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Hebrew University

A print from a 1572 portrayal of pepper-laden ships in the British-controlled port of "Kolkata" in Calcutta, India is shown.

THE KING OF SPICES

BY LAURA HUNT ANGEL

It's the most common spice in the world. Along with cinnamon and cloves, it's also one of the oldest. Alexander the Great had his first taste of it in 327 BC. Wars have been fought over it, and, in 408 BC, the Visigoths demanded 3,000 pounds of it as a ransom for the besieged city of Rome. Dollars to donuts, it's on your table right now, and there is a good chance that you've already had some with your breakfast this morning. It's piper nigrum, or what we call black pepper.

Discovered some 4,000 years ago in southern India, pepper quickly gained the title "King of spices." Archeologists have found evidence of the cultivation of peppercorn plants dating to at least 1,000 years before the time of Christ.

CRAZY OVER YOU

Peppercorns are actually berries, meaning that our common black pepper is a fruit. Pliny the Elder marveled that pepper had "nothing in it that can plead as a recommendation as either fruit or berry, its only desirable quality being that of a certain pungency; and yet it is for this that we import it all the way (to Rome) from India!" Apparently, he was one of the few Romans who remained unimpressed by pepper.

For centuries the ancient Arabs, who carefully protected their market, were the only source for pepper. This increased the value of the spice so much that by the fifth century AD, during the rule of Attila the Hun, that peppercorns were used as a form of legal tender. Roman landlords began to require rent payments in pepper, and inexpensive rentals became known as "peppercorn rents."

By Medieval times, pepper had, by weight, become more valuable than gold. Soon, the Portuguese and Dutch took control of the market, and those who worked with the valuable spice were issued pocket-less, cuff-less uniforms to prevent theft. The difficulty and expense in obtaining peppercorns and other valuable spices is one of the reasons that Christopher Columbus set sail in search of a water route to the Indies. Today, pepper makes up one-fifth of the world's spice trade.

Laura Hunt Angel

Chai maker, barista extraordinaire and all-around wonderful human being, Mollie Garrigan Robinson behind the counter at Sugg Street's Big City Market and Coffee Bar.

VARIETY IS THE SPICE OF LIFE

Although marketed as "black," "green," "white" or "pink," most peppercorns come from the same vining piper nigrum plant, which produces berries in clusters resembling tiny grapes.

Black peppercorns are fully ripened berries that have been sun dried, while white peppercorns are fully ripened berries that have been brined until the black outer hull comes off. Green ones are simply unripe berries.

Pink peppercorns are one of the few common types of pepper that come from a different plant, the Schinus terebinthfolius shrub. They are related to cashews, and people that are allergic to cashews should avoid pink peppercorns. Lesser-known varieties are Cubebe pepper (piper cubeba), a dark brown or black berry with a little tail, and Guinea grains (Amomum melegueta), a relative of cardamom with rust-colored berries. Sichuan peppercorns are the dried berries of the prickly ash.

THE REAL DOCTOR PEPPER

Whether the popular soft drink, Dr. Pepper, actually contains pepper is a highly-guarded secret.

As with most spices, though, peppercorns have been historically valued for their medicinal properties. Some 3,000 years ago when Ayurvedic medicine began to be used in India, practitioners administered black pepper as a digestive aid. Ayurvedic doctors also mixed pepper with honey to make a cough remedy that herbalists still use today to treat colds and flu. Ancient dentists used pepper to combat cavities, swelling and infection.

Indeed, the heat produced by ingesting pepper berries appears to speed the metabolism, helping to treat or prevent a number of digestive issues. The heating property of pepper also seems to help clear congestion when administered for upper respiratory problems. Additionally, peppercorns contain several nutrients, including B vitamins, potassium, manganese, iron and magnesium.

