

# **On Food and Cooking Study Guide**

**On Food and Cooking by Harold McGee**

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## Plot Summary

On Food and Cooking by Harold McGee is an in-depth, insightful look at the foods we eat from a scientific and chemical viewpoint. The author does not examine recipes but instead presents a cohesive book that is more of an encyclopedia than a simple book about cooking. The in-depth discussion of everyday foods and their interactions with one another and our bodies provides a historical and practical examination of dairy, meats, spices, herbs, alcohol and everything in between.

The book begins with a discussion of dairy products and how their unique chemical bonds cause the reactions we see during cooking. The author continues by discussing eggs and their interesting elements. Next is meat and shellfish, separated due to their unique properties. Edible plants are covered next, which discusses both the chemical compounds and nutritional values of fruits and vegetables combined, while the following two chapters are devoted to each in its own right. Herbs and spices, as well as tea and coffee, are then covered, providing readers with a vast look at how these ingredients developed and their effects on our foods. The author then covers seeds, as well as the materials made from seeds, such as dough and batters. Sauces are discussed next, combining information learned in previous chapters to discover the complexity of some of these creations. Sugars, chocolate and confections are discussed in terms of their unique tastes and flavors, as are wine, beer and distilled spirits. In addition, McGee gives a detailed account of how alcohol is fermented and its effects on the body. Finally, the author closes with a brief discussion of cooking methods, utensils and the four basic food molecules. Throughout each chapter, McGee lends insight as to the history of all foods and their uses, both in modern times as well in the past. This book is new edition of a previous edition and includes vastly more information. A fascinatingly comprehensive and practical book, this work can be enjoyed by cooks, scholars and everyday individuals alike.

# Acknowledgements

## Acknowledgements Summary and Analysis

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# Introduction

## Introduction Summary and Analysis

McGee notes this is the second edition of the book, which has lengthened by two thirds and includes many elements not even available in 1984, such as canola oil and other newer food sources.



# Milk and Dairy Products

## Milk and Dairy Products Summary and Analysis

Milk contains several nutrients, including fat, proteins, lactose, vitamin A, vitamin B and calcium, and milk produced from different species produces different levels of these nutrients. Of the unfermented dairy products, milk is the most widely used. Raw milk, or that taken directly from a cow, has a unique flavor, but can be highly toxic, if the cow is infected, or the udder is tainted. In the 1860's, Louis Pasteur created the concept of heat treatment for wine, which caught on eventually in the dairy industry in three basic forms, all of which extend shelf life by killing pathogenic and spoilage microbes.

To make butter, cream is agitated until fat globule membranes are damaged, and the fat released is allowed to gather. The watery portion of the cream is drained, creating buttermilk, while the solid portion, or fat globules, are worked or kneaded to form a solid. Butter is most often used as a spread, garnish, sauce and for frying, as well as in baked goods. Margarine, generally made from vegetable oil, is produced using hydrogenation to harden the liquid oil and then combining this with skim milk and salt.

Ice cream is made from ice crystals of pure water, sugared cream and air cells trapped in the mixture during agitation while freezing. As the water in the cream freezes, the cream coats the ice crystals. Fermented dairy products include yogurt, sour cream and buttermilk. The bacteria in milk, lactococcus and lactobacillus, digest the lactose in milk to cause fermentation. Yogurt, originating in Asia and the Middle East, is made from the lactobacilli bacteria; whereas, sour cream and buttermilks originated in northern Europe and are made from the bacteria lactococci.

Cheese is made of three basic ingredients—milk, rennet enzymes that curdle the milk and microbes that acidify and flavor the milk. The species of animal, the breed of animal and the feed of animal all play a part in the flavor of the resulting cheese. The milk in most cheese is pasteurized to eliminate disease. Cheese begins with starter bacteria, such as the lactic acid bacteria that acidify the milk and generate the flavor of Cheddar, Gouda and Parmesan cheeses. Propionibacteria is used in Swiss starter cultures to consume the lactic acid and covert it to propionic and acetic acids that give the cheese its flavor, as well as its holes. Smear bacteria, used in cheese such as Munster, Epoisses and Limburger, is generally of the brevibacteria group. This group grows only on the outside of cheese and requires oxygen. Thus, the cheese is often wiped with the bacteria, which allows the cheese to be diffused with molecules, altering taste and texture. Molds, such as penicillium, blue mold and white mold, are also used in some cheeses. Cheese is made by allowing lactic acid to covert sugar to acid, adding rennet to curdle the casein protein, draining off the water and adding enzymes to create the flavor desired.



# Eggs

## Eggs Summary and Analysis

The egg is made from a living germ cell, which matures and grows a yellow yolk, full of fats and proteins. The yolk passes through the oviduct and is coated in a whitish membrane of protein cells. An air pocket is left as the egg is then coated in calcium carbonate and protein to form a shell. The yolk of the egg is the nutrition portion, and carries iron, thiamine, vitamin A, proteins and lipoproteins. The white consists of water and protein, and traces of minerals, fatty material, vitamins and glucose.

Eggs can be cooked in a number of ways. This includes eggs cooked in the shell, although the author recommends not boiling eggs. He states that to hard boil an egg, the water temperature must be far above that needed for protein coagulation, meaning that the white of the egg will overcook. Soft boiling should be done in barely bubbling water to avoid overcooking. Baked or shirred eggs, out of the shell, should be placed on a middle oven rack to avoid overcooking. Poached eggs, or eggs cooked within water, cream, milk or other liquids, are best when placed in liquid near the boiling point, to ensure proper shape of the resulting egg. Fried eggs should be cooked at 250 degrees to ensure browning. Scrambled eggs and omelets can be made from lower grade eggs and can be mixed with other ingredients.

Custards are generally made with milk or cream and eggs. Custards also often have fruits or vegetables. Low cooking temperatures are key to proper custards, and one should generally cook in a water bath to ensure equal heating. Custards include quiche, a pie-shaped mix of eggs, cream, meat, cheese and vegetables. Crème caramel, a sweet custard with caramel on top, is made by coating a dish with caramelized sugar and then pouring in the custard mix. Crème brulee is similar, but following removal from the pan, the custard surface is coated with caramelized sugar and heated to hardening with a broiler. Cheesecake is made using eggs and rich filler such as cream cheese, sour cream or heavy cream. The items are mixed and baked at a low temperature in a water bath.



# Meat

## Meat Summary and Analysis

According to the author, meat has helped humans to evolve mentally and physically, as well as to adapt to cold climates where little plant food is available. At the same time, he points out that some believe eating meat to be morally wrong. The author also points out that meat today is far leaner and younger than in recent history due to concerns about cholesterol, and that such changes require changes to cooking methods. Meat, in this book, is used to describe the muscle tissue of animals that is consumable.

