

SUMMER 2013

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COME TO YOUR SENSES

By: Shahenda Ayman

Our five senses are our compass through life; through them we experience our big world. Have you ever wondered how we would live without the sense of sight? Or what food would be like if we did not have the sense of taste, for example? If you are a normal person endowed with all your senses, you would not have an answer to these questions, because we usually take our senses for granted; many would not even give it a thought, which is a huge mistake.

Our senses are a precious gift from God; yet, we usually never value them until we meet a blind person, a deaf person, or any person who has a problem with his/her senses. We perceive the world around us and enjoy it through the senses; each one of our senses helps us survive, function, detect danger, and communicate. Not only that; our senses help us savor the world, its spectacular sights, soothing sounds, memorable smells, delicious tastes, and heartening feelings.

In this issue, we delve into the history of the five senses, explore the mechanism of cameras and the manufacture of perfumes, unravel the changes pregnant women experience and the development of the senses in embryos and the newborn. We also explore the sensory world of animals and plants, as well as that of humans with superpowers.

Moreover, we question the existence of a sixth sense and the applications that give humans an additional sixth sense. We also examine some perplexing phenomena that some of us experience sometimes and wonder about their significance.

We hope you will enjoy exploring with us and come to your senses.

HOW CAN WE PERCEIVE OUR ENVIRONMENT?

By: Sherif M. Salem

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There are endless things that surround us, but how can we detect their presence? Some could be seen like objects, colors, lights, etc.; others could be heard such as sounds, voices, music, etc. Foods and drinks may be salty, sweet, or sour; we can also tell which type of food is cooked without seeing it, using the sense of smell. We can feel surfaces, whether they are smooth or rough, cold or hot; we can also recognize objects in the dark by touching them.

All this knowledge about our environment is known as "special senses", which are the receptors that perceive environmental stimuli of different forms.

These environmental stimuli may be visual; the organ that perceives them is the eye. The eye has a special tissue known as the retina, containing cells called rods and cones, which perceive images. Visual images are then transferred in the form of electrical impulses through the optic nerve to an area in the back of the brain called the occipital cortex, where the electrical impulses are perceived as an image; then, the understanding of the image occurs, such as perceiving a figure as a dog for example. This process is a special sense that is Vision.

Another form of environmental stimuli is auditory; the ear is the organ stimulated by them. At first, sound waves move the tympanic membrane of the ear; they are then transmitted through small bones in the middle ear to the inner ear. A special tissue called the Organ of Corti gets stimulated and transfers the sound waves into electrical impulses carried out through the auditory nerve to the temporal lobe in the cortex of the brain. At that point, sound waves are perceived and understood as being a sound of a cat for example, or a voice of somebody we know. This special sense is called Hearing.

The special sense that is responsible for smelling odors and perfumes is called Olfaction; the nose is the receptor organ for that sense. The tissue lining the nose is called the nasal mucosa; its upper part—olfactory mucosa—carries special receptors for different chemicals responsible for different odors.



The olfactory mucosa transfers these chemical stimuli into electrical impulses carried through the olfactory nerve to the temporal lobe of the brain, where impulses are perceived and understood as a special odor as the odor of a perfume or coffee.

A fourth special sense is the Taste; the organ responsible for gustatory or taste sensation is the tongue. The tongue carries special receptors called taste buds; the chemical materials found in our food stimulate the taste buds, which send electrical impulses through many cranial nerves to the brain to recognize which type of food we are eating, even if we cannot see it.

The fifth and last special sense is tactile sensation or Touch; it is the ability to feel objects through the skin. There are many skin receptors for different forms of tactile stimuli such as pain, temperature, pressure, light touch, vibration senses, etc. All these sensations are carried through sensory nerves to the spinal cord, then to the sensory cortex in the parietal lobe of the brain to perceive touch and understand what you have touched.

Without any of these special senses, one will miss a lot of joy, and will be at risk. By these five special senses we are actually blessed.

SENSING OUR WAY THROUGH LIFE

By: Maissa Azab



Truth be said, when the PSC Editorial Team came up with the theme of the “Five Senses” for the current issue of the PSC Newsletter, which marks the last installment of the Newsletter’s 6th year, I could not possibly imagine the number and diversity of topics they would come up with.

However, as we brainstormed and researched the theme, so many intriguing topics popped up. First and foremost, it was eye-opening to realize that, by merely using our “common sense”, we would realize that we have so much more than just the “five senses” we have grown to memorize by heart despite their evident prominence in our life.

That being said, and having tackled the array of senses we actually possess, and those some very special people can possess, permanently or temporarily, we also delve into the insights and inventions inspired by the five senses, such as cameras and perfumes to name a couple. We also explore the devices that could potentially give people additional senses, as well as the additional senses animals and plants naturally possess to help them survive in their environments.

Moreover, we examine the development of the five senses in human beings during their formation in their mothers’ wombs, as well as the heightened state of the five senses in the mothers themselves during pregnancy. It would not be a complete issue if we do not tackle the perplexing issue of the elusive “sixth sense”, and we do not mean the many other senses humans actually have, or can have or acquire.

Having branched out to so many diverse and intriguing topics, our theme has transcended far beyond the “Five Senses”. We invite you to leaf through the issue and enjoy the fascinating aspects of our theme.

History of Science Museum

Visitors INFO

Opening Hours

Saturday to Thursday
[from 10:00 to 15:00]

Guided Tours Schedule

Saturday to Thursday
[10:30 + 11:30 + 12:30 + 13:30 + 14:30]

- Museum entry fees are included in all Planetarium show tickets.
- For non-audience of the Planetarium, Museum entry fees are EGP 0.50.
- Museum Tours are free for ticket holders.

Planetarium

Available Shows

Stars of the Pharaohs

35 Min. Full-dome Show

Oasis in Space

25 Min. Full-dome Show

Mystery of the Nile

45 Min. IMAX Show

Cosmic Voyage

35 Min. IMAX Show

Stars Show

45 Min. Live Show by the PSC resident astronomer

Universe

22 Min. Full-dome Show

Kaluoka’hina

35 Min. Full-dome Show

The Life of Trees

33 Min. Full-dome Show

Visitors INFO

- For the Planetarium daily schedule and fees, please consult the Center’s official website: www.bibalex.org/psc.
- Kindly note that, for technical reasons, the Planetarium maintains the right to cancel or change shows at any time without prior notification.

ALEXploratorium

Visitors INFO

Discovery Zone

Opening Hours

Saturday, Sunday, Monday, Wednesday and Thursday:

[From 09:30 to 15:30]

Tuesday: [From 09:30 to 12:30]

Guided Tours Schedule

Saturday, Sunday, Monday, Wednesday and Thursday:

[09:30 - 11:00 - 12:30 - 14:30]

Tuesday: [09:30 - 11:00]

Entry Fees

Students EGP 2

Non-students EGP 4

Listen and Discover

• For the list of shows available at the “Listen and Discover” and the schedule, please consult the Center’s official website: www.bibalex.org/psc.

• For reservation, please contact the PSC Administrator at least one week before the desired date.

Show fees

DVD shows:

Students EGP 1

Non-students EGP 2

3D shows:

Students EGP 2

Non-students EGP 4

The world we see has three dimensions: height, width, and depth. However, while watching a movie, our eyes could only see two of these dimensions; that is, until 3D technology revolutionized the shape of modern movies. Yet, the movie industry is determined not to stop at just that.

Recently, 3D propaganda is everywhere; people already want to see and try something new. This technology, together with the revolutionary motion and control experiences, is already giving big hints of things to come in the world of gaming and entertainment.

People with normal eyesight have something called stereoscopic vision. The 6-cm gap between our eyes means that each one sees the world from a slightly different point of view. Rather than perceiving a confusing double vision, our brains process the differences between the two images to create a mental model of the 3D space. This is called stereopsis.

A 3D movie or an S3D—stereoscopic 3D—movie is a motion picture that augments the illusion of depth perception. A regular motion picture camera system is used to record the images as seen from left and right eye perspective or computer-generated imagery generates the two perspectives in post-production. Different left and right eye images are recorded/generated because our left eye sees differently than the right one. Due to this difference, we get impressions of depth, and same principle is used to generate 3D images and films.

The theory behind 3D visuals is fairly simple; however, it is not so easy in practice. First, you need two discrete images that interact in a meaningful way to create a 3D effect. Then, you need a system that sends each image to the correct eye and that eye only; special projection hardware and/or eyewear are used to provide the illusion of depth when viewing the film.

Over the years, cinemas have experimented with 3D technology, applying various techniques. Anaglyph images were the earliest method of presenting theatrical 3D technology. The films had two different layers with two different colors, typically red and green; these two layers were superimposed in a way to counterbalance each other.

The audience were given 3D glasses with red and blue

FEEL THE MOVIE

By: Sara Khattab



filters where the red part of the image was obstructed by the green lens and vice versa. This ensured that the viewers' right and left eyes formed two different images and hence the optical illusion of depth was created.

The downside is that the picture is in monochrome, and not even a simple grayscale; the color filtering by the lenses thus distorted the final color. The fact that each eye sees different colors is distracting; many among the audience watching a 3D film complained of headaches and nausea. Full-colored anaglyph techniques have been developed, but in truth they are only partly full-color and partly 3D.

Another technique that has been applied in cinemas is the battery-powered glasses that use LCD shutters to block the light to each eye in turn. The timing of the alternating lenses was synchronized with frames on the screen; when the projector flashed up a frame for the left eye followed by a frame for the right eye, only the correct eye saw each image.

This gave a full-color 3D image and a convincing 3D effect, but the alternating shutters could be distracting. They were not comfortable to wear either, resembling a futuristic

welder's mask. As the technology was built into the glasses, it was expensive to equip each person in the theater, so it is not surprising that this approach never caught on in cinemas.

In case of polarization systems, to present a stereoscopic motion picture, two images are projected superimposed onto the same screen through different polarizing filters. The viewer wears low-cost eyeglasses that contain a pair of polarizing filters oriented differently (clockwise/counterclockwise with circular polarization or at 90 degree angles, usually 45 degrees and 135 degrees with linear polarization).

Each filter passes only the light similarly polarized and blocks the light polarized differently; each eye sees a different image. This is used to produce a three-dimensional effect by projecting the same scene into both eyes, but depicted from slightly different perspectives.

Since no head tracking is involved, the entire audience can view the stereoscopic images at the same time. Additionally, since both lenses have the same color, people with one dominant eye (amblyopia), where one eye is used more, are able to see the 3D effect, previously negated by the separation of the two colors.

Circular polarization has an advantage over linear polarization in that the viewer does not need to have their head upright and aligned with the screen for the polarization to work properly.

With linear polarization, turning the glasses sideways causes the filters to go out of alignment with the screen filters, causing the image to fade and for each eye to see the opposite frame more easily.

For circular polarization, the polarizing effect works regardless of how the viewer's head is aligned with the screen such as tilted sideways, or even upside down. The left eye will still only see the image intended for it, and vice versa, without fading.

