

CAFFE



Origins

Palestinian Arab women grinding coffee the old fashioned way.

The word "coffee" entered English in 1598 via Italian *caffè*. This word was created via Turkish *kahve*, which in turn came into being via Arabic *qahwa*, a truncation of *qahwat al-bun* or *wine of the bean*. Traditional Islam prohibits the use of alcohol as a beverage, and coffee provided a suitable alternative to wine.

There are several legendary accounts of the origin of the drink itself. One account involves the Yemenite Sufi mystic Shaikh ash-Shadhili. When traveling in Ethiopia, the legend goes, he observed goats of unusual vitality, and, upon trying the berries that the goats had been eating, experienced the same vitality. A similar myth attributes the discovery of coffee to an Ethiopian goatherder named Kaldi and the Legend of Dancing Goats.

One possible origin of both the beverage and the name is the Kingdom of Kaffa in Ethiopia, where the coffee plant originated (its name there is *bunn* or *bunna*).

ETYMOLOGY AND USAGE OF THE TERM

The origin of the term "espresso" is the subject of considerable debate. Although some Anglo-American dictionaries simply refer to "pressed-out" (rooted in the Latin origin of the word), "espresso", much like the English word "express", also carries the meanings of "just for you" and "quickly," both of which can be related to the method of espresso preparation. The Italian spelling of the word is *not* "espresso", though that form is accepted by some English-language dictionaries (e.g. Merriam Webster).

In an Italian coffee bar, as in much of Europe, ordering "a coffee" (un caffè in Italian), means just ordering an espresso. In France, the term café is normally used as well, but the French café is usually dark roasted.

The Muslim world

Syrian Bedouin from a beehive village in Aleppo, Syria, sipping the traditional murra coffee, 1930.

The earliest mention of coffee may be a reference to Bunchum in the works of the 10th century CE Persian physician Razi, but more definite information on the preparation of a beverage from the roasted coffee berries dates from several centuries later.

The most important of the early writers on coffee was Abd al-Qadir al-Jaziri, who in 1587 compiled a work tracing the history and legal controversies of coffee entitled "Umdat al safwa fi hill al-qahwa". He reported that one Sheikh, Jamal-al-Din al-Dhabhani, mufti of Aden, was the first to adopt the use of coffee (circa 1454). Coffee's usefulness in driving away sleep made it popular among Sufis. Al-Jaziri's manuscript work is of considerable interest with regards to the history of coffee in Europe as well. A copy reached the French royal library, where it was translated in part by Antoine Galland as *De l'origine et du progrès du Cafe*. The translation traces the spread of coffee from Arabia Felix (the present day Yemen) northward to Mecca and Medina, and then to the larger cities of Cairo, Damascus, Baghdad, and Istanbul.

The 19th-century orientalist Antoine Isaac Silvestre de Sacy edited the first two chapters of al-Jaziri's manuscript and included it in the second edition of his *Chrestomathie Arabe* (Paris, 1826, 3 vols.). Galland's 1699 work was recently reissued (Paris: Editions La Bibliothèque, 1992).

Coffee beans were first exported from Ethiopia to Yemen. Yemeni traders brought coffee back to their homeland and began to cultivate the bean. The first coffee house was Kiva Han, which opened in Istanbul in 1471

Coffee was at first not well received. In 1511, it was forbidden for its stimulating effect by conservative, orthodox imams at a theological court in Mecca. However, the popularity of the drink led these bans to be overturned in 1524 by an order of the Ottoman Turkish Sultan Selim I. In Cairo, Egypt, a similar ban was instituted in 1532, and the coffeehouses and warehouses containing coffee beans were sacked. Similarly, coffee was banned by the Ethiopian Orthodox Church some time before the 17th century, along with smoking tobacco and chewing the mild stimulant khat, as it was seen as a Muslim and pagan practice. However, in the second half of the 19th century, Ethiopian attitudes softened towards coffee drinking, and its consumption spread rapidly between 1880 and 1886; according to Richard Pankhurst, "this was largely due to Menilek, who himself drank it, and to Abuna Matewos who did much to dispel the belief of the clergy that it was a Muslim drink."

Europe

Coffee was first imported to Italy, according to historic sources. The vibrant trade between the Italian city of [Venice](#) and the Muslims in North Africa, Egypt, and the East brought a large variety of African goods, including coffee, to this leading European port. Venetian merchants decided to introduce coffee to the wealthy in Venice, charging them heavily for the beverage. In this way, coffee was introduced to Europe. Coffee became more widely accepted after it was "baptized" by Pope Clement VIII in 1600 despite appeals to ban the Muslim drink. The first European coffee house (apart from those in the Ottoman Empire, mentioned above) was opened in Italy in 1645.

England

Largely through the efforts of the British East India Company and the Dutch East India Company, coffee became available in England no later than the 16th century according to Leonhard Rauwolf's 1583 account. The first coffeehouse in England was opened in St. Michael's Alley in Cornhill. The proprietor was Pasqua Rosée, the servant of Daniel Edwards, a trader in Turkish goods. Edwards imported the coffee and assisted Rosée in setting up the establishment. The popularity of coffeehouses spread rapidly in Europe, and later, America. By 1675, there were more than 3,000 coffeehouses in England.

The banning of women from coffeehouses was not universal, but does appear to have been common in Europe. In Germany women frequented them, but in England they were banned. Many believed coffee to have several medicinal properties in this period. For example, a 1661 tract entitled "A character of coffee and coffee-houses", written by one "M.P.", lists some of these perceived virtues:

“ 'Tis extolled for drying up the Crudities of the Stomack, and for expelling Fumes out of the Head. Excellent Berry! which can cleanse the English-man's Stomak of Flegm, and expel Giddinesse out of his Head. ”

Not everyone was in favour of this new commodity, however. For example, the anonymous 1674 "Women's Petition Against Coffee" declared:

“ ...the Excessive Use of that Newfangled, Abominable, Heathenish Liquor called *COFFEE* [...] has [...] *Eunucht* our Husbands, and Crippled our more kind *Gallants*, that they are become as *Impotent*, as Age. ”

France

Antoine Galland (1646-1715) in his aforementioned translation described the Muslim association with coffee, tea and chocolate: "We are indebted to these great [Arab] physicians for introducing coffee to the modern world through their writings, as well as sugar, tea, and chocolate." Galland reported that he was informed by Mr. de la Croix, the interpreter of King Louis XIV of France, that coffee was brought to Paris by a certain Mr. Thevenot, who had travelled through the East. On his return to that city in 1657, Thevenot gave some of the beans to his friends, one of whom was de la Croix. However, the major spread of the popularity of this beverage in Paris was soon to come. In 1669, Soleiman Agha, Ambassador from Sultan Mehmed IV, arrived in Paris with his entourage bringing with him a large quantity of coffee beans. Not only did they provide their French and European guests with coffee to drink, but they also donated some beans to the royal court. Between July 1669 and May 1670, the Ambassador managed to firmly establish the custom of drinking coffee among Parisians.

Austria and Poland

The first coffeehouse in Austria opened in Vienna in 1683 after the Battle of Vienna, by using supplies from the spoils obtained after defeating the Turks. The officer who received the coffee beans, Polish military officer Franciszek Jerzy Kulczycki, opened the coffee house and helped popularize the custom of adding sugar and milk to the coffee. Until recently, this was celebrated in Viennese coffeehouses by hanging a picture of Kulczycki in the window. Melange is the typical Viennese coffee, which comes mixed with hot foamed milk and a glass of water. The first coffeehouses in Poland were opened in Kraków in the 16th or 17th century because of their close trade ties with the East, most notably the Turks.

