

Sourdough Bread

By Bob Hurt, <http://bobhurt.com>, Wednesday, March 02, 2005; revised 21 July 2007

Sourdough Bread in a Nutshell

1. Use starter with flour and water to make sponge
2. Mix flour, water, and salt with the sponge to make dough
3. Knead the dough, let it rise, and bake it.



Notes:

1. Use only unchlorinated water. Chlorine kills the bacteria that give the bread its great taste.
2. I use King Arthur Unbleached Bread Flour, which consists mostly of hard winter wheat, plus barley. It has the high (13%+) protein content needed for developing the gluten that makes the bread stick together and rise properly.

Figure 1 Sourdough Loaves

Sourdough Bread Overview

Sourdough bread typically has a tangy flavor and chewy texture that makes the bread delicious and enjoyable to eat.

The sourdough from which you make the bread contains bacteria and yeast indigenous to an area of the world. Most Americans enjoy the unique taste and texture of San Francisco sourdough bread because of the characteristics resulting from the baking technique and the specific bacteria and yeast combination naturally occurring in the San Francisco Bay area.

If you mix flour of your area of the world with unchlorinated water and sugar, and let it sit in an open room with a layer of cheesecloth over the container, within a week or so the local bacteria and yeast will make the mix start bubbling and developing a sour smell and taste. You will then have your own starter. You can accomplish a similar result overnight by using a sourdough starter (culture) you have purchased or previously developed.

You can obtain starters from other areas of the country or world and use them to make sourdough breads typical of that area. For example, you can make San Francisco sourdough bread virtually anywhere if you provide the right environment for fermentation.

Bacteria takes a day or more to mature in the dough, so the natural yeast in the dough must not mature too quickly, or it will deplete too early and the bread won't rise properly in the oven. The bacteria produces acetic acid (vinegar) which creates the tangy flavor and chewy texture, while the yeast produces alcohol ("hooch"), and both produce gases that create bubbles in the mixture that would make bread dough rise. Pioneers usually carried live sourdough culture ("starter") with them and both made bread from it and fed it daily with a little flour and bread water to keep it alive.

You have to let the sourdough ferment much longer than yeast bread because the bacteria colony takes considerable time to grow. Each sourdough ferments best at its own temperature for its own time unique to the specific bacteria and yeast in the dough.

You can bake sourdough bread in bread pans (ideal for school lunch sandwiches or finger sandwiches to serve with tea) or in hand-formed loaves, boules, or baguettes. By varying the recipes, you can make sourdough pancakes, waffles, English muffins, crostini, and panettone.

About Sourdough Starter

Dry starter consists of wet starter that has dried out. Dry starter does not get messy, as wet starter does when you send it in the mail. You can make dry starter by spreading a thin layer of wet starter on a Teflon cookie sheet, letting it sit for a few hours to dry, then pulverizing the resulting flakes to make a powder. You can reconstitute dry starter by mixing it with equal weights of flour and water and letting it sit covered overnight. If it produces a bubbly spongy goo the next morning, the starter works well.

Wet starter provides a source of yeast to make the bread rise, and a source of bacteria to make it tasty and chewy. Store-bought commercial yeast has great rising power and contains no bacteria. Sourdough starter yeast typically has a wild nature. People can keep it alive for centuries, as have the people of Russia and Europe, by periodically feeding it water and yeast food (starches like potatoes or flours of rye, wheat, rice, barley, spelt, and other native grains).

These days most commercial yeasts consist of dry granules that you don't need to feed, and that last for years in the refrigerator. You normally keep home-cultivated yeast/bacteria cultures ("starters") in the form of a spongy or doughy goo in a plastic or glass jar in the refrigerator. Bakeries keep their starters unrefrigerated in the kitchen, and feed them religiously every 6 to 8 hours.

You can make starter yourself by mixing some flour, water, and sugar together to make a batter, and then letting it sit around covered with a cloth in your kitchen for a week or so. Bacteria of some kind will start growing, as will wild yeast. Getting the right strain of bacteria took some luck in the past, but today you can buy starters with specific strains from a variety of sources. Not all sourdough starters contain the cultures that produce the same-tasting bread you can get in San Francisco. Most starters contain lactobacillus which grows best at 92°F.