With the progress of 3D technology, 3D viewing has been able to reach exceptional heights with the help of purposely made animation movies for 4D and 5D theaters; 4D and 5D being marketing terms, not actual geometrical dimensions.

Recently, 3D viewing has been accompanied with synchronization of some special effects installed in the theaters. For example, when it rains in the movie, the audience also experiences the same; when it is lightening in the movie, the same happens in the theater. Other effects also include wind, fog, smell, sensation, etc.

In 5D theaters, seats move in synchronization with motion in the movie, thus providing immersive experience to the audiences. To do this at least six-directional seat movement is required: Left-Right tilts; Forward-Backward Tilts and Up-Down movements. These theaters show an excellent integration of 3D technology, audio, motion synchronization, and multiple special effects using specialized software.

Nowadays, people might hear the terms 6D or 7D—again, not referring to actual geometrical dimensions—however, thus far, it seems that they are simply a marketing myth. The fact remains that there are only 3 geometrical dimensions; having already added sound and motion effects to visual ones, what could be next for the motion picture industry?

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THE STORY



OF THE



SENSES

By: Lamia Ghoneim

To say that humans only have five or six senses is thus a huge understatement; humans perceive, react, operate, and think with a vast collection of neurons networked to the external world and internally throughout the human body. These go way beyond the five classic sensory systems that we know are used for detecting external environmental information.

So how many senses do we really have? Scientists are still unable to give a definite answer to this question, although they all assert that there are more than five. The reason for the general lack of consensus among scientists as to the exact number of senses a human being actually possesses is the difference in opinion on what constitutes a sense.

While they all agree on the classical five senses, some scientists believe that they should be split into subgroups. They assume that sight, for instance, may be divided into perceptions of brightness, color, and depth. Other researchers argue that true senses must not only respond to a specific physical phenomenon, but also correspond to a particular region in the brain.

Using this classification, most neurologists recognize at least five additional senses, in addition to another six if interoceptive senses—those that react to stimuli originating inside of the body—are also considered.

BEYOND THE “FIVE SENSES”

The first additional sense, the actual “sixth sense”, is the sense of **equilibrioception**, which



As children, we were taught that we only have “five senses” to guide us through life; I am sure every one of us can recite them: sight, hearing, smell, taste, and touch.

As early as Kindergarten, we are taught that these are the only sensory systems that we have to perceive information and discover the world around us. We are later taught that anything beyond these five senses would be paranormal, totally outside the realm of the scientific.

Since most of us take the facts we learn at school for granted, the idea of the “five senses” may have remained with us well into adulthood. It turns out that what we were taught at school was incorrect; or at the very least inaccurate.

Ask any contemporary neurologist about the number of senses a human being possesses; the answer would be that they are more than five. The majority count between 14 and 21 actual senses, most of which we were not taught earlier at school.

If that is the case, where did the idea that human beings possess only five senses come from? Why is it commonly accepted wisdom?

THE ORIGIN OF THE “FIVE SENSES”

The original classification of the five senses is widely attributed to Aristotle, one of the greatest philosophers and scientists of all times.

Born in the flourishing civilization of ancient Greece, in 384 BCE, Aristotle was a great renaissance man, a student of Plato and a teacher of Alexander the Great. His studies encompassed, among other things, the entire world of living things, focusing on how the human body functioned.

Although he virtually started from scratch, many of his descriptions and classifications remain sound today. Inevitably though, some of his classifications, such as his classification of the human senses, turned out to be incorrect.

Aristotle devoted a great deal of his writings to the topic of “sense perception”, discussing both the general faculty and the individual senses in great detail. In his most famous work, *De Anima* (Of the Soul),

Aristotle states that there exists no other sense other than the five senses.

He then argues that, for every sense, there is a sense organ. He goes on to show that the five senses—sight, hearing, smell, taste and touch—have a certain orderly arrangement that makes them a complete set. Since, in his opinion, there are only five corresponding sense organs, he concludes that there can exist no other six sense that we do not know about.

Aristotle was mistaken in two different directions; first, in his theory that there are only five organs; and second, in his definition of what constitutes a sense.

It does not take much reflection to figure out that humans possess more than five separate organs; the eyes, ears, nose, tongue, and skin. There is also the vestibular system, which was not discovered until the early 1800s, more than two millennia after Aristotle, which explains his lack of knowledge about this particular organ.

We now know that the vestibular system, located in the inner ear, is an integral part of how we balance ourselves; it also plays a critical role in vision, allowing us to keep our two eyes focused on things even while our heads are moving about.

Six senses are thus quickly, and easily, identified. However, if we intend to count the actual number of senses that we possess, without underestimating ourselves, we must first begin by discussing the true meaning of the word “sense”, and what exactly constitutes a corresponding sense organ.

MAKING SENSE OF THE WORD “SENSE”

The most commonly held definition of a “sense” is “Any system that consists of a group of sensory cell types that respond to a specific physical phenomenon and corresponds to a particular group of regions within the brain where the signals are received and interpreted”.

Modern scientists tweaked Aristotle’s assumption that each sense requires a separate sense organ into the hypothesis that each separate sense really only requires a different kind of “sensory receptor”; a specialized cell—nerve ending—that sends electrical signals to the brain in response to the type of stimuli the cell is optimized for.

The rods and cones in the retina are one kind of sensory receptors; they send signals when stimulated by light of various wavelengths and intensities. The skin alone is brimming with sensory receptors optimized not only for touch, but for other things as well, such as temperature, pain, and body awareness. There are at least six different kinds of temperature receptors, each optimized for a different temperature range.

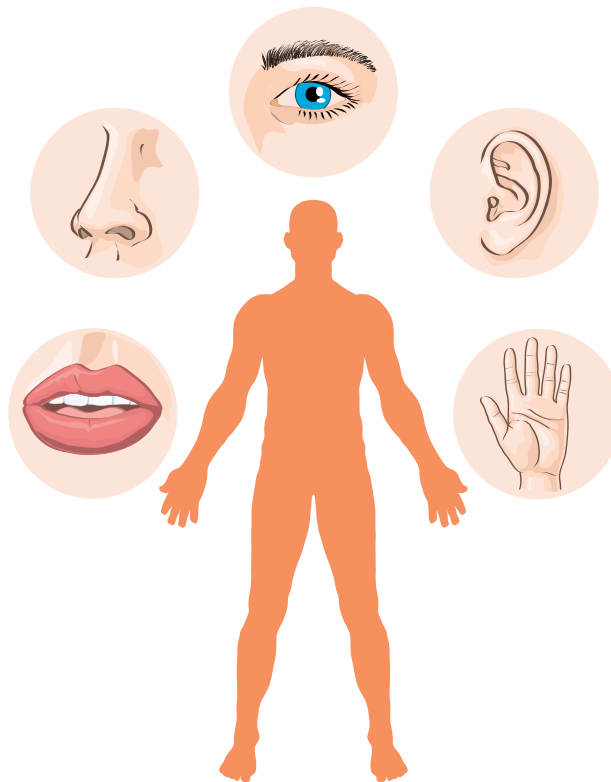
corresponds to the sixth sense organ in the human body; the vestibular system. Although vision plays a role in equilibrioception, the vestibular labyrinthine system found in both of the inner ears is the main responsible organ for balance.

Also known as the sense of balance, it allows an organism to sense body movement, direction, and acceleration, and to attain and maintain postural equilibrium. In other words, it is the sense that keeps you upright and prevents you from falling over most of the time; whether you are walking, climbing up or down, or even standing still.

Nociception is another additional sense we are all very familiar with; in one word it is pain. Contrary to popular belief, the sense of pain is not connected to the sense of touch. Research in the first half of the 20th century indicated that what was once viewed as a subjective experience related to touch is, in fact, a distinct phenomenon that corresponds to a specific area in the brain.

There are three distinct types of pain receptors: cutaneous (skin), somatic (bones and joints), and visceral (body organs). These special sensors react to certain types of stimuli. Once the stimuli reach a given point called “the pain threshold”, a signal of varying strength is sent to the brain via the spinal column, causing us to feel the sensation we recognize as pain.

Proprioception, or the sense of body awareness, is the sense that gives us the ability to tell where our body parts are relative to other body parts. Even with our eyes closed,



we have a sense of body position; where our arms and legs are, for example, and whether we are moving them or not.

Muscles, tendons, joints and the inner ear contain “proprioceptors”, which relay positional information to our brains. Our brains then analyze this information and provide us with a sense of body orientation and movement.

Thermoception, or the sense of temperature, is the sense that informs us to put on an extra layer when there is a chill, and to take it off when it gets warm. It is the sense of heat and the absence of it, which relies on temperature sensors, aka “thermoreceptors”, in the skin that detect the movement of thermal energy.

The thermoceptors in the skin are quite different from the homeostatic thermoceptors found in the brain, which provide feedback on internal body temperature and regulates sweating and shivering, etc.

Temporal Perception, or the sense of time, refers to how the passage of time is perceived and experienced. Although the sense of time can sometimes be subjective—an hour watching a favorite show

can feel shorter than an hour standing in line waiting for your turn—scientists maintain that it is a sense rooted in our biology.

Although it is not associated with a specific sensory system, neuroscientists research indicates that human brains do have a system governing the perception of time, composed of a highly distributed structure involving the cerebral cortex; the cerebellum and basal ganglia. Long-term time-keeping seems to be monitored by the suprachiasmatic nuclei⁽¹⁾, which is responsible for the circadian rhythm⁽²⁾, while short-term time-keeping is handled by other cell systems.

Additionally, we have internal senses or **interoception**, which are the senses that are normally stimulated from within the body. These involve numerous sensory receptors in internal organs that help regulate the different internal systems of the human body, such as stretch receptors that are neurologically linked to the brain.

Stretch receptors include, for example, pulmonary stretch receptors in the lungs, and are used

to sense and control the respiratory rate. There are also stretch receptors in the bladder and bowels, which control the need to excrete waste, and stretch receptors in the stomach and intestines that sense distension due to the presence of excess gas.

Other internal senses include chemoreceptors in the body, which monitor salinity and create a sensation of thirst when levels are high; sensory receptors in the pharynx mucosa, which provide sensations when swallowing or vomiting and control the body’s gag reflex; and chemoreceptor trigger zones in the brainstem’s medulla oblongata, which monitor drugs and hormones in the blood and induces vomiting when necessary, for example during food or alcohol poisoning.

While the previous list is not conclusive, it serves to show that the “five senses” of Aristotle are only just a fraction of the senses that we, human beings, possess. They might be the most obvious senses we have, but they are not by any means more important than all our other senses. So, perhaps it is time to do away with the “five senses” paradigm, and give humans more credit for their fascinating abilities.

GLOSSARY

- (1) **Suprachiasmatic Nuclei** are located in a region of the brain called the hypothalamus, and contain a group of nerve cells (neurons) that control the body’s biological clock, or circadian rhythm.
- (2) **Circadian Rhythm** is a daily cycle of activity observed in many living organisms; it controls many physiological and behavioral rhythms, including the sleep-wake cycle.

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The word "Camera" was originally derived from the Latin term "*Camera Obscura*", meaning "the dark chamber", which describes the early mechanism used for projecting images.