Other regions

The introduction of coffee to the Americas is attributed to France through its colonization of many parts of the continent starting with the Martinique and the colonies of the West Indies where the first French coffee plantations were founded. The first coffee plantation in Brazil occurred in 1727 when Lt. Col. Francisco de Melo Palheta smuggled seeds from French Guiana. By the 1800s, Brazil's harvests would turn coffee from an elite indulgence to a drink for the masses. Brazil, which like most other countries cultivates coffee as a commercial commodity, relied heavily on slave labor from Africa for the viability of the plantations until the abolition of slavery in 1888. The success of coffee in 17th-century Europe was paralleled with the spread of the habit of tobacco smoking all over the continent during the course of the Thirty Years' War (1618–48).

For many decades in the 19th and early 20th centuries, Brazil was the biggest producer of coffee and a virtual monopolist in the trade. However, a policy of maintaining high prices soon opened opportunities to other nations, such as Colombia, Guatemala, Indonesia and Viet Nam, now second only to Brazil as the major coffee producer in the world. Large-scale production in Vietnam began following normalization of trade relations with the US in 1995. Nearly all of the coffee grown there is Robusta.

Despite the origins of coffee cultivation in Ethiopia, that country produced only a small amount for export until the Twentieth Century, and much of that not from the south of the country but from the environs of Harar in the northeast. The

Kingdom of Kaffa, home of the plant, was estimated to produce between 50,000 and 60,000 kilograms of coffee beans in the 1880s. Commercial production effectively began in 1907 with the founding of the inland port of Gambela, and greatly increased afterwards: 100,000 kilograms of coffee was exported from Gambela in 1908, while in 1927-8 over 4 million kilograms passed through that port. Coffee plantations were also developed in Arsi Province at the same time, and were eventually exported by means of the Addis Ababa - Djibouti Railway. While only 245,000 kilograms were freighted by the Railway, this amount jumped to 2,240,000 kilograms by 1922, surpassed exports of "Harari" coffee by 1925, and reached 9,260,000 kilograms in 1936.

Australia is a minor coffee producer, with little product for export, but its coffee history goes back to 1880 when the first of 500 acres began to be developed in an area between northern New South Wales and Cooktown. Today there are several producers of Arabica coffee in Australia that use a mechanical harvesting system invented in 1981.

COFFEE PROCESSING

Processing of coffee is the method converting the raw fruit of the coffee plant (cherry) into the commodity green coffee. The cherry has the fruit or pulp removed leaving the seed or bean which is then dried. While all green coffee is processed, the method that is used varies and can have a significant effect on the flavor of roasted and brewed coffee.

Picking

Workers sorting and pulping coffee beans in Guatemala

A coffee plant usually starts to produce flowers 3-4 years after it is planted, and it is from these flowers that the fruits of the plant (commonly known as coffee cherries) appear, with the first useful harvest possible around 5 years after planting. The cherries ripen around eight months after the emergence of the flower, by changing colour from green to red, and it is at this time that they should be harvested.

Coffee berries are most commonly picked by hand by labourers who receive payment by the basketful. As of 2003, payment per basket is between US\$2.00 to \$10 with the overwhelming majority of the labourers receiving payment at the lower end. An experienced coffee picker can collect up to 6-7 baskets a day. Depending on the grower, coffee pickers are sometimes specifically instructed to not pick green coffee berries since the seeds in the berries are not fully formed or mature. This discernment typically only occurs with growers who harvest for higher end/specialty coffee where the pickers are paid better for their labour. Mixes of green and red berries, or just green berries, are used to produce cheaper mass consumer coffee beans, which are characterized by a displeasingly bitter/astringent flavour and a sharp odour. Red berries, with their higher aromatic oil and lower organic acid content, are more fragrant, smooth, and mellow. As such coffee picking is one of the most important stages in coffee production, and is the chief determinant for the quality of the end product.

Processes

Most of the world's green coffee has gone through some sort of wet processing including most of the premium coffee.

After the Green coffee is picked the coffee is sorted by immersion in water. Bad or unripe fruit will float and the good ripe fruit will sink. The skin of the cherry and some of the pulp is removed by pressing the fruit by machine in water through a screen. The bean will still have a significant amount of the pulp clinging to it that needs to be removed.

In the ferment and wash method of wet processing the remainder of the pulp is removed by breaking down the cellulose by fermenting the beans with microbes for several days and then washing them with large amounts of water. Fermentation can be done with extra water or in "Dry Fermentation" in the fruit's own juices only.

In machine-assisted wet processing fermentation is not used to separate the bean from the remainder of the pulp rather it is scrubbed off by a machine.

After the pulp has been removed what is left is the bean surrounded by two additional layers, the silver skin and the parchment. The beans must be dried to a water content of about 10% before they are stable. Coffee beans can be dried in the sun or by machine but in most cases it is dried in the sun to 12-13% moisture and brought down to 10% by machine. Drying entirely by machine is normally only done where space is at a premium or the humidity is too high for the beans to dry before mildewing. When dried in the sun coffee is most often spread out in rows on large patios where it needs to be raked every six hours to promote even drying and prevent the growth of mildew. Some coffee is dried on large raised tables where the coffee is turned by hand. Drying coffee this way has the advantage of allowing air to circulate better around the beans promoting more even drying but increases cost and labor significantly. The parchment is removed from the bean and what remains is green coffee.

Any wet processing of coffee produces coffee wastewater which can be a pollutant. Around 130 liters of fresh water is required to process one kilogram of quality coffee.

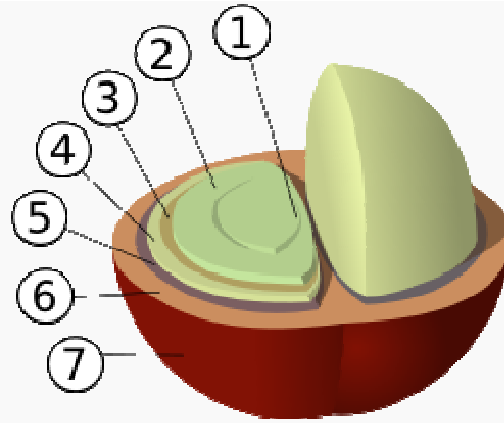
Dry process

Dry process, also known as unwashed or natural coffee, is the oldest method of processing coffee. The entire cherry after harvest is placed in the sun to dry on tables or in thin layers on patios. It will take between ten days and two weeks for the cherries to completely dry. The cherries need to be raked regularly to prevent mildew while they dry. Once the skin is dry, the pulp and parchment are removed from the bean. While coffee was once all dry processed it is now limited to regions where water or infrastructure for machinery is scarce. The supply of dry processed coffee is very limited, with coffee from the Harrar region of Ethiopia and some areas of Yemen and Brazil being the primary sources.

Semi dry process

Semi dry is a hybrid process in very limited use in Brazil and Sumatara/Sulawesi. The cherry is passed through a screen to remove the skin and some of the pulp like in the wet process but result is dried in the sun and not fermented or scrubbed.

Additional steps



Structure of coffee berry and beans: 1: center cut 2: bean (endosperm) 3: silver skin (testa, epidermis), 4: parchment (hull, endocarp) 5: pectin layer 6: pulp (mesocarp) 7: outer skin (pericarp, exocarp)

Sorting grading

Once the coffee is dried to green coffee it is sorted by hand or machine to remove debris and bad or misshapen beans. The coffee is also often sorted by size and placed into one of several grades.

Polishing

Some coffee beans are polished to remove the silver skin. This is done to improve the green coffee beans appearance and eliminate a byproduct of roasting called chaff. It is decried by some to be detrimental to the taste by raising the temperature of the bean through friction which changes the chemical makeup of the bean.

Storage

Green coffee is fairly stable (approx. up to 1 year) if stored correctly. Most often it is in a Jute sack kept in a cool, clean, and dry place.