With modern meat production, a number of controversies are present. While these processes result in a large supply of inexpensive meat, the same processes involve chemical manipulation of metabolism, artificial surroundings and inhumane conditions and feed made from waste. The use of hormones in animals is allowed in some countries to produce leaner meat. Antibiotic use is necessary in these animals but can cause highly-resistant strands of coli and salmonella. The author points out that to him, the inhumane conditions of animals raised for meat is also a primary concern.

Cooking meat can be done in a number of ways. Grilling and broiling meat rely on a heat source very near the outside of the meat, either directly under or directly over the meat. Grilling should only be done when meat is thin to avoid overcooking the exterior. Spit-roasting, or spearing meat, and then placing it over a heat source, is best suited for large meat like whole hog. Barbecuing is done with low temperatures for slow heating over open flame and results in tender meat. Oven roasting is done to ensure even cooking. Frying meat results in a quick-cooking time with high flavor, if the meat is cooked with proper oils in a large enough pan.

Preserving meats has been practiced for at least 4000 years. Early methods involved salting or drying meats. Current methods include canning, refrigeration and freezing, along with more traditional methods. Drying meat removes the moisture from the meat, prohibiting microbes from growing. This is done by salting the meat and then slow cooking the meat for up to several months. Freeze drying is similar, but involves rapid freezing in vacuum conditions, followed by a mild heating to sublimate the water. Cold smoking involves enclosing the meat in a container through which smoke is passed, resulting in uncooked, more firm meat. Finally, canning meats involves placing meat into an airtight container, and heating the meat until done. This ensures the meat is isolated from air and light, but results in a dull flavor.



# Fish and Shellfish

## Fish and Shellfish Summary and Analysis

Fish and shellfish are healthy, in that they are good sources of protein, B vitamins, various minerals, such as iodine and calcium and have very little fat. Fish oil is believed to be high in omega-3 fatty acids, which are vital to brain development and retina development. It also helps the immune system, lowers the risk of cancer and heart disease and lowers cholesterol.

Fish can be served raw but poses a number of health risks. Many therefore, freeze fish to be served raw at -31 degrees to kill any bacteria. Sushi and sashimi are raw fish dishes originating in Japan that consist of salted fish and flavored rice. Tart ceviche uses raw fish cubes soaked in acidic liquid with onion, chili and other seasoning. Kinilaw is similar, but the fish is only dipped in the marinade, which is made from vinegar or sugarcane. Salty poke and lomi are Hawaiian dishes made from salted sliced or pressed raw fish and roasted candlenuts or seaweed.

There are several ways to cook fish but all should be done carefully and delicately to avoid the fish falling apart. Grilling and broiling fish is best for thin, whole fish, fillets or steaks. Baking fish also works well, since the heat surrounds the fish, cooking it evenly. Cooking fish under pastry, leaves or other materials shields the fish from direct heat while still allowing the steam to escape. Frying fish can either be done in a small amount of oil when the fish is breaded, or deep fried with or without batter. In the Japanese dish Tempura, small bits of fish are dipped in barely-mixed dough and fried, so the resulting fish is laced with thin batter. Using liquid to cook fish through simmering, poaching or stewing can also be effective. Fish can be poached in butter, oil or wine but should be added to nearly-boiling liquid and then removed from heat to allow a slower, gentle cooking. Steaming fish in a dish of herbs and spices can add flavor to the fish. Microwaving fish requires the thinner portions be covered to avoid overcooking. Finally, stove top smoking can be used. Fish can also be blended together to form balls, cakes, pates, and so forth.

Shellfish are much like finfish, with a few distinctive qualities. Crustaceans include the shrimp, lobsters, crabs and their relatives. Shrimps and prawns are the most common shellfish, but their flavor declines within only a few days on ice. Lobsters and crayfish are prized primarily for their tail and claw meat. The liver and lobster eggs that are sometimes inside the animal are often added to hot sauces. Crab meat, particularly the meat of the claw and leg, are also sold to consumers, while the liver and the digestive gland are used in crab sauces and pastes.

Preserving fish is often done through drying, but to prevent off-flavor, the fish is often cooked prior to the drying process. Salting fish can also be used to preserve it for several days. Salted cod and salted herring are both highly popular. Cured anchovies are beheaded and gutted, then salted and held at high temperatures for up to a month.



Fermented fish, on the other hand, uses microbes to transform the texture and flavor of fish. Asian fish pastes and sauces generally use fermented fish as the base. Sour fish involves fish stored with carbohydrate-rich foods to preserve the meat. Fish can also be marinated in vinegar, wine or other acidic juices to allow preservation by crippling the bacteria cells with proteins. Canning fish involves initial heating of the fish prior to can insertion to kill bacteria and an additional heating after canning to ensure sanitization.



# Edible Plants

## Edible Plants Summary and Analysis

Fruits and vegetables contain nearly all our consumed vitamin C, which aids in collagen replacement, folic acid, which lessens heart disease, vitamin A, which helps eyesight and much of our vitamin E. Plants also contain phytochemicals, or chemicals that modulate our metabolism. One such phytochemical is the antioxidant. Oxidative damage to the body occurs during normal body processes, where oxygen generates chemicals called free radicals that can damage the body's chemical makeup. This damage can be in the form of tumors, damage to arteries, cataracts, macular degeneration in the eye and blindness, as well as in many other forms. The body staves off such damage through antioxidant molecules, which react with free radicals to neutralize their potential damage. Because plants live essentially through the conversion of oxygen, they are full of antioxidants such as beta-carotene, lutein, zeaxanthin, lycopene, chlorophyll and others. However, plants also contain natural toxins meant to discourage animals from eating them. Alkaloids, which are bitter tasting toxins found in nicotine, caffeine, potatoes and other plants, are toxic at higher levels, which is why green (unripe) potatoes are bitter and toxic to the system. Other toxins include those transferred through soil, mishandling, water, commercial machinery and other methods. To reduce risks, one should always wash vegetables.

Cooking fruits and vegetables often changes the pigments that cause coloration. However, cooking any vegetable somewhat reduces nutritional value because nutrients and vitamins are drawn out into the cooking water. Further, the vegetables lose some flavor due to this loss. Steaming works well for small quantities of vegetables; whereas, pressure cooking should be avoided due to the ease of overcooking. Baking the produce slowly avoids flavor loss; the produce can be covered in oil to prevent fluid loss. Frying and sautéing works much like baking in oil. Using a microwave is not recommended due to uneven cooking and the drying tendency of microwave cooking. Pulverizing and extracting is another method for cooking.

Preserving fruits and vegetables is another method of preparation. Drying fruits and vegetables is done through sun, fire and other methods. Freeze drying involves the use of quick, rapid chilling to remove moisture. Fermentation and pickling can also be used. Fermentation involves dry salting the fruit or vegetable and then placing it in liquid. Pickling involves the use of vinegar or another acid to create a highly acidic environment that kills bacteria. Canning involves cooking produce, and then storing the product in a hermetically sealed container.