The principle upon which all camera equipment is based is traced back to the famous artist and inventor Leonardo da Vinci. Da Vinci showed that all what was needed to project an image was a small pinhole through which light could pass, which is basically a simulation of the sight mechanism discussed in our second School Semester 2012/13 issue, *The Colors of Life*.

Sight in a Box!

By: Moataz Abdel Meguid

A pinhole camera is the most basic type of camera, made up of a light-proof container—usually a box—with a tiny hole in the one side; hence, the term "pinhole". Film, or photographic paper, is placed inside the box, facing the hole; the light enters through the hole, creating an inverted image on the film. Da Vinci practically proved that the smaller the hole is, the sharper the image projected.

Naturally, modern camera models we have today have significantly evolved from this *Camera Obscura*. Today, you only press a button, and a few seconds later you are looking at a full-color image on the camera's LCD screen. However, in those few seconds a lot goes on behind the scenes to create that finished picture.

Let us start from the beginning. A camera is a device that captures images, which can be stored directly, transmitted to another location, or both. The basic technology that makes all of this applicable is fairly simple.

A still film camera is made of three basic elements: an optical element (the lens), a chemical element (the film), and a mechanical element (the camera body itself). Photography's only trick is calibrating and combining these elements in such a way that they record a crisp, recognizable image.

Primitive traditional cameras capture light onto photographic films, while modern digital cameras use electronic image sensors instead, capturing the image and storing it on a microchip, a memory card, for later playback or processing. Video cameras are designed to capture many images in sequence with very short time intervals that makes these images look as if they are moving, motion pictures, when they are displayed in a quick enough sequence.

The main elements and parameters that control the photographing mechanism of the camera are as follow:

1) The Lens

The lens is the image-forming device in the camera. It may be composed of one to as many as 10 or 12 elements. The early cameras had a single-element meniscus lens, which is a lens with one concave and one convex surface. This type of lens suffered from a number of optical defects and was replaced with greatly improved, more complex lenses.

There are three basic types of lenses: normal, wide angle, and telephoto. The lens focal length—the point at which light rays focus through the lens—determines the size of the image that will be produced on the film.

With a normal lens, the viewing field is approximately a 50-degree angle. The objects appear normal

in size and shape, relative to the picture's background. A camera that uses a 35-mm film will usually have a 50-mm lens for normal coverage.

In a wide-angle lens, the field of view is much wider; about 90 degrees. These lenses are used where the distance between the camera and the object is limited, as in interior photography. The wide-angle lens is also used to make smaller objects look larger; for example, to give a spacious impression of a small room, or to photograph large objects from a close up.

Telephoto, or long-focus lenses, have a smaller field of view than a normal lens, and show an enlarged detail of the image over the same film area.

Interchangeable-lens cameras offer the photographer the opportunity to select the best focal length for any given situation. In recent years, variable focal length or "zoom" lenses, have become popular. A single lens of this type can replace many individual lenses, and offers great convenience to the photographer.

The speed or light-gathering power of a lens is indicated by the "f" number, called the "aperture". The lower the f number, the faster the lens; that is, the more light it lets through; a fast lens has an aperture of at least $f/2.0$.

2) The Diaphragm

It is one of the two factors that determine the correct film exposure in the amount of light allowed to pass through the lens. Its function is

to mechanically reduce the aperture, which significantly improves the optical performance, particularly towards the edge of the picture. It also increases the depth of field, which is the zone of good focus.

Most cameras use something called "iris-type" diaphragm, which consists of a number of very thin metal blades. They are mounted so that by rotating a ring or moving a lever, the size of the lens opening can vary. In automatic cameras the diaphragm is adjusted by a built-in mechanism to produce the optimum exposure over a wide range of lighting conditions.

Each change of diaphragm opening changes the amount of light passing through the lens by a factor of 2. For example, when we say that the standard diaphragm settings found on most lenses are 2, 2.8, 4, 5.6, 8, 11, 16, 22, this means that the amount of light allowed through the lens at a setting of 2 is twice the amount allowed through the lens at a setting of 2.8 and so on.

3) The Shutter

The second exposure control factor is the shutter. It is a mechanical device that acts as a gate, controlling the duration of time that light is allowed to pass through the lens and fall on the film.

The simple basic shutter can be, like the diaphragm, made up of a number of thin metal blades that are opened and closed either by a spring-driven clockwork mechanism or, as in most of the recent models, by an electromechanical device. Shutters of this type usually have a maximum speed of $1/500^{\text{th}}$ of a second.



The focal-plane shutter in modern cameras usually consists of two pieces of rubberized fabric that move across the focal plane. The spacing between the fabric edges and the speed of transit determine the effective shutter speed.

Some recent models use ultrathin pieces of titanium instead of fabric. Shutters of this type are capable of very high speeds, in some cases 1/4,000th of a second. The entire shutter mechanism is independent of the optical system, and it is therefore ideal for cameras with interchangeable lenses.

4) The Exposure Control

Many professional photographers use what is called “exposure meters”. These are instruments that measure light intensity and indicate the appropriate aperture and shutter speed to the film type used according to the prevailing light conditions.

Complete automatic exposure control is now a standard in all snapshot cameras, although many new professional instruments offer an automatic system that permits the photographer to retain a great deal of individual control.

Non-reflex cameras use a selenium cell mounted adjacent to the lens to measure the incoming light and select a combination of lens aperture and shutter speed that will produce a negative of good quality.

Single-lens reflex cameras without exception are fitted with “through the lens” metering systems that offer the ultimate in automated control of exposure. A light-sensing cell is located in the optical path inside the camera and gives an extremely accurate reading of the prevailing light conditions. The information is processed by an electronic circuit built into the camera, and the aperture and shutter speed are set accordingly.

5) The Viewfinder

For the photographer, the viewfinder defines the area covered by whatever lens is in use in the

camera. The most primitive type is a simple wire frame mounted just over the lens; proper eye position is determined by a vertical post mounted at the rear of the camera. The view seen through the frame with the post in the center is equal to the area covered by the lens.

The type of viewfinder in most frequent cameras today is a reversed telescope except in single- and twin-lens cameras. On a typical high-grade 35mm camera with interchangeable lenses, a bright line in the viewfinder outlines the area covered by the lens in use; it changes size automatically to correspond with the lenses of different focal lengths.

In a single-lens reflex camera, the image focused by the camera lens is reflected by a mirror onto a ground-glass screen, usually through a special prism arrangement. Twin-lens reflex cameras have two coupled lenses; one acts as a viewfinder, and like the single-lens reflex, reflects the image it sees on a ground-glass screen.

So what happens when you press the button?

When you look through the lens before taking the picture, the image is actually being “bounced” off several mirrors. When you take the photo, the mirrors fold back and are captured in the camera. When you are finished taking the photo, they go back into place so you can see through it again.

That is why when you take a photo there is that snapping noise. If you were to look through it at that moment, you could probably see blackness for a split second because the mirrors have gone and then you can see it again because they are back. During this split second, the previously mentioned mechanism takes place.

Photography is undoubtedly one of the most important inventions in history; it has truly transformed how people conceive the world. Photography lets us capture images and moments in time, preserving them for years to come.

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By: Moataz Abdel Meguid

Smell in a Bottle!

Since the beginning of recorded history, humans have attempted to alter, mask, or enhance their own odor by using chemical products that emulate nature's pleasant smells; these chemicals are known as perfumes.

Nowadays, the perfume industry has developed a lot to not only emulate the pleasant scents found in nature, but also to create original exciting scents that are not genuinely found in nature.

Many natural and man-made materials have been used to make perfumes, to be applied to the skin and clothing, to be put in cleaners and cosmetics, or to simply scent the air. Due to the differences in body chemistry, temperature, and body odors, no perfume will smell exactly the same on any two people.

Basic chemistry would describe the perfume as a mixture of fragrant essential oils or aroma compounds, fixatives and solvents that can give the human body a pleasant scent. Modern perfumery as we know it today started late into the 19th century with the invention of what chemists call “Commercial Synthetic Aroma Compounds”; such as Vanillin or Coumarin. These compounds allowed for the composition of perfumes with smells previously

unattainable solely from natural aromatics alone.

Raw materials involved in the manufacturing process—aka the ingredients—may be flowers, grasses, spices, fruit, wood, roots, resins, balsams, leaves, gums, or animal secretions. Resources such as alcohol, petrochemicals, coal, and coal tars, are also used during the process.

Modern manufacturing plants usually do not produce perfumes using natural oils. In fact, very few of the known flowering plant species contain these essential oils. Synthetic chemicals must therefore be added to re-create the smells of non-oily substances; they are also used to create original scents not found in nature.

Some perfume ingredients are animal products. For example, castor comes from beavers, musk from male deer, and ambergris from the sperm whale. Animal substances are often used as fixatives that enable perfume to evaporate slowly and emit odors longer. Other fixatives include coal tar, mosses, resins, or synthetic chemicals. Alcohol and sometimes water are used to dilute ingredients in perfumes. It is the ratio of alcohol to scent that determines whether the perfume is *Eau de Toilette* or *cologne*.

The process of manufacturing any perfume involves four basic steps:

1) Collection

Before the manufacturing process begins, the initial ingredients must be brought to the manufacturing center. Plant substances are harvested from around the world, often hand-picked for their unique fragrance. Animal products are obtained by extracting the fatty substances directly from the animal. Aromatic chemicals used in synthetic perfumes are created in the laboratory by perfume chemists.

2) Extraction

Oils are extracted from plants by several methods: steam distillation, solvent extraction, enfleurage, maceration, or expression.

- In steam distillation, steam is passed through the plant material held in a still, whereby the essential oil turns to gas. This gas is then passed through tubes, cooled, and liquefied. Oils can also be extracted by boiling plant substances such as flower petals in water instead of steaming them.
- In solvent extraction, flowers are put in large rotating tanks or drums, then benzene or petroleum ether is poured over them to extract the essential oils. The flower parts dissolve in the solvents, leaving a waxy material that contains the oil, which is then placed in ethyl alcohol. The oil dissolves in the alcohol and rises; heat is then used to evaporate the alcohol, which, once fully burned off, leaves a higher concentration of the perfume oil on the bottom.
- During enfleurage, flowers are spread on glass sheets coated with grease and left to release their oils for several days. The process is repeated several times with fresh flowers being added to the plates until the fat on the plates is completely saturated with the aromatic oils of the flowers. The oil saturated fat, called a pomade, is then dissolved by alcohol; the resultant essential oil remaining after the alcohol evaporates is technically called an "absolute".
- Maceration is similar to enfleurage, except that warmed fats are used to soak up the flower smell. As in solvent extraction, the grease and fats are dissolved in alcohol to obtain the essential oils.
- Expression is the oldest and least complex method of extraction. This process is now used in obtaining

citrus oils from rind, fruit, or plant by pressing manually or mechanically until all the oil is squeezed out.

3) Blending

Once the perfume oils are extracted, they are ready to be blended together according to a formula determined by a master in the field known as the "Nose". It may take as many as 800 different ingredients and several years to develop the special formula for a unique scent.