Aging

All coffee, when it was introduced in Europe, came from the port of Mocha in what is now modern day Yemen. To import the beans to Europe the coffee was on boats for a long sea voyage around the Horn of Africa. This long journey and the exposure to the sea air changed the coffee's flavor. Later, coffee spread to India and Indonesia but still required a long sea voyage. Once the Suez Canal was opened the travel time to Europe was greatly reduced and coffee whose flavor had not changed due to a long sea voyage began arriving. To some degree, this fresher coffee was rejected because Europeans had developed a taste for the changes that were brought on by the long sea voyage. To meet this desire, some coffee was aged in large open-sided warehouses at port for six or more months in an attempt to simulate the effects of a long sea voyage before it was shipped to Europe.

Although it is still widely debated, certain types of green coffee are believed to improve with age; especially those that are valued for their low acidity, such as coffees from Indonesia or India. Several of these coffee producers sell coffee beans that have been aged for as long as 3 years, with some as long as 8 years. However, most coffee experts agree that a green coffee peaks in flavor and freshness within one year of harvest, because over-aged coffee beans will lose much of their essential oil content.

Decaffeination

Decaffeination is the process of extracting caffeine from green coffee beans prior to roasting. The most common decaffeination process used in the United States is supercritical carbon dioxide (CO₂) extraction. In this process, moistened green coffee beans are contacted with large quantities of supercritical CO₂ (CO₂ maintained at a pressure of about 4,000 pounds force per square inch (28 MPa) and temperatures between 90 and 100 °C [194 and 212 °F]), which removes about 97 % of the caffeine from the beans. The caffeine is then recovered from the CO₂, typically using an activated carbon adsorption system.

Another commonly used method is solvent extraction, typically using oil (extracted from roasted coffee) or ethyl acetate as a solvent. In this process, solvent is added to moistened green coffee beans to extract most of the caffeine from the beans. After the beans are removed from the solvent, they are steam-stripped to remove any residual solvent. The caffeine is then recovered from the solvent, and the solvent is re-used. Water extraction is also used for decaffeination. Decaffeinated coffee beans have a residual caffeine content of about 0.1 % on a dry basis. Not all facilities have decaffeination operations, and decaffeinated green coffee beans are purchased by many facilities that produce decaffeinated coffee.

ROASTING PROFILE

A roasting profile describes the time vs. temperature trajectory of the beans through the roasting process. Typical roasting profiles take the beans from ambient temperature to a peak between 205°C (400°F) and 250°C (480°F) in a period from 4 to 20 minutes. The beans are then rapidly cooled. The times spent at various temperatures as well as the peak temperature achieved greatly impact the flavor and the color of the roast. Rapid cooling of the beans is necessary to prevent substantial flavor damage to the beans. Generally the equipment available to home roasters makes accurate and repeatable profile control more difficult than with professional commercial roasting equipment which is often automated and well instrumented, though home roasters can become very good at their craft with experience.

COFFEE ROASTING



Roasting coffee transforms the chemical and physical properties of green coffee beans into roasted coffee products.

The roasting process is integral to producing a savory cup of coffee. When roasted, the green coffee bean expands to nearly double its original size, changing in color and density. As the bean absorbs heat, the color shifts to yellow and then to a light "cinnamon" brown then to a dark and oily color. During roasting oils appear on the surface of the bean. The roast will continue to darken until it is removed from the heat source.

At lighter roasts, the bean will exhibit more of its "origin flavor" - the flavors created in the bean by the soil and weather conditions in the location where it was grown. Coffee beans from famous regions like Java, Kenya, Hawaiian Kona, and Jamaican Blue Mountain are usually roasted lightly so their signature characteristics dominate the flavor.

As the beans darken to a deep brown, the origin flavors of the bean are eclipsed by the flavors created by the roasting process itself. At darker roasts, the "roast flavor" is so dominant that it can be difficult to distinguish the origin of the beans used in the roast. These roasts are sold by the degree of roast, ranging from "Light Cinnamon Roast" through "Vienna Roast" to "French Roast" and beyond. Many consider that a "full city"

roast is a great roast because it is "not too light" and "not too dark".

In the 19th century coffee was usually bought in the form of green beans and roasted in a frying pan. This form of roasting requires much skill to do well, and fell out of favor when vacuum sealing of pre-roasted coffee became possible. Unfortunately, because coffee emits CO₂ for days after roasting, the coffee must be allowed to get slightly stale before it can be vacuum sealed. For this reason two technologies have been employed: pressurized canisters and bags featuring built-in pressure relief valves.

Today home roasting is becoming popular again. Computerized drum roasters are available which simplify home roasting, and some home roasters simply roast in an oven or in air popcorn poppers. Once roasted, coffee loses its flavor quickly. Although some prefer to wait 24 hours after roasting to brew the first cup, all agree that it begins to get off-flavors and bitterness about 1-2 weeks after roasting even under ideal conditions like being stored in an airtight container or de-gassing valve bag.

Home roasting coffee



Start of roast



End of roast



Chaff

Home roasting is the process of obtaining green coffee beans and roasting them on a small scale for personal consumption. Personal roasting of coffee has been practiced for centuries, and has utilized numerous method of roasting the beans. Until World War I, it was more common for at-home coffee drinkers to roast their coffee in their residence than it was to buy pre-roasted coffee. During the 20th century, roasting coffee in the home faded in popularity with the rise of the commercial coffee roasting companies. In recent years home roasting of coffee has seen a revival, primarily it is a means for the coffee aficionado to get access to better quality, fresher roasted beans.

FRESHNESS

Depending on the origin and storage technique coffee flavor can peak anywhere after 24 hours with some coffees reaching peak flavour after 14 days. After this period of improvement coffee flavor declines, once again factors such as origin and storage influence the speed of this process. Grinding roast beans accelerates the rate of staling to a matter of minutes. There are numerous factors involved in the decline of coffee flavor after roasting, among these are the oxidation of oils and other compounds exposed to atmospheric oxygen after the roasting process damages bean cell wall integrity, and also the loss of flavor active volatile compounds to evaporation. It is worth noting that freshly roast coffee beans produce a significant amount of carbon dioxide (CO₂) gas as a result of the roasting process. This CO₂ gas has a modestly protective effect for freshness to the extent that it prevents atmospheric oxygen from contacting the beans. Other means of extending freshness such as freezing roast beans and displacing surrounding air with an inert gas are somewhat controversial.

Because home roasters have control of the roasting quantity and schedule, they can arrange to have coffee available at or near its flavor optimum. Many home roasters insist on roasting several times per week for the sake of obtaining optimal coffee flavor.

Unroasted (green) coffee beans can have a shelf life of one year or longer if properly stored.

BEAN SELECTION

Green coffee beans vary in quality due to many factors. The origin of the beans makes a notable difference in the resulting flavor. It seems that there is some regional character associated with coffee which may in part be due to plant genetics, and also in part to terroir or the regional climate. Also modest changes in growing conditions impact coffee flavor. The processing method of coffee 'cherries' into dried green beans impacts flavor and aroma of the resulting beverage. For all these reasons the selection of the beans is an important quality factor. In recent years internet retailers and home roasting co-operatives have made a very wide selection of beans available to home roasters.

QUALITY

Because the unroasted beans are relatively stable, and roast coffee is quite unstable, the home roaster has a decided freshness advantage over all forms of commercially roast coffee, together with the ability to formulate exact roast times to taste. The recent hobby interest in home roasting and particularly the advent of home roasting co-operatives and internet green bean vendors have made a very wide selection of high quality green beans available to home roasters, comparable to or exceeding the variety available in the best commercial shops. In addition home roasters have reasonable control of the roasting profile and can with modest equipment, experience, and skill produce results comparable to commercial roasting systems.