# A Survey of Common Vegetables

## A Survey of Common Vegetables Summary and Analysis

Roots and tubers are the underground organs of plants which can contain high levels of starch or water. Potatoes are one type of starchy tuber. Sweet potatoes are a special type of potato that sweetens during cooking due to the breakdown of starch to maltose. Tropical roots and tubers such as cassava, manioc and yuca contain less water and more starch than common potatoes, so become more floury when baked. The yam is a starchy tuber rarely found anywhere other than Africa and South America with a toxic alkaloid that must be removed by leaching prior to cooking. Carrots are another form of tuber, but are less starchy than potatoes and sweeter. Parsnip, another tuber, contains more starch than the carrot, but converts it to sugar in winter, making the root more sweet in colder months. Parsley root, the taproot of parsley, also contains terpenes, making it a flavorful spice. Lettuce, another tuber, contains little starch, fructose carbohydrates, and a mild flavor but is difficult to digest.

Lower stems and bulbs are the next vegetable group, as they sit at or just above the ground. Beets, eaten since prehistory, have highly-colored exteriors due to betain pigments. They can be eaten raw or cooked and can add sweetness to cakes and syrups. The celery root, tasting much like celery, can be cooked or shredded into salad. The turnip can be eaten raw, cooked or pickled, while the radishes found in the United States are generally eaten raw. The onion family, including onions, garlic and leeks, has a pungent, sulfur flavor when raw, due to chemical deterrents in the plant. When cooked, however, this flavor is altered into a rich, savory flavor.

The leaves of vegetables include lettuces, cabbages and other leafy vegetables. Leaves are often eaten raw or used as wrapping for other foods during cooking. Most common lettuce varieties are non-bitter and are used raw in salads. Chicories and endives are more bitter lettuce varieties often used in salads and in cooking but are mixed with salt to reduce overpowering bitterness. Dandelion greens are also used in salad but are blanched to make them more palatable. Cabbage, kale, collards and Brussels sprouts contain high levels of vitamin C and A, and antioxidants. Brussels sprouts are highly bitter, which does not diminish with cooking, although cooking them in large pots of water can leech out some bitter compounds. Rocket, cress, mustard greens and Ethiopian mustard are plants with small, weedy leaves, with a full, almost meaty flavor. Spinach, a member of the beet family, has large leaves used in salads as well as other cooked dishes. Other leafy vegetables include amaranth, grape leaves and mâche, which are all used in salads, as well as nettles, used in soups and stews, and purslane, used in both salads and vegetable dishes.

The flowers of vegetables are also used in cooking. Banana flowers are astringent due to high tannin levels but are cooked as a vegetable. Daylily buds are eaten both fresh and dried and are filled with carotenoids and antioxidants. Roselle, hibiscus and



Jamaica are names for the flower covering the hibiscus plant. Squash blossoms are stuffed, deep fried or chopped and added to soups. Artichokes often turn brown after cutting, which can be minimized through cooking. Broccoli, cauliflower and romanesco are all members of the cabbage family without the bitter glucosinolates and are often served steamed or in other dishes, although they can be eaten raw.

There are many fruits commonly used as vegetables, since cooking is often required to make these products edible. Members of the nightshade family, such as tomatoes, eggplants, and others often have highly specialized chemical defenses that make the products difficult to eat. Tomatoes are the second most popular "vegetable" in the United States. They are fruit but are considered vegetable because of low sugar content and large amounts of glutamic acid, which make them ideal flavor enhancers for meat products. Squash and cucumbers are also fruits. Winter squash is rich in beta-carotene and starch and can be used in sautés or stews or purees and even pies and custards. Summer squash is less sweet than winter squash and softens more quickly when cooking. Cucumbers are melon-like, with similar flavor, texture and aroma. The green bean, long bean and pea are also used as vegetables, and are often cooked for use in soups, stews or by themselves. The avocado, often used as a flavoring, is served raw, since cooking lends a bitter flavor and egg quality. Sweet corn contains high levels of zeaxanthin, which are eye-protecting antioxidants. Corn is eaten raw, boiled, in other dishes, popped or ground into corn meal. Okra is generally fried or used to thicken soups or stews. Olives, which are small fruits, are bitter and are generally used to make olive oil.

# A Survey of Common Fruits

## A Survey of Common Fruits Summary and Analysis

Apples, pears, and their relatives, the pome fruits, are made up of mostly the enlarged tip of the flower stem, with seeds protected in the center core. The stone fruits are named as such by the stone-hard shell that surrounds the large seed in the center of the fruit. Apricots, of which there are many varieties, have a distinctive aroma derived from terpenes that smell of citrus, herbs and flowers. Cherries are either sweet or sour; the difference is due only to the level of accumulated sugars within the fruit. Peaches and nectarines are of the same family, with nectarines having a smooth exterior and peaches having a fuzzy exterior. Plums and hybrids of plums are harvested before ripening and are eaten dried or made into preserves, although some are eaten raw. Prunes are dried plums that develop a rich flavor due to retained sugars that tend to taste caramelized and toasted, making them perfect for meat dishes.

Berries are those fruits borne on bushes and low plants, rather than trees. Caneberries include the fruits of blackberries, raspberries and their relatives. These fruits grow in groups and are nourished through contact with the flower base on the plant. Blueberries have a distinctive spicy aroma due to their terpenes and freeze well, so are used in a variety of dishes. Cranberries are harvested dry or by flooding the bog in which they grow. Currants and gooseberries are high in acid and rich in vitamin C. Grapes are often used to make wine but are also made into raisins, eaten raw or used in jams and jellies. Strawberries are slightly unusual in that the seeds are on the exterior of the fruit. Other temperate fruits include the ground cherry, resembling small tomatoes, used in preserves and pies. Persimmons are sweet and mild with bright orange flesh and are eaten raw, frozen in sorbet or made into pudding. Rhubarb, actually a vegetable, is often used as a fruit in pies and tarts.

Fruits from warm climates vary from those in temperate climates. Melons, closely related to the cucumber, have been used since the first century. Summer melons with rough rinds, such as the cantaloupe, are highly aromatic and do not keep well. Winter melons are the opposite and include honeydews. Minor melons, including pomegranate melon, are often used for preserves. Watermelon is a distant relation to other melons, since it consists of seed-bearing tissue rather than seed surrounding tissue.

Citrus fruits are some of the most important in today's culture, due to their pleasant aroma, robust flavor and tendency to store well. Oranges are juicy, sweet, and particularly versatile. Navel oranges are eaten fresh due to their seedless interiors but are rarely used in juice due to their tendency to grow bitter flavors in short time. Juice oranges, however, contain seeds, but are much sweeter. Blood oranges, named for their bright red tissue, taste of citrus and raspberries. Grapefruit is a hybrid of the sweet orange and pummelo, and thus are moderately bitter. Limes are highly acidic and sour, so are often used as an acidifier, as are lemons.



