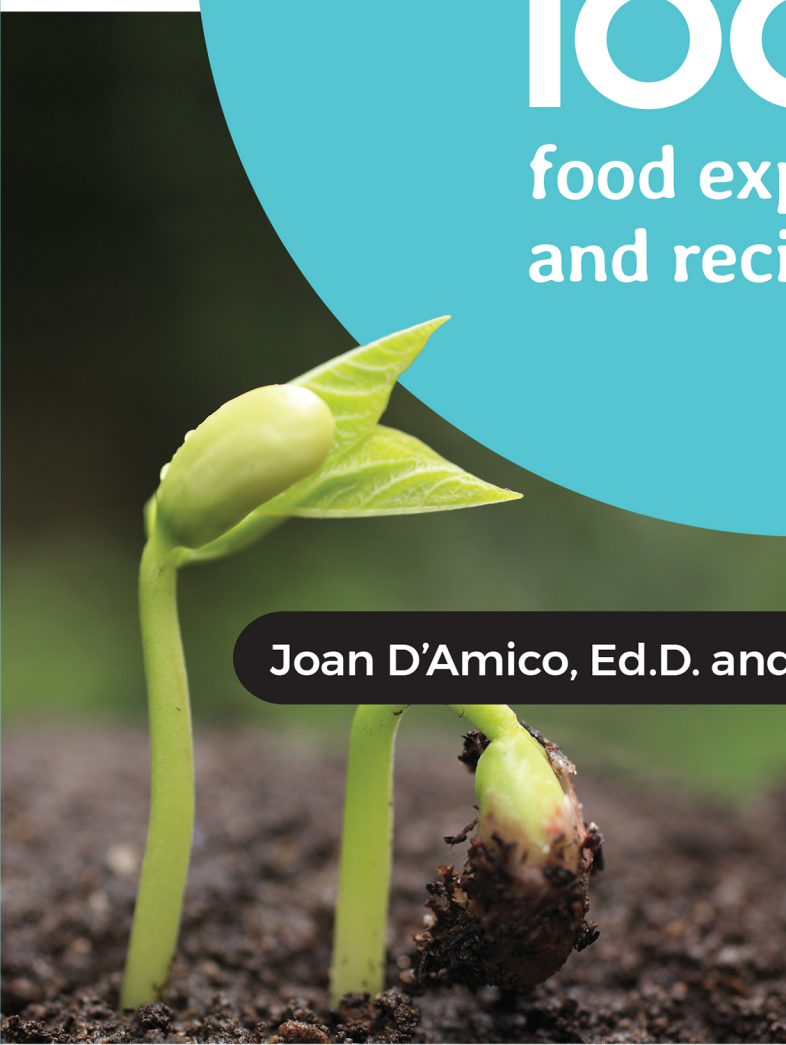




second  
edition

# the science chef 100 fun

food experiments  
and recipes for kids



Joan D'Amico, Ed.D. and Karen Drummond, Ed.D.

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*The Science Chef* is an exploratory guide to cooking with a scientific twist! It allows children to fully immerse themselves in making practical recipes that directly relate to scientific concepts. These easy-to-follow recipes create a natural blend of food and science and will engage young scientists of all ages.

**Annamarie Russo, Supervisor of K-5 STEAM Education**

*The Science Chef* series exemplifies the authors' passion for teaching kids. What a wonderful way to inspire scientific exploration by putting young culinary enthusiasts to work in the kitchen! Now more than ever, these books are important tools for educating kids at school or at home.

**Ellen Taylor, Manager, The Farm Cooking School**

*The Science Chef* is not your average cook book. The authors' brilliant concepts combine life and academic skills with delicious recipes. Math, science and culinary arts make cooking a truly interactive and multidisciplinary experience that kids can take from the classroom to their own family kitchens.

**Darleen Reveille, RN,  
Robert Wood Johnson Foundation Community Health Leader**



# THE SCIENCE CHEF



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# THE SCIENCE CHEF

**100+**  
Fun Food  
Experiments and  
Recipes for Kids

SECOND  
EDITION

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SECOND EDITION



To Christi, Alexa, and Kyle. May all your dreams come true.

—**Joan D'Amico**

For Caitlin.