If you use the Carl Griffith 1847 Oregon Trail sourdough starter (available for a mere donation via the internet), and you receive it in powdered or granulated form, you can reconstitute it by putting a teaspoon of it in a tablespoon of luke-warm water (less than 100 degrees), and letting it sit 3 or 4 hours to soften the granules. Then add more water, a little sugar, and enough flour to make a thick batter. If you let it sit in a 90°F area (like an oven with the light on, door slightly ajar if in summer) for a couple of hours, you will notice it bubbling up and making a spongy starter.

You can leave the starter at room temperature in a glass or plastic container loosely covered with a lid to keep the dust out while letting the gas escape. If you bake bread daily, you should feed the starter every 6 to 8 hours with water and flour. If you bake bread only weekly, you can put the starter in the refrigerator and feed it once a week.

The liquor that forms on the top of the starter that sits a long time without being fed has the name of "hooch." It consists mostly of alcohol. You can drink it, pour it out, or stir it in.

If you end up with too much starter, you can throw the excess out, or make bread from it.

You do not need much starter to make sourdough bread. However, you can make less-tart bread by using more starter (a good way to get rid of the excess) in your dough. This will make it

rise fairly quickly, but not allow it to develop the tangy taste because bacteria take many hours to grow and develop that tartness. You will still get a nice loaf of bread, but it won't be much like sourdough bread, even though you've used sourdough starter.

Overview of the Sourdough Bread Making Process

The bacteria and yeast in the starter make the best kind of bread if you build their colonies in cycles. Begin with a small amount of starter and an equal weight of flour and water, let it sit 9 hours to make a sponge, add flour and water each of the same weight as the sponge, let it sit 8 hours, add flour and water each of the same weight as that sponge, and let it sit 3 hours. You will have just used the "tripling" method of making sponge. If you start with 20 grams of starter (a heaping teaspoon) you end up with 540 grams (about 1.2 pounds) of sponge.

To that sponge, you add 10% of the sponge weight in salt, 5 times the sponge weight in flour and 3 times the sponge weight in unchlorinated water to make the dough. If you start with 540 grams of sponge, you will use 2.7 kilograms (about 6 pounds) of flour, 1.62 kilograms (about 3.6 pounds) of water, and 54 grams (about 3 Tablespoons and 1 teaspoon) of salt. Knead those ingredients for about 5 minutes, cover and let it rise several hours to 1.5 times the size, stretch and poke it with fingers of both hands pointing downward, fold it, repeat the stretch and fold two times to redistribute bubbles, form it into loaves, cover them, give them a final rise, slice the top to keep oven rise from breaking the crust, and bake it at a fairly high temperature with mist or a pan of boiling water in the oven to make a crunchy crust.

During the rises, you let the dough rise slowly to allow the bacteria to grow and impart the tangy flavor. You must prevent the yeast from depleting the food before the dough gets tart. With some starters, such as San Francisco, you must ferment the dough in a cool, humid atmosphere, such as by enclosing it above (but not on) cubes of ice inside an ice chest overnight. If the yeast depletes the food, it stops producing gas, and the dough does not rise sufficiently to make a large-bubbled crumb in the finished bread.

Rye flour tends to make the starter's bacteria grow better, so wisdom dictates mixing rye and a gluten-forming wheat 50-50 with an equal weight of water to feed the starter. But you can also mix in raw or cooked potatoes, leftover cooked rice or pasta, some crushed grapes, a little sugar or honey, and so on. Sugars make the yeast grow (replicate) very fast.

Making Sponge – Tripling Method

Regardless of the kind of starch you use in the starter, you can select any kind of high-protein flour to make the bread dough. To do this, you use the tripling method to make a sponge, which you will add to the dough later. You take a small amount of the starter (a teaspoon, for example), stir in an equal weight of water and equal weight of flour, and let it sit a couple of hours at about 80°F. It will rise up into a sponge. Then you repeat that process twice more, letting it sit for about 8 hours each time. In the end, you will have 9 times the original weight of the starter (you triple the weight three times), half a cup or more.

The above tripling method could be done scientifically by allowing the sponge to sit till its pH level falls below 4.3, indicating high acidity as a result of the growth of bacteria. Since most people don't have a pH meter, it is best to use the times indicated, assuming you can control the temperature. Some people actually build a sponge and dough incubator with temperature controls, and they do get good bread that way. But it is not necessary.

I have prepared tables below that show you the proper proportions of flour, water, and starter to use in order to produce the sponge.