EQUIPMENT

Home coffee roasting equipment includes a variety of retail machines made specifically for this purpose and additionally a number of home-built devices which have been ingeniously adapted to the purpose of coffee roasting. However, the traditional and simplest way of roasting the beans is to stir the green coffee beans in a flat pan over a high heat. This method is quite acceptable for coffee drinkers who are happy to have a variety of roast levels in their beans as it's almost impossible to achieve a consistent roast while stirring.

The most common DIY roasters include hot-air popcorn poppers (side-vented models), stove-top popcorn poppers (manual stovetop), heat/hot air guns (normally for stripping paint), and barbecue roasting with home made steel drums suspended and rotated over burners. Hot-air poppers have a high failure rate due to the longer duty cycle and higher heat output required of them in this application. Heat guns and hot-air popcorn poppers are generally the least expensive home-use roasters available. Some home-built roasters are based on stir-arm popcorn poppers coupled with convection ovens. A recent innovation is the conversion of bread making machines used in conjunction with heat guns. The bread maker provides the agitation of the beans and the heat gun a concentrated source of heat for roasting. This method is particularly popular in Australia where it has become known as a 'Corretto', a reference to the online nickname of the developer of the method.

Hot air popcorn popper method

Start with 46 grams of green coffee beans roasting for 8 minutes and 40 seconds in a side-vented, hot air popcorn popper venting into a metal or ceramic bowl. Use a timer with a loud alarm to ensure you don't forget to unplug the roaster. A couple of beans may be expelled into the bowl along with the chaff. When done, unplug the popper, discard the chaff in the bowl, dump the roasted beans into the bowl and quickly cool the beans by pouring them between two bowls for about a minute. A wait time of about 24 hours before brewing is recommended, as the flavour improves significantly. Roasting should be done out-of-doors, in a garage, or under a stove fan exhausting outside as enough smoke to set off a smoke detector is produced. With this method, one's own senses are used to determine degree of roast and subsequent doneness of beans. The color and aroma of smoke, appearance of chaff, the "first crack" and "second crack" are all indicators of degree of roast of the beans. As one gains experience in roasting different markers for roast can be used to optimize a particular roast for a particular variety of bean. As ambient temperature changes the time needed to achieve doneness will change. This difference can be compensated for by attention to the aforementioned indicators of roast doneness.

Dedicated home coffee roasters

There are a variety of consumer appliances made specifically for coffee roasting such as the Hearthware iRoast2, Swissmar Alpenrost, NESCO Professional Coffee Roaster (formerly Zach & Dani's Home Roaster), the FreshRoast +8, HOTTOP Bean Roaster, and the Gene Cafe Roaster. These are generally more expensive than home-built options, but offer more automation of the process and avoid the potential hazards of reappropriating other equipment which may be pushed outside of its intended operating range by this unexpected use.

Most of the purpose-built homeroasting appliances are either "air" or "drum" roasters. Commonly, it is held that fluid-bed or air roasting method tends to produce more acidity in the coffee beans while the drum roasting method tends to produce more body in the coffee beans. More recent exploration into the art of roasting in the home has shown that the fast heat up times typical in many fluid bed roasters leads to greater acidity being exposed in the bean, whereas the slower heat up times in drum roasters help develop more body. As new machines come to market that allow for greater control over the heat application process, it should be possible for fluid bed air roasters to develop more body and less acidity, and vice versa for the drum roaster appliances.

Recently, there have been "hybrid" roasters introduced to market that borrow technologies and methodologies being explored in the professional roasting field; most notably the Gene Cafe roaster out of Korea. Recently introduced into North America, this roaster uses an oscillating, off-axis drum rotation to agitate and apply even roasting to the beans, and uses a sealed hot air flow to heat the roast drum chamber.

The main drawbacks with many of the dedicated home roasting appliances are their relatively small batch size (some roasters are capable of handling only 75 grams of green coffee), frequent limitations in the "roasting profile" used by professional roasters to further control the resulting coffee roast, and often slow cool-down abilities for the freshly roasted beans, which could result in a dulling or flattening of potential flavors in the coffee.

Another issue with home roasting coffee is the smoke and fumes that are generated during the roasting process. Because of this, it is preferable to roast coffee in a well-ventilated area. However, when roasting coffee outdoors, the ambient temperature needs to be monitored because this can have an effect on the quality of the roast.

New devices coming to market are providing more control over some of these variables, including the iRoast2 which allows for programmable roasting profiles, and the Gene Cafe Roaster which allows the user to adjust both roast time and temperature at any time during the roast. The HOTTOP is notable as having one of the best cooling cycles of any purpose-built home roasting appliance, coming close to the ability of small professional roasters.

These improvements, along with other developments are fostering a better understanding and appreciation for the art of roasting coffee. They are also continually improving the quality of coffee roasted in the home. Home roasting allows the coffee aficionado to be integral in the process and become more knowledgeable while enjoying better, cheaper and fresher coffee.

Coffee beans can be roasted to different levels and is usually dependent on the variety of coffee bean being roasted as well as the style of coffee being prepared. A typical roast takes around twenty minutes to complete. The images show an example of a roasting cycle, in this case utilizing a HOTTOP drum roaster.

PROCESS

The coffee roasting process consists essentially of cleaning, roasting, cooling, grinding, and packaging operations. In larger operations, bags of green coffee beans are hand or machine-opened, dumped into a hopper, and screened to remove debris. The green beans are then weighed and transferred by belt or pneumatic conveyor to storage hoppers. From the storage hoppers, the green beans are conveyed to the roaster. Roasters typically operate at temperatures between 370 and 540 °F (188 and 282 °C), and the beans are roasted for a period of time ranging from a few minutes to about 30 minutes. Roasters are typically horizontal rotating drums that tumble the green coffee beans in a current of hot combustion gases; however some other common types of roasters use electricity or even heat from wood. The roasters operate in either batch or continuous modes and can be indirect- or direct-fired.

Many people who roast coffee prefer to follow a "recipe" when bringing out the flavor characteristics they wish to highlight. This recipe is often referred to as a roast profile. Any number of factors may help a person determine the best profile to use, such as the coffee's origin, varietal, processing method or desired flavor characteristics. A common way of expressing a roast profile is by using a graph showing time on one axis and temperature on the other, which can be recorded manually or using computer software and data loggers linked to temperature probes inside the drum. As time elapses and the temperature of the coffee beans rises inside the drum the person roasting is able to refer to a previously recorded profile in order to match the profiles for consistency from batch to batch.

Indirect-fired roasters are roasters in which the burner flame does not contact the coffee beans, although the combustion gases from the burner do contact the beans. Direct-fired roasters contact the beans with the burner flame and the combustion gases. At the end of the roasting cycle, water sprays are used to "quench" the beans. Following roasting, the beans are cooled and run through a "destoner". Destoners are air classifiers that remove stones, metal fragments, and other waste not removed during initial screening from the beans. The destoners pneumatically convey the beans to a hopper, where the beans are stabilized and dried (small amounts of water from quenching exist on the surface of the beans). This stabilization process is called equilibration. Following equilibration, the roasted beans are either ground by multi-stage grinders or packaged as whole beans. Roasted whole beans can be considered fresh for up to, but not exceeding one month. Once coffee is ground it is only good for about 24 hours. Unroasted beans boast all of coffee's acids, protein, and caffeine—but none of its taste. It takes heat to spark the chemical reactions that turn carbohydrates and fats into aromatic oils, burn off moisture and carbon dioxide, and alternately break down and build up acids, unlocking the characteristic coffee flavor.