—**Karen Eich Drummond**

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# About This Book

Welcome to the updated second edition of *The Science Chef* designed to help you learn about science in new and tasty ways. Whenever you cook, you use the science of chemistry to mix and heat ingredients to make something new, like bread from flour, yeast, and water or popcorn from corn kernels and heat. You learn about biology when you investigate fruits, seeds, grains, herbs, spices, and other products from nature that we eat. And you learn the science of nutrition when you think about how the substances in foods you eat affect your body.

The first section, “Discovering Science in the Kitchen,” covers the basics about science, cooking skills and equipment, food safety, and nutrition. *Read it carefully before you do any of the experiments or try any of the recipes.*

Part I, “Questions, Questions, Questions,” explores answers to science questions such as “Why does popcorn pop?” and “How does bread rise?” Part II, “No More Boxes, Cans, or Jars: Do It Yourself,” invites you to make foods from scratch or grow foods, instead of buying them ready made at the store, using science to explain the steps. For example, you can make your own spaghetti sauce, ice pops, and cookie mix.

Each chapter explores a different science topic by giving you an experiment or activity you can do right in your kitchen, followed by easy-to-make recipes that are based on the experiment. Altogether there are over 100 experiments and recipes for you to try. Each experiment and activity include a purpose statement, a list of the materials you will need, the steps to follow, questions for you to answer, and an explanation of what happened.

To answer the questions, first find a notebook with at least 20 pages. Design a notebook cover that says *Science Chef Notebook* and tape or paste it on the notebook cover. Each time you do an experiment, write

down the chapter number and title at the top of a sheet of paper. Then write down the number of the first question along with your answer. Continue to answer all questions—there are usually about three or four questions.

After doing the experiment or activity, you can have some fun making one or more of the recipes. For example, learn what makes popcorn pop, then make some sensational snacks such as Trail Mix Popcorn, or grow some herbs to use in Garden Fresh Tomato Sauce.

Each recipe is rated according to how much cooking experience is required. The easiest recipes are noted as Beginner. Intermediate recipes require some cutting and cooking with heat. Advanced recipes require higher level cooking skills, but only a few recipes are marked as advanced.

**Always be sure you have an adult to guide you when the experiment or recipe asks you to use the oven, stove, electrical appliances, or a knife.**

All recipes also:

- list the time you need to make them and the number of servings each recipe makes.
- use easy-to-find ingredients and standard kitchen equipment.
- are kid-tested and kid-approved.
- emphasize wholesome and plant-based ingredients.

Each chapter has a video showing how to prepare one of that chapter's recipes. The videos are found at [www.wiley.com/go/sciencechef](http://www.wiley.com/go/sciencechef).

At the end of the book you'll find a nutrient analysis of each recipe, glossary full of definitions, and index. So get your apron on, roll up your sleeves, wash your hands, and get ready to become a science chef. We hope you have as much fun learning, cooking, and eating as we did writing this book for you!

We would also like to thank our peer reviewers: Michelle Durham, who previously worked as a professor of criminal justice and currently teaches in Fort Lauderdale (Florida), and Laura Thomas, a teacher at Meridian School, an International Baccalaureate World School in Round Rock, Texas.

Joan D'Amico  
Wayne, New Jersey

Karen Eich Drummond  
Yardley, Pennsylvania

# Discovering Science in the Kitchen

To learn about science, you don't have to go any further than your kitchen. **Food science** uses scientific principles, such as chemistry and biology, to explain how foods cook and also how foods are processed and preserved so everyone has access to safe, nutritious food. Experiments in this book are designed to illustrate key scientific principles in how foods are prepared, such as how flour thickens a soup or sauce, and also how foods are grown and produced, including how yogurt is made.

The experiments use the **scientific method**, a step-by-step process used to investigate questions. A scientist makes a **hypothesis** that predicts an answer to the question. The hypothesis is then tested by making observations that often include measurements. The results are analyzed and then summarized in a conclusion. For example, you know that baking powder makes bubbles when mixed in water due to a chemical reaction, but you are not sure if the temperature of the water affects how many bubbles are made. So you decide to test a hypothesis that baking powder makes more bubbles in hot water. By adding baking powder to hot water and to cold water, you can observe if there was a difference in the amount of bubbles produced.