Tropical fruits are also popular. The banana and the plantain are starchy and full of nutrients. They are seedless berries that grow in bunches and are climactic fruit, so ripen after harvesting. Cherimoya and atemoya are medium-sized sweet fruits low in acid that ripen after harvest and are often used in drinks and sorbet. Durians are thorn covered fruits of Southeast Asia. Breadfruit and jackfruit are large fruits with high starch and sugar contents and a musky, berry odor. Lychees, from Asia, are small, with dry skins and a large seed. They are sweet and flower smelling and are eaten fresh, or used in syrups, drinks, sauces and preserves. Mangos are aromatic fruits of Asia, whose skin contains an irritant compound, but are sweet in flavor. Papaya is used while still immature in salads and pickles due to a slightly bitter flavor, while the ripe fruit is used raw. Passion fruit is made from a brittle outer husk and hard seeds embedded in a pulpy covering. The pineapple softens when harvested, but does not sweeten. Star fruit, named for their star shaped interior, are tart, and often used as decoration on salads.





# Flavorings From Plants

## Flavorings From Plants Summary and Analysis

Herbs are plant leaves, used fresh or dried, while spices are bits of dry seeds, barks and roots. Spices lend flavor as well as aroma to foods and have long been sought after, even leading ancient peoples to explore new lands in search of such items. Most herbs and spices are made of flavor materials known as essential oils, the term stemming from the fact that spices and herbs blend better with oil and fat than in water.

The author discusses several herbs, grouping them into three distinct categories, those of the mints, the carrots and other herbs. Mints, of which there are 600 varieties, range from the sweet flavors of peppermint and spearmint to the strong apple flavors of pennyroyal. The carrot family grows in less extreme areas of the Mediterranean and are often milder than the mint herbs and spices. Angelica has a fresh, pine aroma but has a sweet flavor and is often used in gins and candies. Celery tastes of walnuts and citrus and is often sautéed with onions and carrots as a base for sauces. Chervil has a delicate flavor and is best used raw. Coriander, also known as cilantro, is the world's most widely-used herb. Its aroma is "soapy" due to the aldehyde decenal, which also makes the herb volatile and easily damaged by heat. It is used primarily as a garnish or in uncooked preparations. Dill has a pleasant green, fresh flavor and is most often used in fish. Fennel can be sweet or bitter, depending on the species and is often used in meat or in vegetable dishes. Lovage has a sweet, flowery aroma and is used in beef and tomato dishes.

The laurel family of herbs grow mostly in tropical areas and are highly used in Asia. Avocado leaf has a tarragon aroma and are often dried and crumbled to flavor chicken and fish. Bay laurel, or bay leaves, have aromas of woody, floral, eucalyptus and clove and are used in savory dishes. California bay leaves are slightly stronger than bay laurel but are used in similar dishes. Sassafras leaves are used to flavor gumbo and lend a spicy flavor.

The author next discusses several temperate spices, grouping them into five distinct categories, those of the carrots, the cabbages, the beans, the chillis and other spices. The carrot family of spices is generally derived from the seeds of the plant. Ajwain resembles thyme in flavor. Anise, a sweet spice, is used in candies and alcohols but also in tomato dishes. Caraway, with a distinctive citrusy flavor, is used in cabbage, potato and pork dishes. Celery seed tastes of the celery vegetable and is used in salad dressings and sausages. Coriander has a highly lemony aroma and is used in sausage, alcohol, hot dogs and most Indian dishes. Cumin is used in Asian and Indian food and is highly spicy. Dill seed is stronger than dill weed and has a fresh, spicy, citrus flavor.

Most of the cabbage family spices are prized due to their irritation, pungency and sharp flavors, derived from defensive chemicals within the plants. Mustards, of which there are many flavors, are used in thousands of dishes including mayonnaise, vinaigrette, oils,



condiments, meat and vegetable dishes and even fruits. Horseradish is used as a relish, while wasabi, a similar spice, is used in meat dishes. In the bean family, licorice, a sweet spice, is used as an extract in syrups, beers, tobacco and candies. However, licorice also contains the hormone glycyrrhizic acid, which can disrupt blood pressure levels. Fenugreek, also in the bean family, is bitter and used as a gel in many Middle-Eastern sauces.

In the chilli family, the active ingredient is capsaicin, a defensive chemical of the plant. The chemical does not appear to increase cancer risks or stomach ulcers, affects temperature regulation, increases metabolic rates and triggers brain signals to make individuals feel full. At the same time, it can burn the eyes but also provides sore muscle relief.

Tropical spices are vast and often vary greatly in flavor. Allspice tastes of clove, cinnamon and nutmeg and is used in meat and fish dishes, as well as pie seasoning. Cardamom is slightly sweet and is used in baked goods and coffee. Cinnamon can be either sweet or hot and is used in baking as well as candies and coffees. Cloves are highly aromatic and is used medicinally as an antibacterial and numbing agent in mouthwash and dental products. It is also used in hundreds of cooking recipes, as well as in some cigarettes. Ginger, both sweet and bitter like a combination of lemon and pepper, is used in sausages, fish, sodas and sweets. Mace and nutmeg are peppery spices with fresh, mild overtones and are used in sweets and dairy-based products. Nutmeg also has hallucinogenic effects if eaten in excess. Black pepper is moderately pungent, with a pleasant aroma and is used in nearly any dish for basic flavoring. Vanilla, one of the most common spices, is filled with sugars, a phenolic compound known as vanillin and amino acids, which result in a highly-pleasing aroma.

Tea and coffee are the most widely-consumed drinks in the world and contain a bitter alkaloid, that of caffeine. Whereas coffee is a bean, tea is generally derived from a leaf. In small doses, caffeine stimulates the central nervous system, resulting in a more alert feeling, increased energy, improved mood and increased mental performance. |

# Seeds

## Seeds Summary and Analysis

The author defines seeds in this chapter as structures by which plants create a new generation. They contain embryonic plant material together with food supplies for the new plant and an outer insulating layer. These seeds fall into three categories, those of grains and cereals, which are of plants in the grass family, legumes, from the bean family and nuts, from several different families. Seeds have high levels of energy and protein and B vitamins. A lack of these vitamins in history led to diseases such as beriberi and pellagra. Seeds also contain antioxidants such as vitamin E and tocotrienols, soluble fiber (which slows digestion, moderates blood insulin, reduces cholesterol and benefits intestinal bacteria required for the health of intestinal cells), insoluble fiber (which speeds the passage of food through the body), and phenolic compounds, many of which reduce cancer risks. On the other hand, legumes contain lectins and protease inhibitors that can cause malnourishment and anemia. Additionally, seeds are the primary triggers of food allergies with peanuts, soybeans, and tree nuts among the number one cause of food allergies. A chemical within many seeds, that of gluten, is an allergen to those with celiac disease, as well. Finally, seeds, when cooked, can become hosts to several bacteria and should be immediately refrigerated.

