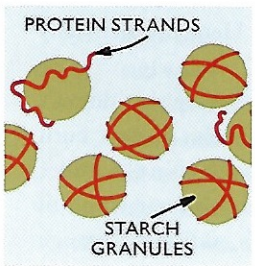
THE SCIENCE OF GOOD COOKING

More Water Makes Chewier Bread

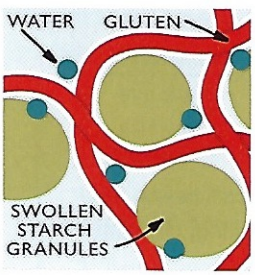
Bread. It's ironic that something so simple seems so complicated to modern cooks. In many cases, the ingredient list for bread recipes consists of just flour, water, salt, and yeast. And the method and required equipment should not be daunting. After all, they were baking bread in ancient Egypt.

HOW THE SCIENCE WORKS

WHEN WATER AND FLOUR COMBINE



WITHOUT WATER *When flour is dry, the starch's protein strands are lifeless and unmoving.*



WATER ADDED *When flour and water are combined, the protein strands change shape and link together to form gluten.*

Let's start with the ingredients.

Yeast is a living organism. Its function in bread dough is to consume sugars and starches present in the flour and then convert them into carbon dioxide and alcohol, which gives the finished loaf its lift and flavor. This process is known as fermentation.

The two most common forms of yeast in the grocery store are active dry and instant. They are similar in appearance and origins but are processed differently: Active dry yeast is dried at higher temperatures, which kills more of the exterior yeast cells (this is why it requires an initial activation in warm water), whereas instant, or rapid-rise, yeast is dried at more gentle temperatures (so it can be added directly to the dry ingredients). As a result, substituting equal amounts of one for the other will not provide the same results. (See "Substituting Active Dry Yeast for Instant," page 329.)

Yeast is important, but bread would be nothing without the combination of flour and water. Though it may look like nothing more than white powder, flour is a complex substance made mostly of starch and lesser amounts of proteins (see "Flour 101," page 357). With the proper treatment, it provides the structure and texture of breads of all kinds.

The role of flour in bread begins when it is combined with water and yeast—the first step of bread making. The wheat proteins in flour are unmoving and lifeless when dry but begin to change shape when they come in contact with water, a process called hydration. During hydration, the individual protein molecules, which consist of the loosely coiled glutenin and the more tightly wound gliadin (see concept 39), begin to link up with one another to form long, elastic chains called gluten. These strands of gluten combine to form a membranelike network. The network engulfs swollen starch granules and gas bubbles, stretching as the dough rises and then bakes, giving the finished loaf its structure and chew.

The amount of water added to your flour and yeast is important: The more water in a dough, the stronger and more extensible the gluten strands. If the gluten strands are strong and extensible, they can support the starch granules and gas bubbles that hydrate and swell as the dough rises and bakes, giving you an airier bread with good chew. During baking, the water within the dough turns to steam, creating hollow pockets as moisture rushes to escape. Extra water also creates a looser dough, which allows the steam bubbles to expand more easily. In a drier dough, gas bubbles have a harder time forming and are more likely to collapse. Getting those gas bubbles to hold their shape until the dough has risen and set in the oven is the key to creating an open, airy crumb.

TEST KITCHEN EXPERIMENT

We wanted to see and taste the differences in bread made with varying quantities of water so we designed a simple experiment. We started with our recipe for a rustic Italian bread, which has a hydration level of about 68 percent (for more on percent hydration, see "Calculating Baker's Percentage," page 328), and tried both increasing and decreasing the amount of water in the recipe. For simplicity's sake, and to eliminate unwanted variables, we skipped using a biga (see concept 40) and made the doughs using a straight mixing method. Along with the original recipe, we tested the following hydration levels: 50 percent, 60 percent, 75 percent, and 80 percent.

THE RESULTS

While even the 60 and 75 percent hydrated doughs showed significant differences, the extremes were most illustrative. The 50 percent hydrated loaf featured a tight, fine crumb with small air pockets—and showed little spread and expansion. On the other hand, the dough with 80 percent water had a loose, open crumb with large, irregular holes, and the bread baked up very flat and wide. In the middle of these outer limits, the original recipe featured moderate-size holes and good volume and height. Because the levels of flour, yeast, and salt were the same for all of our breads, ignoring the texture, tasters found the flavor of each loaf to be identical.

THE TAKEAWAY

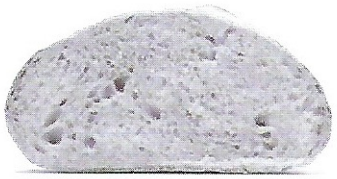
The ratio of water to flour is important when making bread dough. When flour hits water, the individual wheat proteins begin to change shape, connecting to form strands of gluten. Gluten is responsible for creating the network within a dough that gives bread its structure. Too little water, and a strong gluten network cannot form. Without a strong gluten network, the gas bubbles created within the dough cannot hold and rise, making the finished product a dense loaf with too tight a crumb, as we saw in our bread with 50 percent hydration. Too much water, on the other hand, can dilute and weaken the gluten, likewise hindering a bread's ability to rise, as in the loaf with 80 percent hydration.

We vary the hydration of our doughs depending on our desired end product, however. Our Pizza Bianca (page 328), which does not need a high rise, is a bread that we want to be extraordinarily chewy. Therefore, we hydrate it at 90 percent. Our Olive-Rosemary Bread (page 334), on the other hand, is best with a moderate chew, medium-sized holes, and a nice rise. We hydrate this loaf at 63 percent. No matter what kind of crumb and rise you desire, it always pays to measure your ingredients well. Too much water or flour can drastically alter the texture of your bread.

HOW WATER AFFECTS BREAD TEXTURE

50 PERCENT HYDRATION

This loaf had the smallest ratio of water to flour, resulting in a weak gluten network. As a result, the loaf was small and dense with a tight crumb.



68 PERCENT HYDRATION

With a typical hydration level of 68 percent, this loaf rose and expanded well, possessing modest-size holes.

80 PERCENT HYDRATION

This loaf had the greatest ratio of water to flour, causing the gluten network to be weak and diluted. Therefore, the loaf is flat and wide with large air pockets.

ALMOST NO-KNEAD BREAD

MAKES 1 LARGE ROUND LOAF

You will need at least a 6-quart Dutch oven for this recipe. An enameled cast-iron Dutch oven with a tight-fitting lid yields the best results, but the recipe also works in a regular cast-iron Dutch oven or heavy stockpot. Check the knob on your Dutch oven lid, as not all are ovensafe to 500 degrees; look for inexpensive replacement knobs from the manufacturer of your Dutch oven (or try using a metal drawer handle from a hardware store). This dough rises best in a warm kitchen that is at least 68 degrees.

- **3 cups (15 ounces) all-purpose flour**
- **1½ teaspoons salt**
- **¼ teaspoon instant or rapid-rise yeast**
- **¾ cup plus 2 tablespoons water, room temperature**
- **6 tablespoons mild-flavored lager, room temperature**
- **1 tablespoon white vinegar**

1. Whisk flour, salt, and yeast together in large bowl. Add water, beer, and vinegar. Using rubber spatula, fold mixture, scraping up dry flour from bottom of bowl, until shaggy ball forms. Cover bowl with plastic wrap and let sit at room temperature for at least 8 hours or up to 18 hours.

2. Lay 18 by 12-inch sheet of parchment paper inside 10-inch skillet and spray with vegetable oil spray. Transfer dough to lightly floured counter and knead by hand 10 to 15 times. Shape dough into ball by pulling edges into middle. Transfer loaf, seam side down, to prepared skillet and spray surface of dough with oil spray. Cover loosely with plastic wrap and let rise at room temperature until doubled in size, about 2 hours. (Dough should barely spring back when poked with knuckle.)

3. Thirty minutes before baking, adjust oven rack to lowest position, place Dutch oven (with lid) on rack, and heat oven to 500 degrees. Lightly flour top of dough and, using sharp serrated knife or single-edge razor blade, make one 6-inch-long, ½-inch-deep slash along top of dough. Carefully remove pot from oven and remove lid. Pick up loaf by lifting parchment overhang and lower into pot (let any excess parchment hang over pot edge). Cover pot and place in oven. Reduce oven temperature to 425 degrees and bake, covered, for 30 minutes. Remove lid and continue to bake until crust is deep golden brown and loaf registers 210 degrees, 20 to 30 minutes longer. Carefully remove loaf from pot; transfer to wire rack, discard parchment, and let cool to room temperature, about 2 hours, before slicing and serving. (Bread is best eaten on day it is baked but will keep wrapped in double layer of plastic wrap and stored at room temperature for up to 2 days. To recrisp crust, place unwrapped bread in 450-degree oven for 6 to 8 minutes.)

PRACTICAL SCIENCE BREAD LIKES A HUMID OVEN

Steam is key when baking bread with a nice, crisp crust. A Dutch oven holds steam well, or you can add steam to the oven yourself.

A major breakthrough in the no-knead bread recipe first published in the *New York Times* was to bake the bread in a preheated Dutch oven, which creates the dramatic open-crumbed structure and the shatteringly crisp crust that was previously attainable only in a professional bakery. How does this work?

First, as the loaf heats it gives off steam to create a very humid environment inside the Dutch oven. Since moist air transfers heat much more efficiently than dry air, the loaf heats much more rapidly. This in turn causes the air bubbles inside to expand much faster, leading to a more open crumb structure. As a test, we baked two loaves of bread, one in a Dutch oven and the other on a preheated baking stone. After one minute in the oven, the surface temperature of the Dutch oven–baked loaf had risen past 200 degrees, while the other loaf had reached only 135 degrees.

Steam contributes to a great loaf in several other ways. As steam condenses onto the surface of the baking bread, it keeps the crust soft, allowing the bread to continue to expand until the crust dries. (A dry crust is much harder to expand.) It also causes the starches to form a thin sheath that eventually dries out, giving the finished loaf a shiny crust that stays crisp. Finally, once the crust dries and gets very hot, sugar molecules caramelize and react with proteins to form the wonderful flavor and dark brown color of crusty bread.

Many recipes suggest adding water or ice cubes to the oven; the problem is home ovens cannot retain moisture in the way a professional steam-injected oven can. With its thick walls, small internal volume, and heavy lid, a Dutch oven is the ideal environment to create and trap steam.

For regular bread baking, with loaves baking on a rimmed baking sheet, our usual approach to creating steam in a home oven is to pour boiling water into a preheated loaf pan placed on the oven's bottom rack, but the water doesn't continue to boil for very long. Inspired by the superheated stones used to generate steam in Swedish saunas, we've come up with a more effective approach: using lava rocks. These irregularly shaped rocks (available at many hardware stores for use in gas grills) have a lot of surface area for absorbing and retaining heat, maximizing the amount of steam produced when boiling water is introduced. To do this, place a wide pan filled with lava rocks on the bottom oven rack, and pour about ¼ cup of boiling water into the rocks once they are preheated. Keep the oven door closed for one minute to create steam. When you place the bread in the oven, pour another ¼ cup of water over the rocks, and bake as usual.

