brewing. "Every time a new book comes out, I buy it."

1993 CIDERMAKER OF THE YEAR

GABRIEL OSTRIKER

Cidermaker of the Year. Award sponsored by Lyon's Brewery of Dublin, Dublin, Calif.

Gabriel Ostriker found a book about the traditions and processes of making cider by English cidermaker Jo Deal in a used bookstore. It was that book that got him interested in cidermaking. "My first batch was a complete mess," says the 23-year-old, from Somerville, Mass. Ostriker's ciders are made with juice from local and regional orchards. He does plan to start a small orchard on some land that his parents own in Massachusetts, and would like to obtain some true English cider-apple tree shoots to grow. "The English cider trees were wiped out in this country during the 1930s because they had fallen into disrepair and had diseases that were harming the culinary apple trees." Ostriker believes true cider apples deliver a cider with more body, tannins and other flavors that he enjoys. He has had the pleasure of tasting English cider in pubs and in small towns and orchards where the cider is brewed by homebrewers and farmers.

Ironically, Ostriker has yet to brew a batch of beer. Cider is his exclusive passion, and the first-, second- and third-place awards he took in the National Homebrew Competition prove that since his first batch he has spent a lot of time perfecting his techniques. His third-place 'Symphony Crantastique' was a blend of apple juice and cranberry juice he pressed from whole cranberries. He ferments with the natural wild yeasts that remain in the unfiltered and unpasteurized juices he uses. He has tried Champagne yeasts, but finds them difficult to use. "I haven't been happy with the results," Ostriker says "The yeast eats and eats and eats, and you can't stop it." He prefers ciders somewhat low in alcohol, about 7 percent, with final gravities between 1.005 and 1.015.

To make his ciders, Ostriker uses one Campden tablet per gallon, which kills the less hardy yeasts and bacteria. The remaining yeasts take over the environment and ferment the must. Ostriker has had widely different results depending on the kind of apples the juice comes from. "I tried a batch with just-pasteurized apple juice, but I'm not proud of it," he says. "Different apples can have different yeasts and vast differences in flavor."

Ostriker urges cidermakers to be patient while learning the craft. "I did it for years before I got something I liked. It takes a while. Let cider age for at least six months before you even try it. Two-year-old ciders can be fantastic." Despite the reluctance some people have for using sulfites, Ostriker believes experimenting with Campden tablets is important. "Otherwise, you can't control the fermentation and you get off-flavors."

Ostriker has a bachelors degree in music specializing in vocal performance. He lives in Somerville and works as a bicycle courier.

★ ★ ★ 1993 SAKÉMAKER OF THE YEAR

JIM LONG

Sakémaker of the Year. Award sponsored by Hakusan Sake, Napa, Calif.

Sakémaking is actually easier than beermaking, according to Jim Long of Sacramento, Calif. "The rice koji does the 'mashing' for you, so you don't have to worry about maintaining mash temperatures and conversion like you do in beer brewing," he says. "The most difficult part of saké brewing is pressing the saké, because you usually need another person to help."

Saké is made from rice and rice koji, a unique fungus that converts rice starch to sugar and at the same time ferments the sugar into alcohol. While fermenting, saké looks more or less like a batch of beer being mashed. "You have this kind of rice mush," says the 37-year-old Long, "When you're through fermenting, you have to squeeze the liquid out of the mush." Long uses a fruit press for this task, and the resulting liquid is allowed to settle and clear.

Seven years ago, while studying business at Sacramento State University, Long walked into a homebrew supply shop to buy ingredients to make wine, and saw some homebrew kits. "At that time I didn't even know you could make beer, and I thought 'I'd rather drink beer than wine,' so I bought the beer-brewing kit instead." After checking out books on brewing at the university library, Long whipped up his first batch, a pale ale.

Currently, Long uses a gravity feed system made from converted kegs. Electric hot water heating elements are mounted inside the kegs. He has plans to build a recirculating infusion mash system. "When I'm finished, it will be really easy to brew, just flip some switches and set the thermostats and you're all set." With a new baby among his three children, Long has not had much time to brew in the past few months, but he's hoping his new system will enable him to brew more often.

For saké brewing, Long uses a rice steamer and a refrigerator for controlling fermentation temperatures. "Maintaining a consistent fermentation temperature is the secret to making good saké," says Long, "The koji is very sensitive to temperature and you want the yeast to be fed slowly instead of getting a big burst of sugar." Sanitation is less critical, Long believes, because saké may be more acidic than beer wort. Part of the saké brewing process is mixing additional proportions of water, rice and koji into the batch over several days.

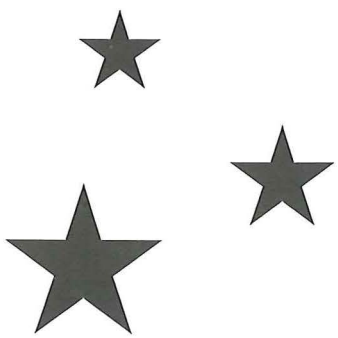
To do the mixing, saké brewers usually use their bare hands.