After creating the scent, it is mixed with alcohol. The amount of alcohol in a scent can vary greatly; most full perfumes are made of about 10-20% perfume oils dissolved in alcohol and a trace of water. Colognes contain approximately 3-5% oil diluted in 80-90% alcohol, with water making up about 10%, while Eau de Toilette has the least amount, which is 2% oil in 60-80% alcohol and 20% water.

4) Aging

A fine perfume is often aged for several months or even years after it is blended. Later, the "Nose" tests the perfume once again to ensure that the correct scent has been achieved.

Each essential oil and perfume has three "Notes": "Notes de Tête" or top notes, "Notes de Coeur" or central notes, and "Notes de Fond" or base notes. Top notes have tangy or citrus-like smells; central notes are aromatic flowers like rose and jasmine, which provide the perfume's body; while base notes are woody fragrances, which provide an enduring fragrance. More "Notes" of various smells, may be further blended.

Perfume Quality Control

As perfumes depend heavily on harvesting plant substances and the availability of animal products, perfumery business can often be risky.

Thousands of flowers are needed to obtain just one pound of essential oils; if the season's crop is destroyed by disease or adverse weather, the whole product batch will be in jeopardy. Moreover, consistency is hard to maintain in natural oils, the same species of plant raised in several different areas with slightly different growing conditions may not yield oils with exactly the same scent.

Problems are also encountered in collecting natural animal oils. Many animals once killed for the value of their oils are listed on the endangered species list and cannot be hunted. For example, sperm whale products like ambergris have been outlawed since 1977.

Furthermore, most animal oils in general are difficult and expensive to extract. Deer musk must come from a deer found in Tibet and China; civet cats that are bred in Ethiopia are kept for their fatty gland secretions; beavers from Canada and the former Soviet Union are harvested for their castor.

Synthetic perfumes have given perfumers more freedom and stability in their craft. Despite the fact that natural ingredients are more desirable in the very finest perfumes, the use of synthetic perfumes and oils eliminates the need to extract oils from plants and animals, minimizing the risk of a bad plant harvest, and saving much expense as well as the lives of many animals.

The Future of Perfume Industry

Today, perfumes are made and used in different ways than in previous centuries. They are manufactured more frequently using synthetic chemicals rather than natural oils. Less concentrated forms of perfume are also becoming increasingly popular. When these factors are combined, they

decrease the cost of the scents, encouraging more widespread and frequent, often daily, use.

Using perfume to heal, make people feel good, or improve relationships between genders are the new frontiers being explored by the industry. The sense of smell is considered a right brain activity, which rules emotions, memory, and creativity. Aromatherapy—smelling oils and fragrances to cure physical and emotional problems—is being revived to help balance hormonal and body energy.

The theory behind aromatherapy states that using essential oils helps bolster the immune system when inhaled or applied topically. Smelling sweet smells also affects one's mood and can be used as a form of psychotherapy.

It is true that fragrance can control our emotions and manipulate our psychological state. We all like to smell good; in fact, we may try on tens of perfumes before we find the one that suits our mood or personality.

Like aromatherapy, more research is being conducted to synthesize human perfume, which is the body scents we produce to attract or interact with other humans.

The role that "scent" plays has become a great necessity; not only in the industry of perfumes, but in the manufacture of almost any product whatsoever because it is very important for the producer that his product has its own unique smell.

Commercially speaking, the scent has become an important part of the selling process. For example, you will be seeing tens of types of dish soaps, shampoos, or air fresheners on the supermarket shelf; regardless of the quality of any of these products, they all have one thing in common, which is that they smell nice, and that is what they are selling.

Truth is, humans have always had perfumes. Maybe not in the form we have today, but early humans too appreciated having sweet smelling aromas around them. Today, we still appreciate the smell of a good fragrance and it has become part and parcel of our attire. It is almost inconceivable for us to feel dressed, without a hint of perfume to make it complete.

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SUPER

Pregnant Woman



By: Reham Elbannan

During pregnancy, the changes in a woman's senses are largely attributed to hormones. Pregnant women feel that everything has turned upside down. When women become pregnant, their estrogen level increases, most prominently heightening their sense of smell. In some cases, even vision changes during pregnancy.

On the other hand, one-quarter of the women reported abnormal taste sensitivity in the early stages of pregnancy, including a heightened sensitivity to bitter items, and a lowered sensitivity to salty items. Nevertheless, heightened sensitivity to bitter items such as coffee may be the body's way of protecting the unborn baby. Conversely, decreased sensitivity to salt may help women consume more salt, which in turn makes them thirstier, helping them consume the fluids and various nutrients they need to support the fetus.

Super Smell

During pregnancy, almost every pregnant woman becomes more sensitive and reactive to the scents around them, describing a heightened awareness and sensitivity to a variety of odors.

Although there is little consistent and reliable data on the sense of smell of pregnant women, the vast majority report a perceived increase in their own sensitivity to odors. Scientists have hypothesized that, for some women, it is this heightened sense of smell that leads to morning sickness.

There are some strategies that may help some women dealing with smell disorders. Indeed you cannot cut off your nose, but you can try to avoid scents that drive you crazy, especially those that ramp up your morning sickness symptoms.

- Cook and eat only foods you can stand to smell;
- Leave your windows open whenever possible to banish cooking or musty odors;
- Wash your clothes more often than usual, since fibers tend to hold onto odors;
- Switch to unscented or lightly scented toiletries, cleaning products, etc.;
- Ask the people around you to be extra considerate: request that friends and colleagues go easy on the fragrance, and of course, avoid people who are smoking;

- Try to surround yourself with those scents—if there are any—that actually make you feel better. Mint, lemon, ginger and other herbs are more likely to soothe your nausea than make it worse.

Another way to deal with an aversion to certain smells is to introduce new foods as replacements. For instance, if the scent of scrambled eggs sends you heaving at breakfast, try replacing it with a bowl of cereal or oatmeal. If you used to love tuna sandwiches for lunch, replace the fish with turkey or chicken.

You can also keep a pleasant-smelling air freshener on hand to battle noxious odors. Just make sure the air freshener scent does not upset your stomach as well!

Super Taste

Most women experience changes in their sense of taste during pregnancy, preferring saltier and sweeter foods. Dysgeusia—a decrease in the ability to taste—is most commonly experienced during the first trimester of pregnancy. Some women also experience a metallic taste in the mouth during pregnancy, which can aggravate nausea and may indicate a nutrient imbalance.

While taste disorders are typically associated with the loss of taste, a taste disorder that heightens your sense of taste is a problem that

affects most of pregnant women around the world.

Obesity among many pregnant women can be linked to a heightened sense of taste, as food that are high in sugar and fat pack strong flavors. This craving for flavorful junk food is due to dysfunction of opioid receptors in the brain that drive the palatability of foods.

Here are some tips that may help some women dealing with taste disorders during pregnancy.

- Brush and floss your teeth regularly, and keep your tongue clean to eliminate germs and bacteria in the mouth;
- Eat citrus fruits such as orange and lemon, and foods marinated in vinegar such as pickles, as they produce saliva in excess, which washes off the bad taste in mouth, and keeps the mouth and teeth clean;
- Gargling with diluted solutions of baking soda and water neutralizes the acids in the mouth, thus relieving the metallic taste;
- Sucking on mints, sour foods like lemons, or sour candies seems to help some women;
- Drinking much water is one of the best remedies for metallic taste in mouth.

Super Vision

Some pregnant women experience vision changes as well, characterized by increased myopia—aka nearsightedness.

Although researchers do not know the precise biological mechanisms behind changes in vision, most women return to pre-pregnancy vision after giving birth.

Common changes in vision during pregnancy include blurriness and discomfort with contact lenses. Pregnant women often experience an increase in intraocular pressure, and women experiencing preeclampsia or a diabetic pregnancy may be at an elevated risk of rare eye problems such as retinal detachment or vision loss.

Scientists debate whether a pregnant woman's heightened senses serve any benefit to her or to her unborn baby. Some researchers believe that sensitivity to odors and taste causing morning sickness benefits the mother because she is rejecting foods containing chemicals and toxins harmful to the fetus.

Scientists who support this theory say it explains why pregnant women are sensitive to the smell and taste of cigarettes, alcohol, bitter vegetables, and caffeinated beverages. Some data shows that women who experience nausea have a lower rate of miscarriage, suggesting that the nose is doing its job in keeping the baby safe.

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LOOK WHO IS SENSING!



By: Reham Elbannan and Sally Gad

Look Who is Touching

Touch is the first sense to develop in the embryo. Sensitivity starts in the cheeks then quickly extends to the palms by the 11th week and the soles by the 12th week; the abdomen and buttocks acquire sensitivity around the 17th week. The baby may experiment with this newfound sense of touch by stroking its face or sucking on a thumb, as well as feeling other body parts.

In the last trimester, gentle patting and stroking alerts the baby to the mother's touch and it may respond by calming down or kicking and nudging. By the 32nd week, nearly every part of the baby's body is sensitive to heat, cold, pressure, and pain.

Hence, touch is one of the newborn's most advanced senses, and it has shown to be a foundation of cognitive and emotional development. Newborns are best able to feel with their mouths, which is no surprise considering this is how infants tend to explore everything. Incredibly, one-month-old babies are able to form abstract mental images of things they have sucked on.

Baby girls tend to be more sensitive to touch than boys, a difference that persists through life; on the other hand, baby boys develop a lateralized increased sensitivity to touch on their non-dominant side.

Severe deprivation of early touch leaves both animals and humans stunted in every way—emotionally, physically, cognitively, even immunologically. Preterm babies have thus shown to benefit from therapies like “kangaroo care” and infant massage.

Look Who is Tasting

A fetus will have developed taste buds, resembling that of an adult, by weeks 13 to 15. During the last trimester, the fetus swallows up to a liter a day of amniotic fluid, which serves to get the baby accustomed to breast milk.

All along pregnancy months, unborn children grow physically, mentally and physiologically. You may liken the womb to a dark cave of quiet water, and wonder how the five senses as we know them develop from the embryo stage until the baby is born.

While still in the womb, the unborn baby with all its organs in place breathes, moves, swallows amniotic fluid, and reacts to stimuli preparing itself for life. The development and conditioning processes that happen throughout the nine months are crucial to get the baby's five senses ready for exploring the outside world.

Once the baby is born, parents are curious about its perception of what goes around it; what their newborn feels, smells, tastes, sees, and hears. In fact, some senses are fully developed at birth, while others continue to develop and acquire full capacity after birth.

Let us examine the development journey of the classic five senses in human beings.

Amazingly, the amniotic fluid that surrounds the fetus is rich in tastes—sugars, acids, salts, as well as strong flavors from the mother's diet such as curry, garlic, coffee, etc. Studies have shown fetus preference for sweet tastes over bitter and sour ones, evidenced by the amount of swallowing that takes place when exposed to these tastes.