WHY THIS RECIPE WORKS

In 2006, New York Times *writer Mark Bittman published a recipe developed by Jim Lahey of the Sullivan Street Bakery in Manhattan that promised to shake up the world of home baking: It allowed the average cook to bake bread that looked like it had been produced in a professional bakery and involved no kneading at all. However, as we baked loaf after loaf, we found two big problems: The dough deflated when carried to the pot, causing misshapen loaves, and it lacked flavor. To give the dough more strength, we lower the hydration and add the bare minimum of kneading time to compensate.*

DON'T KNEAD—MUCH The original no-knead bread has a hydration level of 85 percent (see "Calculating Baker's Percentage," page 328), while most rustic breads max out at around 80 percent hydration, and standard sandwich breads hover between 60 percent and 75 percent hydration. This high level of water, along with the long rest, helps to form the gluten strands and, in effect, takes the place of kneading (see concept 39). Here, we cut back on the water in order to make the dough easier to handle. But with a lower level of hydration the gluten strands are not rearranged to the same degree as they are in the original recipe and need some help. This is why we knead our "no-knead" dough. Fifteen seconds is all it takes.

ADD VINEGAR AND BEER Two ingredients proved key to help boost the loaf's flavor: vinegar and beer. Bottled vinegars are generally 5 percent solutions of acetic acid—the same acid produced by bacteria during dough fermentation. The addition of 1 tablespoon of distilled white vinegar adds tang. Bread's unique flavor comes during fermentation, when yeast produces alcohol, carbon dioxide, and sulfur compounds. These three elements are present together in another location—a bottle of beer. We choose lager over other types of beer because most non-lager beers undergo a process called "top fermentation," whereby yeast floats on top of the wort (grain mashed in hot water), which is exposed to oxygen and kept warm. Oxygen and warmth persuade yeast to produce spicy, astringent flavor compounds called phenols and fruity, floral compounds called esters that are desirable in beer but not in bread. Lagers, on the other hand, undergo "bottom fermentation," where the yeast is kept submerged in the low-oxygen environment at the bottom of the wort at colder temperatures, which causes the yeast to produce fewer phenols and esters, but more sulfur compounds, so that the breadier yeast and sulfur flavors come forward.

BAKE IN TWO HOT OVENS We bake this bread in a preheated Dutch oven. Be careful of the knobs. The manufacturers of our favorite Dutch ovens (the 7¼-Quart Round French Oven by Le Creuset) and our Best Buy Dutch oven (the 6.5-Quart Cast Iron Dutch Oven by Tramontina) recommend against heating the pots to this temperature due to the phenolic (black) knobs used on the lids. But there is a simple solution. The knobs on both lids are secured with a single screw that is easily removed. Once the knob is removed, you can replace it with an inexpensive all-metal drawer handle purchased from a hardware store.

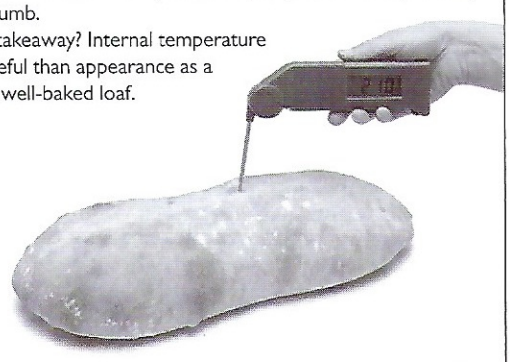
PRACTICAL SCIENCE BAKE UNTIL IT IS DONE

Internal temperature can be less useful than appearance.

We commonly advise checking the internal temperature of a loaf of bread before making the decision to pull it from the oven. A properly baked loaf should register a temperature between 195 and 210 degrees on an instant-read thermometer, depending upon the type of bread. But is internal temperature by itself sufficient proof that bread is fully baked?

We placed temperature probes in the center of two loaves of rustic Italian bread and monitored them as they baked. Halfway into the baking time, the internal temperature of the loaves had already passed 200 degrees, and they reached the optimal 210 degrees a full 15 minutes before the end of the recommended baking time. We pulled one loaf from the oven as soon as it neared 210 degrees and left the other in the oven for the recommended baking time. (The temperature of the longer-baked loaf never rose above 210, because the moisture it contains, even when fully baked, prevents it from going past the boiling point of water, or 212 degrees.) The differences between the two loaves were dramatic: The loaf removed early had a pale, soft crust and a gummy interior, while the loaf that baked for the full hour had a nicely browned, crisp crust and a perfectly baked crumb.

The takeaway? Internal temperature is less useful than appearance as a sign of a well-baked loaf.



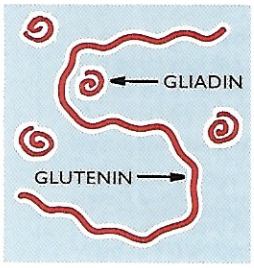
210 BUT HALF-BAKED

210 AND FULLY BAKED

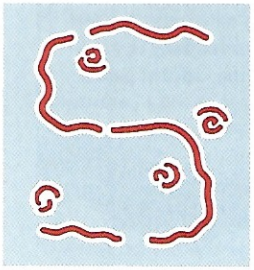
Rest Dough to Trim Kneading Time

Part therapy, part exercise, kneading is the most enjoyable part of the bread-making process. But many bakers make the mistake of overdoing it, especially when they rely on mixers. Yes, kneading is an important step, necessary in order to develop structure in the bread. But too much kneading robs the dough of flavor and alters its texture. The solution is as simple as taking a break during the mixing process.

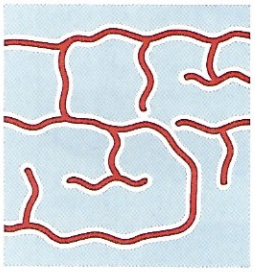
HOW GLUTEN FORMS DURING AUTOLYSE



FLOUR *The two proteins in flour are gliadin and glutenin. When flour and water are combined, these proteins come together in a random matrix.*



AUTOLYSE *While the dough rests before kneading, the flour proteins begin to break down.*



KNEADING *After autolyse, the broken flour proteins are easy to align into an organized network by kneading.*

HOW THE SCIENCE WORKS

The ultimate goal of making bread dough is to create gluten, a strong network of cross-linked proteins that traps gas bubbles and stretches as the dough bakes, creating the bubbly, chewy crumb structure that is the signature of any good loaf. How does it work?

To really understand gluten we need to begin with the proteins in flour: glutenin and gliadin. Glutenin is a very large, loosely coiled protein while gliadin is a much smaller and tightly coiled sphere. Glutenin provides most of the strength and elasticity of the dough, allowing it to bounce back after it has been stretched. Gliadin provides its stretch.

When water and flour first mix, the glutenin and gliadin form in a random, disorganized matrix of gluten that is initially very weak. In order to strengthen this network, these proteins need to be aligned next to each other so that they can better link together. Imagine the proteins as coiled-up balls of yarn you are trying to tie together into one longer piece, which you'll then sew together into a wider sheet. In their coiled state, it's not possible to tie them together; first you have to untangle and straighten them out. This straightening out and aligning is usually accomplished by kneading. As the matrix of proteins are kneaded, disorganized weaker bonds are pulled apart and reattached into straight, strong, orderly sheets of gluten. And it's important for this gluten network to be very strong, especially in rustic breads with a fair amount of water. If not, the loaves spread sideways in the oven rather than rising up.

Kneading develops gluten but at some point more kneading is counterproductive. Too much kneading causes the dough to become warm and turn from a wheaty tan color to a grayish white, producing loaves with a sickly pallor and expired flavors. Overmixing and overheating are difficult to do by hand, but easy when using an electric mixer. The action of the dough hook creates heat through friction and also kneads excessive air into the dough, bleaching it of flavor and color in a process known as oxidation. (When properly kneaded, dough should have a smooth, almost shiny appearance. If you pull the dough, it should feel very stretchy and quickly spring back into place.) We don't want to give up the easy, quick option of our stand mixer. But how do we prevent overmixing the dough?

Autolyse. Developed by French bread-making authority Raymond Calvel in the 1970s, autolyse (pronounced AUTO-lees, also called autolysis in the U.S.) is a technique in which flour and water are first mixed together and then allowed to rest before being kneaded. (We often add yeast along with the flour and water. Though it's not traditionally part of autolyse, we find that the early addition

does not make a significant change.) Autolyse makes a significant difference in both the flavor and structure of many breads. Why?

Autolyse occurs after the random matrix of proteins has come together, but before the sheets of gluten have formed and aligned. While the mixture rests, naturally occurring enzymes (known as proteases) break down the disorganized bonds of gluten, acting like scissors, cutting the coiled-up proteins into smaller segments that are easier to straighten and align during kneading. This is why dough that has undergone autolyse requires much less kneading than freshly made dough. When this rested dough is then kneaded, the gluten is positioned to form a stronger, more organized network more quickly. And the less time the dough is kneaded in the stand mixer, the better.

While kneading by hand can be a gratifying process, most of our recipes call for a stand mixer simply because it's easier. (And in cases where the dough is extremely wet and loose—as in Pizza Bianca (page 328)—working it by hand is virtually impossible.) Machine-kneading is rougher; it links gluten strands together only to tear them apart. Hand-kneading is gentler, producing gluten that, once formed, stays together, which can ultimately lead to chewier texture. But gluten develops no matter how you mix the dough. And we've found the differences aren't dramatic enough to lock away our stand mixer and revert to hand-kneading. Yes, hand-kneading can deliver ever so slightly better results, but it's more work and there's the risk of adding too much flour as you work the dough on the counter.

TEST KITCHEN EXPERIMENT

Just how much kneading time does an autolyse period really save? To find out, we made two batches of a simple rustic Italian bread. For one loaf we mixed flour, water, yeast, and salt together in a stand mixer with a dough hook and kneaded it on low speed until the dough completely cleared the bowl and clung to the hook. For the second, we mixed only the flour, water, and yeast until just combined, and then let the mixture sit for 20 minutes before adding the salt and kneading. We repeated the test two more times, measuring the time it took for the dough to cling to the hook, not the bowl, and averaged the results.

THE RESULTS

The results painted a clear picture. The doughs that were given the 20-minute respite took an average of about five minutes less kneading (about 10 minutes versus more than 15) to clear the bowl. This significant decrease in kneading time translated into bread with better crumb color, aroma, and wheat flavor.

THE TAKEAWAY

During autolyse, naturally occurring enzymes begin to break down the bonds of gluten, turning the long and coiled glutenin and gliadin proteins into smaller pieces. These smaller pieces of protein are much easier to organize and align during kneading than they would be if the autolyse were skipped. The result? For the mixture of water, flour, and yeast that we let rest, a full five minutes was shaved from our kneading time, preventing overmixing and unnecessary oxidation, which dulls the natural flavor and color of wheat. (Be sure not to add salt during autolyse. See "Hold the Salt—Temporarily," page 334.)