The volatile oils in

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The world of waves; Marconi and the radio

MICHAEL J. **HOWARD**

Guglielmo Marconi was born this week, back in 1874 in Bologna, Italy. It's to his ability to see what others couldn't that we owe first the radio, then TV and, ultimately, our Wi-Fi and our cellphones.

One of the great triumphs of science had already taken place before young Signore Marconi started experimenting with the idea of using radio waves to wirelessly carry information. The telegraph, invented by Samuel Morse in 1842, had transformed the speed at which information traveled from the speed of a fast horse to the speed of light. The big downside of the telegraph, however, as anyone who has ever watched an old Western on television knows, is that it relied on wires to carry an electrical signal from a sending station to a receiving station. If the wire was broken, the link was broken.

Telegraphy had transformed the way people could gather and act on information. Abraham Lincoln was said to have hovered over the telegraph in the White House any time that forces were engaged in battle during the Civil War so he could get news and issue orders, almost in real time. Only a few decades earlier, information flow between commander and soldiers in the field moved by messengers carrying pieces of paper.

I've touched on electromagnetic radiation many times in these columns, in connection with everything from atoms to photosynthesis. James Maxwell, a Scottish physicist, did some of the early work on electromagnetism, and in 1867, he predicted the existence of electromagnetic waves. Maxwell's work is some of the most fundamentally important scientific work that's ever been done. In 1887, a German physicist named Heinrich Hertz was the first to take Maxwell's theoretical work and actually produce radio waves in a laboratory. In his honor, the measurement of frequency of electromagnetic waves is done in units of Hertz, or cycles per second, abbreviated Hz.

Marconi was a brilliant thinker and saw in Hertz's work a possible way to develop "wireless telegraphy," where information could be transferred between two stations without wires. This may not seem like such an amazing thought now, but it certainly was back when nobody but Marconi thought it was possible.

We've talked about the nature of electromagnetic waves previously, but we'll hit a couple of the high spots again. Electromagnetism is one of the fundamental forces in the universe, along with gravity and the forces that bind together the particles that make up atoms. Electomagnetism travels in waves, and the distance between those waves (the wavelength) determines how those waves interact with other things. At the long wavelength end of this electromagnetic spectrum are radio waves and at the other, short-wavelength, end of the spectrum are gamma waves, like those generated by a nuclear explosion. In between the two lie infrared radiation, visible light, ultraviolet radiation, microwaves and X-rays.

It's important to understand that all these different types of electromagnetic waves are fundamentally the same. There is no fundamental difference between electromagnetic waves in the visible light part of the spectrum (those wavelengths that we can see) and X-rays. What makes them different is the wavelength, or frequency, of the waves.

Being waves, there are two ways in which electromagnetic waves can be different. One is the wavelength, which is the distance from the top of one wave to the top of the next, like the space between the ripples when you toss a pebble into a pond. Wavelength is related to frequency by the additional factor of time. How many waves pass by in a given time (like in "cycles per second," or Hertz, which is the standard to measure it) is the frequency. The other property of an EM wave is how tall the wave is, or it's amplitude. Amplitude is the height of the wave from the top of the wave to the bottom, or trough, of the wave. Tossing a big rock into the pond will create taller waves (larger amplitude) than tossing in a small pebble. So, an EM wave can be completely described by using only two measures — wavelength (or frequency) and amplitude.

Whether you realize it or not, you're already familiar with both of those terms. If you look at the radio dial on a radio that actually has a dial (if you can find one), you'll see two scales — one is AM and the other is FM. AM stands for "amplitude modulation" and FM stands for "frequency modulation." Marconi's thunderbolt of an idea was that, by varying those two factors — amplitude and frequency — you could use a radio wave to carry information. In 1894, he and his butler (Marconi was from a wealthy family) started experimenting in his attic, and by 1895, Marconi was able to demonstrate the first radio transmitter.