A few chapters have an activity instead of an experiment. The activities include growing an herb plant, making your own mayonnaise and yogurt, and learning about crystals in ice and sugar. Each experiment and activity illustrate a variety of scientific principles.

To be a good scientist, all you need to do is start with a question. For example, at home tonight someone is putting dried pasta into a pot

of boiling water to cook. Your question may be, “What happens when spaghetti is cooked in boiling water?” With good observation skills you will notice that before being boiled, spaghetti is dry and hard. Then after cooking, it is swelled up in size and is soft enough to eat. So while spaghetti is cooking in the boiling water, it is absorbing water that makes it swell in size and also tender enough to eat.

## Preparation and Cooking Skills

Chefs need to master cutting and measuring skills and the basics of mixing and stovetop cooking. Here are the skills you will be practicing as you try the recipes in this book.

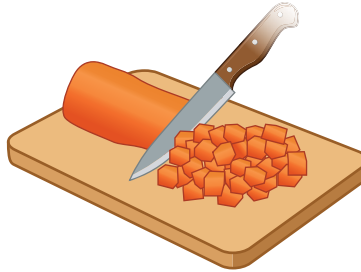
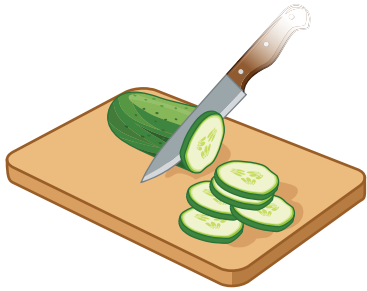
### Cutting

Foods are cut before cooking so that they will look good and cook evenly. Place the food to be cut on a cutting board and use a knife that is a comfortable size for your hand. To hold the knife, place your hand on top of the handle and fit your fingers around the handle. The grip should be secure but relaxed. In your other hand, hold the item being cut. Keep your fingertips curled under to protect them from cuts. Never cut toward part of your body. (See the “Safety Rules!” section of this chapter for more on how to cut safely.)



Here are some commonly used cutting terms you'll need to know.

- |       |  |
|-------|--|
| slice | To cut into uniform slices.            |
| dice  | To cut into cubes of the same size.    |
| chop  | To cut into irregularly shaped pieces. |



- |       |   |
|-------|---|
| mince | To chop very fine into very small pieces.   |
| grate | To rub a food across a grater's small punched holes, to produce small or fine pieces of food. Hard cheeses, such as parmesan, and some vegetables are grated. |



Holes for grating  
hard cheese and  
other hard foods.

shred

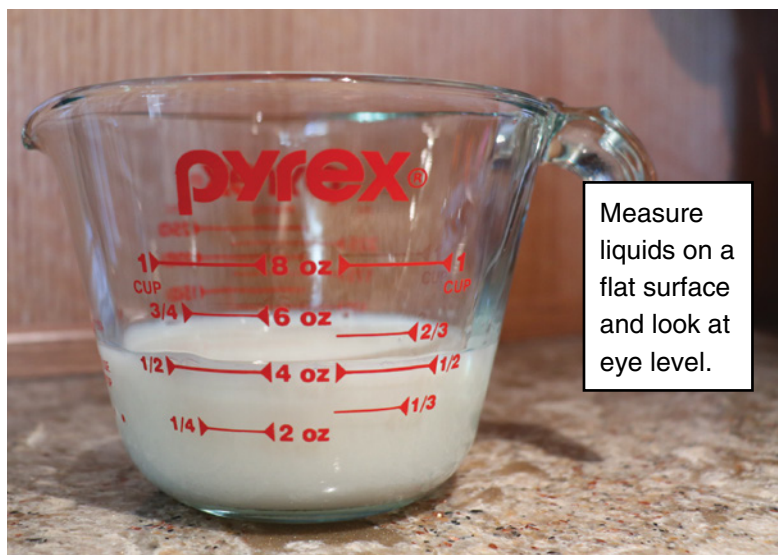
To rub a food across a surface with medium to large holes or slits. Shredded foods look like strips. The cheese used for making pizza is always shredded.