The lesson? Let your dough rest. Autolyse does not reduce the overall time it takes to make a loaf of bread, but it gives you a better-tasting, better-looking loaf of bread. And it will reduce wear and tear on your stand mixer.

AUTOLYSE AT WORK

WITHOUT A REST *The dough without a rest was far from ready after 10 minutes of kneading.*

AFTER 20-MINUTE REST *The dough that was allowed to rest for 20 minutes pulled away from the side of the bowl, finished with kneading, after 10 minutes.*

A brief rest after mixing together the ingredients for our doughs shortens the kneading time on recipes ranging from Olive-Rosemary Bread to Rustic Dinner Rolls. We also use this technique with Pizza Bianca (page 328), Rosemary Focaccia (page 340), and New York–Style Thin-Crust Pizza (page 344).

OLIVE-ROSEMARY BREAD

MAKES 2 LARGE LOAVES

If you don't have a stand mixer, you can mix the dough by hand. To do this, stir the wet and dry ingredients together with a stiff rubber spatula until the dough comes together and looks shaggy. Transfer the dough to a clean counter and knead by hand to form a smooth, round ball, 15 to 25 minutes, adding additional flour, if necessary, to prevent the dough from sticking to the counter. Proceed with the recipe as directed. If you don't have a baking stone, bake the bread on an overturned and preheated rimmed baking sheet set on the lowest oven rack. Almost any variety of brined or oil-cured olives works in this recipe, although we prefer a mix of both green and black olives.

- 1¾ cups water, room temperature
- 2 tablespoons honey
- 2 teaspoons instant or rapid-rise yeast
- 3½ cups (19¼ ounces) bread flour, plus extra as needed
- ½ cup (2¾ ounces) whole-wheat flour
- 2 teaspoons salt
- 2 tablespoons minced fresh rosemary
- 1½ cups olives, pitted, rinsed, and chopped coarse

1. Whisk water, honey, and yeast together in bowl of stand mixer fitted with dough hook. Add bread flour and whole-wheat flour to bowl and mix on low speed until cohesive dough is formed, about 3 minutes; cover bowl tightly with plastic wrap and let sit at room temperature for 20 minutes.

2. Make well in center of dough and add salt and rosemary. Knead dough on low speed for 5 minutes, scraping down bowl and dough hook as needed. Increase speed to medium and continue to knead until dough is smooth and slightly tacky, about 1 minute. If dough is very sticky, add 1 to 2 tablespoons bread flour and continue mixing for 1 minute. Transfer dough to lightly floured counter and press into 12 by 6-inch rectangle, with long side facing you. Press olives evenly into dough, then roll dough toward you into firm cylinder, keeping roll taut by tucking it under itself as you go. Turn loaf seam side up and roll cylinder into coil. Transfer dough, spiral side up, to large, lightly greased bowl, cover tightly with plastic wrap, and let rise at room temperature until it increases in size by 50 percent, about 1 hour.

3. Spray rubber spatula or bowl scraper with vegetable oil spray. Fold partially risen dough over itself by gently lifting and folding edge of dough toward middle. Turn bowl 90 degrees; fold again. Turn bowl again; fold once more. Cover with plastic and let rise for 30 minutes. Repeat folding, replace plastic, and let rise until doubled in size, about 30 minutes.

4. Transfer dough to lightly floured counter, being careful not to deflate. Divide dough in half, loosely shape each piece into ball, and let rest for 15 minutes. Flip each ball over and, starting from top, roll dough toward you into firm oval shape. Using palms, roll each oval (seam side down) from center outward until 12-inch loaf is formed.

PRACTICAL SCIENCE
HOLD THE SALT—TEMPORARILY

Salt hinders autolyse. Wait to add it to bread dough.

Salt is an important component of dough because it strengthens gluten to help form chewy bread. But does it hinder autolyse? We wondered if adjusting when we added salt to bread dough could help speed things along.

We prepared two simple doughs. In the first, we combined the flour, water, yeast, and salt with a bread starter called a biga (see concept 40 for more on starters) all at once before resting; in the second, we withheld the salt for 15 minutes.

We found that briefly omitting the salt hastened gluten development by an hour. After just 15 minutes, the unsalted dough was already pliant and smooth, while the salted dough was still gluey and stiff. Why? Salt inhibits both the ability of flour to absorb water and the activity of the enzymes that break down proteins to begin the process of forming gluten. If allowed to rest without salt, the flour is able to get a jump on gluten development by absorbing as much water as it can and letting its enzymes work sooner to develop gluten networks.

15-MINUTE REST, WITH SALT
Dough is sticky and stiff.

15-MINUTE REST, WITHOUT SALT
Dough is supple and smooth.

Poke any olives that fall off into bottom seam, then pinch seam closed. Transfer each loaf, seam side down, to 12 by 6-inch piece of parchment and cover with plastic. Let rise until doubled in size, 1 to 1½ hours. (Dough should barely spring back when poked with knuckle.)

5. One hour before baking, adjust oven rack to lower-middle position, place baking stone on rack, and heat oven to 450 degrees. Slide parchment with loaves onto pizza peel. Using sharp serrated knife or single-edge razor blade, make one 3½-inch-deep slash on diagonal along top of each fully risen loaf, starting and stopping about 1 inch from ends. Spray loaves with water and slide parchment with loaves onto baking stone. Bake for 15 minutes, spraying loaves with water twice more during first 5 minutes of baking time. Reduce oven temperature to 375 degrees and continue to bake until crust is deep golden brown and loaves register 210 degrees, 25 to 30 minutes. Transfer loaves to wire rack, discard parchment, and let cool to room temperature, about 2 hours, before slicing and serving. (Bread can be wrapped in double layer of plastic wrap and stored at room temperature for up to 3 days. Wrapped with additional layer of aluminum foil, bread can be frozen for up to 1 month. To recrisp crust, thaw bread at room temperature, if frozen, and place unwrapped bread in 450-degree oven for 5 to 10 minutes.)

PRACTICAL SCIENCE
TURN THE DOUGH, DON'T PUNCH IT

Turning the dough creates a coarser crumb with better chew.

Most bread recipes call for punching down the dough between the first and second rises. Despite its name, punching down is best accomplished by pressing down gently on the dough. This process exposes the yeast to new food sources, which keeps it going strong longer. Punching also "degasses" the bread, resulting in a loaf with a fairly fine crumb—perfect for sandwich bread, but not a rustic loaf. To create a coarser crumb with better chew, we discovered that turning the dough (gently folding it over onto itself between the first and second rises) reactivates the yeast without pressing out as much air. (For more information, see "Turn the Dough Gently," page 340.)

PUNCHED
Bread bakes up with a tight, more regular crumb better suited to sandwich bread.

TURNED
Bread bakes up with a coarse, open crumb and chewy texture better suited to rustic bread.

WHY THIS RECIPE WORKS:

Olive-rosemary bread is a basic Italian rustic loaf flavored with olives and the subtle perfume of rosemary. It should have a coarse crumb, chewy interior, and thick, burnished crust. But this hearty loaf is about as elusive as it is perfect. At home, it's too easy to bake loaves that are more like sandwich bread than rustic breads, with a soft crumb and thin crust. And the olives are either forced into the dough early on and mixed to the point of disintegration or added at the very end as a sparse afterthought. To perfect our home version, we first turn to the bread recipe, and then work on the olive distribution plan.

ADD A LITTLE HONEY We add a bit of honey to our bread dough to add sweetness and help bring out the savory flavor of the olives. Replacing some bread flour with whole-wheat flour gives a nuttier flavor, too. Because we add these flavors, this means that the dough doesn't need to ferment overnight like many other simple rustic breads.

PRESS THE OLIVES Pitting the olives against the stand mixer isn't a fair match. The olives and dough are like oil and water—resisting each other and leaving the olives to smear against the outside of the dough and the bottom of the bowl. We found success in rolling the olives into the dough before the first rise, pressing them into the rolled-out dough as if making cinnamon rolls. This gives us a nicely textured loaf with evenly dispersed olives. As for what kind of olives to use, any variety will do. Olive preference is highly subjective. We tend to prefer a mix.

USE MORE ROSEMARY Rosemary is often perceived as being brutish; if used excessively, it can easily overpower a dish with its piney harshness. But we soon realized that this herb behaves differently when baked into bread—its flavor is as fleeting as the little specks are invisible. We use a whopping 2 tablespoons in order to get a demure background flavor to complement the bright, fruity olives.

LET IT REST The autolyse (allowing the mixture of flours, water, and yeast to rest so that the flour has more time to absorb the water) is instrumental for more efficient kneading in this recipe. It takes 20 minutes, but this is 20 minutes we don't mind adding. Turning the dough during the first rise also drastically improves its elasticity and strength, which results in larger holes in the bread and a heartier chew (see "Turn the Dough, Don't Punch It").

SLASH AND SPRAY Slashing the risen loaf with a sharp paring knife or razor allows the crust to expand, preventing the bread from splitting in the oven. Misting the loaf right before it goes into the oven delays the formation of a crust, allowing the bread to fully expand without tearing or splitting. The steam also promotes the formation of a crispy, glossy crust.

RUSTIC DINNER ROLLS

MAKES 16 ROLLS

If you don't have a stand mixer, you can mix the dough by hand. To do this, stir the wet and dry ingredients together with a stiff rubber spatula until the dough comes together and looks shaggy. Transfer the dough to a clean counter and knead by hand to form a smooth, round ball, 15 to 25 minutes, adding additional flour, if necessary, to prevent the dough from sticking to the counter. Proceed with the recipe as directed. Because this dough is sticky, keep your hands well floured when handling it.

- 1½ cups plus 1 tablespoon water, room temperature
- 2 teaspoons honey
- 1½ teaspoons instant or rapid-rise yeast
- 3 cups plus 1 tablespoon (16½ ounces) bread flour, plus extra as needed
- 3 tablespoons whole-wheat flour
- 1½ teaspoons salt

1. Whisk water, honey, and yeast together in bowl of stand mixer until well combined, making sure no honey sticks to bottom of bowl. Transfer bowl to stand mixer fitted with dough hook. Add bread flour and whole-wheat flour and mix on low speed until cohesive dough is formed, about 3 minutes; cover bowl tightly with plastic wrap and let sit at room temperature for 30 minutes.

2. Sprinkle salt evenly over dough and knead on low speed for 5 minutes, scraping down bowl and dough hook as needed. Increase speed to medium and continue to knead until dough is smooth and slightly tacky, about 1 minute. If dough is very sticky, add 1 to 2 tablespoons flour and continue mixing for 1 minute. Transfer dough to large, lightly greased bowl; cover tightly with plastic and let rise at room temperature until doubled in size, about 1 hour.

3. Spray rubber spatula or bowl scraper with vegetable oil spray. Fold partially risen dough over itself by gently lifting and folding edge of dough toward middle. Turn bowl 90 degrees; fold again. Rotate bowl again and fold once more. Cover with plastic and let rise for 30 minutes. Repeat folding, replace plastic, and let dough rise until doubled in size, about 30 minutes longer.