Nuts differ from grains and legumes in that they are larger, richer in oil and require little to no cooking to be edible. Most nuts are the embryo's storage laves, while others are masses of endosperm. The skin that surrounds most nuts is rich in antioxidants, such as vitamin E and folic acid, monosaturated fatty acids, and therefore lower the risk of heart disease. Nut flavor comes from the oils within the nut. They are also highly fragile, pick up odors from other materials and can go rancid quickly if the fat acids are fragmented by oxygen or light. They are therefore best stored in opaque containers at cool temperatures. In general, nut skins are removed prior to eating or cooking, and many are made into nut pastes, butters, oils, and milks.

# Cereal, Doughs, and Batters

## Cereal, Doughs, and Batters Summary and Analysis

There are three basic elements of dough, which contains more flour than water, and of batter, which is opposite. Those are water, gluten proteins and starch granules. Gluten is mainly proteins and is the cause of the gum-like, elasticity of dough. Starch granules, on the other hand, hold onto their surfaces, make up more than half the volume of dough and tenderize the gluten.

There are several types of wheat, the most common grain used in breads. Yeast is used to make bread lighter. Yeast, a fungi, uses the sugars in dough for energy and produces carbon dioxide and alcohol as a by product. This gas inflates the dough, as well as strengthens the gluten and improves elasticity.

Batters are different than dough because they are fluid and contain more water. The water disperses the gluten too far apart to form bonds, so their network is very loose. When cooked, the starches absorb enough water for the batter to become solid but tender. Pastries are different, in that they are meant to be fragile and fragmented. Fat is incorporated into the dough to make a crumbly or flaky texture.

Cookies are sweet and rich, tender, moist or dry, crumbly or flaky and crispy or chewy. Most cookies are made with pastry or all-purpose flour but can be made with bread or cake flour if less spreadable dough is desired. Noodles were developed in China, and spread quickly to the Mediterranean. Pasta and noodle dough must be malleable enough to shape into thin strips but strong enough to stay intact when boiled.

# Sauces

## Sauces Summary and Analysis

Sauces are designed to enhance the flavor of the material they are covering; whereas, soups are designed to be less concentrated, so they can be consumed on their own. Sauces are often made of seasonings, condiments, artificially intensified flavors, liquids and other ingredients. Flavor in sauce is really derived from both the taste as well as the smell, and because of this, there are literally thousands of combinations. Most sauces are thickened with flour and other starches. Salt, sugar and acid add to the flavor of sauces.

Purees are sauces thickened with plant particles, such as tomatoes and apples. This method produces a courser sauce and is not designed to provide smoothness but instead often designed to be chunky, such as with salsa or applesauce. Emulsions are sauces thickened with oil. Emulsions can only be made of two liquids that do not readily blend well together, where one liquid, such as water, is continuous, and the other is divided. Cream and butter sauces can be served alone or mixed with other ingredients. Mayonnaise is an emulsion of oil, egg yolk, lemon juice, vinegar, water and mustard. It is made from room temperature ingredients, and everything is initially mixed together except the oil, which is then whisked in slowly.

Salt is an interesting ingredient, added to nearly every food. Salt is a mineral and a taste enhancer and modifier, and essential to nutrition.



# Sugars, Chocolate, and Confectionery

## Sugars, Chocolate, and Confectionery Summary and Analysis

Sugar is a versatile ingredient due its ability to lend sweetness to almost any dish in a variety of ways. Honey was the precursor to sugar and fruit the precursor to honey. All sugars contain three atoms, those of carbon, hydrogen and oxygen. Glucose and fructose are simple sugars, or monosaccharide, while table sugar is a disaccharide made up of a glucose molecule and sucrose molecule combined. Sugars tend to hold moisture when dissolved in water, so provide moisture in baked goods, keep frozen desserts semi-soft, help hold together granola and other goods and help preserve fruits. Glucose, or dextrose, is a simple sugar and is the most common. It is found in honey and corn syrup, but is often blended with other sugars because it is less sweet and less dissolvable in water. Fructose is found in fruits and honey and is sold in crystalline form. It is the sweetest sugar, the most soluble in water and absorbs water most effectively. Sucrose is a complex sugar, made from glucose and fructose. Inversion involves the breaking apart of the different sugars with acidic compounds and is useful in candy making to prevent sucrose crystallization. Lactose is a complex sugar as well, made from glucose and galactose and is found in milk. All forms of sugar can be used to sweeten, to cover bitter flavors, or to balance flavors.

Honey was the first sweetener in Europe, but North Americans did not use it in until 1625. Maple syrup and sugar was important to the native American diet and was a cheap alternative for colonists to cane sugar. Prior to industrialization, cane sugar was made by clarifying the cane juice, boiling it into thick syrup and crystals, draining the impurities from the solids and washing the syrup from the crystals. Molasses is the syrup left after cane sugar has been processed. High fructose corn syrups are made from plain corn or potato syrup, but due to an enzyme process, are changed from glucose to fructose. Corn syrup is made by extracting starch from corn and treating it with microbial or malt enzymes to develop syrup, which is then clarified, decolorized and evaporated to the desired consistency.

Sugar candies are made essentially of different blends of sugar and water. The concentration of sugar in cooked syrup alters the texture of candy. The more water in the syrup, the softer the candy will be. There are three basic types of candies, those of noncrystalline candies, crystalline candies, and candies that are altered with gums, gels and pastes.

Chocolate began as a drink developed from the cacao tree. By the 1600s, there was limited use of the plant in biscuits, ices, and mousse, as well as with nuts. The Dutch invented cocoa powder and eating chocolates, while the Swiss developed milk chocolate and refined textures. Chocolate is made through fermenting the beans and pulp of the plant, roasting and grinding them to refine the chocolate flavor. Cocoa powder is derived from the cakes of roasted cocoa beans and is highly acidic; butter is



added; cocoa powder has a strong chocolate taste. Alkalized cocoa is that which has been treated with potassium carbonate, which raises the acidity and results in a less sharp flavor. Instant cocoa is similar but with added sugars for flavor. Chocolate and cocoa are used in a variety of foods, such as Mexican sauces, European stews, baked goods, fillings and icings.



# Wine, Beer, and Distilled Spirits

## Wine, Beer, and Distilled Spirits Summary and Analysis

Wine has been fermented since at least 3000 BCE, when the Egyptians made both red and white wine. The important components are sugars, which the yeasts feed on and convert to alcohol; acids, which help prevent the growth of microbes; tannins, which contribute a body and weightlessness to wine; pigments that provide color, as well as astringency, and aromatic compounds.

Beer is made from grain, rather than grapes. Because yeast cannot break down starch alone, the grain must be treated to break starch down to sugar prior to fermentation. Throughout the ages, beer has been the drink of the common citizens, and people used their own saliva, mold or the grain itself, known as malting, to break down the starches.

Distilled spirits are the concentrated essence of beer and wine, and come from the concept that different substances boil at different temperatures. As they boil, the vapors can be captured and condensed to make higher levels of alcohol. Brandies are made from grape wine and are often aged 60 years or more. Whiskies are distilled from fermented grains and aged in barrels. Malt whiskey is made from barley; grain whiskey is made from various cereals; the most common is a blend of malt and grain whiskey. Gins are distilled from a fermented mixture of malt, corn and rye, to which juniper berries are added. Rums are made by fermenting molasses solution with pure yeast culture, or with mixed microbial cultures. Vodka is made from fermented starch, such as grain or potatoes and works well in cocktails. Tequila is distilled from the heart of the agave plant, which is steamed or roasted, mashed, fermented and distilled.