Making the Bread

Bread - Now, to make the bread, you weigh the starter and put 5 times that weight of flour and 6 times that weight of water and 2% of that weight of salt in a bowl, stir it to get the flour wet, and let it sit for 15 minutes. Then you add the starter and knead the dough by hand 10 to 15 minutes till it is silky and soft. It will be sticky. Try to enjoy it. Put the dough in an oiled bowl, cover it with plastic wrap, let it rise in a covered bowl 2 or 3 hours (nearly double) at 92°F, squash it and pull it a few times, let it rise another couple of hours at 92°F, shape it into a loaf, and bake it at 450°F for 30 minutes to an hour (depending on whether the loaf is huge or long and skinny). Why 92°F? Because that is the perfect temperature for the interesting bacteria to replicate. And that is what makes the bread chewy and a little sour tasting.

Here are the specific instructions for making the sourdough bread the way I have learned to do it. If the grams weights bother you, don't worry. Just refer to the tables that follow this description.

1. 5 grams starter with 5 grams flour and 5 grams water = 15 grams, and let it sponge at 80-85°F for 2.5 hours
2. 15 grams sponge with 15 grams flour and 15 grams water = 45 grams, and let is sponge at 80-85°F for 8.5 hours
3. 45 grams sponge with 45 grams flour and 45 grams water = 135 grams, and let it sponge at 80-85°F for 8 hours. By this time the bacteria will be nicely developed. If you are not able to make the dough immediately, refrigerate the sponge, then allow it to sit at room temperature for 2 hours when you are ready to make the dough.
4. 900 grams King Arthur bread flour, 18 grams salt, and 540 grams water. Mix till ingredients wet, let it sit (autolysis) for 20 minutes.
5. Add 135 grams sponge and knead 7 minutes. Put in oiled bowl, cover with plastic wrap, and let stand 2.5 hours at 92°F.
6. Pull and fold the dough in half ten times, then cut it into loaf portions, form into loaves, slice the tops, cover with oiled plastic wrap, and let stand at 92°F till nearly double in size. This might take 2 to 3 hours. If you let them rise in the refrigerator, that will give the bacteria more time to grow, and the dough will become tarter. You will need to let them rise longer, maybe up 4 to 7 hours. If you let them rise too long, there will be no "oven-spring" rising. I think oven spring is nice, but not necessary.
7. Sprinkle cornmeal on baking stone or into greased pans, gently place loaves on them, and bake at 550°F with pan of already boiling water in bottom of oven. Quickly spritz the oven bottom and walls with hot water every 3 minutes for 9 minutes. After 9 minutes, reduce heat to 425°F. Bake skinny loaves 20 minutes and fat loaves 35 minutes, and full bread pan loaves 45 to 50 minutes. If you have a probe thermometer, you can stick it into the center of the loaf and stop baking the bread when the internal temperature reaches 190°F.
8. For shiny loaves, brush them with milk or a mixture of milk and egg 15 minutes into baking.

I start making the sponge around noon on one day, let the sponge rise over night, and then make the dough the next morning. It makes a nice weekend project.