Radios can be very complex, like our cellphones, but the basics of radio transmission are actually pretty simple. There has to be a transmitter on one side and a receiver on the other. The transmitter generates an electrical current that varies in amplitude or frequency and sends that electrical current into an antenna, which generates radio waves that mirror the electrical signal that made them. The radio waves then propagate (propagation means waves moving through space, like the ripple starting at the middle of the splash made by a pebble in a pond moving outwards) out from the antenna in all directions. If those waves hit another antenna, the receiving antenna will then convert the radio waves back into an electrical current that can then do something, like cause a speaker to vibrate.

Of course, being able to pick out a particular radio transmitter from all the others makes things more complicated, as does trying to produce high-quality reception over long distances. In the very basic radio I just described, the receiving antenna is going to receive every radio wave that bumps into it, and the result would be just noise. However, radios have tuners, which are adjustable circuits, called resonators, that can be set to amplify only one specific signal that is at a particular frequency. That amplified signal is then fed into whatever device, like a speaker, that's used to actually hear the transmission.

In this simple example, the transmitter actually generates two waves. One is called the "carrier wave," and it's set at a particular frequency. This is the frequency that you actually set your radio to, like 103.5 FM (which is 103,500,000 Hz or 103.5 Megahertz (MHz). The other wave that's broadcast by the transmitter is the one that carries the actual information. In an FM (remember, that mean "frequency modulation") radio, that second wave, called the sideband, varies in frequency. The variations are what carry the information.

For instance, a part of the sideband wave at a particular frequency corresponds to a particular sound. When the receiver detects that frequency in the sideband transmission, it causes that sound to be produced in the speaker. The frequency of the sideband may be changed (modulated) thousands of times in a second, allowing for the full richness of a voice or an instrument to be reproduced. AM transmissions work the same way. The main difference is that the information is conveyed by modulation of the amplitude of the sideband wave, not the frequency. This is a pretty large oversimplification, but it covers most of the main points of radio transmission.

Radio waves of different frequencies have different characteristics, as do AM versus FM signals. FM is the band of choice for listening to music because the FM signal allows for more information to be carried by the signal, which is why stereo sound (stereo means that there are separate signals for the right and left speakers) was first only possible in FM radios. Because the amplitude of the FM wave stays about the same, it's less prone to interference from electrical signals and other EM waves, so FM stations are usually clearer and much less noisy than AM stations. FM tuners are also able to better discriminate between two signals that are close together in frequency, so it's easier to tune in a single station that it is in AM.

AM stations, on the other hand, can be more powerful and, depending on atmospheric conditions, AM radio stations can sometimes be heard hundreds of miles away. Radio waves propagate in straight lines, so they usually can't transmit beyond the horizon (they don't follow the curve of the Earth). That is why radio transmission towers are often very tall or on top of tall buildings — the taller the tower, the further the signal can reach before it gets to the horizon and travels off into space. AM transmissions can, when conditions are right, bounce off an electrically-charged layer of the atmosphere, called the ionosphere, and be directed back toward the ground. When this happens, the signal can be picked up much further away than usual. FM waves don't bounce off the ionosphere, so they're limited by the straight-line distance. The purpose of communication satellites in orbit is to allow signals to be received over greater distances. The signal is beamed up to the satellite and then rebroadcast back down to the surface, thus getting around the problem of straight-line limitations.

Radio waves are not only man-made. They're also generated by stars and other bodies throughout the universe. These cosmic radio waves can tell us much about the heavens, and there are huge arrays of radio-telescopes at various locations around the world that can detect radio waves that were generated by stars thousands of light-years away. If you want to see some beautiful pictures, look up the GLEAM project on the Internet and see some amazing things. Do it on your cellphone, over your Wi-Fi system. While you do it, say a little birthday thank you to the great Signore Marconi. He changed the world.

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SPICES

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peppercorns have powerful antioxidant properties, capable of removing free radicals (mutated cells) from the body. One of these oils, piperine, helps to boost the purifying qualities of other antioxidants when used in combination. Since piperine increases the body's production of pigment, it's also been used successfully in the treatment of vitiligo.