4. Grease two 9-inch round cake pans. Transfer dough to floured counter and sprinkle top with more flour. Using bench scraper, cut dough in half and gently stretch each half into 16-inch log. Cut each log into 8 equal pieces and dust top of each piece with more flour. With floured hands, gently pick up each piece and roll in palms to coat with flour, shaking off excess. Arrange rolls in prepared pans, placing 1 in center and 7 spaced evenly around edges, with long side of each roll running from center of pan to edge and making sure cut side faces up. Loosely cover pans with lightly greased plastic and let rolls rise until doubled in size, about 30 minutes. (Dough should barely spring back when poked with knuckle.)

5. Thirty minutes before baking, adjust oven rack to middle position and heat oven to 500 degrees. Spray rolls lightly with water, bake until tops of rolls are brown, about 10 minutes, then remove them from oven. Reduce oven temperature to 400 degrees; using kitchen towels or oven mitts, invert rolls from both cake pans onto rimmed baking sheet. When rolls are cool enough to handle, turn them right side up, pull apart, and space evenly on baking sheet. Continue to bake until rolls develop deep golden brown crust and sound hollow when tapped on bottom, 10 to 15 minutes, rotating sheet halfway through baking. Transfer rolls to wire rack and let cool to room temperature, about 1 hour, before serving. (Rolls can be placed in zipper-lock bag and stored at room temperature for up to 3 days. Wrapped with aluminum foil before placing in bag, rolls can be frozen for up to 1 month. To recrisp crust, thaw rolls at room temperature, if frozen, and place unwrapped rolls in 450-degree oven for 6 to 8 minutes.)

WHY THIS RECIPE WORKS

The remarkably crisp crust of European-style dinner rolls keeps them in the domain of professionals, who use steam-injected ovens to expose the developing crust to moisture. We wanted a reliable recipe for rustic dinner rolls with a crisp crust and chewy crumb as good as any from an artisanal bakery. But when we tasted our first batch, we found a dense, bland crumb beneath a leathery crust. The flavor was easy to improve—we add whole-wheat flour for earthiness and honey for sweetness. A little extra yeast improves the crumb slightly, but making the dough wetter and letting it sit for 30 minutes (a process called autolyse) are the best fixes.

USE A WET DOUGH Our first tests left us with unimpressive dinner rolls. As a result,we began playing with hydration (see concept 38) to fix the dense crumb. After all, during baking, the water within the dough turns to steam, which then rushes to escape, making hollow pockets within. The more water, the airier the crumb. Determining that our original recipe gave us a dough with 60 percent hydration, we assembled several batches of dough with varying amounts of water. Sure enough, increasing hydration opened the crumb considerably.

Working our way up, we found about 72 percent hydration to be optimal; more than that and the dough started to get too wet to shape into rolls.

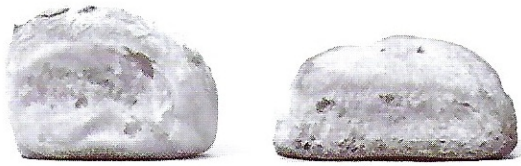
ADD HONEY AND WHEAT As in our Olive-Rosemary Bread (page 334), we swap some bread flour for whole wheat and add a bit of honey. This gives us rolls with subtle earthiness and just enough sweetness to leave the rolls' savory profile intact.

HANDLE GENTLY Using more water improves the finished rolls but also makes the dough extremely sticky, oozy, and hard to shape. In fact, the very process of forming rolls sometimes causes the delicate dough to deflate, making its texture too dense. To solve this problem, we forgo shaping altogether and instead use a bench scraper to divide the dough into rough (but equal) pieces. With less handling, these rolls retain far more of the open texture we take such pains to achieve. But to keep the soft dough from spreading and baking into a squat shape we begin by crowding them in a cake pan, coated lightly with flour. To keep the spots that rest against each other from staying soft, we remove the rolls from the oven halfway through baking, pull them apart, and return them to the oven spaced out on a baking sheet. With this two-stage baking method, they finish uniformly golden and crisp.

PRACTICAL SCIENCE
A HOT OVEN MEANS MORE RISE

Baking rolls in a hot oven means they will rise higher.

Cranking up the heat when the rolls go into the oven maximizes what professional bakers call "oven spring," the rapid rise in volume that all yeasted dough experiences when it first hits a hot oven. The higher this initial lift, the higher the finished bread.



HIGHER HEAT = HIGHER RISE

LOWER HEAT = LESS LIFT

START HIGH For a shatteringly crisp crust, we start the rolls at a higher temperature, then reduce the heat to finish them. This initial blast of heat makes all the difference between a so-so crust and one with real crackling crispness. It has another advantage, too—boosting the oven spring (the rise that yeasted dough experiences when it first hits the heat of the oven), so the crumb is even airier than before. Misting the rolls with water before baking (mimicking steam-injected ovens) makes the crust even crisper.

PRACTICAL SCIENCE FREEZE AND BAKE DOUGH

Freeze bread dough between the first and second rises for the best results.

For most of us, fresh-baked bread is a treat rather than an everyday event, since mixing the dough and allowing it to rise (or "proof") typically takes at least four hours (around three hours for the first rise and one hour for the second). But what about freezing the dough ahead of time? We froze dough for a rustic white loaf at three separate junctures: immediately after mixing, after the first rise (just before the dough was divided and shaped into loaves), and after forming the loaves and letting them rise the final time. Several weeks later, we thawed the dough in the refrigerator overnight and then baked it.

TOO SOON
Freezing the dough just after mixing killed too many of the yeast cells before they had a chance to ferment—a process that creates more complex flavor compounds and releases the carbon dioxide that makes dough rise. In addition, freezing before the first rise reduced gluten development, so the loaf didn't have enough structure to fully expand. The result: a small, squat loaf with bland flavor.

TOO LATE
Dough frozen late in the game—after the second rise—was overproofed: As the already fully risen dough slowly thawed, the random remaining viable yeast cells continued to produce gas in some parts of the dough but not in others, weakening this structure. The result: a misshapen loaf that collapsed during baking.

JUST RIGHT
Freezing the dough between the first and second rises was the best strategy. The first rise ensured that enough yeast had fermented for the dough to develop complex flavors and some rise. The remaining viable yeast cells then finished the job as the dough thawed and then rose for the second time.

Time Builds Flavor in Bread

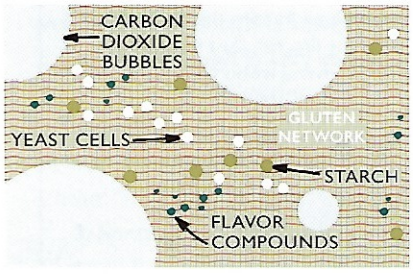
Why do breads from artisan bakers taste so good? Sure, these bakers probably have access to great flour and very good water. And, yes, their skill level and professional equipment no doubt contribute to the tangy, complex flavor of their breads. But expert bakers know that really good flavor comes simply from waiting. Stretching the bread-making process over two days isn't any more work but it can yield fantastic bread with much better flavor.

HOW THE SCIENCE WORKS

In bread baking, we follow a basic set of steps. After mixing and kneading comes fermentation, also known as the first rise.

Fermentation is arguably the oldest of cooking techniques. Even the early hunters and gatherers must have noticed that meat and berries tasted and smelled quite different a few days after collection. Louis Pasteur made the seminal discovery that the changes in food over time often result from the metabolic activity of microbes. Pasteur was observing the action of yeast, which converts sugars to ethyl alcohol and releases carbon dioxide gas as a byproduct. And as we know, an important component of bread is yeast.

FERMENTATION IN BREAD DOUGH



FERMENTATION *With time, the yeast produces flavor compounds in bread dough, as well as carbon dioxide, which helps it to rise.*

During fermentation, the gluten, which was worked hard during kneading, will relax and become more stretchable and supple. Meanwhile, the live yeast cells will begin to go to work, reacting with the sugars produced from the breakdown of starch, releasing carbon dioxide and ethyl alcohol. This releasing of the carbon dioxide into the relaxed, elastic dough is like slowly blowing air into a balloon. The bread is ready for its next step—shaping—when it has doubled in size. (The yeast doesn't stop its work after the first rise, however. It continues to produce carbon dioxide during the second rise, and during baking the heat causes a last rise, called oven spring, which lasts until all of the yeast is killed.)

Fermentation not only allows the yeast to give the dough its lofty rise but also produces a multitude of aromatic molecules that contribute to the flavor of the bread. If the fermentation happens too quickly in a warm room, however, the yeast can produce an excess of unpleasant sour-smelling volatile acids. To combat this, and to produce bread with deep flavor, we like to use two different techniques: pre-ferments and cool fermentation.

Pre-ferments—often known as sponges or starters—are made before the bread dough itself is even put together. In a sponge, for example, yeast, water, and flour are mixed together and left to ferment for a few hours. The sponge is then combined with more water and flour and any other ingredients in the recipe for the final dough. This dough is then kneaded and left to sit for its first rise.

In contrast to a sponge, a starter consists of a portion of dough saved from the last time bread was made. The classic example is sourdough starter, which many cooks save in a crock in their refrigerator. To begin the bread-making process with a starter, the baker adds water and flour to the starter and then lets the

mixture sit and ferment. Whereas the sponge is added in its entirety to the ingredients for the final dough, a small portion of the starter is put back in the crock and saved for the next round of baking. Pre-ferments are great for recipes with minimal ingredients because they boost the flavor in bread dramatically. With a lengthy rest, long carbohydrate chains, starches, and other polysaccharides that have little taste break down into a multitude of sugars, acids, and alcohol with lots of flavor.

Cool fermentation, on the other hand, is all about temperature and is why we often recommend letting bread dough rise overnight in the refrigerator. This takes longer then letting bread rise on a warm counter. But there are many positive effects. First, it reduces the size of the gas bubbles that are created as the dough rises. (The larger the bubbles in the dough prior to baking the more open and puffy the final dough will be.) But aside from producing finer, tighter gas bubbles, cold fermentation has the added benefit of creating more flavorful dough. Why? Because at lower temperatures yeast produces less carbon dioxide and more of the initial side products of fermentation: flavorful sugars, alcohol, and acids.

TEST KITCHEN EXPERIMENT

To determine the rate at which yeast converts sugars to ethyl alcohol and releases carbon dioxide during fermentation, we made the basic yeasted dough for our waffles (see page 348) using milk, butter, flour, sugar, salt, two eggs, and 1½ teaspoons of instant yeast. We split the batter into two batches and then fashioned a simple respirometer, using a test tube and balloon, for each of them. We left one out at room temperature and placed one in the refrigerator.