Sourdough Sponging, Mixing, and Baking Details						
Stage	Weight Grams/kg	Equiv Weight Ounces/ Pounds	Flour	Water	Salt	Time
Single Recipe (two loaves)						
Sponge 1	5 grams	0.18 ounces	1.6 tsp	1.01 tsp		2.5 Hours @ 80°F
Sponge 2	15 grams	.53 ounces	1.6 Tbsp	1.01 Tbsp		8.5 Hours @ 80°F
Sponge 3	45 grams	1.59 ounces	4.8 Tbsp	3.03 Tbsp		8 Hours @ 80°F
Sponge	135 grams	4.76 ounces		.51 cup (sponge)		pH < 4.3
Dough (Knead 10 min.)	18 grams	0.63 ounces			1.1 Tbsp	2.5 hours @92°F
	900 g	31.75 oz (1.98 lb)	6 cups			Punch & Fold
	540 g	19.05 oz (1.19 lb)		2.28 cups		2.5 hours @ 92°F
Bake	2 loaves	Till internal temperature reaches 190°F				35 min @ 425°F
Double Recipe (4 loaves)						
Sponge 1	10 grams	0.35 ounces	1.07 Tbsp	2.02 tsp		2.5 Hours @ 80°F
Sponge 2	30 grams	1.06 ounces	3.2 Tbsp	2.02 Tbsp		8.5 Hours @ 80°F
Sponge 3	90 grams	3.17 ounces	9.6 Tbsp	6.07 Tbsp		8 Hours @ 80°F
Sponge	270 grams	9.52 ounces		1.1 cup (sponge)		pH < 4.3
Dough (Knead 10 min.)	36 grams	1.02 ounces			2.2 Tbsp	2.5 hours @92°F
	1.8 kg	63.49 oz (3.97 lb)	12 cups			Punch & Fold
	1.08 kg	38.1 oz (2.38 lb)		4.56 cups		2.5 hours @ 92°F
Bake	4 loaves	Till internal temperature reaches 190°F				45 min @ 425°F
Quad Recipe ~ 8 loaves)						
Sponge 1	20 grams	0.71 ounces	2.13 Tbsp	1.35 Tbsp		2.5 Hours @ 80°F
Sponge 2	60 grams	2.12 ounces	6.4 Tbsp	4.05 Tbsp		8.5 Hours @ 80°F
Sponge 3	180 grams	6.34 ounces	1.2 cups	12.16 Tbsp (3/4 cup)		8 Hours @ 80°F
Sponge	540 grams	19.05 oz (1.19 lb)		2.2 cups (sponge)		pH < 4.3
Dough (Knead 10 min.)	72 grams	2.04 ounces			4.4 Tbsp	2.5 hours @92°F
	3.6 kg	126.99 oz (7.94 lb)	24 cups			Punch & Fold
	2.16 kg	76.19 oz (4.76 lb)		9.11 cups		2.5 hours @ 92°F
Bake	8 loaves	Till internal temperature reaches 190°F				55 min @ 425°F

About Conversions and Measures

Grams are a measure of weight. A gram of water weighs the same as a gram of flour. However, a cup of flour weighs between 120 and 165 grams, depending on how you scoop the flour. If you shake the flour container (assuming it has some head room) or fluff the bowled flour with a fork, you aerate it and increase its volume. Then if you gently pour it into a flat-topped cup measure and rake off the excess with a knife, it will weigh about 120 grams. If you dig your cup down into a sack of flour without fluffing it, and then rake the cup level, it will weigh up to 165 grams. If you fluff it, then dig your cup into it, it will weigh about 150 grams, or 5 ½ ounces.

So let's assume you use the fluff-dig method and get a 150-gram cup of flour. By contrast, water weighs 8.3+ pounds (3,785+ grams) per gallon (16 cups), or about 237 grams per cup. Thus, 150 grams of water is 0.634 cup (a little less than 2/3 cup).

I think it would reasonably safe, if you don't have a scale, to figure that whatever scoop you use for flour, you should fill that scoop about 2/3 full for an equivalent weight of water. The below tables show how to convert from grams to ounces and approximately what volume measurements correspond to weights, for salt, water, and flour.

Conversions			
Weight Conversions		Temperature Conversions	
1 gram (gr)	0.03527396194958 ounce	Farenheit to Celcius	.56F - 32
1 kilogram (kg)	35.27396194958 ounces	Celcius to Farenheit	1.8C + 32
1 kilogram (kg)	2.204622621849 pounds		
1 ounce (oz)	28.349523125 grams		
1 pound (lb)	453.59237 grams		
Measure Conversions			
Measure	Weight Flour (grams)	Weight Water (grams)	Weight Kosher Salt (grams)
Teaspoon	3.125	4.94	5.52
Tablespoon	9.375	14.8	16.56
Cup	150	237	265

Fun Variations

I believe it best to stick with a proven recipe before varying it to try something new. After you are able to make good quality, high-rising, chewy, tangy sourdough bread with a crispy crust, you might want to try some of these fun and nutritious variations.

Substitute Other Fluids for Water

Run some fresh garden vegetables through your juicer, and use the juice instead of water in the bread recipe. It is okay to make too much because you can drink any excess while you're baking. I suggest the following items. I have used them to add color and flavor to bread:

- 1 big carrot
- 1 stalk of celery
- 1 bunch of scallions
- 1 head of garlic
- 1 bunch of cilantro
- 2 Habanera peppers
- 1 red bell pepper
- 1 ripe red tomato

In addition to the juice, you may also add

- 1 or 2 raw eggs (beaten and added to the measuring cup first)

Use Different Flours

Substitute 50% of the flour in the recipe for one more other flours, singly or blended. I favor King Arthur's high-protein unbleached bread flour, and at least half the total flour should be of this kind because its gluten causes such a good rise. It also contains malted barley flour. For the balance of the flour, try these for added flavor, nutrition, and texture:

- King Arthur White Whole Wheat Bread Flour
- Rye flour
- Barley flour
- Spelt flour
- Oatmeal

Add Different Flavors and Garnishes

Enhance the flavor or texture of the bread with seeds or spices like the following:

- Cumin
- Curry powder
- Cardamom
- Coriander
- Caraway seeds
- Poppy seeds (may also be sprinkled on top)
- Sesame seeds (may also be sprinkled on top)
- Sunflower seeds



Figure 2 Maria enjoys Bob's sourdough bread

Pine nuts
Pistachio nuts
Cashews
Ground Chipotles (smoked Jalapeños peppers)
Freshly chopped Habanera peppers

When adding large seeds or nuts, you should not add too many because they make the dough heavier and may affect rising or cause undue compression of the bread. I suggest no more than half a cup for a two-loaf recipe. You should be even more sparing with highly flavorful seeds like caraway because too many might be overwhelming. Add delicate seeds that might break apart to the dough only in the final kneading.

San Francisco Sourdough Bread Recipe and Method

- *Saccharomyces Cervisiae* – commercial baker's yeast, cannot survive in the acid environment created by sourdough bacteria.
- *Saccharomyces Exiguus* – sourdough yeast, happily survives in acid environment created by sourdough bacteria.

San Francisco Sourdough starter contains *Lactobacillus Sanfranciscus* bacteria, and that, when the bread dough has sufficiently fermented, imparts the uniquely tangy taste, robust aroma, and chewy texture to the finished bread.

Lactobacillus Sanfranciscus originates in the area of San Francisco, California, just as the bacteria in starters from other areas of the world originate there because of the unique climate and other conditions of each area. The climate and conditions of the area cause the particular strain of bacteria to flourish, and any strain indigenous to one area might not thrive in the climate and conditions of any other area. Therefore, if you do not live in the San Francisco area and you purchase San Francisco sourdough starter, expecting to make bread from it that is identical in taste and texture to bread made from the same starter in the San Francisco area, you are quite likely going to be disappointed. For a variety of reasons, the San Francisco sourdough starter might mutate into a different starter, its native bacteria might die out and be replaced by bacteria indigenous to your area, and you will end up with some kind of sourdough bread that is not San Francisco sourdough bread.

For this reason, I recommend making your own starter by letting a mixture of flour, water, and sugar sit in a glass or plastic container under a cloth for a couple of weeks until it starts fermenting. Then feed and cultivate that starter till for a week or so to make a base starter for your own "My-Town" Sourdough Bread. Who knows, it might taste better than the original San Francisco Sourdough Bread. One writer wrote this about the reason for the taste:

As I understand it, all stable "sourdough" starters are a symbiotic mixture of yeasts and bacteria, that, through their mutual liking of the other's by-products, cause the mixture to remain stable over time, relatively unaffected by other wild yeasts & bacteria that may, by chance, settle into the mix.

In the case of "San Francisco Sourdough" the protagonists have been identified as *Lactobacillus sanfrancisco* (the bacteria) and *Saccharomyces Exiguus* (the yeast).

Troy Boutte, of this list, wrote in 1995:

"Lactobacillus san francisco, when fermented by itself from a pure culture, has an odor of canned corn early in the fermentation. After about 17-20 hours of fermentation under good conditions, the pH of the ferment will drop to about 3.6 - 3.8. At that time the odor will have changed to a very complex and unique odor which of course makes it impossible to compare it to anything else.

Most people say it smells like sweaty sneakers or old socks, but not in an unpleasant way. ... The odor comes from 40-50 small volatile compounds that have been identified in these ferments. Besides lactic acid, the most abundant compounds are acetic acid (vinegar), ethyl acetate (cross between vinegar and alcohol), and ethanol. Other compounds are esters of short chain fatty acids that give goat cheese and butter their respective odors and flavors.

I've found that the odor of this ferment bears little relationship with the flavor of the bread produced. Baking seems to mellow out the flavor, leaving what many people consider to be an excellent flavor to the bread."

<http://www.sourdoughhome.com/threestagefrench.html>

Other Sourdough Resources and Recipes

A little History – Sourdough

A few years ago, the late Carl Griffith started offering sourdough starter free to anyone who would send him a self-addressed stamped envelope (SASE). Carl descended from Pioneers who traveled to the Pacific Northwest via the Oregon Trail in 1847 and used the ancestor of this very starter to make bread on the trail. Carl and his forebears had kept the starter alive for 150 years.