For his winning batch of saké, Long used yeast from the Hakusan Saké brewery in Napa. "They thought it was kind of weird that I wanted some of their 'kasu,' especially when I pulled out my sterile jar to put it in. Kasu is really just waste material that is used for pickling. It's a rice cake they have pressed through membrane filters that contains enough yeast to work on my saké batches. I just crumbled it into my batch and it took right off."

Long has been interested in Japanese culture and foods for some time, and has plans to learn the language. He would like to help brew at the regional saké breweries. "They seem a bit secretive about some of their processes. You tour a brewery and some pieces of equipment are covered up. If you ask they tell you it's one of their trade secrets. I'd really like to know what's under those covers."

In 1992, after Long's wife, Tina, won Sakémaker of the Year, he called Hakusan Saké, the sponsor of the category, and asked for a tour. "Michael Chramko was really great. I asked if we could bring some friends and he said to bring whomever we wanted. We ended up with about 20 people out there tasting saké and enjoying the brewery."

Long is experimenting with fruit sakés and his "apple saké," a combination of saké and hard cider, took second place in the National Homebrew Competition this year. His believes his interest in herb and fruit beers led him to try brewing saké two years ago after reading a copy of the *Saké Connection*, a newsletter published by Fred Eckhardt of Portland, Ore. "I'd really like to thank Fred for all his work in this area," says Long, "He has a lot of knowledge and he has always been willing to share it with brewers."



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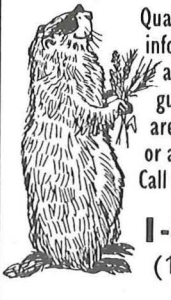

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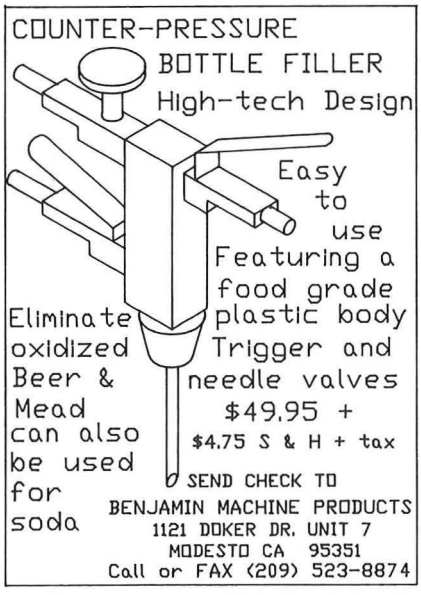

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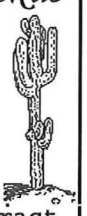

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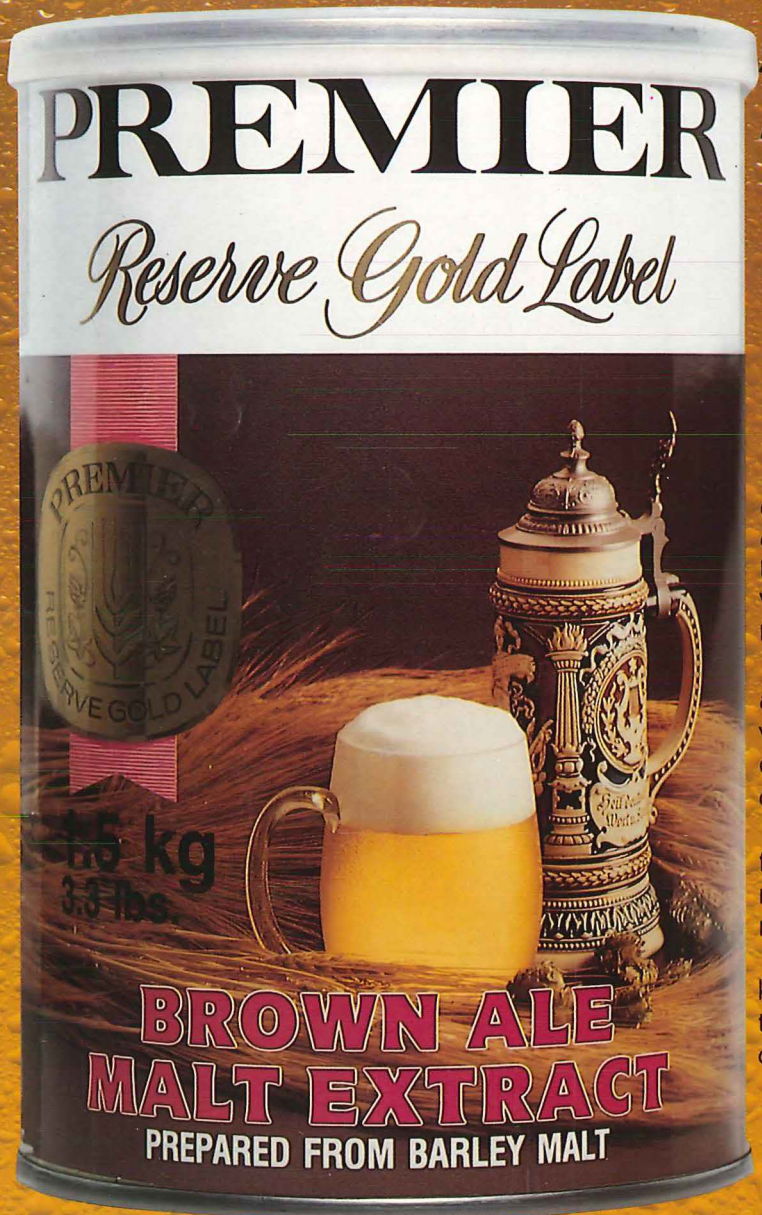