## Measuring

Ingredients can be measured in three different ways: by counting (six apples), by measuring volume ( $\frac{1}{2}$  cup of chopped apples), or by measuring weight (1 pound of apples).

To measure the volume of a liquid, use a measuring cup designed to measure liquids. Liquid measuring cups are usually made of glass and have a handle. Place the measuring cup on a flat surface and check that the liquid goes up to the proper line on the measuring cup while looking directly at it *at eye level*.



Measuring cups for dry ingredients such as flour are often made of metal. They are designed to be filled to the top and then leveled off. To measure the volume of a dry ingredient, such as flour, spoon it into the measuring cup and level it off with a table knife. Do not pack the cup with the dry ingredient—that is, don't press down on it to make room for more—unless the recipe says to. You can pack the cup when you are measuring brown sugar, butter, or margarine.



When cooking, you will most commonly work with cups, tablespoons, and teaspoons. One cup contains 16 tablespoons and one tablespoon contains 3 teaspoons.



Following is a helpful measurement table.



# Equivalents

1 tablespoon = 3 teaspoons

1 cup = 16 tablespoons

1 cup = 8 fluid ounces

1 quart = 2 pints

1 quart = 4 cups

1 quart = 32 fluid ounces

1 gallon = 4 quarts

1 stick butter or margarine =  $\frac{1}{2}$  cup = 8 tablespoons

## Mixing

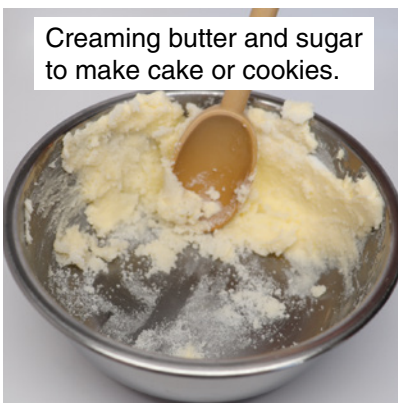
There are all kinds of ways to mix up ingredients! Here are definitions of the most common types.

|      |   |
|------|---|
| mix  | To combine ingredients so they are all evenly distributed.  |
| beat | To move the utensil back and forth to blend ingredients together—same as mixing but a little more rigorous.                           |
| whip | To beat rapidly using a circular motion, usually with a whisk, to incorporate air into the mixture (such as in making whipped cream). |
| fold | To move the utensil with a gentle over-and-under motion.  |





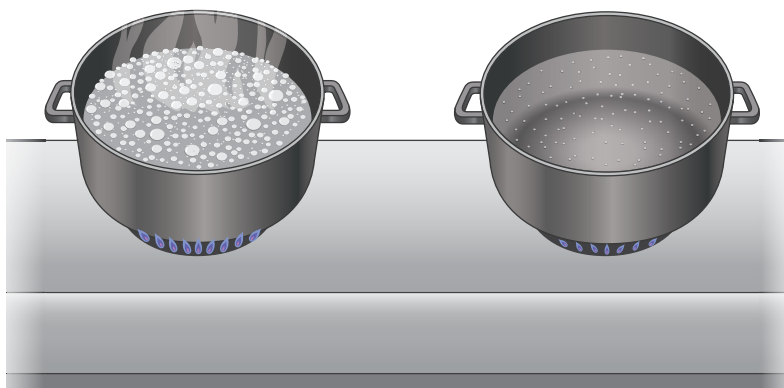
- whisk To beat ingredients together quickly with a wire whip.
- cream To mix a solid fat (usually butter) with sugar by pressing both against the bowl with the back of a spoon until they look creamy.



## Stovetop Cooking

There are different ways to cook on your stove. Here are descriptions of cooking methods you will be practicing as you try the recipes in this book. Because it is easy to get burned while cooking on the stove, see the “Safety Rules!” section of this chapter.