DARKNESS

A note on flavor: Describing the tastes of different roasts is as subjective as putting a wine into words. In both cases there's no substitute for your own personal taste, for sample

	Aliases	Roaster Watch	Surface	Flavor
Light	<i>Cinnamon roast, half city, New England</i>	<i>After about seven minutes the beans "pop" and double in size, and light roasting is achieved. American mass-market roasters typically stop here.</i>	<i>Dry</i>	<i>Light-bodied and somewhat sour, grassy, and snappy</i>
Medium	<i>Full city, American, regular, breakfast, brown</i>	<i>At nine to eleven minutes the beans reach this roast, which U.S. specialty sellers tend to prefer.</i>	<i>Dry</i>	<i>A bit sweeter than light roast; full body balanced by acid snap, aroma, and complexity</i>
Dark	<i>High, Viennese, Italian Espresso, Continental</i>	<i>After 12 to 13 minutes the beans begin hissing and popping again, and oils rise to the surface. Roasters from the U.S. Northwest generally remove the beans at this point.</i>	<i>Slightly shiny</i>	<i>Somewhat spicy; complexity is traded for rich chocolaty body, aroma is exchanged for sweetness</i>
Darkest	<i>French</i>	<i>After 14 minutes or so the beans grow quiet and begin to smoke. Having carmelized, the bean sugars begin to carbonize.</i>	<i>Very oily</i>	<i>Smokey; tastes primarily of roasting, not of the inherent flavor of the bean</i>



Grades of coffee roasting; from left: unroasted (or "green"), light, cinnamon, medium, high, city, full city, Italian, and French.

EMISSIONS AND CONTROL

Particulate matter (PM), volatile organic compounds (VOC), organic acids, and combustion products are the principal emissions from coffee processing. Several operations are sources of PM emissions, including the cleaning and destoning equipment, roaster, cooler, and instant coffee drying equipment. The roaster is the main source of gaseous pollutants, including alcohols, aldehydes, organic acids, and nitrogen and sulphur compounds. Because roasters are typically natural gas-fired, carbon monoxide (CO) and carbon dioxide (CO₂) emissions are expected as a result of fuel combustion. Decaffeination and instant coffee extraction and drying operations may also be sources of small amounts of VOC. Emissions from the grinding and packaging operations typically are not vented to the atmosphere.

Particulate matter emissions from the receiving, storage, cleaning, roasting, cooling, andstoning operations are typically ducted to cyclones before being emitted to the atmosphere. Gaseous emissions from roasting operations are typically ducted to a thermal oxidiser or thermal catalytic oxidiser following PM removal by a cyclone. Some facilities use the burners that heat the roaster as thermal oxidisers. However, separate thermal oxidisers are more efficient because the desired operating temperature is typically between 650°C and 816°C (1200°F and 1500°F), which is 93°C to 260°C (200°F to 500°F) more than the maximum temperature of most roasters. Some facilities use thermal catalytic oxidizers, which require lower operating temperatures to achieve control efficiencies that are equivalent to standard thermal oxidisers. Catalysts are also used to improve the control efficiency of systems in which the roaster exhaust is ducted to the burners that heat the roaster. Emissions from spray dryers are typically controlled by a cyclone followed by a wet scrubber.

ESPRESSO

Espresso brewing, with a dark reddish-brown foam, called *crema* or *schiuma*.

Espresso or **caffè espresso** is a concentrated coffee beverage brewed by forcing very hot, but not boiling water under high pressure through coffee that has been ground to a consistency between extremely fine and powder.

Espresso was developed in Milan, Italy in the early 20th century, but up until the mid-1940s it was a beverage produced solely with steam pressure. The invention of the spring piston lever machine and its subsequent commercial success changed espresso into the beverage we know today. Espresso is now produced with between 9 and 18 atmospheres or bars of pressure.

The defining characteristics of espresso include a thicker consistency than drip coffee, a higher amount of dissolved solids than drip coffee per relative volume, and a serving size that is usually measured in shots, which is about 30ml (1 ounce) in size. Espresso is chemically complex and volatile, with many of its chemical components quickly degrading from oxidation or loss of temperature. Properly brewed espresso has three major parts: the heart, body, and the most distinguishing factor, the presence of crema, a reddish-brown foam that floats on the surface of the espresso. It is composed of vegetable oils, proteins and sugars. Crema has elements of both emulsion and foam colloid.

As a result of the high-pressure brewing process, all of the flavors and chemicals in a typical cup of coffee are concentrated. Because of its intense and high concentration of ingredients (including caffeine), espresso lends itself to mixing into other coffee based drinks, such as lattes, cappuccini, macchiato and mochas, without being diluted in the resulting drink.

Contrary to popular belief in some cultures that an espresso contains less caffeine than most other typical servings of coffee, Espresso contains approximately twice the caffeine content per volume as regular brewed coffee. Espresso contains approximately 40 milligrams per fluid ounce, but only about 1/3 the content per serving.¹

BREWING PROCESS

A modern espresso machine.



A manual espresso machine



Moka



Preparation of espresso requires an espresso machine. The act of producing a shot of espresso is termed "pulling" a shot. The term derives from lever espresso machines, which require pulling down a handle attached to a spring-loaded piston, forcing hot water through the coffee at the requisite pressure. To pull a shot of espresso, a metal filter-basket is filled with 7 to 10 grams of ground coffee for a single shot or 12 to 18 grams for a double shot. The espresso is then tamped, using about 40 pounds of pressure, evenly and rotationally applied, into a firm puck of coffee. The portafilter (or group handle) holds the filter-basket and is locked under the grouphead's diffusion block. When the brew process begins, pressurized water at 90 ± 5 °C (200 ± 9 °F) and approximately 90 kPa (13 PSI; 0.9 Bar) is forced into the grouphead and through the ground coffee in the portafilter. Water cooler than the ideal zone causes sourness; hotter than the ideal zone causes bitterness. High-quality espresso machines control the temperature of the brew water within a few degrees of the ideal. The serving temperature of espresso is significantly lower, typically around 60-70 °C (140-158 °F), owing to the small serving size and the cooling effects of the cup and of the pouring process.

This process produces a rich, almost syrupy beverage by extracting and emulsifying the oils in the ground coffee. An ideal shot of espresso should take between 20 and 30 seconds to arrive on a professional-grade machine, timed from when the coffee begins to flow from the machine (unless the machine has a "preinfusion" stage, which may add about 7 seconds to the process). Varying the fineness of the grind, the amount of pressure used to tamp the grinds, or the pump pressure itself can be used to bring the extraction time into this ideal zone. Most prefer to pull espresso shots directly right into a pre-heated demitasse or shot glass, to maintain the ideal temperature of the espresso and preserve all of its crema. Apart from the espresso made manually by a barista, espresso is also made by automatic machines in which the brewing process takes place with an espresso-brewer.

Freshly brewed espresso must be served or mixed into other coffee beverages immediately, or it will begin to degrade due to cooling and oxidation. Temperature and time of consumption are important variables that must be observed to enjoy an ideal espresso; it should be consumed within 2 minutes from when it is served.

ESPRESSO ROAST

A common misconception about espresso is that it is a specific bean or roast level. Any bean or roasting level can be used to produce authentic espresso. While some major North American chains push dark roasts as their espresso roasts, some of the winning blends used in the World Barista Championship have been what is classified as a medium or "City" or "Full City" roast, with little or no visible surface oil on the beans.

The popularity of different levels of roast in espresso varies greatly. Espresso is typically made from a blend of beans roasted anywhere from very light to very dark. In Southern Italy, a darker roast is preferred but in Northern Italy, a more medium roast is the most popular type. Companies such as Starbucks and Peets have popularized darker roasts in North America and around the world, but the current trend in espresso coffee is matching the roast level to the bean type; this means that the most popular roast style is moving away from being associated with roast color, and more associated with what will produce the best flavor extraction in the cup for each region and type of bean.