Newborns can discriminate between tastes and have shown definite taste preferences. Even preemies, as young as 33 weeks, suck harder on a sweetened nipple than on a plain rubber one. Females and heavier babies show a stronger preference for sweet tastes than boys and smaller babies. On the other hand, sour and bitter tastes provoke strong reactions in newborns, but they seem remarkably indifferent to salts.

Salt appreciation develops at 4 months, when an infant will prefer salty solutions over water. This may be related to the fact that young infants are unable to use salts to concentrate their urine, and thus have less need to consume it—human milk is very low in sodium.

The taste of breast milk is affected by the mother's diet; yet, only few infants decrease their feeding in response to this. Hence, a varied maternal diet may in fact help infants be less picky eaters, since we tend to be initially averse to new flavors.

Look Who is Smelling

A fetal nose develops between the 11th and 15th weeks. Yet, the nasal cavity remains filled by a plug of tissue; the ability to smell thus begins around 28 weeks of gestation.

Previously, scientists thought that fetuses did not have any sense of smell, since it was assumed that smelling depended on breathing air. However, it is now believed that the amniotic fluid surrounding the fetus passes through the baby's oral and nasal cavities, triggering both the sense of taste and smell.

Studies have shown that newborns are drawn to the odor of breast milk, although they have no previous experience with it. Researchers think this may come from cues they have learned in prenatal life, since the fetus smells almost everything the mother eats or inhales. Newborns prefer to nurse on breasts moistened with amniotic fluid, and cry less when exposed to its odor.

A newborn can reliably distinguish its mother's breast pad from any other woman's, as well as her neck and underarm odor. This olfactory recognition also depends on the amount of close contact, especially nose-to-skin while breastfeeding. The newborn's familiarity with its mother's scent also has a calming effect. Bad news for men: babies are not so quick to recognize their father's scent.

Senses & Memories

By: Shahenda Ayman



Look Who is Hearing

The womb is not a silent place; there is blood whooshing through the mother's vessels, gurgling and rumbling from her stomach and intestines, and then there are the tones of her voice and the voices of others. Sound is the major source of stimulation to a fetus; after the 6th month, it becomes its major channel of information. By the end of the second trimester, unborn babies can hear.

A fetal ear begins to form at around 8 weeks, becoming structurally complete at about 24 weeks. As early as week 18, the bones of the inner ear and the nerve endings from the brain become ready for the fetus to hear sounds such as its mother's heartbeat; it may even be startled by loud noises!

The fetal hearing progresses as the network of nerves to the ears matures. Even though the sounds it hears are muffled, it may recognize its mother's voice. So this might be a good time for mothers to read and even sing to their babies.

The fetal movements or body patterns may change in response to sounds. Many pregnant women report fetal jerks or sudden kicks just after a door slams or a car backfires. Also, the fetal heartbeat rate often slows down when its mother speaks, suggesting that the fetal can recognize her voice and get eased by it.

Since the baby's hearing improves up through pregnancy, it functions fairly well at birth. In fact, a newborn has already had about 12 weeks listening experience, and even has some definite preferences about what it hears, at the top of which is its mother's voice. Babies also prefer other complex, intonated sounds as music, lullabies, and nursery rhymes. Again, newborns do not seem to show a preference to the father's voice before few weeks.

Look Who is Seeing

Vision is the last sense to develop in the embryo. In uterus, the eyelids remain closed until about the 26th week in order for the retinas to fully develop. By that time, the eyes open and even begin to blink.

Just as the womb is not completely quiet, it is not totally dark, either. As early as week 18—when the eyes are still closed—the retinas can detect a small amount of light if the mother is out in the bright Sun or under strong lights.

By week 33, the pupils of the eyes can detect light, constrict and dilate, allowing the baby to see dim shapes. Experimental studies shining a bright

light on the belly of a woman at the 37th week have shown the baby's heart rate speeding up, or the baby turning in response to the light. As soon as their eyes open in the womb, twins seem to have no trouble locating each other, or touching faces, or holding hands.

The sense of vision is still primitive at the time of birth, compared to the other senses. Newborns arrive with what they need; at birth, a baby's vision is perfectly focused from 20 cm to 30 cm. Newborns can recognize their mothers' faces, even at one day of age; in general, babies prefer faces and face-like shapes to other objects. One-day olds have even been seen to successfully imitate an interesting facial display, but this really requires a quiet alert state.

In the first two months, babies seem to scan around until they find the edge of something, and examine that edge. Between two and three months of age, the focus shifts on finding where things are to examining what things are—scanning all over an object, and noticing much more details.

Newborns can see some color, but not really the full spectrum as color perception develops by 3-4 months. They are drawn to movement and bold contrasts, and compelled to look at novel objects.

Unborn babies inhabit mothers' wombs for nine long months, getting ready to experience life; to feel the cool breeze and the warm Sun, to taste delicious foods and drinks, to enjoy the sounds of birds and the flowery smell of gardens. Having come out, their senses continue to develop, helping them cognize the new world they are to inhabit for the rest of their lives.

Glossary

* **Kangaroo Care** is a method of care of preterm infants, which involves infants being carried, usually by the mother, with skin-to-skin contact.

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Sometimes we hear a song, or smell a certain odor that reminds us of something that happened in the past. It is like rewinding a scene with all its details and incidents. This may seem a random occurrence to us, but it turns out that this is an intentional function of the brain. Our five senses leave memory imprints on different parts of our brains to help us retain information later.

Sight is one of the senses humans rely on heavily; however, it is not perfect when it comes to recalling memories. You would know this if you have ever struggled to recall the face of someone upon meeting them again. There are times when your sense of sight serves you well, though. Information from your ocular organs travels to your temporal lobe, leaving an imprint on your brain; this information is what you use to recognize people and movements. Without this information, you would not be able to recognize anyone you know by sight alone.

As for sound, the human mind has the ability to recognize tune, rhythm, and wording of a song after a lapse of time without hearing it. You may be familiar with these phenomena if you can recall children's rhymes immediately when you hear them again. Not only does your brain remember the information from the songs well, but it also remembers voices too. For example, you may go a long time without hearing a certain voice, but you can recognize it immediately when you hear it again. Information attained from sound stores itself in the auditory cortex of the brain.

A smell, on the other hand, can bring a flood of memories and take you back to a moment in the past. What happens is that your nose sends signals to your olfactory cortex in your brain so you can recognize the smell. From there, the information travels to the limbic system of your brain, which links that smell to past events, bringing your memories to the forefront of your mind.

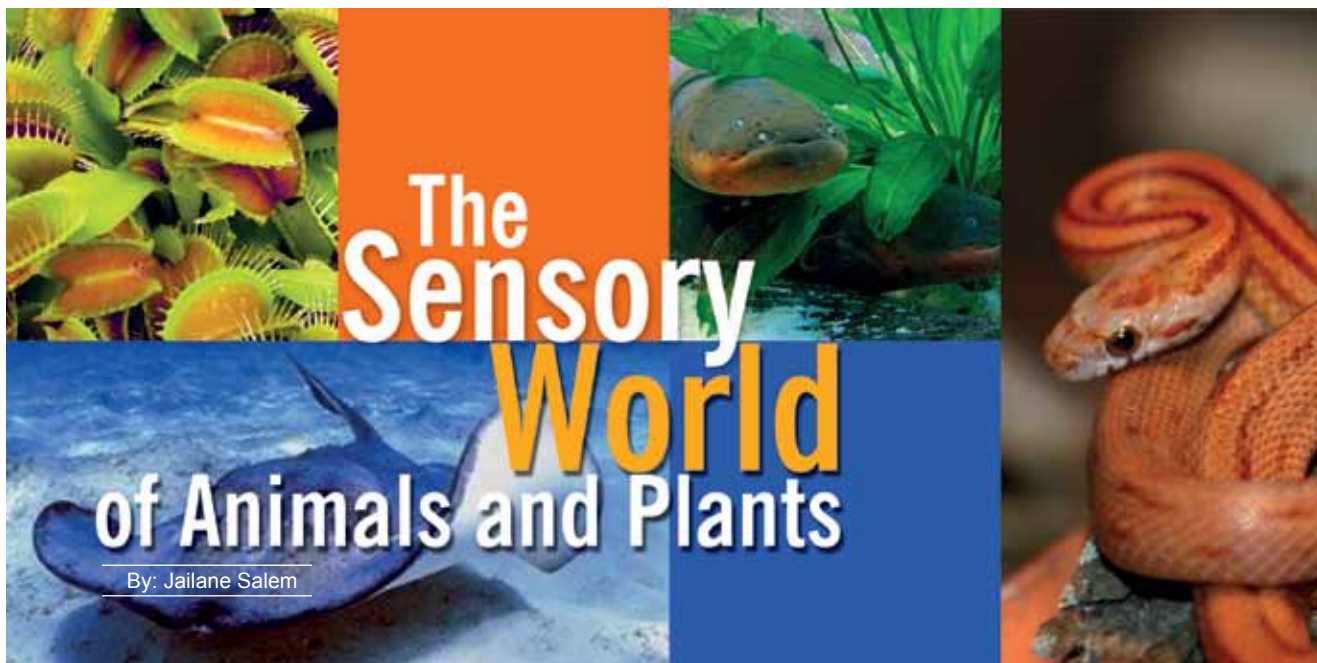
Finally, touch is an important sense we use from birth to experience the world around us. Sensations from your skin stay with you in the form of impulses. For example, when you experience something painful as a burn, your mind will immediately associate the thing that burned you with pain. From that point, you will condition yourself to avoid that pain. You also do the same for pleasurable sensations like softness. The signals from your skin travel to the insula cortex in your brain and stay there for future reference.

It is amazing how our senses act as a memory inventory. The next time you hear a song or smell a certain odor that takes you back to pleasant times, remember that it is your senses that take you there.

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The Sensory World of Animals and Plants

By: Jailane Salem

Our senses help us understand the world around us and explore our environment. As humans, we have five distinct senses: sight, hearing, smell, taste, and touch; however, have you ever thought of what it would be like to experience the world if you had senses like those of animals and plants?

Well, let us just say you would have had an out of this world experience since animals and plants need different kinds of information to survive, and thus have different senses to do the job.

Super Sensing Animals

Have you ever wondered how a pigeon always finds its way home without the help of a GPS system? Or why a dog starts barking at the door in anticipation of its owner coming long before he/she is actually at the door? All of these senses are inherent in animals.

Nature's Radars

There are sounds that we, humans, cannot hear, perhaps because their frequency is too low or too high. Animals, however, are not like us; some hear sounds that we cannot. That is where echolocation comes in handy to animals.

Bats get much of the details they need to find food or to explore the environment around them through echolocation. They click, squeal, and scream, emitting sounds up to 120 decibels, and detecting the echoes produced by these sounds. These echoes give them a huge amount of information about their surroundings.

The time it takes for an echo to return, for example, reveals the distance of an object; the changes in the sound's frequency as it bounces off another creature can

even reveal the speed and direction of the animal's movement. Special ear and brain adaptations enable them to use this ability very much like a radar; they have enlarged ear flaps that gather and direct sound towards thin and extremely sensitive eardrums.