Carl Griffith's Sourdough Bread Recipes

You don't need to follow my recipe above. You can follow any of Carl's recipes. I found this San Francisco Sourdough bread recipe in Carl's brochure.

San Francisco Sourdough Bread

From Bread Alone by Daniel Leader & Judith Blahnik:

First make up a sponge and let it sit at 74 - 80 degree draft free place for 24 hours:

Starter - 2/3 cup
Water (dechlorinated) - 1 cup
White flour - 1½ cup

Final dough:

Water - 2 cups
White flour – 5½ - 6½ cups
Fine sea salt - 1 T

Mix final dough and knead it



Figure 3 Bob's sauerkraut with sourdough bread

for 15 to 20 minutes. Let it ferment at 74 - 80 degrees in a draft free area for 2 ½ hours in a large bowl, covered with a damp towel or plastic wrap. Deflate the dough by pushing down in the center and pulling up on the sides. Cover bowl with a clean damp towel or plastic wrap and let sit in a warm (74-80) draft free place for 30 minutes. Turn out on a floured area and knead briefly. Shape into a tight ball. Cover with a clean damp towel or plastic wrap and put in a warm (74-80) draft free place for 30 minutes. Shape. You may divide the dough into two pieces and shape into two round logs or into round loaves (free form) or one large freeform loaf. Proof the loaves in a warm (74-80) draft free place till they rise 1 1/2 times the size - about 1 hour - on a floured towel. Preheat oven for an hour before baking. Bake on a baking stone at 450 for 15 minutes, reduce heat to 425 for 20 minutes longer. Turn out and thump the bottom to test for doneness (sounds hollow) and cool on a wire rack for 25 minutes before cutting. Spritzing the oven at the beginning and each 3 minutes for the first 10 minutes will make a hard crust. One can use two conventional baking pans if desired.

Alaskan Sourdough Bread

1 c Sourdough starter
4 T Melted lard (or oil)
1 t Baking soda
8 c Bread flour (approximately)
2 1/2 c Warm Water
1/2 c Sugar
1 T Salt

Combine starter, all the water, and 3 c flour the night before and place in warm, draft free place.

The next morning add other ingredients and knead till smooth and elastic. Place in greased bowl in warm place and let rise to double. Knead down again, shape into loaves, let rise to top of pan plus a little and bake in greased pans in moderate oven - 375 for about an hour till done. When it is ready it sounds hollow when thumped. Turn out on racks, cover with dish cloth and let cool.

Where to Get Sourdough Starter and More Information

Carl Smith's 1847 Oregon Trail Starter

Carl is gone now, but his generous willingness to give bakers that wonderful starter is being carried on by volunteers. You can procure the starter by sending a SASE to the address given at the web site. The site also has many photos of breads made with the starter.

Carl Smith's 1847 Oregon
Trail Starter
<http://carlsfriends.org>

Sourdoughs International

Sourdoughs International purveys dozens of starter cultures from all parts of the world (including San Francisco), and each produces bread with a unique flavor. They don't, of course, sell Carl Smith's starter. Their starters range in price from \$9 to \$20. The company is the brainchild of Ed Wood, author of the book [*Classic Sourdoughs: A Home Baker's Handbook*](#), available at <http://Amazon.com>. I highly recommend it.

Sourdoughs International
PO Box 670
Cascade, ID 82611
208-382-4828
<http://sourdo.com>

King Arthur Flour's Baker's Catalogue

King Arthur Flour (<http://kingarthurfLOUR.com>) not only makes great bread flour, but also hosts a Baker's Catalogue at which you can purchase sourdough starters and baking supplies. You might notice the bakers couche, a canvas cloth in which to couch skinny baguette loaves that are so popular in France. The couche is profoundly handy when you want to make several baguettes side by side.

Baker's Catalogue
<http://bakerscatalogue.com>

Yankee Grocery

The [Yankee Grocery](http://yankeegrocery.com) offers packets of San Francisco sourdough starter for only \$4. I have not tried it, but it certainly is economical.

Yankee Grocery
203-776-2091
<http://yankeegrocery.com>

Where to Get More Information and Communicate with Bakers

King Arthur Flour's web site (<http://kingarthurfLOUR.com>) offers many baking recipes, and good information about flours and baking technology.