- boil To heat a liquid to its boiling point, or to cook in a boiling liquid. Water boils at 212 °F (100 °C). You can tell it is boiling when you see lots of large bubbles popping to the surface. When a liquid boils, it is turning into steam (the gaseous state of water). Water can't get any hotter than 212 °F (100 °C); it can only make steam faster. Boiling is most often used for cooking pasta.



|        |   |
|--------|---|
| simmer | To heat a liquid to just below its boiling point, or to cook in a simmering liquid. You can tell a liquid is simmering when it has some bubbles floating slowly to the surface. Most foods cooked in liquid are simmered. Always watch simmering food closely so you can turn down the heat if it starts to boil. |
| steam  | To cook in steam. Steam has much more heat and cooks foods quicker than boiling water does. Steaming is an excellent method for cooking most vegetables.  |
| sauté  | To cook quickly in a pan over medium-high heat in a small amount of fat. Vegetables, such as onions, are often sautéed in oil to bring out their flavor and brown them.   |

## Cracking and Separating Eggs

It is best to crack an egg into a clear glass cup or bowl before adding it to the other ingredients. That way if the egg smells bad or has a red spot, you can throw it out before the egg goes in with the other ingredients. An egg with a red spot is safe to eat but is usually thrown out because of its appearance. You should also check for eggshells in the egg before adding the egg to the other ingredients.

Sometimes you will need to separate the egg yolk from the egg white for a recipe. To do this, crack the egg over an egg separator and a bowl. Make sure you get the yolk in the middle. The holes in the bottom of the egg separator allow the whites to drain into the bowl.



If you don't have an egg separator, you can separate an egg by cracking it over a bowl, keeping the yolk in one half of the shell. Carefully pass the egg yolk from one half of the shell to the other without letting it break until the whites have all fallen into the bowl.

# Pots, Pans, and More!

Let's take a close look at the cooking equipment in your kitchen. These are the basic tools you'll need to do the experiments and prepare the recipes in this book. Any kitchen tools that are used in only one or two recipes are described within those recipes.

## Pots and Pans

*saucepan*: (also called pot) Used for general stovetop cooking, such as boiling pasta or simmering a sauce.

*Dutch oven*: A large cooking pot with a lid. Excellent for stews, soups, and braising meat.



*steamer basket*: A perforated metal basket used to hold vegetables or other foods over steaming water in a saucepan.



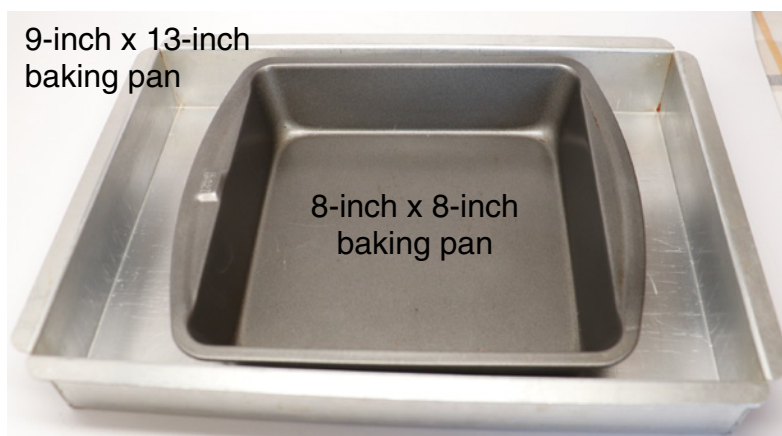
*frying pan*: (also called a skillet) Used for cooking foods, such as hamburgers or onions, in fat or oil.

*griddle*: A flat surface without sides used for cooking pancakes, French toast, and bacon.



## Baking Pans and Tools

*baking pan*: A square or rectangular pan used for baking and cooking foods in the oven. The most common sizes are 9 × 13 inch and 8-inch or 9-inch square.



*layer cake pans*: Round metal pans used to bake layers of a cake.

*loaf pan*: A rectangular metal or glass pan with slanted walls. Used in both baking (for breads, for example) and cooking (such as for meat loaf).



*cookie sheet*: A large rectangular pan with no sides or with half-inch sides, used for baking cookies and other foods. May also be called *sheet pan* when it has sides.



*muffin tins*: Pans with small, round cups used for baking muffins and cupcakes.



*tube pan*: A metal cake pan with a center tube used for making angel food cakes, sponge cakes, and special breads.

*biscuit cutter*: A round piece of metal used to cut biscuits from dough.

*wire rack*: Used for cooling baked goods.

*rolling pin*: A wooden or plastic roller used to flatten items such as pie crust and biscuit dough.