# Cooking Methods and Utensil Materials

## Cooking Methods and Utensil Materials Summary and Analysis

Browning reactions are the chemical reactions that occur at high heats, regardless of the cooking method used. These reactions produce new flavors within the food and are named after the color changes that also occur. Heat can be transferred to foods in a number of ways. Direct contact cooking, or conduction, occurs when heat is exchanged to foods through direct contact with a hot surface. Convection is heating through fluids, such as in stew. Radiation heats food through electrical and magnetic fields that radiate to the surface of foods, causing heat. Grilling and broiling are forms of infrared radiation. Baking involves air convection and radiation. Boiling and simmering are examples of water convection; whereas, steaming is the result of vapor condensation and convection. Pan frying and sautéing are examples of conduction; deep frying is an example of oil convection. Microwaving is an example of radiation but should be used sparingly, since it produces greater fluid loss.

# The Four Basic Food Molecules

## The Four Basic Food Molecules Summary and Analysis

There are four basic food molecules, those of water, fats and oils, carbohydrates and proteins. Water is found in almost all living things, and bonds well to itself. Fats and oils do not mix with water, provide high flavors and tenderization, include beta-carotene, vitamin E, cholesterol and wax, all of which are required for human health.

Carbohydrates include sugars and oligosaccharides, which are tasteless, but indigestible, so cause gases to accumulate in the colon. Proteins are comprised of acids, peptides and enzymes which contribute much of the flavor of foods, as well as cause the primary reactions that allow food to be cooked, browned, and fermented.



# Characters

## Harold McGee

As the author of the book, Harold McGee is the primary source of information in the work. With extensive experience in food chemistry as well as cooking and physics, his role in the book is to convey to readers not only the important foods and their properties but to answer basic cooking questions with facts, diagrams and examples. His tone is light throughout the piece, making the in-depth chemical explanations enjoyable to read. He tends to avoid his own opinions, instead relying on the basics of chemical reactions and nutrition, as well as industry facts. However, when his opinions are included, they are clearly against animal cruelty, as well as against the modernization and industrialization of the food industry. McGee clearly favors quality ingredients, cooked with proper equipment under sanitary conditions. He also places emphasis on food safety, showing again his love not only for how things combine, but how to combine them safely and responsibly. His inclusion of the history of each food, its origins and its current place in modern society also shows him to be interested in all facets of food. Further, his inclusion of tables, diagrams and brief stories of historical figures shows him to be an efficient researcher, who wishes to spread his love for food to the rest of the population. By not only including foods often used in the United States or other large countries, but also foods and ingredients scarcely seen outside third-world nations, McGee presents his information in a diverse manner, necessary for the overall success of the book.

## Louis Pasteur

Louis Pasteur was a French chemist, who, in the 1860s, invented the process of pasteurization. Originally developed to lengthen the shelf life of alcohol, Pasteur's invention led to the pathogen-killing heat treatment that allows milk and several other products to be enjoyed by those who do not live on a farm. Further, Pasteur also introduced the use of standard, purified microbial cultures to make cheeses and other fermented foods. Even further, his investigations in the 1850s led to the discover of the nature of the leavening process, vital to raising breads. In short, Pasteur's work in food chemistry and in chemistry in general gave rise to such concepts as microbiology and other major areas associated with food science.

## Nicolas Appert

Nicolas Appert was a French brewer and confectioner around 1800. He discovered while working that if he sealed food in a glass container and then heated the container in boiling water, the food would keep without spoiling. While this seems minor, it was actually the first known use of canning as a method of preservation. This discovery is vital to food science, as it allows hundreds of products to be enjoyed across the world



by individuals who would otherwise be unable to sample such foods. For example, Appert himself began canning and selling fish and seafood in hermetically-sealed containers as early as 1810, and by 1840, Pacific salmon was available around the world. At the time, it was believed to preserve fruits and vegetables almost as though they were fresh. In reality, however, there is no question, simply by taste, that canned goods have been cooked. However, without Appert's discovery, many of us would not enjoy the foods we do today.

## Justus von Liebig

Justus von Liebig was a German chemist, who came up the idea of searing meat to seal in juices around 1850. Although the reasoning for the method was later disproved, Liebig's idea spread like wildfire after the publication of his theory in his book "Researches on the Chemistry of Food." He stated that the "nutritious" water-soluble compounds in meat could be retained by heating the meat quickly over a high heat to seal in the juices. While this is incorrect, Liebig did introduce the idea of searing, which adds immense flavor and the products of browning reactions. Incidentally, this same misconception by Liebig pushed him to invent meat extracts, which are still in use today.

## Andreas Marggraf

Andreas Marggraf was a Prussian chemist in the 1700s. In 1747, he showed that brandy mixed with the white beet would extract the juices in crystal form that were identical to the crystals found in sugar cane. Although his ideas did not take hold until 1812, his findings were vital in the development of the sugar-beet factory. Today, nearly 30 percent of all sucrose is beet sugar. Without Marggraf's discovery, many countries would have had to continue to rely on the West Indies for sugar cane.

## Christopher Columbus

Christopher Columbus was vital to introducing spices and herbs, as well as many other materials, to Europe, and the New World. In 1493, Columbus brought to the New World sheep, goats and the first of the Spanish longhorn cattle that would eventually become proliferate in Mexico and Texas. His expeditions to find new routes to the Indies opened the door to the "West Indies," from which vanilla and chillis became popular, along with a host of new vegetables. He also introduced pineapple, which he found in the Caribbean in 1493, to the French and the Dutch and introduced corn to Europe. In 1493, he carried sugar cane to what is now Haiti and the Dominican Republic, and within 40 years, the area was one of the main growers of the crop. In 1502, he brought the cocoa bean to Europe. Without his travels and his transportation of spices, herbs and foods, it is possible that much of the world would still be lacking in what are today considered vital flavorings and foods.



## Crusaders

Like Columbus, the Crusaders brought into existence an entirely new world of foods and spices for Europe and therefore to the New World. Through the Crusaders, the European traders were brought into contact with the Middle East and Arab trade and traditions. Mediterranean flavorings were in use but were quickly replaced by exotic spices and herbs such as cinnamon, ginger and almonds. In addition, the Crusaders brought back with them information on cloth sieves, the consume and the solid jelly. Such base foods have been developed over the years into some of the most advanced dishes in the world.

## Romans

The Romans were instrumental in developing the flavors of foods we use today. Wheat bread was a staple of their food selection and huge amounts were imported from Africa and other parts of the Empire. Rome also used vast amounts of honey in sweeter dishes, even using it as offerings to the Gods. Mustard appears to have been developed as a condiment during Roman times, as well, and they used lettuce and fruits as both appetizers as well as desserts. Honey was often used to preserve fruits, showing the world a new form of food preservation and were also well-versed in sauces and alcohol. While their methods were simplified, their abilities to combine foods led others to devise new and exotic recipes enjoyed the world over.