You can get excellent advice on making various sourdough breads, including bread based on the 1847 Oregon Trail Sourdough Starter, at <http://samartha.net>. I have derived my recipes above from Samartha's advice, and I thank him for his excellent rendering of methodology and science, and for his contribution to my bread-making experience.

You can exchange information and ask questions at the internet newsgroup *alt.rec.sourdough*. <http://xnews.newsguy.com> provides a good and free reader for perusing the newsgroup. Darrell Greenwood, Dick Adams, Samartha, and other Carl's Friends, who have loads of experience making sourdough bread, are regular contributors.

Some other web sites with good information, photos, and recipes are:

- <http://www.nyx.net/~dgreenw/sourdoughfaqs.html>
- <http://carlsfriends.org>
- <http://sourdoughhome.com>
- <http://www.nyx.net/~dgreenw/sourdoughfaqs.html>

Where to Get a Good Baking Stone

Here's a hint on how to get a fabulous baking stone cheap. Find a marble/granite outlet that sells to builders and has a big outdoor storage of granite slabs. Go look through the scraps and find the rectangular or oval shapes that were cut out of the counter tops to make holes for sinks. These fit perfectly in the oven. Get the 1.25-inch thickness slabs. I bought a couple for \$10 each. Home Depot charges \$51 a square foot for 1-inch thick granite slabs.

These granite slabs sink holes are polished like glass on one side, and rough-cut on the other. Because of the smooth top, you can bake bread loaves of bread directly on them, and easily clean them. You must pre-heat the oven for best results. Granite can tolerate more than 1000 degrees without cracking, and it holds heat well, so the stones help prevent loss of heat when you open the oven door. Because of their thickness, you need to preheat the oven for 45 minutes to an hour so they are heated thoroughly throughout.

If you have trouble with moisture accumulating under the loaf on the slick top, you did not allow adequate pre-heating for the stone. You can flip the stone over and try baking on the rougher bottom.

The No-Knead, Stretch-and-Fold Technique

You do not have to knead bread dough to develop the gluten sufficiently to bake good loaves. This will please you if you don't have an electric mixer and you have a lot of loaves to make. Instead of kneading, follow the below procedure:

1. Increase hydration to 70% (so the water weighs 70% of the weight of the flour)
2. Mix the ingredients, including any nuts or seeds, together thoroughly by hand to form a wetted mass.
3. Cycle through the below stretch and fold process three times:
 - a. Let the dough sit covered for 45 minutes.
 - b. Dump it on a generously floured work surface
 - c. Sprinkle flour on the dough so it won't stick to your hands much.
 - d. Stretch the dough horizontally and vertically to form a large rectangle about 1 inch thick.
 - e. Aim the fingers of both hands downward and poke the dough with all fingers all over several times so as to make any bubbles smaller and develop gluten that gives the dough rising power.
 - f. Fold the sides so the edges meet in the middle; fold the top and bottom so the edges meet in the middle
 - g. Rotate the dough 90 degrees
 - h. Repeat the above stretch and fold steps (d-g) two more times (three stretches, pokes, and folds total, per cycle)
 - i. Fold the dough one final time to make a mound
 - j. Return the dough to the bowl and cover it

The above steps constitute one cycle, and you must do three such cycles 45 minutes apart. After the last stretch and fold cycle, return the dough to the bowl, cover it, let it rise, then cut the dough with a sharp knife and form the chunks into loaves.

Do not deviate from the above process. You will produce perfectly risen dough of excellent texture with any nuts or seeds evenly distributed.

How to Distribute Sourdough Starter to Friends

Once you get hooked on baking sourdough bread, you'll want to share it with friends. You can do this by preparing dried starter and labels, putting a couple of tablespoons in a zip-lock bag, and sending it in the mail. I dry the starter by spreading a thin layer of soupy starter I fed 4 hours earlier (so it has started to ferment robustly) on a Teflon cookie sheet and letting it dry in the oven with the light on and the door ajar to keep the temperature from getting too high. Temperature should sit at about 110 degrees F. It should dry within 4 hours or less. It peels up easily. I crumble it into the bag and stick a label on the bag. The label instructions for making bread differ slightly because of the differences between starters. I use 2³/₄" x 2³/₄" Avery 5196 labels (originally for 3¹/₂" diskettes). The following two pages contain label sheets ready for printing.