THE RESULTS

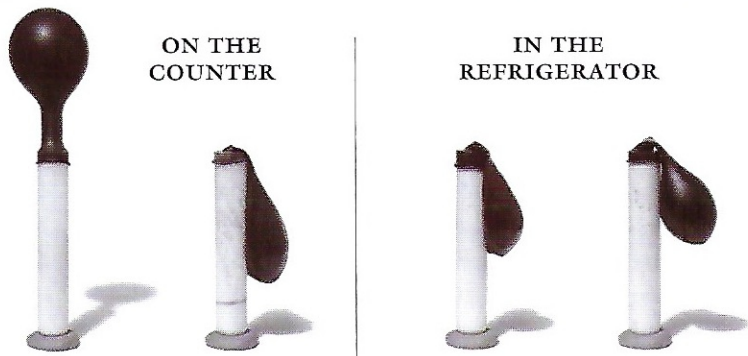
Within a short period of time (three hours), the room-temperature batter had produced enough carbon dioxide to inflate the (semi-permeable) balloon, indicating healthy yeast activity. But after 18 hours, the batter was spent and no longer produced carbon dioxide, causing the balloon to deflate. The refrigerated batter produced carbon dioxide at a very slow but steady rate. Even after 18 hours, the batter was still producing enough carbon dioxide to partially fill the balloon.

THE TAKEAWAY

Yeast plays two roles: providing leavening and flavor. When yeast is left out at room temperature, it grows quickly, leavening the batter—or dough—rapidly. In this case, however, the yeast is spent, and therefore no longer providing and making flavor, after 18 hours.

Cool fermentation takes place in the refrigerator. And refrigerating the dough allows the yeast to leaven at a slow and steady pace, producing flavor along the way. You get to the same place (a fully risen dough) but because the journey has taken so much longer, more flavorful compounds are created in the process. Not only does this cool fermentation provide more flavor in our finished product, but it gives the cook more time and flexibility to move the dough or batter along to its next step when you want.

COOL FERMENTATION TAKES MORE TIME, ADDS MORE FLAVOR



AFTER 3 HOURS
The batter quickly produces enough carbon dioxide to fill the balloon.

AFTER 18 HOURS
Yeast cells have died and the balloon has collapsed.

AFTER 3 HOURS
The batter produces a little carbon dioxide to partially fill the balloon.

AFTER 18 HOURS
The batter continues to produce carbon dioxide at a steady rate.

Both of these recipes rely on a sponge made the day before the bread is baked to build flavor.

ROSEMARY FOCACCIA

MAKES TWO 9-INCH ROUND LOAVES

If you don't have a baking stone, bake the bread on an overturned and preheated rimmed baking sheet set on the lowest oven rack.

SPONGE

- ½ cup (2½ ounces) all-purpose flour
- ⅓ cup water, heated to 110 degrees
- ¼ teaspoon instant or rapid-rise yeast

DOUGH

- 2½ cups (12½ ounces) all-purpose flour
- 1¼ cups water, heated to 110 degrees
- 1 teaspoon instant or rapid-rise yeast
- Kosher salt
- ¼ cup extra-virgin olive oil
- 2 tablespoons minced fresh rosemary

1. FOR THE SPONGE: Combine flour, water, and yeast in large bowl and stir with wooden spoon until uniform mass forms and no dry flour remains, about 1 minute. Cover bowl tightly with plastic wrap and let stand at room temperature for at least 8 hours or up to 24 hours. Use immediately or store in refrigerator for up to 3 days (allow to stand at room temperature for 30 minutes before proceeding with recipe).

2. FOR THE DOUGH: Stir flour, water, and yeast into sponge with wooden spoon until uniform mass forms and no dry flour remains, about 1 minute. Cover with plastic and let rise at room temperature for 15 minutes.

3. Sprinkle 2 teaspoons salt over dough; stir into dough until thoroughly incorporated, about 1 minute. Cover with plastic and let rise at room temperature for 30 minutes. Spray rubber spatula or bowl scraper with vegetable oil spray. Fold partially risen dough over itself by gently lifting and folding edge of dough toward middle. Turn bowl 90 degrees; fold again. Turn bowl and fold dough 6 more times (for total of 8 folds). Cover with plastic and let rise for 30 minutes. Repeat folding, turning, and rising 2 more times, for total of three 30-minute rises.

4. One hour before baking, adjust oven rack to upper-middle position, place baking stone on rack, and heat oven to 500 degrees. Gently transfer dough to lightly floured counter. Lightly dust top of dough with flour and divide it in half. Shape each piece of dough into 5-inch round by gently tucking under edges. Coat two 9-inch round cake pans with 2 tablespoons oil each. Sprinkle each pan with ½ teaspoon salt. Place round of dough in 1 pan, top side down; slide dough around pan to coat bottom and sides with oil, then flip dough over. Repeat with second piece of dough. Cover pans with plastic and let rest for 5 minutes.

5. Using fingertips, press dough out toward edges of pan, taking care not to tear it. (If dough resists stretching, let it relax for 5 to 10 minutes before trying to stretch it again.) Using dinner fork, poke entire surface of dough 25 to 30 times, popping any large bubbles. Sprinkle rosemary evenly over top of dough. Let dough rest in pans until slightly bubbly, 5 to 10 minutes.

6. Place pans on baking stone and lower oven temperature to 450 degrees. Bake until tops are golden brown, 25 to 28 minutes, rotating pans halfway through baking. Transfer pans to wire rack and let cool for 5 minutes. Remove loaves from pans and return to rack. Brush tops with any oil remaining in pans. Cool for 30 minutes before serving. (Leftover bread can be wrapped in double layer of plastic wrap and stored at room temperature for 2 days. Wrapped with additional layer of aluminum foil, bread can be frozen for up to 1 month.)

PRACTICAL SCIENCE TURN THE DOUGH GENTLY

Delicately folding the dough helps the bread to rise and improves flavor.

We rely on turning to build flavor and structure in bread dough as it rises. Turning involves delicately folding the dough over several times as it rises. A plastic bowl scraper is perfect for this job, but a rubber spatula will work, too. Just coat the scraper or spatula lightly with vegetable oil to keep it from sticking to the dough. Slide the scraper under the edge of the dough and lift and fold the dough toward the center of the bowl. Turn the bowl 90 degrees and repeat the process. Turn the bowl 90 degrees one more time and fold. When you're done, the dough should be shaped roughly like a square. In general, you will want to re-cover the bowl with plastic wrap, let it rise, and repeat the turning process 30 minutes later. (The exact timing will vary from recipe to recipe.)

Turning gently stretches the dough and builds strength as any wayward sheets of gluten—the protein that gives baked goods structure—are brought into alignment. In addition, turning the dough rids the dough of excess carbon dioxide, which otherwise inhibits yeast activity, to ensure maximum flavor and rise. We strongly recommend that you take a minute to turn the dough as it rises.

WHY THIS RECIPE WORKS

Focaccia can easily disappoint when it turns out heavy and thick. We wanted a light, airy loaf, crisp-crusted and topped with just a smattering of herbs. To start, a sponge (a mixture of flour, water, and yeast that rests for at least eight hours) gives us the flavor benefits of a long fermentation with minimal effort. But loaves with a sponge alone are not tender and airy enough. Because vigorous kneading develops too much gluten, we use a gentler approach—and a lot of oil in the pan.

BEGIN WITH THE BIGA A brush of fruity olive oil and heady seasonings give focaccia an addictive savory edge, but that doesn't mean a thing if the dough itself lacks flavor. The biggest key here is fermentation—the process by which long chains of carbohydrates with little taste convert to sugars, alcohol, acids, and carbon dioxide. And like many other organic processes, it's most effective over a long period of time. To get the benefits of long fermentation with minimal effort, we use a "pre-ferment" (also known as a sponge, or *biga* in Italian): a mixture of flour, water, and a small amount of yeast that rests overnight before being incorporated into a dough either in place of or along with more yeast. Time is the main factor here. That little bit of yeast in the biga grows as the hours go by, and the flavor that slowly develops is stronger and more complex than you would get by simply adding yeast to flour and water and kneading. With a biga, our focaccia dough holds plenty of flavor—with or without toppings added.

USE A LOT OF WATER As we've learned, a dough with a higher level of hydration is more capable of expanding without tearing, promoting the formation of larger bubbles (see concept 38). A high proportion of water to flour and a long resting process let the natural enzymes in the wheat replicate the effect of kneading. We use a higher level of hydration here in our focaccia—84 percent—to help open up the crumb structure.

REST AND FOLD As for our Almost No-Knead Bread (page 330), we don't knead our focaccia, per se. But we do fold it. (See "Turn the Dough Gently," opposite.) To prevent squat loaves of bread, we turn the dough while it rises. A standard no-knead dough develops structure gradually because the individual gluten clusters are relatively slow to combine into larger units. But gently turning the dough over itself at regular intervals accomplishes three things: It brings the wheat proteins into closer proximity with one another, keeping the process going at maximum clip; it aerates the dough, replenishing the oxygen that the yeasts consume during fermentation; and it elongates and redistributes the bubbles. After turning our dough three times in the process, we end up with a well-risen focaccia with a tender, moist crumb.

KEEP THE OIL IN THE PAN Olive oil is a key ingredient in focaccia, but we find that if added straight to the dough, it can turn the bread dense and cakelike. (Just as with shortbread, fat "shortens" the dough by blocking gluten's ability to form continuous networks.) Instead, we bake the bread in round cake pans, where a few tablespoons of oil coating the exterior can be contained. After swirling the bottom in the oil and some coarse salt, we flip the dough, gently stretch it into the pan's edges, and let it rest for just a few extra minutes before sliding it onto the hot pizza stone. This focaccia has a crackly, crisp bottom, a deeply browned top, and an interior that is open and airy.

POKE AND SPRINKLE With a dinner fork, poke the dough surface 25 to 30 times. This will pop large bubbles of air and allow any extra gas to escape. Then sprinkle the dough with a healthy dose of minced fresh rosemary.

WHOLE-WHEAT SANDWICH BREAD

MAKES TWO 8-INCH LOAVES

If you don't have a stand mixer, you can mix the dough by hand. To do this, stir the wet and dry ingredients together along with the soaker and sponge with a stiff rubber spatula until the dough comes together and looks shaggy. Transfer the dough to a clean counter and knead by hand to form a smooth, round ball, 15 to 25 minutes, adding additional flour, if necessary, to prevent the dough from sticking to the counter. Proceed with the recipe as directed. If you don't have a baking stone, bake the bread on an overturned and preheated rimmed baking sheet set on the lowest oven rack.

SPONGE

- 2 cups (11 ounces) bread flour
- 1 cup water, heated to 110 degrees
- ½ teaspoon instant or rapid-rise yeast

SOAKER

- 3 cups (16½ ounces) whole-wheat flour
- ½ cup wheat germ
- 2 cups whole milk

DOUGH

- 6 tablespoons unsalted butter, softened
- ¼ cup honey
- 2 tablespoons instant or rapid-rise yeast
- 2 tablespoons vegetable oil
- 4 teaspoons salt

1. FOR THE SPONGE: Combine flour, water, and yeast in large bowl and stir with wooden spoon until uniform mass forms and no dry flour remains, about 1 minute. Cover bowl tightly with plastic wrap and let sit at room temperature for at least 8 hours or up to 24 hours.