BARISTAS

A professional operator of an espresso machine is a "barista", the Italian word for a bartender. In Italy and other parts of Europe, the barista is considered a career position, often with skills and training passed down from generation to generation. In other parts of the world, the job of the barista has been frequently seen as an employment choice for young people, one to get them started in employment, but is not seen as a career choice.

In North America and other parts of the world, the title of barista has long been in use, especially in Italian-style cafes and coffeehouses, but the use of the term gained mainstream popularity when Starbucks started to call their counter staff by this title[dubious – discuss]. Since the late 1990s, the term barista became synonymous with the person in a cafe who specialized in preparing espresso-based beverages for customers. Along with this came the term "home barista" to distinguish the home espresso enthusiast.

There is a current movement both outside of Europe and even within parts of the continent to build pride and professionalism among baristas, encouraging them to consider their work as a serious craft, worthy of the respect granted to other food preparation artisans. In some ways this trend is meant to follow the traditions in places like Italy, France, and Portugal where the barista is considered a respectable career decision. In other ways, this trend is part of what is seen as the "Third Wave" in coffee, where transparency in information sharing is paramount, and the open discussion of ideas, concepts, opinions, and education are shared, even amongst competing businesses in the world of coffee and espresso. The trend is part of the bigger process in specialty coffee to promote coffee as a culinary drink, not as something "regular" or average.

The Barista Guild of America was founded in the United States to promote the professionalism of baristas in that country. Another means of promoting the trade are the Barista Championships. This competition starts as a series of regional events in numerous countries, including the United States, Canada, Australia, New Zealand, Italy, Great Britain, Norway, and Sweden, among others. The competition culminates in the annual World Barista Championship.

Responding to high turnover among coffee shop staff and a desire to reduce training costs, most commercial manufacturers are developing or improving lines of fully automatic machines, which allow a minimally-trained employee to create an espresso drink by merely pushing a button. Starbucks has been a notable adopter of these machines.

POPULARITY

A drive-through espresso bar near Silicon Valley

Espresso is the main type of coffee in most of southern Europe, notably Italy, France, Portugal, and Spain. It is also popular throughout much of the rest of Europe and in Argentina, Brazil, and Cuba, and urban centres in North America, Australia, and New Zealand. In Australia and New Zealand, espresso accounts for nearly all of the commercial cafe, coffeehouse and restaurant coffee business.

In the United States, South Florida's influx of Cuban refugees brought their love of espresso with them although espresso consumption was limited largely to the Cuban community. With the rise of coffee chains such as Starbucks, Seattle's Best Coffee, Caribou Coffee, and others, espresso-based drinks rose in popularity in the 1990s in the United States, with the city of Seattle being generally viewed as the fount of the modern interest. In addition to the Italian style of coffee, these chains typically offer variations and innovations by adding syrups, whipped cream, flavour extracts, soy milk, and different spices to their drinks. Cities like San Francisco, New York, Philadelphia, and Chicago have long traditions of espresso drinking, with the North Beach area in San Francisco being perhaps the most well known.

Espresso have become increasingly popular in recent years, in regions where "American Coffee" has been the main coffee for centuries. In Scandinavia, chains have emerged, selling various sorts of espresso from street corners and high streets. Europe has indeed taken in the espresso as one of their favourite drinks. Many companies now have espresso machines, to be used free of charge by their employees.

Home espresso machines have also increased in popularity with the general rise of interest in espresso, and with the Internet and its use as a tool to spread information about this beverage around the world. Today, a wide range of high-quality home espresso equipment can be found in specialist kitchen and appliance stores, online vendors, and department stores. The Internet has facilitated the spread of information about a wide range of espresso-based drinks, and can dispel (or promote) many myths on how to properly brew espresso.

DECAFFEINATION

Decaffeination is the act of removing caffeine from coffee beans, mate, cocoa, tea leaves and other caffeine containing materials. (While caffeine-free soft drinks are occasionally referred to as "decaffeinated," some are actually prepared by simply omitting caffeine from production.)

In the case of coffee, the decaffeination processes are performed on unroasted (green) beans, but the methods vary somewhat. It generally starts with the steaming of the beans. They are then rinsed in solvent that contains as much of the chemical composition of coffee as possible without also containing the caffeine in a soluble form. The process is repeated anywhere from 8 to 12 times until it meets either the international standard of having removed 97% of the caffeine in the beans or the EU standard of having the beans 99.9% caffeine free by mass. Coffee contains over 400 chemicals important to the taste and aroma of the final drink; this effectively means that no physical process or chemical reaction will remove only caffeine while leaving the other chemicals at their original concentrations.

Coffea arabica normally contains about half the caffeine of *Coffea robusta*. A *Coffea arabica* bean containing little caffeine has been found recently in Ethiopia. This may change how low-caffeine coffee is produced in the future. Additionally, genetic engineering technology may be eventually applied to create a "naturally" caffeine-free coffee. But for now, one of several methods to remove the caffeine from caffeine-containing beans is employed.

Roselius process

The first commercially successful decaffeination process was invented by Ludwig Roselius and Karl Wimmer in 1903. It involved steaming coffee beans with a brine (salt water) solution and then using benzene as a solvent to remove the caffeine. Coffee decaffeinated this way was sold as Coffee (Kaffee, Koffie etc) HAG (from Kaffee Handels Gesellschaft or Coffee Trading Company) in most of Europe, as Café Sanka in France and later as Sanka brand coffee in the US. Due to health concerns regarding benzene, this process is no longer used commercially and Coffee Hag and Sanka are produced using a different process.

Swiss water process

The Swiss Water Process is a method of decaffeinating coffee beans that was developed by the Swiss Water Decaffeinated Coffee Company. To decaffeinate the coffee bean by the Swiss Water method, a batch of green (unroasted) beans is soaked in hot water, releasing caffeine. This process is done until all the caffeine and coffee solids are released into the water. These beans are then discarded. Next, the water passes through a carbon filter which traps the caffeine molecules but allows the water and the coffee solids to pass through. The caffeine-free water which comes through, known as "flavor-charged" water by the company, is then put in a similar filtration device, and new coffee beans are added. However, since the flavor-charged water cannot remove any of the coffee solids from the new beans, only the caffeine is released. The process repeats, filtering out all the caffeine until the beans are 99.9% caffeine free. These beans are removed and dried, and thus retain most if not all of their flavor and smell.

Although the process originated in Switzerland in the 1930s, today the world's only Swiss Water decaffeination facility is based near Vancouver, Canada.

Direct method

In the direct method the coffee beans are first steamed for 30 minutes and then repeatedly rinsed with either methylene chloride or ethyl acetate for about 10 hours. The solvent is then drained away and the beans steamed for an additional 10 hours to remove any residual solvent. Sometimes coffees decaffeinated using ethyl acetate are referred to as naturally processed because ethyl acetate can be derived from various fruits or vegetables. However for the purpose of decaffeination it is not generally possible to create such a large quantity of ethyl acetate, thus the chemical is synthetically derived.

Indirect method

In the indirect method beans are first soaked in hot water for several hours, essentially making a strong pot of coffee. Then the beans are removed and either methylene chloride or ethyl acetate is used to extract the caffeine from the water—as in other methods, the caffeine can then be separated from the organic solvent by simple evaporation. The same water is recycled through this two-step process with new batches of beans. An equilibrium is reached after several cycles, where the water and the beans have a similar composition except for the caffeine. After this point, the caffeine is the only material removed from the beans, so no coffee strength or other flavorings are lost. Because water is used in the initial phase of this process, sometimes indirect method decaffeination is referred to as "water processed" even though chemicals are used.