## Louis Camille Maillard

Louis Camille Maillard was a French physician, who was the first to describe the reactions of chemicals responsible for the cooked color and flavor of bread crusts, chocolate, coffee, dark beer and roasted meats that did not rely on sugar. This process is now known as Maillard reactions and is applied to several thousands of foods. Although certainly not the "inventor" of the process, nor even a food chemist, he did spread word of the reactions to the world, allowing the technique to be applied to foods with which it would otherwise not have been used.

## Amelia Simmons

Amelia Simmons was the first to discuss in literature the use of pearlash or potash in leavening bread. In a cookbook written by her in 1796, four recipes called for the use of the material, made by soaking the ash produced when plant materials are burned, draining off the liquid and drying it to concentrate the remaining substances. This blend of alkaline potassium carbonate was the precursor to baking soda and baking powder, commonly used today in leavening bread.



# Objects/Places

## Phenolic Compounds

Phenolic compounds are chemical molecules made from rings of 6 carbon atoms, which are vital to plant life. These compounds are often antioxidants and minerals beneficial to human health.

## Antioxidants

Antioxidants are molecules that react with free radicals within the body to help stop them from degenerating DNA. Since these free radicals are the causes of cancers and tumors, antioxidants are important for human health.

## Tannins

Tannins are compounds of three to five carbon rings that span two or more normally-separate protein molecules, bond to them and hold them together. The result in the human mouth is a sense of astringency because the tannins bond to saliva to force the proteins to stick to the tongue, increasing friction.

## Alkaloids

Alkaloids are bitter tasting toxins in some plants used as a defense mechanism against predators. At high doses, alkaloids are toxic.

## Cyanogens

Cyanogens are bitter, hydrogen cyanide molecules that plants use to generate energy. Without proper food preparation, plants with the chemical are toxic.

## Hydrazines

Hydrazines are substances in many plants containing nitrogen, which causes liver damage and cancer.

## Protease Inhibitors and Letins

These plant chemicals cause red blood cells to bind to one another, as well as a variety of other symptoms related to food poisoning.

## Maillard reactions

Maillard reactions, also known as browning reactions, occur when a carbohydrate molecule reacts with an amino acid. An unstable structure is formed and undergoes further changes, producing hundreds of byproducts. The reaction occurs as food is heated to high temperatures, resulting in a brown color and full, rich flavor.

## Capsaicin

Capsaicin is the chemical found in chilli fruit that results in a "spicy" taste and feeling. It is a defensive chemical, which activates pain and heat receptors in the mouth, which many individuals have come to enjoy. The chemical does not appear to increase cancer risks or stomach ulcers, affects temperature regulation, increases metabolic rates and triggers brain signals to make individuals feel full. At the same time, it can burn the eyes but also provides sore muscle relief. To limit the spice of a dish, the spongy tissue and seeds of the chilli should be removed. If already ingested, one can drink very cold liquid or eat something solid and rough, such as rice or crackers. Drying chillies weakens their flavor slightly. Other temperate climate spices include hops, used in beers and ales, mahleb, used in baked goods, mastic, used in breads and sweets, nigella, used in breads of Asia, and saffron, used around the world in rice, fish stew and hundreds of other dishes.

## Terpenes

Terpenes are compounds constructed of five carbon atoms in a zigzag pattern. These compounds are versatile, in that they can be combined into thousands of different combinations, resulting in tens of thousands of different flavor and aroma possibilities.

# Themes

## Food Chemistry

The basic premise of the book is to explain the vast subject of food chemistry in a simplified, easy to read way. Throughout the book, the author refers to taste compounds, flavor molecules, protein breakdowns, amino acids, vitamins and a variety of other topics all related to food and their basic chemical make up. Cooking, and the results of certain cooking styles, is explained, not in terms of the chef, but in terms of the chemical reactions within the food that make such things occur. In addition, the author explains the make up of all kinds of foods, spices, fruits and vegetables, so that readers can clearly understand which parts are used and why those parts react the way they do when cooked or eaten raw. Food toxins are explained not in terms of why the toxins exist but in terms of the compounds within foods that make such toxins possible. By using diagrams, pictures, a blend of scientific names and common names, and similar terms throughout chapters, the author ensures an understanding of basic food chemistry. This knowledge is conveyed without the need for incomprehensible chemistry formulas but with a light and easy tone and wording that is chemically based, but with real world intentions. This theme is not only the primary focus of the book but helps readers to comprehend all facets of foods, in terms of the how, why, when and where foods react in different situations. This concept is vital not only to understanding the book but also to understanding cooking as a whole.

## Food Safety

The secondary theme of the book is that of food safety. Through each section of each chapter, the author explains possible contamination issues with each food type. This includes diseases such as salmonella, Escherichia coli, Trichinosis, Trichina spiralis and Mad cow disease, as well as many others. These explanations include the type of disease, how it can be caused, the overall effects of the disease on the body, as well as ways to prevent it. In addition to disease, the author also discusses how to adequately store and process each food for maximum safety, including when to use freezing, refrigeration, boiling, cooking and simple room temperature storage. Even further, the author discusses what signs to look for when examining food for consumption, such as coloring, smell and texture. By discussing each of these issues in depth, the author makes a clear point that food safety is of primary importance to chefs and consumers alike. Through his in-depth analysis of disease, safe cooking techniques and foods prone to disease, the author presents an easy-to-understand overview of the dangers of improper storage, handling, preparation, and the risks associated. Since the information is not presented in terms of medical terminology but instead of the common household chef, the extremely-important theme is easy to understand and grasp throughout the entire book.





## Food History

Throughout the book, the author discusses several aspects of food, including many historical issues. The author tells of the origins of foods, from their area of discovery to their development over time, as well as their original uses. Many of the foods were used first in the Orient, but some he discusses were altered greatly in ancient Rome and the Mediterranean. McGee even discusses the origin of the words used to describe various foods, many of which are of Latin origin. Throughout this, McGee discusses major events in cooking such as the invention of the centrifuge, the discovery of baking soda and baking powder, and the development of pasteurization. The history, while secondary to the main premises of food chemistry and safety, is vital to the book, in that the lessons help readers understand why foods have changed and why certain foods are more developed than others. McGee even quotes writers such as Captain John Smith, Marcel Proust and Louis Lemery, who are food experts of their time. Also included are passages from ancient textbooks, discusses of cave drawings and finds of food related ancient artifacts. Each of these components is interesting in its own right, but when combined, provide readers with a coherent, complete view of the history of food.