On the other hand, the flow of molten material in the Earth's core, and the flow of ions in the atmosphere generate a magnetic field that surrounds the Earth. This magnetic field is used by many animals to give them directions.

We have invented the compass to help us better navigate by detecting the Magnetic North; animals with the magnetic sense use it for direction and long distance travel. Many use it to locate their homes, while others use it when migrating from one place to another; it is basically their own compass, which they have been using way before humans invented it.

Scientists researching this amazing magnetic sense in animals have found that animals with this sense have deposits of magnetite—an iron-rich magnetic material—in their nervous system. Even

though scientists do not yet know how these structures work, some suspect that they excite membranes inside neurons and trigger nerve impulses that send direction-related information to the brain. They basically act like microscopic compass needles.

For example, young loggerhead turtles read the Earth's magnetic field to adjust the direction in which they swim. The moment they hatch from eggs, they seem to know exactly where they are going, as if they were born with a set of directions, which, with the help of their magnetic sense, ensures that they always stay in warm waters during their first migration around the rim of the North Atlantic. Over time, they build a more detailed magnetic map by learning to recognize variations in the strength and direction of the field lines, which are angled more steeply towards the Poles and flatter at the magnetic equator.

Nature's Goggles

Some kinds of snakes have infrared vision; they use infrared sensory organs to detect and hunt warm-blooded prey. These infrared "eyes" are cup-like structures that form crude images as infrared radiation hits a heat sensitive retina, allowing them to track their prey by their body heat from up to a meter away.

These snakes do this using relatively simple organs called pits, which lie near their nostrils. These pits are a small dip containing a

membrane that is packed with heat-sensitive nerve endings, which act as infrared receptors. They also have specific protein channels that react to heat; these channels are found on nerve cells that are part of the sensory system, which detects touch and temperature.

Even though this is completely separate from the visual system, both sets of information end up in the same place; the optic tectum, which is a part of the brain. "There, the two maps of space—visual and infrared—merge into one," says Michael Grace, a neuroscientist investigating pit viper thermal sensing at the Florida Institute of Technology in Melbourne.

Not only do some animals have infrared vision, others can see a whole other spectrum of light. For example, bees can see ultraviolet light, which gives it an experience of the world very different from ours. When we look at flowers in a garden, we see myriads of colors; when a bee flies over a garden, however, it sees flowers differently.

Flowers leap out from much darker-looking leafy backgrounds, and they have ultraviolet-reflecting landing strips that show the way to the nectar. All this is seen through the pixilated window of mosaic vision, with each unit of the insect's compound eye providing one of the 5000 dots that make up an image.

Bees can also see polarized light and this is how they find their way back home, by checking the pattern

of polarized light in the sky. “Just like you see red from blue, they see one polarity from another,” says Bill Stark, an insect-vision researcher at Saint Louis University in Missouri. Air molecules in the atmosphere scatter photons to create a pattern of polarized light arranged around the Sun, helping bees navigate by the position of the Sun even when the sky is cloudy.

Nature's Chords

“It felt electric” that is how we sometimes describe an event, but we cannot actually feel electricity like some animals do. Some animals can sense electrical charges, and others can actually physically produce electricity.

Electric eels and some rays have modified muscle cells that produce an electric charge strong enough to shock and sometimes kill their prey. Other fish use weaker electric fields to navigate murky waters or to monitor their surroundings.

Sharks have great use for their electric sense; they use it to detect their next meal and they boast hundreds of thousands of their own electroreceptor organs inside their bodies. They have the greatest electrical sensitivity and are able to detect a signal of half-a-billionth of a volt of any other animal.

Other animals with amazing electric powers are eels, most commonly found in the waters of South America. Electric eels have the capability to produce more electricity than any other animal in the world.

With 5000 to 6000 stacked electroplax, these sea snakes are so powerful that they can shock their prey with a 500-watt voltage. Studies have shown that these eels have the ability to produce intermittent shocks without tiring for an hour. To put it in perspective, this amount of electricity could easily prove deadly for the average-sized adult human.

Super Sensitive Plants

When we see plants, we never really think of them as organisms that have senses the same way we do. Plants do not perceive the world in the same way that we do; however, they are susceptible to sensory stimulations just like we are.

Plants are rooted in one place and therefore have many abilities that allow them to survive in different kinds of environments, whether they are comfortable or strenuous ones.



Plants are sensitive to environmental factors; during each Spring, they come to life in all shapes and forms, showing they have their own internal directions that they follow and that are encoded in their genes. Plants are also sensitive to touch, light, temperature, and different chemicals. Their sensitivity is translated via movements, growth directions, and metabolism changes.

There are many plants that react when touched, one of them is the Mimosa plant, which retreats its leaves immediately when touched. Carnivorous plants close their trap the moment they are touched and end up devouring whatever unfortunate prey that gets trapped.

Some plants from the family of the cucumber reduce the length of their stem, increase their diameter, and turn stiffer in the next 48 hours after experiencing a rub. Trees exposed repeatedly to the attacks of winds and rains react in the same way creating asymmetry in their shape.

Legumes have a specific swelling called pulvinus at the base of their leaves. Pulvinus triggers rapid movements of less than a second, as a reaction to touch or light variations. A sensitive plant requires 30 minutes to return to its initial position especially if it has been stimulated repeatedly.

Plants are very sensitive to light and have special sensors called photoreceptors that help them monitor the amount, as well as the quality of light they receive. Plants depend on light to orient themselves to the environment they live in and to time.

Some photoreceptor pigments are more sensitive to red, others to blue or ultraviolet, since each one of them can affect a plant differently. The element that detects the intensity and direction of the blue light, the cryptochrome, intervenes in the process of opening the stomas, the pores through which the leaf makes gas exchanges. Due to these photoreceptors, if you have an indoor plant placed close to a window, it will visibly bend towards it, placing its leaves perpendicularly to the direction of the sunlight.

Plants can be very clever in defending themselves against parasites; they use their chemical sense in order to repel pests. When plants are attacked, the attacker leaves evidence in the form of chemicals which the plant “senses” and then proceeds to act accordingly.

If you have ever heard of chemical warfare, well plants have been doing so ever since their inception. They emit chemical signals that often spread far away from the attacked point and creates

a long-term defense reaction. One example is larches, which is a kind of tree; when they are defoliated by the caterpillars of moth, they resort to producing smaller and less nutritious leaves, a fact that diminishes the number of predators for 4-5 years.

There is more to the world than meets the eye; this is very apt when it comes to our perception of the world we inhabit. Animals and plants have a very different experience of the world from ours; what they can feel, see, hear, smell, and taste can only leave us with a sense of awe.

We sometimes think that we know it all, but that is the furthest thing from the truth; there are parallel worlds that are beyond us. So the next time your pet perks up its ears, or seems to be looking intently at an invisible spot where there is nothing visible, they might simply be perceiving something that is simply beyond your reach, so pay attention!

Quick Facts

- Dolphins like bats can use echolocation for movement and locating objects.
- Penguins have flat corneas that allow for clear vision underwater.
- Buzzards can see small rodents from a height of about 4.6 km.
- Falcons can see a 10-cm object from a distance of 1.5 km.
- Snakes have no external ears. They do not hear the music of a “snake charmer”; instead, they are probably responding to the movements of the snake charmer and the flute.
- Elephants have hearing range between 1 Hz and 20000 Hz. The very low frequency sounds are in the “infrasound” range, which humans cannot hear.
- Cats have hearing range between 100 Hz and 60,000 Hz.
- Dogs can hear sound as high as 40000 Hz.
- Pigs’ tongues contain 15000 taste buds, while the human tongue has 9000 taste buds.
- Blowflies taste with 3000 sensory hairs on their feet.
- Butterflies have hairs on their wings to detect changes in air pressure.
- Crabs have hairs on their claws and other parts of their bodies to detect water current and vibration.

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IS COMMON SENSE

By: Jailane Salem



is such a small difference, it can nevertheless be enough for someone to give an irrational response to something.

People who suffer from Asperger syndrome—an autism spectrum disorder—on the one hand, often have high levels of intelligence. However, they tend to have difficulties in communication, failing to understand social cues, leading people to view them as lacking common sense.

Common sense is not universal as some assumptions go; it varies and changes from one place to another. What some people consider as common sense in one place does not necessarily add up to common sense somewhere else. If you live in an urban area, the first thing you do when you cross a street is look for oncoming cars to avoid accidents; however, if you live in a rural area you would not necessarily behave in the same way since cars would be a rare occurrence.

Just as common sense changes over place, it changes over time. What was perceived as common sense in the 13th century will not be considered common sense today. Just like certain beliefs were observed as facts then may have been proven wrong and therefore are no longer believed to be common sense.

Common sense is all learned; it is based on information that we acquire from people around us as well as our own personal experience. It can be taught to adults who seem to lack it; however, this would require getting exposed to various “what if” scenarios and have the common sense response explained to them.

It is common sense that helps us every day; it is, for example, what tells us that drinking too much coffee might deprive us of a good night sleep, not because it is an inherent knowledge that we have, but because we have learned so from past experience.

Voltaire, a French writer, observed that common sense is not “common” in the true sense of the word, since many people seem to fail in applying this faculty to their decisions. Hence, whenever you hear of something that is perceived as common sense, re-examine it to see how much truth it actually holds, and if you are about to make a decision, make sure you use your common sense.

Glossary

*A **frontal lobotomy** is a barbaric surgical procedure that was once performed on the brain of someone who suffered from certain psychiatric conditions.

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COMMON

You just had a shower and your hair is still wet. You are on your way out, when your father suddenly stops you saying: “It is cold outside! If you go out with your hair wet, you will catch a cold”. You hurry back in to dry your hair with a blow dryer, then go on your merry way after a sigh of relief that you just avoided falling sick.

Your father has just given you an advice that would be widely seen as common sense; a widely known piece of information that is commonly perceived as true. However, wet hair is not the cause of a cold, germs are. So, why is it that people perceive certain information as common sense? What exactly is common sense? Can it be improved?

Common sense is defined in Merriam-Webster as “sound and prudent judgment based on a simple perception of the situation or facts,” while Cambridge Dictionary defines it as “the basic level of practical knowledge and judgment that we all need to help us live in a reasonable and safe way”.

Basically, common sense is judgment that is based on things that are common knowledge and established facts, either by the person making the judgment or by society in general. Science has not been able to actually prove the existence of common sense, or explain its development; however, certain observations have been made.

For some time, people wondered if common sense is located in a specific part of the brain. What scientists observed was that patients who underwent prefrontal lobotomies* were able to resume their normal lives when they returned to their homes, with one exception that they lacked proper judgment. Scientists thus concluded that this could indicate that the prefrontal region of the brain is to some extent connected to our decision-making process and common sense response.

Common sense is based on knowledge and experience. If you see a flame you will not try to touch it because you know that this will only lead to a burn. Toddlers, however, do not know that going near a flame would burn them, therefore they cannot act accordingly. You are capable

of deducing reasonable judgment from prior knowledge, and therefore you would avoid doing it, which is common sense.