CO₂/O₂ process

This process is technically known as supercritical fluid extraction. With the CO₂ process, pre-steamed beans are soaked in a liquid bath of carbon dioxide at 73 to 300 atmospheres. After a thorough soaking, the pressure is reduced allowing the CO₂ to evaporate, or the pressurized CO₂ is run through either water or charcoal filters to remove the caffeine. The carbon dioxide is then used on another batch of beans. This same process can also be done with oxygen (O₂). These liquids work better than water because they are kept in supercritical state near the transition from liquid to gas so that they have the high diffusion of gas and the high density of a liquid. This process has the advantage that it avoids the use of potentially toxic solvents.

Triglyceride process

Green coffee beans are soaked in a hot water/coffee solution to draw the caffeine to the surface of the beans. Next, the beans are transferred to another container and immersed in coffee oils that were obtained from spent coffee grounds. After several hours of high temperatures, the triglycerides in the oils remove the caffeine - but not the flavor elements - from the beans. The beans are separated from the oils and dried. The caffeine is removed from the oils, which are reused to decaffeinate another batch of beans. This is a direct contact method of decaffeination

COFFEE AND HEALTH

Coffee contains several compounds which are known to affect human body chemistry. The coffee bean itself contains chemicals which are psychotropic (in a way some find pleasing) for humans as a by-product of their defense mechanism. These chemicals are toxic in large doses, or even in their normal amount when consumed by many creatures which may otherwise have threatened the beans in the wild.

Coffee as a stimulant

Coffee contains caffeine, which acts as a stimulant. For this reason, it is often consumed in the morning and during working hours. Students preparing for examinations with late-night "cram sessions" frequently use coffee to keep themselves awake. Many office workers take a "coffee break" when their energy is diminished. Recent research has uncovered additional stimulating effects of coffee which are not related to its caffeine content. Coffee contains an as yet unknown chemical agent which stimulates the production of cortisone and adrenaline, two stimulating hormones. For occasions when one wants to enjoy the flavor of coffee with almost no stimulation, decaffeinated coffee (also called decaf) is available. This is coffee from which most of the caffeine has been removed, by the Swiss water process (which involves the soaking of raw beans to absorb the caffeine) or the use of a chemical solvent such as trichloroethylene ("tri"), or the more popular methylene chloride, in a similar process. Another solvent used is ethyl acetate; the resultant decaffeinated coffee is marketed as "natural decaf" because ethyl acetate is naturally present in fruit. Extraction with supercritical carbon dioxide has also been employed. Decaffeinated coffee usually loses some flavor over normal coffees and tends to be more bitter. There are also coffee alternatives that resemble coffee in taste but contain no caffeine (see below). These are available both in ground form for brewing and in instant form. Caffeine dependency and withdrawal symptoms are well-documented; see Caffeine for more on the pharmacological effects of caffeine.

Benefits

Reduced risk of Alzheimer's disease: Several studies comparing moderate coffee drinkers (about 2 cups a day) with light coffee drinkers (less than one cup a day) found that those who drank more coffee were significantly less likely to develop Alzheimer's disease later in life.

Reduced risk of gallstone disease: Drinking caffeinated coffee has been correlated with a lower incidence of gallstones and gallbladder disease in both men and women in two studies performed by the Harvard School of Public Health. A lessened risk was not seen in those who drank decaffeinated coffee.

Reduced risk of Parkinson's disease: A study comparing heavy coffee drinkers (3.5 cups a day) with non-drinkers found that the coffee drinkers were significantly less likely to contract Parkinson's Disease later in life. Likewise, a second study found an inverse relationship between the amount of coffee regularly drunk and the likelihood of developing Parkinson's Disease.

Cognitive performance: Many people drink coffee for its ability to increase short term recall and increase IQ.

Likewise, in tests of simple reaction time, choice reaction time, incidental verbal memory, and visuospatial reasoning, participants who regularly drank coffee were found to perform better on all tests, with a positive relationship between test scores and the amount of coffee regularly drunk. Elderly participants were found to have the largest effect associated with regular coffee drinking. Another study found that women over the age of 80 performed significantly better on cognitive tests if they had regularly drunk coffee over their lifetimes.

Analgesic enhancement: Coffee contains caffeine, which increases the effectiveness of pain killers, especially migraine and headache medications. For this reason, many over-the-counter headache drugs include caffeine in their formula.

Antidiabetic: Coffee intake may reduce one's risk of diabetes mellitus type 2 by up to half. While this was originally noticed in patients who consumed high amounts (7 cups a day), the relationship was later shown to be linear.

Anticancer: Coffee can also reduce the incidence of cirrhosis of the liver and has been linked to a reduced risk of hepatocellular carcinoma, a primary liver cancer. Coffee consumption is also correlated to a reduced risk of oral, esophageal, and pharyngeal cancer.

Cardioprotective: Coffee reduces the incidence of heart disease, though whether this is simply because it rids the blood of excess lipids or because of its stimulant effect is unknown.

Laxative/diuretic: Coffee is also a powerful stimulant for peristalsis and is sometimes considered to prevent constipation; it is also a diuretic. However, coffee can also cause loose bowel movements.

Practitioners in alternative medicine often recommend coffee enemas for "cleansing of the colon" due to its stimulus of peristalsis, although mainstream medicine has not proved any benefits of the practice.

Antioxidant: Coffee contains the anticancer compound methylpyridinium. This compound is not present in significant amounts in other food materials. Methylpyridinium is not present in raw coffee beans but is formed during the roasting process from trigonelline, which is common in raw coffee beans. It is present in both caffeinated and decaffeinated coffee, and even in instant coffee.

Prevention of dental caries: The tannins in coffee may reduce the cariogenic potential of foods. In vitro experiments have shown that these polyphenolic compounds may interfere with glucosyltransferase activity of mutans streptococci, which may reduce plaque formation. In rat experiments, tea polyphenols reduced caries.

Gout: Coffee consumption decreased risk of gout in men over age 40. In a large study of over 45,000 men over a 12-year period, the risk for developing gout in men over 40 was inversely proportional with the amount of coffee consumed.

Risks

Many notable effects of coffee are related to its caffeine content. Amongst other known negative health associations it is not clear whether these are due to the caffeine or other unidentified compounds (suggesting that these may be modified by switching to decaffeinated coffee).

Anxiety and sleep changes: Many coffee drinkers are familiar with "coffee jitters", a nervous condition that occurs when one has had too much caffeine. It can also cause anxiety and irritability, in some with excessive coffee consumption, and some as a withdrawal symptom. Coffee can also cause insomnia in some, while paradoxically it helps a few sleep more soundly.

Constipation: Due to its diuretic effect, coffee use can lead to dehydration in some individuals, and as a result, contribute to constipation.

Cosmetic: Like tea, coffee causes staining of the teeth.

Cholesterol: Coffee brewed using a French press method contains oils otherwise trapped by more commonly used paper filters. These oils have been shown to significantly raise LDL cholesterol levels. The risk is not present in paper filtered coffee.

Blood pressure: A recent study by Harvard Med that set out to prove that the caffeine in coffee would put people at risk for high blood pressure ended up rejecting the theory. 155,000 nurses were followed for 12 years and the results showed that large amounts of coffee did not induce a "risky rise in blood pressure". As a note, this study did not include men.

Effects on pregnancy and menopause: A February 2003 Danish study of 18,478 women linked heavy coffee consumption during pregnancy to significantly increased risk of stillbirths (but no significantly increased risk of infant death in the first year). "The results seem to indicate a threshold effect around four to seven cups per day," the study reported. Those who drank eight or more cups a day (64 U.S. fl oz or 1.89 L) were at 220% increased risk compared with nondrinkers. This study has not yet been repeated, but has caused some doctors to caution against excessive coffee consumption during pregnancy.