2. FOR THE SOAKER: Combine flour, wheat germ, and milk in separate large bowl and stir with wooden spoon until shaggy mass forms, about 1 minute. Transfer dough to lightly floured counter and knead by hand until smooth, 2 to 3 minutes. Return soaker to bowl, cover tightly with plastic, and refrigerate for at least 8 hours or up to 24 hours.

3. FOR THE DOUGH: Tear soaker apart into 1-inch pieces and place in bowl of stand mixer fitted with dough hook. Add sponge, butter, honey, yeast, oil, and salt and mix on low speed until cohesive mass starts to form, about 2 minutes. Increase speed to medium and knead until dough is smooth and elastic, 8 to 10 minutes. Transfer dough to lightly floured counter and knead by hand to form smooth, round ball, about 1 minute. Place dough in large, lightly greased bowl. Cover tightly with plastic and let rise at room temperature for 45 minutes.

4. Gently press down on center of dough to deflate. Spray rubber spatula or bowl scraper with vegetable oil spray; fold partially risen dough over itself by gently lifting and folding edge of dough toward middle. Turn bowl 90 degrees; fold again. Turn bowl and fold dough 6 more times (total of 8 folds). Cover tightly with plastic and allow to rise at room temperature until doubled in size, about 45 minutes.

5. Grease two 8½ by 4½-inch loaf pans. Transfer dough to well-floured counter and divide in half. Press 1 piece of dough into 17 by 8-inch rectangle, with short side facing you. Roll dough toward you into firm cylinder, keeping roll taut by tucking it under itself as you go. Turn loaf seam side up and pinch it closed. Place loaf seam side down in prepared pan, pressing gently into corners. Repeat with second piece of dough. Cover loaves loosely with greased plastic and let rise at room temperature until nearly doubled in size, 1 to 1½ hours (top of loaves should rise about 1 inch over lip of pan).

6. One hour before baking, adjust oven racks to middle and lowest positions, place baking stone on middle rack, place empty loaf pan or other heatproof pan on bottom rack, and heat oven to 400 degrees. Bring 2 cups water to boil on stovetop. Using sharp serrated knife or single-edge razor blade, make one ¼-inch-deep slash lengthwise down center of each loaf. Working quickly, pour boiling water into empty loaf pan in oven and set loaves in pans on baking stone. Reduce oven temperature to 350 degrees. Bake until crust is dark brown and loaves register 200 degrees, 40 to 50 minutes, rotating loaves front to back and side to side halfway through baking. Transfer pans to wire rack and let cool for 5 minutes. Remove loaves from pans, return to rack, and let cool to room temperature, about 2 hours, before slicing and serving. (Bread can be wrapped in double layer of plastic wrap and stored at room temperature for up to 3 days. Wrapped with additional layer of aluminum foil, bread can be frozen for up to 1 month.)

WHY THIS RECIPE WORKS

To bump up the whole-wheat flavor, we soak the whole-wheat flour in milk overnight to soften the flour and reduce its bitter notes. Adding some wheat germ further ramps up the wheat flavor. We use a biga (a combination of bread flour, water, and yeast left overnight in the refrigerator) to develop a full range of unique flavors. Three final tweaks give our bread even more character: using honey instead of white sugar, cutting back on the fat, and swapping some of the butter for vegetable oil.

UP THE AMOUNT OF WHOLE WHEAT Most recipes for whole-wheat sandwich bread lead to one of two pitfalls. They either pay lip service to being "whole wheat," yielding loaves containing so little of the whole-grain stuff that they resemble the fluffy, squishy bread you find at the supermarket, or they call for so much whole wheat that the loaves bake up coarse and dense, crumbling as soon as you slice into them. (The challenge when making whole-wheat bread is that the very thing that gives it character and distinguishes it from white bread—the presence of bran—is also an impediment to gluten development.) We wanted a sandwich bread with a full-blown nutty (but not bitter) taste and a hearty yet soft crumb that sliced neatly.

We first do this by substituting bread flour for all-purpose flour. Thanks to the boost in gluten development from its extra protein, we are able to increase the amount of whole-wheat flour from 40 to 50 percent. But to up the percentage even more, we have to soak. A prolonged soaking of the whole-wheat flour accomplishes three things: First and foremost, it softens the grain's bran, thereby preventing the sharp edges from puncturing and deflating the dough. Second, the hydrating effect also prevents the grains from robbing moisture from the dough, which would toughen the crumb. Third, steeping

the grains activates the wheat's enzymes, converting some starches into sugars and, in turn, reducing bitterness and coaxing out a sweet flavor. Using a soaker, we can get our whole wheat up to 60 percent, producing a considerably wheatier final product. (See "Soaking Wheat for Better Bread," below.) (In order to keep the dough cool during the kneading process, we refrigerate the soaker overnight. This way, the friction of kneading won't cause the dough's temperature to rise and lead to an overrisen product whose flavor and texture both suffer.)

ADD WHEAT GERM To bring our already wheaty wheat bread up to the next level, we add extra wheat germ, which is removed along with the bran during the milling process for refined flour and is a significant source of not only the whole grain's nutrition but also its sweet flavor. To add even more to the flavor of our bread, we add some honey for a complex sweetness and cut back on the fat, swapping some of the butter for oil, for a hearty yet soft-textured loaf.

USE A BIGA The difference between a good-tasting loaf and one that offers the most robust, well-developed flavor can boil down to the use of a biga. When left to sit overnight, this mixture of flour, water, and yeast develops a full range of unique flavors that give bread even more character. Because we are already soaking the whole-wheat flour overnight, we make our biga at the same time and let it ferment overnight.

IMPLEMENT THE USUAL TRICKS This recipe relies on many of the usual tricks: We turn the dough midway through the first rise in order to remove large gas bubbles and promote even fermentation. We slash the top of the dough before baking to make it easier for the dough to rise suddenly in the oven. And before putting the bread in the oven, we pour boiling water into an empty loaf pan that we positioned on the bottom rack. This supplies steam—a common bread baker's technique that prevents the crust from drying out before the loaves have fully expanded.

PRACTICAL SCIENCE

SOAKING WHEAT FOR BETTER BREAD

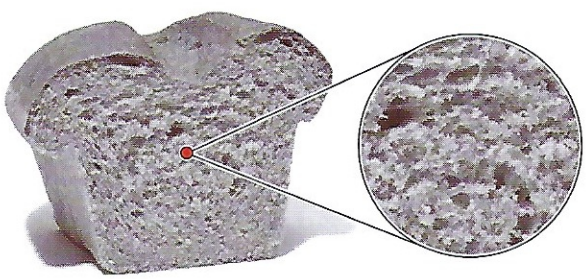
Soaking the whole-wheat flour in milk improves both the texture and flavor of our Whole-Wheat Sandwich Bread.

When developing our recipe for whole-wheat bread, our goal was to cram as much whole wheat into the dough as possible to create a seriously wheaty sandwich loaf. Fifty percent whole wheat wasn't enough to get us to this goal—but any more and the bread got too heavy and developed off-flavors. Would giving the whole-wheat flour a long soak before creating the final dough allow us to bump up its amount?

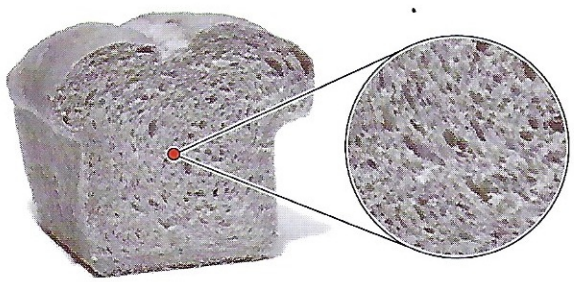
We baked two loaves, each with a 3:2 ratio of whole wheat to refined bread flour. We soaked the whole-wheat flour in the first batch overnight in the milk from our recipe before combining it with the other ingredients. In the second batch, we didn't give the whole-wheat flour any special treatment and proceeded with the recipe as usual.

The texture and flavor of the bread made with the soaked flour were markedly better than those of the loaf in which we didn't soak the whole wheat.

Soaking has a twofold effect on the final loaf. First, it dulls the flour's hard, fibrous bran, blunting its ability to disrupt gluten development and produce a denser crumb. Soaking also activates enzymes in the flour that convert some of the starches into sugars, thereby sweetening the bran's natural bitterness. The technique allowed us to pack our bread with roughly 50 percent more whole wheat than most recipes call for and still create a loaf with earthy-sweet flavor and a soft yet hearty crumb.



SOAKED FLOUR
Lighter texture, no bitterness



UNSOAKED FLOUR
Dense texture, bitter flavor

These three recipes don't use a sponge but they call for letting the dough rise in the refrigerator so yeast can develop flavor in the dough slowly. This simple idea is applied to recipes that are very different from each other.

NEW YORK–STYLE THIN-CRUST PIZZA

MAKES TWO 13-INCH PIZZAS, SERVING 4 TO 6

If you don't have a baking stone, bake the pizzas on an overturned and preheated rimmed baking sheet. You can shape the second dough round while the first pizza bakes, but don't add the toppings until just before baking. You will need a pizza peel for this recipe. It is important to use ice water in the dough to prevent the dough from overheating while in the food processor. Semolina flour is ideal for dusting the peel; use it in place of bread flour if you have it. The sauce will yield more than needed in the recipe; extra sauce can be refrigerated for up to one week or frozen for up to one month.

DOUGH

- 3 cups (16½ ounces) bread flour
- 2 teaspoons sugar
- ½ teaspoon instant or rapid-rise yeast
- 1⅓ cups ice water
- 1 tablespoon vegetable oil
- 1½ teaspoons salt

SAUCE

- 1 (28-ounce) can whole tomatoes, drained
- 1 tablespoon extra-virgin olive oil
- 1 teaspoon red wine vinegar
- 2 garlic cloves, minced
- 1 teaspoon salt
- 1 teaspoon dried oregano
- ¼ teaspoon pepper

CHEESE

- 1 ounce Parmesan cheese, grated fine (½ cup)
- 8 ounces whole-milk mozzarella, shredded (2 cups)

1. FOR THE DOUGH: Pulse flour, sugar, and yeast in food processor (fitted with dough blade if possible) until combined, about 5 pulses. With food processor running, slowly add water; process until dough is just combined and no dry flour remains, about 10 seconds. Let dough sit for 10 minutes.

2. Add oil and salt to dough and process until dough forms satiny, sticky ball that clears sides of bowl, 30 to 60 seconds. Transfer dough to lightly oiled counter and knead briefly by hand until smooth, about 1 minute. Shape dough into tight ball and place in large, lightly oiled bowl; cover bowl tightly with plastic wrap and refrigerate for at least 24 hours or up to 3 days.

3. FOR THE SAUCE: Process all ingredients in clean bowl of food processor until smooth, about 30 seconds. Transfer to bowl and refrigerate until ready to use.