Does everyone have common sense? Unfortunately, no; some people seem to lack common sense. What may come as a surprise is that people who have a high IQ level actually tend to lack it; that is according to Bruce Charlton, Editor-in-Chief of the *Medical Hypotheses* journal.

Charlton believes that a lot of people with very high IQs tend to ignore common sense because they favor reasoning to learned cultural behavior. Some people may see this as a smart thing to do, since sometimes what we believe to be common sense ends up being completely wrong and unfounded. Yet, Charlton believes that this often leads to geniuses coming up with strange responses or behaviors.

Common sense is generally related to universal truths that are learned through social interaction. This also factors into why very smart people lack common sense, because they often favor solitude and therefore forgo key social interaction.

Also, people who usually tend to be overly emotional can also lack common sense because the region of the brain controlling emotions reacts a few milliseconds quicker than the one controlling decision-making. Even though this



ADRENALINE RUSH

By: Jailane Salem

Feats of superhuman strength are impossible in everyday life activities; however, they become a reality when one is put in a situation that triggers our “fight or flight” response.

In extreme situations, our bodies are prepped for either completing amazing feats or escaping from a threatening situation. It is believed that the “fight or flight” response has developed due to the precarious living situations in ancient times, when humans had to either flee from predatory animals or fight to the death to survive.

When one finds oneself in a life or death situation, one needs one’s body to be in its best form; meaning one’s muscles and reflexes have to be ready to perform beyond their usual capacity, and one’s senses must be alert and in tip-top shape to help one survive.

Last year, a young woman in Virginia, USA, achieved a heroic act by saving the life of her father. Her father was in their home’s garage working on his car; he was under the car when suddenly a jack that was holding the car up slipped, causing the car to crush the man underneath it. Lauren Kornacki, the daughter, found her father pinned to the ground and unresponsive; she proceeded to lift up the car, pull him out, and then give him CPR⁽¹⁾.

The father was soon recovering in a hospital; if it were not for his daughter, he may have not survived. However, how is it possible that a normal 22 year old woman could lift a car?

During a stressful or fearful situation such as Lauren’s, seeing her father pinned beneath a car, the hypothalamus is activated. The hypothalamus is mainly responsible for maintaining the body’s homeostasis⁽²⁾, or stable physiological balance. The hypothalamus has a direct connection to the adrenal medulla—the center of the adrenal glands—which releases the hormone epinephrine, aka adrenaline.

The theory behind the adrenaline rush is that we typically only use a small percentage of our muscles’ capabilities. When adrenaline is pumped into our circulation, blood is shunted away from our guts and to our muscles; this, in turn, means more oxygen getting into our muscles.

Adrenaline also facilitates the conversion of our body’s stored energy source, glycogen, to

fuel in the form of glucose. The combination of increased oxygen and energy levels strengthens our muscles beyond normal levels.

It was Earl Sutherland, a biochemist, who found that adrenaline accelerates the breakdown of sugar in the liver to provide quick energy during moments of stress. He also discovered later on that the hormone stimulates individual cells in two steps.

Firstly, it latches onto a receptor on the cell surface. The receptor then triggers the release inside the cell of a second signal: a molecule called cyclic AMP⁽³⁾ (cAMP). Sutherland then determined that cAMP has a larger role, serving as an intermediary for many hormones regulating metabolism in both simple and complex organisms. For this important breakthrough, he was awarded the Nobel Prize in 1971.

Gordon Lynch, a physiologist at the University of Melbourne, Australia, who has been researching the chemical pathways that influence muscle strength said that “the release of adrenaline promotes blood flow to working muscles, speeds up metabolism, and enhances the capacity for muscles to contract with more force and power than what we might normally require to perform most of the tasks we perform during daily living.

It is possible that, during situations of extreme stress and danger, the adrenaline rush enables us to unlock a muscle’s true potential that might otherwise not be achieved voluntarily.” He goes on, explaining that adrenaline does this by gearing up more “motor units”, nerves, and the muscle fibers they control, than are normally used all at once.

“When performing most tasks, we are actually only recruiting a small number of motor units, or a sufficient number to complete the task as required. More demanding, intense activities require that more motor units be recruited. In many cases, we may never actually recruit all of the motor units available, unless we are placed in rare situations of “fight or flight”.

When you undergo an adrenaline rush, your senses are affected in various ways. Let us say you are being attacked by someone and this situation urges you to switch to the adrenaline

mode. You will notice that your vision is somewhat distorted, which occurs because you are only focused on the threat; things thus appear larger or closer than they actually are.

Besides having your vision distorted, your peripheral vision can drop away and all you end up seeing is the threat. Your auditory sense can be compromised because every brain cell you have is focused on the threat. Therefore, even if a loud sound occurs next to you, it is very likely that you may not register it.

Your pain tolerance increases as well; you do not feel things that would normally have you wailing although the damage is done. You may feel it to a lesser extent or not at all, but it will definitely be there the next day. Even though many people admire young women lifting cars and doing other extraordinary acts, after the adrenaline rush they are left with torn muscles and tendons, and perhaps more severe injuries.

After you are out of danger, your body starts to calm down, returning to its original state. We may live our whole lives without experiencing an adrenaline rush, but some people actually seek it out for the thrill. Adrenaline addicts are daredevils practicing extreme sports or doing extreme activities just to feel that rush. For the remaining majority who are not thrill seekers, keep in mind that even though we do not turn green and triple in size, each one of us has a dormant Hulk within oneself, waiting to be awakened in extreme situations.

Glossary

- (1) **CPR** stands for Cardiopulmonary Resuscitation, which is an emergency procedure for a person whose heart has stopped, or is no longer breathing.
- (2) **Hypothalamus** is a portion of the brain that contains a number of small nuclei with a variety of functions.
- (3) **Cyclic AMP (cAMP)** is the intracellular agent which mediates the action of many hormones on the target cell.

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Every once in a while, when life gets tough, and everyday challenges seem more than what my limited abilities can overcome, I dream of having a superpower or two. Superman powers are definitely at the top of my list: flying, planet-shifting super-strength, never-ending stamina, and enhanced super-senses; anyone of those powers would surely make my life much easier.

Then I have to succumb to the sobering reality that, because of the laws of physics and anatomy, such incredible powers remain only in the domain of comic books and Sci-Fi movies; they simply do not exist in real life.

That is, except for some rare cases of a few actual individuals, who happen to share some of the extraordinary powers and enhanced senses of the superheroes—or super-villains—of science fiction. Those are real people who live and walk among us, but happen to possess bona fide superpowers that seem to defy the laws of physics and nature.

Meet the superheroes of the real world:

1) Captain Sonar

Real Name: Ben Underwood

Superpower: Super Echolocation, aka Sonar Vision

Although Ben Underwood—who has recently died at the age of 16 after a long battle with cancer—had tragically lost both his eyes to cancer at the age of 3 and was completely blind; he played basketball, rode a bicycle and roller-skates, played video-games, and led quite a full life. Basically, he did almost anything a person with vision can do.

At the age of 5 he developed the ability to “see” with sounds, using echolocation to navigate the world around him. While he is not the first person to develop this ability to some degree, no one has ever been able to take it this far, and to push the limits of human perception to this extraordinary level.

His ability was so far developed to the point that he could “see” the difference between a truck and a car in a parking lot, and search for and find lost objects for his mom around the house.

With a superpower similar to that of the Marvel Comics blind superhero Daredevil, Ben did not need guide-dogs, or even use his hands to navigate. He had learnt to perceive and locate objects by making a steady stream of sounds with his tongue, then listening for the echoes as they bounced off the surfaces around him.

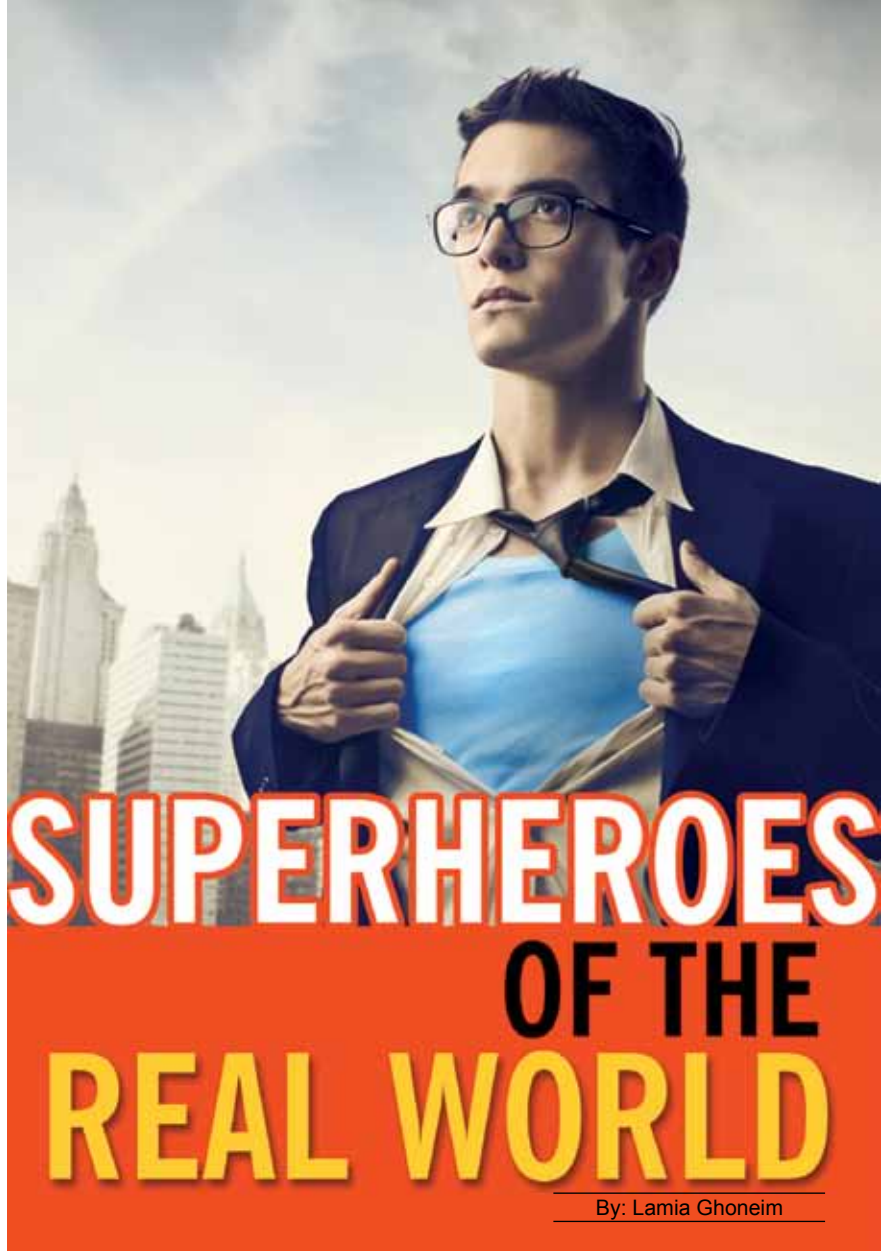
About as loud as the snapping of fingers, Ben’s clicks told him what was ahead; the echoes they produced could be soft (indicating metals), dense (wood), or sharp (glass). Judging by how loud or faint they were, Ben had learnt to gauge distances. Amazingly, his sensitive hearing could detect those echoes with utmost precision. In the real world, his ability is only second to bats and dolphins.