There are also gender-specific effects: in some PMS sufferers it increases the symptoms; it can reduce fertility in women; it may increase the risk of osteoporosis in postmenopausal women; and there may be risks to a fetus if a pregnant woman drinks 8 or more cups a day (64 U.S. fl oz or 1.4 L or more).

Decaffeinated coffee is occasionally regarded as a potential health risk to pregnant women, due to the high incidence of chemical solvents used to extract the caffeine. These concerns have almost no basis, however, as the solvents in question evaporate at 80–90 °C, and coffee beans are decaffeinated before roasting, which occurs at approximately 200 °C. As such, these chemicals, namely trichloroethane and methylene chloride, are present in trace amounts at most, and neither pose a significant threat to unborn children.

Coronary artery disease: A 2004 study tried to discover why the beneficial and detrimental effects of coffee conflict. The study concluded that consumption of coffee is associated with significant elevations in biochemical markers of inflammation. This is a detrimental effect of coffee on the cardiovascular system, which may explain why coffee has so far only been shown to help the heart at levels of four cups (24 fl oz or 600 mL) or fewer per day.

The health risks of decaffeinated coffee have been studied, with varying results. One variable is the type of decaffeination process used; while some involve the use of organic solvents which may leave residual traces, others rely on steam.

A study has shown that cafestol, a substance which is present in boiled coffee drinks, dramatically increases cholesterol levels, especially in women. Filtered coffee contains only trace amounts of cafestol.

Polymorphisms in the *CYP1A2* gene may lead to a slower metabolism of caffeine. In patients with a slow version of the enzyme the risk for myocardial infarction is increased by a third (2-3 cups) to two thirds (>4 cups). The risk was more marked in people under the age of 59.

A Harvard study over 20 years of 128,000 people published in 2006 concluded that there was no evidence to support the claim that coffee consumption itself increases the risk of coronary heart disease. The study did, however, show a correlation between heavy consumption of coffee and higher degrees of exposure to other coronary heart disease risk factors such as smoking, greater alcohol consumption, and lack of physical exercise. The results apply only to coffee filtered through paper filters, which excludes boiled coffee and espresso, for example. Additionally, the lead researcher on this study acknowledged that subsets of the larger group may be at risk for heart attack when drinking multiple cups of coffee a day due to genetic differences in metabolizing caffeine.

The Iowa Women's Health Study showed that women who consumed coffee actually had fewer cardiovascular disease incidents and lower cancer rates than the general population. For women who drank 6 or more cups, the benefit was even greater. However, this study excluded 35% of its original participants who already had cardiovascular disease and other chronic diseases when the study began. Since participants were all over the age of 55, no good conclusion can be drawn about the long term effect of coffee drinking on heart disease from this study.

VARIATIONS

Affogato (It. "drowned"): Espresso served over [gelato](#). Traditionally vanilla is used, but some coffehouses or customers use any flavor.

Alexandrino: an espresso topped with a layer of [condensed milk](#), sometimes served with a cinammon stick for a spoon (popular in some Portuguese cafes).

Americano (It. "American"): Espresso and hot water, classically using equal parts each. Popular rumor purports that the Americano was invented by European baristas for American G.I.'s during [World War II](#), because they were only familiar with drip coffee during that era. Also called a [long black](#).

Café Bonbon (Sp. "candy coffee"): A shot of espresso served in a small glass filled with [condensed milk](#). The shot and the milk remain separate unless stirred, as in a [black and tan](#).

Breve (It. "short"): Espresso in [half and half](#), in proportions equal to those of a café latte. Similarly, a mocha breve is espresso, chocolate, and half and half in proportions equal to those of a café mocha.

Café Noisette (Fr. "hazelnut coffee"): Espresso cut with warm milk, similar to a cortado. The combination of dark French roasted coffee and milk gives a nutty taste, hence the name.

Caffè Tobio: Two shots of espresso with an equal amount of American Coffee.

Cappuccino: Traditionally, one-third espresso, one-third steamed milk, and one-third [microfoam](#). Often in the United States, the cappuccino is made as a café latte with much more foam, which is less espresso than the traditional definition would require. Sometimes topped (upon request) with a light dusting of [cocoa](#) powder. In some nations where espresso is not a common beverage (particularly in [Japan](#)) most coffee shops top cappuccinos with [cinnamon](#) or [cardamom](#) instead of cocoa.

Corretto (It. "corrected"): coffee with a shot of liquor, usually [grappa](#) or [brandy](#). "Corretto" is also the common Italian word for "spiked (with liquor)".

Cortado (Sp./Port. "cut"): Espresso "cut" with a small amount of warm milk.

Cubano (Sp. "Cuban"): Sugar is added to the collection container before brewing for a sweet flavor, different than that if the sugar is added after brewing. Sugar can also be whipped into a small amount of espresso after brewing and then mixed with the rest of the shot.

Doppio: (It. "Double") Double shot of espresso.

Espresso con Panna (It. "espresso with cream"): Espresso with whipped cream on top.

Flat white: a coffee drink very popular in both Australia and New Zealand, made of one-third espresso and two-thirds steamed milk.

Iced coffee: Generally refers to coffee brewed beforehand, chilled, and served over ice. In Australia, Iced Coffee generally refers to Espresso blended into cold milk and Ice Cream, with some chains using Gelato in place of Ice Cream. In Italy, the Iced Coffee (*Caffè Freddo*) is pre-sweetened and served ice-cold, but never with ice. In the United States, instead, Iced Coffee is brewed on the spot and poured over ice.

John Wayne: Two portions of any flavor syrup, though commonly caramel or vanilla, two portions of half & half, and two shots of espresso. The ingredients are added slowly in this order, so that the end result is layered with three distinct flavors and temperatures, and is customarily drunk all at once. The drink is slowly becoming popular in Texas, and is also referred to as an "Undertow" or a "Teardrop".

Kennedy: A cup of coffee with three shots of espresso in it.

Latte (It. "milk"): This term is an abbreviation of "caffelatte" (or "caffè e latte"), coffee with milk, an espresso based drink with a volume of steamed milk, served with either a thin layer of foam or none at all, depending on the shop or customer's preference.

Latte macchiato (It. "stained milk"): Essentially an inverted café latte, with the espresso poured on top of the milk. [Starbucks](#) has popularized the latte macchiato with their "caramel macchiato", consisting of vanilla-flavored milk with espresso and caramel drizzled over the top. The latte macchiato is to be differentiated from the caffè macchiato (described below).

Caffè Macchiato (It. "stained"): A small amount of foam is spooned onto the espresso. The caffè macchiato is to be differentiated from the latte macchiato (described above).

Lungo (It. "long"): More water (about 1.5x volume) is let through the ground coffee, yielding a weaker taste (40 ml). Also known as an [allongé](#) in French.

Mocha: Normally, a latte blended with chocolate. This is not to be confused with the region of Ethiopia or the coffee grown in that region (which is often seen as 1/2 of the blend "mocha java").

Night Rider: 1 part cocoa mix and 1 shot of espresso in a cup of American coffee.

Nico: Breve with orange syrup and cinnamon.

Quad-shot: Four shots of espresso in a small mug, bigger than a demitasse.

Ponce Livornese: A shot of dark rum, or rum flavoured liqueur ("Ruhm Fantasia"), with sugar and a lemon peel is heated under the steam spigot. An Espresso shot is then poured on top.

Red eye or **Black eye**: A cup of drip coffee with two shots of espresso in it. Also known as a *slingshot*, a *depth charge*, a *shot in the dark*, an *Al Pacino*, an *autobahn*, or a *hammerhead*.

Ristretto (It. "restricted") or **Espresso Corto** (It. "short"): with less water, yielding a stronger taste (10-20 ml). Café serré or Café court in French.

Solo: (It. "single") Single shot of espresso.