4. TO TOP AND BAKE THE PIZZA: One hour before baking, adjust oven rack to upper-middle position (rack should be 4 to 5 inches from broiler), set baking stone on rack, and heat oven to 500 degrees. Transfer dough to clean counter and divide in half. With cupped palms, form each half into smooth, tight ball. Place balls of dough on lightly greased baking sheet, spacing them at least 3 inches apart; cover loosely with greased plastic and let sit for 1 hour.

5. Coat 1 ball of dough generously with flour and place on well-floured counter (keep other ball covered). Use fingertips to gently flatten dough into 8-inch disk, leaving 1 inch of outer edge slightly thicker than center. Using hands, gently stretch disk into 12-inch round, working along edges and giving disk quarter turns. Transfer dough to well-floured pizza peel and stretch into 13-inch round. Using back of spoon or ladle, spread ½ cup tomato sauce in thin layer over surface of dough, leaving ¼-inch border around edge. Sprinkle ¼ cup Parmesan evenly over sauce, followed by 1 cup mozzarella. Slide pizza carefully onto baking stone and bake until crust is well browned and cheese is bubbly and beginning to brown, 10 to 12 minutes, rotating pizza halfway through baking. Transfer pizza to wire rack and let cool for 5 minutes before slicing and serving. Repeat step 5 to shape, top, and bake second pizza.

NEW YORK–STYLE THIN-CRUST WHITE PIZZA

MAKES TWO 13-INCH PIZZAS, SERVING 4 TO 6

If you don't have a baking stone, bake the pizzas on an overturned and preheated rimmed baking sheet. You can shape the second dough round while the first pizza bakes, but don't add the toppings until just before baking. You will need a pizza peel for this recipe. It is important to use ice water in the dough to prevent the dough from overheating while in the food processor. Semolina flour is ideal for dusting the peel; use it in place of bread flour if you have it.

DOUGH

- 3 cups (16½ ounces) bread flour
- 2 teaspoons sugar
- ½ teaspoon instant or rapid-rise yeast
- 1⅓ cups ice water
- 1 tablespoon vegetable oil
- 1½ teaspoons salt

WHITE SAUCE

- 1 cup whole-milk ricotta cheese
- ¼ cup extra-virgin olive oil
- ¼ cup heavy cream
- 1 large egg yolk
- 4 garlic cloves, minced
- 2 teaspoons minced fresh oregano
- 1 teaspoon minced fresh thyme
- ½ teaspoon salt
- ¼ teaspoon pepper
- ⅛ teaspoon cayenne pepper
- 2 scallions, sliced thin, dark green tops reserved for garnish

CHEESE

- 1 ounce Pecorino cheese, grated fine (½ cup)
- 8 ounces whole-milk mozzarella cheese, shredded (2 cups)
- ½ cup whole-milk ricotta cheese

1. FOR THE DOUGH: Pulse flour, sugar, and yeast in food processor (fitted with dough blade if possible) until combined, about 5 pulses. With food processor running, slowly add water; process until dough is just combined and no dry flour remains, about 10 seconds. Let dough sit for 10 minutes.

2. Add oil and salt to dough and process until dough forms satiny, sticky ball that clears sides of bowl, 30 to 60 seconds. Transfer dough to lightly oiled counter and knead briefly by hand until smooth, about 1 minute. Shape dough into tight ball and place in large, lightly oiled bowl; cover bowl tightly with plastic wrap and refrigerate for at least 24 hours or up to 3 days.

3. FOR THE SAUCE: Whisk all ingredients except scallion greens together in bowl; refrigerate until ready to use.

4. TO TOP AND BAKE THE PIZZA: One hour before baking, adjust oven rack to upper-middle position (rack should be 4 to 5 inches from broiler), set baking stone on rack, and heat oven to 500 degrees. Transfer dough to clean counter and divide in half. With cupped palms, form each half into smooth, tight ball. Place balls of dough on lightly greased baking sheet, spacing them at least 3 inches apart; cover loosely with greased plastic and let sit for 1 hour.

5. Coat 1 ball of dough generously with flour and place on well-floured counter (keep other ball covered). Use fingertips to gently flatten dough into 8-inch disk, leaving 1 inch of outer edge slightly thicker than center. Using hands, gently stretch disk into 12-inch round, working along edges and giving disk quarter turns. Transfer dough to well-floured pizza peel and stretch into 13-inch round. Using back of spoon or ladle, spread half of white sauce in

PRACTICAL SCIENCE KEEPING INFLATION DOWN

Cool fermentation results in a thinner crust and more flavor.

The biggest factor contributing to a crust that turns out thick versus thin is the size of the gas bubbles in the dough before it goes into the oven. The more the bubbles expand with carbon dioxide as the dough ferments (or "proofs"), the thicker the final crust. Could a longer rise in the refrigerator fix the problem?

We made two batches of bread dough. We left one to rise at room temperature for four hours and placed the other in the refrigerator for 24 hours. We baked both according to our recipe.

The dough left to rise at room temperature produced a crust that puffed up like focaccia, while the dough that rose in the fridge baked up with smaller bubbles and boasted far more flavor.

Fermentation is a two-phase process: First, the carbohydrates in the dough are converted by the yeast to sugars, alcohol, and acids. Next, these convert to carbon dioxide, expanding the bubbles created in the dough when it was first mixed. At room temperature, the process moves rapidly to the production of carbon dioxide. But in the fridge, the process is slowed way down. With enough time, the complex-tasting sugars, alcohol, and acids form, but very little carbon dioxide gets converted, so the bubbles in the dough stay small and the crust bakes up both thinner and more flavorful.

PUFFY AND BLAND

THIN AND FLAVORFUL

thin layer over surface of dough, leaving ¼-inch border around edge. Sprinkle ¼ cup Pecorino evenly over sauce, followed by 1 cup mozzarella. Dollop ¼ cup ricotta in teaspoon amounts evenly over pizza. Slide pizza carefully onto baking stone and bake until crust is well browned and cheese is bubbly and beginning to brown, 10 to 12 minutes, rotating pizza halfway through baking. Transfer pizza to wire rack and let cool for 5 minutes before slicing and serving. Repeat step 5 to shape, top, and bake second pizza.

WHY THIS RECIPE WORKS

With home ovens that reach only 500 degrees and dough that's impossible to stretch thin, even the savviest cooks can struggle to produce New York–style parlor-quality pizza. We were in pursuit of a New York–style pizza with a perfect crust—thin, crisp, and spottily charred on the exterior; tender yet chewy within. High-protein bread flour gives us a chewy, nicely tanned pizza crust and the right ratio of flour, water, and yeast gives us dough that stretches and retains moisture as it bakes. We knead the dough quickly in a food processor then let it rest in the refrigerator for at least 24 hours to develop its flavors. After we shape and top the pizza, it goes onto a blazing-hot baking stone to cook. Placing the stone near the top of the oven allows the top of the pizza to brown as well as the bottom. In minutes we get a pizza with everything in sync: a thoroughly crisp, browned crust with a slightly chewy texture.

USE HIGH-PROTEIN FLOUR We opt for high-protein bread flour (about 13 percent by weight) in our pizza dough. It's a typical choice when a chewy, nicely tanned crust is the goal, since the proteins both encourage gluten development and brown easily. We add enough water to hydrate the dough at about 63 percent (see concept 38)—enough so it stretches easily without ripping or sticking to our fingers and retains moisture as it bakes. The dough is a little sticky, but we add some extra flour to the exterior as we shape and stretch the dough. We use a food processor to mix the dough. A more conventional stand-mixer method might take 15 to 20 minutes to produce a shiny, elastic dough, but the food processor turns out comparably kneaded dough in less than two minutes. (Though for many bread recipes, we would caution against the rough treatment of a food processor, which can tear apart the strands of gluten that give bread structure and the ability to rise, here the amount of flour used is relatively small. Also, because this is a pizza, we do not need to develop the structure of a dough destined to be a flatbread.)

CHILL THE DOUGH Cool fermentation of the dough not only helps keep the bubbles in the dough smaller and tighter, it creates more flavor via the production of sugar, alcohol, and acids (see "Keeping Inflation Down," page 345).

ADD SUGAR AND OIL Adding oil and sugar to the dough helps to encourage more crunch and color in the crust. (We often sprinkle a spoonful of sugar over poultry skin to help it darken and crisp up in the oven, and there's no reason the same trick can't be used here.) The sugar undergoes both caramelization and the Maillard reaction to produce aromas and brown pigments.

STRETCH BY HAND Forget using a rolling pin. You can flatten and stretch the dough by hand. On a well-floured surface and using your fingertips, gently flatten half of the dough into an 8-inch disk, leaving the outer edge slightly thicker than the center to create a fatter "handle." With your hands, stretch the dough into a 12-inch round, working along the edges and giving the dough quarter turns. Transfer to a well-floured peel and stretch to a 13-inch round.

SHRINK YOUR HEADROOM Home ovens don't get hot enough to produce a deeply browned crust before the interior crumb dries out and toughens. The best solution has always been the hottest setting on the oven dial and a baking stone, which soaks up the radiation heat like a sponge. Following that logic, most recipes call for the stone to be placed as low in the oven as possible, where it gets maximum exposure to the main heating element. But that doesn't really make sense, and we even have an industry clue to prove it: commercial pizza ovens. These wide, shallow chambers quickly reflect heat from the floor back onto the top of the pie as it cooks, preventing the crust from drying out before the toppings have browned. We can't alter the shape of our oven, but we can move the stone up closer to the top to narrow the gap between the stone and ceiling. The best position for the stone is really as close to the top of the oven as possible—about 4 inches or so from the ceiling, which leaves just enough headroom to comfortably house the pie.

MAKE AN EASY SAUCE We use a no-cook sauce here—canned tomatoes, garlic, olive oil, and spices pureed in a food processor. Red wine vinegar enhances the tomatoes' bright acidity. We supplement the creamy, stretchy mozzarella with a fistful of sharp, salty, finely grated Parmesan.

TOP WELL We like our thin-crust pizza simply dressed with tomato sauce and shredded mozzarella and Parmesan, but additional toppings are always an option—provided they're prepared correctly and added judiciously. (An overloaded pie will become soggy.) If you're using hearty vegetables, aim for a maximum of 6 ounces per pie, precooked to remove excess moisture. Leafy green vegetables and herbs like spinach and basil are best placed beneath the cheese to protect them or added raw to the fully cooked pie. Meats (no more than 4 ounces per pie) should be precooked and drained to remove excess fat.

CRESCENT ROLLS

MAKES 16 ROLLS

We developed this recipe using lower-protein flour such as Gold Medal or Pillsbury. If using a higher-protein flour such as King Arthur, reduce the flour amount to 3½ cups (17½ ounces). If you don't have a stand mixer, you can mix the dough by hand. To do this, stir the wet and dry ingredients together with a stiff rubber spatula until the dough comes together and looks shaggy. Transfer the dough to a clean counter and knead by hand to form a smooth, round ball, 15 to 25 minutes, adding additional flour, if necessary, to prevent the dough from sticking to the counter. Proceed with the recipe as directed.