Important new scientific research is beginning to show that pepper may one day be used as a treatment for Alzheimer's and other forms of dementia. The components of this amazing spice appear to stimulate neural pathways in the brain. Pepper has also been shown to clear cholesterol from the arteries much in the same way that the fiber in oatmeal does.

In and of itself, black pepper is an anti-inflammatory. However, it should be noted that too much black pepper can also interfere with prescription medications.

Wordpress

Several of the many variaties of peppercorns; although most come from the same plant, each maintains its own special flavor.

SPICY RITUALS

In 1881, French egyptologist Gaston Maspero was with a group of archeologists and anthropologists exploring a secret cache discovered near Deir el-Bahri, Egypt. They discovered over 50 mummies, and among them was none other than Rameses II, also known as Rameses the Great.

Originally buried in the Valley of the Kings, Rameses' body was later removed by priests wishing to protect it from looters. When Maspero removed the wrappings from the ancient Pharaoh, he discovered that the king had red hair and that his straight aquiline nose had been filled with peppercorns.

In spiritual folklore, wearing strands of peppercorns against the skin is said to protect one from envious thoughts and evil spirits. It's still used in the practice of Hoodoo and Voodoo, where practitioners use it in protection rituals and banishment spells.

THE RECIPES

While black pepper pairs well with beef, other meats and many savory dishes, it can also be the hidden ingredient in sweet dishes and even beverages.

CHAI

From India, chai is a blend of black tea and spices, including cardamom, cinnamon, ginger and peppercorns. Not in the mood to grind spices? Stop in at the Big City Market and Coffee Bar (23-25 Sugg St.). One sip of Mollie Garrigan Robinson's authentic brew will have you looking for Bengal tigers on the streets of Madisonville. You will need a mortar and pestle or other means to grind the spices for this recipe from Epicurious.

1 2" piece fresh ginger
2 teaspoons black peppercorns
2 cinnamon sticks
10 whole cloves
6 cardamom pods
6 cups water
6 bags (or 6 teaspoons) black tea (preferably Darjeeling)
2 cups whole milk
½ cup light brown sugar, or honey to taste

Using a mortar or a mallet, lightly crush the spices and place them in a medium saucepan. Add the water and bring to a boil. Reduce heat to medium-low, partially cover pan and simmer for 10 minutes. Remove from heat, add the tea and steep 5 minutes more. Add the milk and sugar and reheat just until the sugar is dissolved. Remove from heat, strain the tea and serve. About 8 cups tea.

DOUBLE CHOCOLATE BLACK PEPPER COOKIES

Using black pepper in sweet dishes is not exclusive to the Indian continent. Italians mix pepper with chocolate and raisins to create a spicy iced cookie. This recipe is a variation on a South African chocolate-pepper cookie. To make these cookies low carb and diabetic friendly, replace the flour with almond flour and use a granulated sugar substitute in place of the brown sugar.

8 oz bittersweet chocolate, coarsely chopped
1 ¾ cups all-purpose white flour
½ cup cocoa
1 ½ teaspoons fresh ground black pepper
½ teaspoon baking soda
1 cup sugar or substitute
½ cup (1 stick) cold butter
2 eggs
1 teaspoon vanilla extract

Preheat oven to 350 degrees F; Line a cookie sheet with parchment.

Melt half of the chocolate in a microwave or double boiler, set aside. In a food processor with a mixer, combine flour, cocoa, black pepper, baking powder and sugar. Cube the butter and add it to the dry ingredients, pulsing or mixing until the mixture resembles bread crumbs. Add the eggs, vanilla and melted chocolate, mix until smooth. Stir in chopped chocolate.

Drop by tablespoonfuls onto prepared baking sheet. Bake 8-10 minutes or until just set (cookies will firm up as they cool.) Let cool for a few minutes before removing from pan. Makes about 2 dozen cookies.