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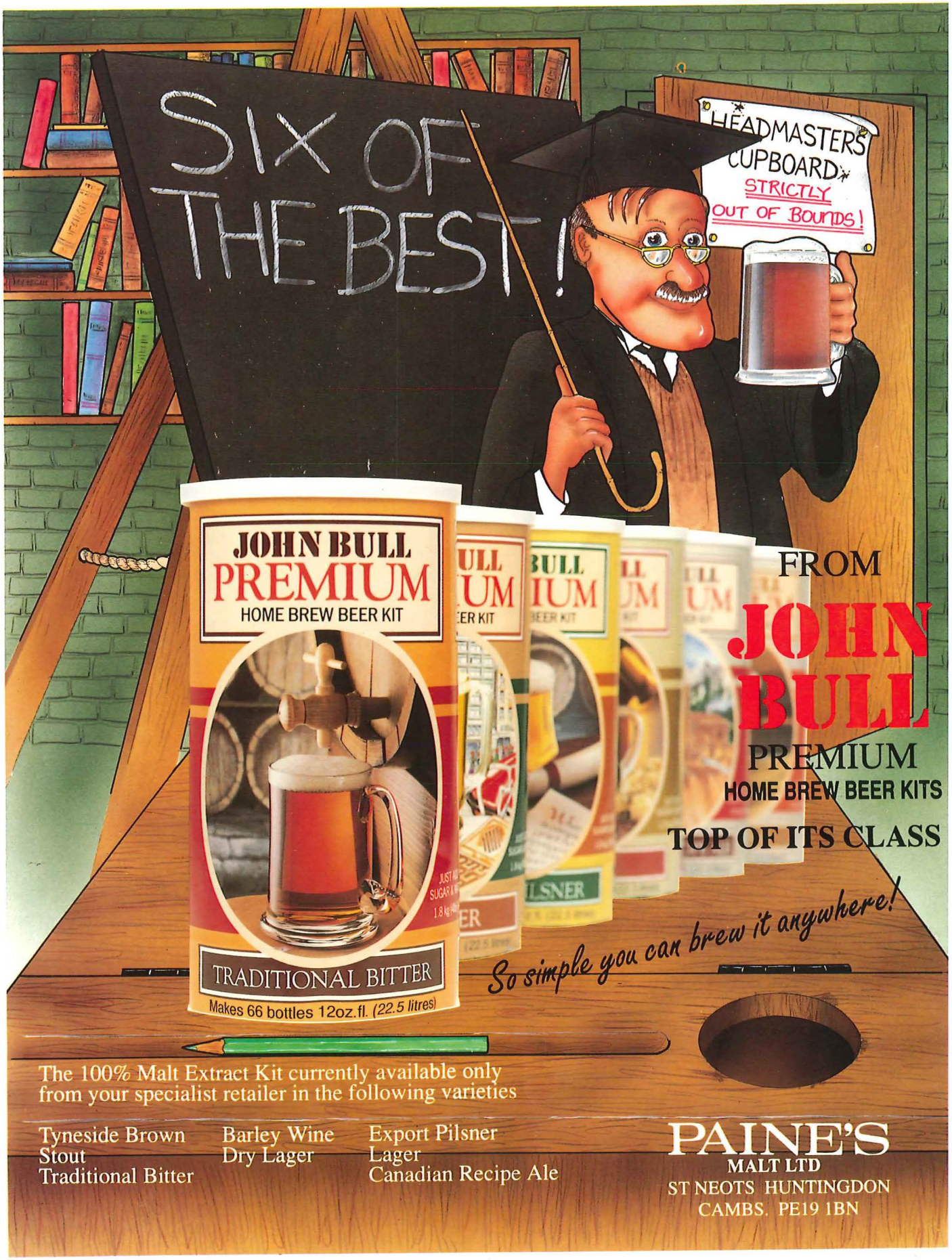

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