# Style

## Perspective

The author discusses food from a personal, historical and scientific point of view. His years of work in food chemistry, food physics, as well as in food in general, lends a sense of intelligence and depth to the work that would otherwise not be possible. Without McGee's vast research into the history, development, chemical makeup and societal views of foods ranging from milk to spices to meat to breads to sweets, the book would be just another cookbook. This book, however, goes far beyond that simple premise to expand every aspect of food, lending a better understanding not only of foods, but of the cooking process. It is McGee's knowledge of the science of food that allows these themes to come through clearly, precisely and accurately but with a lightness that makes the text easy to read. While McGee does not push his opinions often throughout the book, he does mention on several occasions a desire to limit any possible cruelty to animals and encourages readers to purchase free range chickens, support dairies with sanitary conditions

and to support local farmers. He also supports organic foods, mentioning often that technology has limited food flavors greatly.

## Tone

The tone of the book is very light and instruction-like. The author speaks clearly, with extreme depth, but does not write in such a way as to make the text inaccessible. No knowledge of chemistry or history or sciences are necessary to understand the material presented. The topic is one of little controversy, so the tone is not combative. However, the author does lend his own opinions at times in terms of animal cruelty and the modernization of foods, and these areas are definitely opinionated, although not presented as accusatory or confrontational, but simply as factual. McGee presents his material as objective, factual and intellectual, which allows the book to move freely and smoothly between hundreds of different topics. With such a light tone, this vast book would not only be incomprehensible, but far too long to be effective. The light tone, peppered with interesting tidbits of history and modern tips for cooking, simply adds to the enjoyment of the book.

## Structure

The book is divided into fifteen chapters, an acknowledgment section, introduction, and appendix, a reference section, and an index. The acknowledgment section is a simple list, with slight detail, of those the author wishes to thank, both for their contributions to his work, and for their support. The Introduction discusses the changes between this version of the book and McGee's previous edition, done twenty years ago. Each individual chapter is then broken down in similar ways. First, the author introduces the

food group, then discusses the chemical and biological makeup, type of the food, methods of cooking, storage and historical information. Each chapter is similar in length, although does vary slightly. The appendix discusses chemistry such as atoms, molecules and energy in more depth, while the references lists books to which the author owes credit. The index then lists all topics alphabetically. The book is, in total, 883 pages.



## Quotes

"It's still possible to savor the remarkable foods that millennia of human ingenuity have teased from milk. A sip of milk itself or a scoop of ice cream can be a Proustian draft of youth's innocence and energy and possibility, while a morsel of fine cheese is a rich meditation on maturity, the fulfillment of possibility, the way of all flesh." pg.8.

"Over the centuries there have been several clever answers to the conundrum, Which came first, the chicken or the egg? The Church Fathers sided with the chicken, pointing out that according to Genesis, God first created the creatures, not their reproductive apparatus. The Victorians Samuel Butler awarded the egg overall priority when he said that a chicken is just an egg's way of making another egg. About one point, however, there is no dispute: eggs existed long before chickens did. Ultimately, we owe our souffles and sunny-side-ups to the invention of sex." pg. 69.

"Paradoxically, meat is also the most widely avoided of major foods. In order to eat meat, we necessarily cause the death of other creatures that feel fear and pain, and whose flesh resembles our own. Many people throughout history have found this a morally unacceptable price for our own nourishment and pleasure. The ethical argument against eating meat suggests that the same food that fueled the biological evolution of modern humans now holds us back from full humaneness." pg. 121.

"The oceans are voluminous and ancient, the 'primordial soup' in which all life began, and in which the human imagination has found rich inspiration for myths of destruction and creation, of metamorphosis and rebirth. The creatures that live in this cold, dark, dense, airless place are unmatched among our food animals in their variety and their strangeness." pg. 180.

"The plant world encompasses earthy roots, bitter and pungent and refreshing leaves, perfumed flowers, mouth-filling fruit, nutty seeds, sweetness and tartness and astringency and pleasing pain, and aromas by the thousands!" pg. 243.

"Fruits and vegetables, herbs and spices are the most complex foods we eat. If we know even a little bit about which substances create their flavor, then we become more attuned to how the flavor is built, and better able to perceive echoes and harmonies among different ingredients. Such perceptions enrich the experience of eating, and can help us become better cooks." pg. 301.

"So the plant fills these fruits with a mouthwatering mixture of sugars and acids, endows them with pleasant aromas and eye-catching colors, and softens them for us; they're delicious and beautiful even when raw." pg. 350.

"In the ancient world, [herbs and spices] were more than mere foods; they were thought to have medicinal and even transcendental properties. Sacrificial fires wafted the fumes of aromatics upward to please the gods, and at the same time offered earthbound humans a whiff of heaven." pg. 386.



"Seeds are our most durable and concentrated foods. They're rugged lifeboats, designed to carry a plant's offspring to the shore of an uncertain future." pg. 452.

"Bread is the most everyday and familiar of foods, the sturdy staff of life on which hundreds of generations have leaned for sustenance. It also represents a truly remarkable discovery, a lively pole on which the young human imagination may well have vaulted forward in insight and inspiration. For our prehistoric ancestors it would have been a startling sign of the natural world's hidden potential for being transformed, and their own ability to shape natural materials to human desires." pg. 516.

"While the meat or grain or vegetable is always one or less itself, a sauce can be anything the cook wants it to be, and makes the dish a richer, more various, more satisfying composition. Sauces help the cook feed our perpetual hunger for stimulating sensations, for the pleasures of taste and smell, touch and sight. Sauces are distillations of desire." pg. 581.

"Ordinary sugar is an extraordinary food. Sugar is pure sensation, crystallized pleasure. All human beings share an innate liking for its sweetness, which we first experience in mother's milk, and which is the taste of the energy that fuels all life." pg. 645.

"Like all good foods, wine, beer, and spirits nourish and satisfy the body. What sets them apart is the very direct way in which they touch the mind. They contain alcohol, which is both a source of energy and a drug. In moderate amounts, alcohol causes us to feel and express emotions of all kinds-happiness, conviviality, sadness, anger-with more freedom. In large amounts, it's a narcotic: it numbs feeling and clouds thought. Alcoholic drinks thus offer various degrees of release from our usual state of mind. Small wonder that they were once considered an earthly version of the nectar of the gods, foods that give mortals a taste of being carefree masters of life!" pg. 713.



## Topics for Discussion

What are the primary sources of aromas in foods? Be sure to give examples.

The author discusses the important physiology in meats that makes them taste and cook the way they do. Please discuss how muscle fibers play a role in the taste, texture, and flavor of meat.

In Chapter six, the author discusses the reason some plants have higher potency than others. Please discuss this in depth, making sure to fully explain why and how plants use this potency.

List three fruits from tropical climates and discuss their chemistry, physiology and the differences among each.

Compare and contrast the four different types of sugars.

Throughout the novel, the author mentions his belief that modern science and industrialization have lowered the flavor of many foods and taken away from the glory that is food. Do you agree or disagree? Be sure to support or refute at least two of McGee's points.

Compare and contrast the six metals listed in Chapter 15 in terms of their abilities to conduct heat and their effect on foods.