- 16 tablespoons unsalted butter, cut into 16 pieces
- ¾ cup skim milk
- ¼ cup (1¾ ounces) sugar
- 3 large eggs
- 4 cups (20 ounces) all-purpose flour
- 1 teaspoon instant or rapid-rise yeast
- 1½ teaspoons salt
- 1 large egg white, beaten with 1 teaspoon water

1. Microwave butter, milk, and sugar in 4-cup liquid measuring cup until butter is mostly melted and mixture is warm (110 degrees), about 1½ minutes. Whisk to melt butter and blend in sugar. Beat eggs lightly in medium bowl; add about one-third of warm milk mixture, whisking to combine. When bottom of bowl feels warm, add remaining milk mixture, whisking to combine.

2. Using stand mixer fitted with paddle, mix flour and yeast together on low speed until combined, about 15 seconds. Add egg mixture in steady stream and mix until loose, shiny dough forms (you may also see satiny webs as dough moves in bowl), about 1 minute. Increase speed to medium and beat for 1 minute; add salt slowly and continue beating until stronger webs form, about 3 minutes longer. (Dough will remain loose rather than forming neat, cohesive mass.) Transfer dough to large, lightly greased bowl; cover tightly with plastic wrap and let rise at room temperature until dough doubles in size and surface feels tacky, about 3 hours.

3. Line rimmed baking sheet with plastic. Sprinkle dough with flour (no more than 2 tablespoons) to prevent sticking and press down gently to deflate. Transfer dough to floured counter and press into rough rectangle shape. Transfer rectangle to prepared baking sheet, cover with plastic, and refrigerate for 8 to 12 hours.

4. Transfer dough rectangle to lightly floured counter and line baking sheet with parchment paper. Roll dough into uniform 20 by 13-inch rectangle. Cut dough in half lengthwise, then cut each rectangle into 8 triangles, trimming edges as needed to make uniform triangles. Before rolling crescents, elongate each triangle of dough, stretching it an additional 2 to 3 inches in length. Starting at wide end, gently roll up dough, ending with pointed tip on bottom, and push ends toward each other to form crescent shape. Arrange crescents in 4 rows on prepared baking sheet, wrap baking sheet with plastic, and refrigerate for at least 2 hours or up to 3 days.

5. Remove baking sheet with chilled rolls from refrigerator, unwrap, and slide baking sheet into large clean garbage bag; seal to close. Let crescents rise until they feel slightly tacky and soft and have lost their chill, 45 minutes to 1 hour.

6. Thirty minutes before baking, adjust oven racks to lower-middle and lowest positions, place second rimmed baking sheet on lower rack, and heat oven to 425 degrees. Bring 1 cup water to boil on stovetop. Lightly brush risen crescent rolls with egg-white mixture. Working quickly, place baking sheet with rolls on upper rack, then pour boiling water onto rimmed baking sheet on lower rack and quickly close oven door. Bake for 10 minutes, then reduce oven temperature to 350 degrees and continue baking until tops and bottoms of rolls are deep golden brown, 12 to 16 minutes longer. Transfer rolls to wire rack, let cool for 5 minutes, and serve warm. (Rolls can be placed in zipper-lock bag and stored at room temperature for up to 3 days. Wrapped with aluminum foil before placing in bag, rolls can be frozen for up to 1 month.)

TO MAKE AHEAD: Rolls can be partially baked and frozen until ready to serve. Begin baking rolls as instructed, but let them bake at 350 degrees for only 4 minutes, or until tops and bottoms brown slightly. Remove them from oven and let cool to room temperature. Place partially baked rolls in single layer inside zipper-lock bag and freeze. When ready to serve, defrost rolls at room temperature and place in preheated 350-degree oven for 12 to 16 minutes.

WHY THIS RECIPE WORKS

Crescent rolls from the supermarket are artificial-tasting and stale quickly, but making them at home is time-consuming. We were determined to come up with a recipe for rich, tender, flaky crescent rolls that could fit into an already-hectic holiday cooking schedule. We found that skim milk adds flavor without density, and melted butter and extra eggs enrich the dough. An overnight chill makes the finished rolls crisp and flaky, and the resilient dough can be shaped.and refrigerated for three days (or parbaked and frozen for one month), then baked right before serving, for rich, buttery rolls without any fuss.

ADD BUTTER The dough for our crescent rolls differs from rustic bread and pizza doughs—it has a lot of fat. This family of bread dough (which includes American sandwich bread, brioche, and challah) calls for eggs, milk, and butter on top of flour, water, and yeast. With all of that fat, however, the dough can be incredibly sticky and hard to handle. This is why chilling it is essential. (Chilling also gives the gluten time to relax so that you can stretch the dough easily into crescents.)

CHILL WELL Not only is a chilled dough easier to handle, but the texture of the final rolls made from chilled dough is better, too. These rolls are flaky and flavorful with a blistery, snappy crust. The process of retarding (or chilling for a long time) allows acetic acid to build up in the dough, which is responsible for a richer flavor as well as a blistered crust.

STRETCH, CUT, AND ROLL To turn a lump of dough into 16 crescent rolls, first roll the dough into a 20 by 13-inch rectangle. Use a pizza wheel to trim the edges. Cut the dough in half lengthwise, and then cut each length into eight triangles. Elongate each triangle of dough before rolling the crescent, stretching it an additional 2 to 3 inches in length. And then, starting at the wide end, gently roll up the dough, ending with the pointed tip on the bottom.

START IN HOT OVEN We start our crescent rolls in a 425-degree oven for an initial bake, and then lower the oven temperature to 350 degrees just when the rolls are starting to color. Why? This improves the rolls' oven spring, or the dramatic increase in size caused by that initial blast of heat from the oven. The high heat makes the rolls larger and loftier. Lowering the oven temperature allows the rolls to bake through without burning.

YEASTED WAFFLES

MAKES SEVEN 7-INCH ROUND OR FOUR 9-INCH SQUARE WAFFLES

While the waffles can be eaten as soon as they are removed from the waffle iron, they will have a crispier exterior if rested in a warm oven for 10 minutes. (This method also makes it possible to serve everyone at the same time.) This batter must be made 12 to 24 hours in advance. We prefer the texture of the waffles made in a classic waffle iron, but a Belgian waffle iron will work, though it will make fewer waffles.

- 1¾ cups milk
- 8 tablespoons unsalted butter, cut into 8 pieces
- 2 cups (10 ounces) all-purpose flour
- 1 tablespoon sugar
- 1½ teaspoons instant or rapid-rise yeast
- 1 teaspoon salt
- 2 large eggs
- 1 teaspoon vanilla extract

1. Heat milk and butter in small saucepan over medium-low heat until butter is melted, 3 to 5 minutes. Let mixture cool until warm to touch.

2. Meanwhile, whisk flour, sugar, yeast, and salt together in large bowl. Gradually whisk warm milk mixture into flour mixture; continue to whisk until batter is smooth. Whisk eggs and vanilla in small bowl until combined, then add egg mixture to batter and whisk until incorporated. Scrape down bowl with rubber spatula, cover bowl with plastic wrap, and refrigerate for at least 12 hours or up to 24 hours.

3. Adjust oven rack to middle position and heat oven to 200 degrees. Set wire rack in rimmed baking sheet; place in oven. Heat waffle iron according to manufacturer's instructions. Remove batter from refrigerator when waffle iron is hot (batter will be foamy and doubled in size). Whisk batter to recombine (batter will deflate). Bake waffles according to manufacturer's instructions (use about ½ cup for 7-inch round iron and about 1 cup for 9-inch square iron). Transfer waffles to wire rack in preheated oven; repeat with remaining batter. Serve.

BLUEBERRY YEASTED WAFFLES

We found that frozen wild blueberries—which are smaller—work best here. Larger blueberries release too much juice, which burns and becomes bitter when it comes in contact with the waffle iron.

After removing waffle batter from refrigerator in step 3, gently fold 1½ cups frozen blueberries into batter using rubber spatula. Bake waffles as directed.

WHY THIS RECIPE WORKS

Raised waffles are barely on the current culinary radar, and that's a shame. They sound old-fashioned and do require an ounce of advance planning, but they are crisp, tasty, and easy to prepare. We wanted to revive this breakfast treat with yeasted waffles that were creamy and airy, tangy and salty, refined and complex. We settled on all-purpose flour, found the right amount of yeast to provide a pleasant tang, and added a full stick of melted butter for rich flavor. Refrigerating the batter overnight keeps the growth of the yeast under control and produces waffles with superior flavor. Even better, now all we have to do in the morning is heat up the iron.

LET RISE OVERNIGHT The concept for yeast waffles is simple enough. Most of the ingredients (flour, salt, sugar, yeast, milk, melted butter, and vanilla) are combined the night before and left to rise on the counter. The next day, eggs and baking soda are added and the batter is baked off. But older recipes call for the batter to be left out at room temperature, which causes the batter to rise and then fall, and turn sour rather than tangy. We find that slowing down the fermentation in the fridge ensures that flavors don't overdevelop. Also, this way we don't need to wait to add the eggs in the morning.

PRACTICAL SCIENCE REFRIGERATING MAPLE SYRUP

Once opened, store maple syrup in the refrigerator—or the freezer.

Because of its high moisture level and lack of preservatives, maple syrup is a perishable food product that is susceptible to the growth of yeasts, molds, and bacteria. Refrigeration not only helps maple syrup retain its flavor but prevents microorganisms from growing as well. Unopened, maple syrup will last several years stored in a cool, dark place. Once opened, it will keep six months to a year in the refrigerator.

But as maple syrup can be pricey, it can make sense to buy it in large quantities when on sale. For long-term storage (more than a year), we wondered if storing syrup in the freezer would work as well as refrigeration. We froze half the contents of one bottle of syrup, refrigerated the rest, and then conducted a comparative tasting. The syrup stored in the freezer never froze solid and, once warmed, was identical in taste to the refrigerated syrup. (The syrup never froze because of the high concentration of solids in the liquid—in this case, the sugar.) At most, the syrup will become thick, viscous, or crystallized during freezing, but a quick zap in the microwave will restore it so well that you would never know it had been "frozen."

DON'T ADD BUTTERMILK We think buttermilk is the key to great pancakes and waffles made à la minute. (See Best Buttermilk Pancakes recipe, page 360.) Unfortunately, most cooks don't have buttermilk in the fridge and many markets don't even carry it. The good news about this recipe: It works best with regular milk. The yeast provides plenty of tang. Buttermilk would be overkill.

NO BAKING SODA Many older recipes call for baking soda to be added with the eggs just before baking. In our recipe, this isn't necessary. The baking soda is needed for lift in those recipes because the batter is left out overnight, which results in dead yeast in the morning. In our waffles, the yeast has plenty of leavening power the next morning because the batter has been refrigerated; as a result, the baking soda is redundant.

USE A HOT IRON Not all waffle irons are the same—you want to use a hot iron. The best irons produce waffles that are evenly cooked and consistently browned from the beginning to the end of a batch—and in the promised shade of light to dark. Look for models with thick heating coils extending under most of the cooking surface, which helps to ensure uniformly golden waffles that cook efficiently.