2) Rubberboy

Real Name: Daniel Browning Smith

Superpower: Super Flexibility

Named the World’s Most Flexible Man by the Guinness Book of World Records, world famous contortionist, the Rubberboy, has an unmatched ability to bend his body into the most unnatural shapes and positions.



His father discovered his unique power at the young age of 4, when he saw him jump off the bunk bed and land in an incredible gymnast split during a roughhousing session with his siblings.

Since then, Daniel developed a fascination with contortionism and resolved to become the greatest contortionist the world has ever seen. With his father’s support, his hard work and professional training, he managed to develop his talent into a great superpower, holding seven world records for extreme, unrivaled flexibility.

Daniel can do almost anything with his body, from dislocating both his arms and legs to rotating his torso 180 degrees. His abilities are kind of similar, to some extent, to the superpowers of the “Incredibles” heroine Elastigirl.

The Rubberboy has proved his unique abilities in many professional basketball and baseball games, and on many shows. In addition to being the world’s most famous contortionist, he is also an actor, an entertainer, and a host on Stan Lee’s Superhumans.

3) Electric Man

Real Name: Ma Xiangang

Superpower: Electrical Invulnerability/Manipulation

China resident Ma Xiangang is a man capable of something no one else in the world is capable of. He can touch live wires filled with eye-popping electricity without feeling any pain whatsoever; he is simply immune to electricity.

Xiangang discovered his super power after touching a live wire on the fuse box from his television set; rather than being shocked to death, he felt no pain or convulsions, and survived with the knowledge that he is imperious to electric shock.

According to the *Beijing Sci-Tech Report*, Xiangang can fix electrical circuits with his bare hands; he does not need any safeguards. He can light up bulbs by touching 220-volt power lines, holding a positive wire in one hand and a negative wire in the other. Of course, anybody could do this with enough electricity, but they would most likely die or at least convulse.

Ma underwent a series of tests at the Physics Laboratory in Haerbin Industrial University. The test results showed that his body's resistance was seven to eight times higher than that of an average human being.

Scientists are unable to accurately explain his unique ability, but they think that his powers are most likely due to his extremely dry skin. Apparently, his hands are much rougher and drier than a normal person's, which allows his skin to act like a pair of insulated gloves, preventing most of the electricity from entering his body; what does get through, he absorbs and can then pass through a part of his body.

That is not all; Xiangang claims he can also "control" the voltage of the power passing through his body, storing jolts of electricity for brief periods of time, and then later releasing them. His abilities sound like those of the super-villain named Electro—an enemy of Spiderman who gained the ability to control electricity after being struck by lightning while working on a power line.

Xiangang actually utilizes his powers; however, instead of defending power plants from evil gangs of vandals, Xiangang uses his jolting ability to give diathermic massage, in which high-frequency electrical currents are used to heat deep muscular tissues.

4) Incredible Mind

Real Name: Daniel Paul Tammet

Superpower: Superhuman Mentality

Daniel Paul Tammet is a British high-functioning autistic young man, who from the outside appears unremarkable; but behind Daniel's bookish exterior lies a superhuman gift; one of the most extraordinary brains our planet has ever seen.

He is a mathematical genius, capable of astronomical calculations in the blink of an eye. Moreover, he is a gifted linguist, speaking nine languages, including one he created himself called Manti.

Daniel was born with the ability to experience numbers in an exceptionally vivid way; in his mind's eye, every digit from zero to 10,000 is pictured as a 3-dimensional shape with a unique color and texture. Experiencing numbers as colors or sensations is a well-documented form of synesthesia—perceiving one sense as another—but the detail and specificity of Daniel's mental imagery of numbers is unique.

Daniel was studied repeatedly by researchers in Britain and the United States, and has been the subject of several peer-reviewed scientific papers. For scientists, he is particularly interesting because of his ability to describe exactly what goes on in his head, unlike most other savants who cannot explain their abilities.



He explains that he can "see" results of calculations as landscapes, and that he can "sense" whether a number is prime or composite. He has described his visual image of 289 as particularly ugly, 333 as particularly attractive, and π as beautiful. Daniel does not only verbally describe these visions, but also creates artwork, particularly watercolor paintings, such as his painting of π .

"The numbers are moving in my mind," he says. "Sometimes they are fast, sometimes they are slow. Sometimes they are dark, sometimes they are bright. That emotion, that motion, and that texture will be highly memorable for me."

Daniel suffered epileptic seizures as a young child, which he subsequently outgrew following medical treatment. At age 25, he was diagnosed with "savant syndrome"; a rare autistic condition in which people with developmental disorders are exceedingly brilliant in a particular area. For Daniel, his brilliance much exceeded his disability.

Daniel is capable of learning new languages very quickly. To prove this for the Channel Five documentary, Daniel was challenged to learn Icelandic in one week. Seven days later he appeared on Icelandic television conversing in Icelandic, with his Icelandic language instructor saying it was "not human".

Tammet's incredible brain is comparable to that of Brainiac, a principal foe of Superman, with supreme calculation abilities, enhanced memory and advanced understanding of sciences.

5) Magnetic Man

Real Name: Liew Thow Lin

Superpower: Human Magnet

Liew Thow Lin is a 70-year-old Malaysian retired contractor, also known as the "Magnetic Man" of Malaysia because of his incredible ability to stick metal objects to his body.

Liew can make metal objects, weighing up to 2 kg each, up to 36 kg total, stick to his skin; he recently made the news for pulling a car twenty meters along a level surface by means of an iron chain hooked to an iron plate on his midriff.

While his magnetic ability is not as powerful as Magneto—the primary villain of X-Men who has the power to manipulate electromagnetic fields—still, he is the real-world closest thing to a human magnet. His grandchildren also have the same unique ability, which means it must be hereditary.

Researchers were initially baffled at the discovery that Lin's body did not exhibit any kind of abnormal magnetic field. Extensive studying revealed that Lin's skin itself has high friction levels, which creates a special suction effect that may explain why metals stick to his body.

6) The Man Who Can Run Forever

Real Name: Dean Karnazes

Superpower: Superhuman Endurance

If Dean Karnazes wants to run forever, he can. That is the extent of his superhuman endurance, second only to Superman's never ending stamina. This American legend long-distance runner is capable of inhuman feats of fortitude, such as running 50 marathons in each of the 50 States in 50 consecutive days.



Karnazes has run a marathon on every continent twice over and also ran 350 miles nonstop over three sleepless nights. During his infamous endurance 50-50 marathon, his training and medical team, discovering that there was almost no scientific research into such a feat, decided to keep their own record of his health over the course of the event.

That is how they discovered the secret behind his incredible abilities; his muscles are almost invulnerable to damage. The amount of CPK (Creatine Phosphokinase), an enzyme that heals muscle tissue and leads to soreness, in his bloodstream after the first week was less than one fifth of the amount of CPK present in an average runner after just one marathon.

Moreover, they discovered that his muscles not only damage much less with exercise than the normal person's, they actually get used to continuous exercise and stop being damaged altogether, much like X-Men's hero Wolverine.

The team also found out that he has more blood in his circulatory system than the average person, allowing him to stay hydrated and healthy for longer periods of time. Most impressively though, his science team concluded that if he was kept properly hydrated and fed, he could run at around 7-10 mph, literally forever or until he died of old age.

7) MONKFORCE

Real Name: Buddhist Monks

Superpower: Heat-Generation

Buddhist monks have been known to possess a unique super-sense; they can control the temperature of their skin through meditation. Experts have been studying them for more than 20 years, trying to discover how they are able to exhibit such a phenomenon.

By using a meditation technique called Tummo, these monks can lower their metabolism by a staggering 64%—whilst a normal human being metabolism can only drop 10-15%, and only when they are sleeping.

What is even more fascinating is that, when scientists studied them further, they discovered that they were also able to raise their skin temperature, measured from their toes and



fingers, as much as 17°F, while their core temperature stays normal.

During a particularly harsh scientific experiment, the scientists documented a group of monks spending a night out on a rocky ledge in the Himalayas. Dressed in nothing but their robes, with no extra insulation whatsoever, the monks spent the night sleeping on cold rocks, at altitude 4.5 km and temperature of 0°F.

Such conditions should have killed the monks, but instead they slept peacefully; the camera did not even catch them shivering at any point. When they woke up, they walked calmly back to their monastery, not seeming to notice the cold at all, unlike the scientists and camera crew who were all bundled up and freezing by morning.

8) Das Uberboy

Real Name: Unknown

Superpower: Superhuman-Strength

Das Uberboy's real name is being kept a secret, presumably for his protection. He was born in the year 1999, in Germany, and from the moment the nurses laid eyes on him in the hospital, they knew something was different about him.

His muscles looked nothing like the soft baby muscles of the other infants in the nursery; they were bulging and well defined, especially in his thighs and upper arms. After further inspection by the doctors in the hospital, they were shocked to discover that the newborn's body was ripped with muscles similar to those on professional body-builders.

The newborn—it turned out in the first such documented case in a human—had a double dose of a genetic mutation that had changed the way his muscles were growing. Normal people have a gene responsible for producing the protein myostatin, which normally restrains muscle growth, ensuring that muscles do not grow too large. In the super boy, both copies of the gene were inactive; he was making no myostatin at all, meaning that nothing was stopping his muscles from growing, say as big as the Incredible Hulk.

Whether or not he grew up to be a superhuman is unknown, again presumably for his protection. What we do know is that at 4 years of age, Uberboy could lift six times more weight than an average kid. We sure hope that he developed a sense of justice, along with his stronger-than-life muscles.

That all sounds amazingly incredible; I am sure you all now wish you had at least one of these extraordinary abilities. Nevertheless, let us not forget that none of the superheroes we have grown up reading about and watching in endless cartoons, TV shows and movies, have an easygoing life. They all have a kryptonite-type element that can be the cause of their downfall, not to mention an endless stream of enemy super-villains. Thus, one wonders what would be the downside of having one of the extraordinary abilities we have unraveled here, and others still to be revealed.

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If you were stranded on a remote island, all alone, and could only take five things with you, what would they be? This is the question people usually ask in jest or to see what you value the most; for some people, however, this is no hypothetical question but a reality that they fully inhabit.

Remember watching Tom Hanks in "Cast Away" and feeling his grief over losing his friend impersonated in the volleyball he had named Wilson? How would you have fared in such a situation? What measures would you have gone to in order to survive? And in what ways would you have adapted your senses in order to increase your chances at surviving in such a difficult situation.

Well, why don't we examine an actual real life example? Masafumi Nagasaki is a Japanese man who has forsaken life in society and leads a simple life on a small inhospitable Japanese island. The remote spot is just a kilometer wide, and is in Japan's tropical Okinawa prefecture located closer to Taiwan than Tokyo.

The island Mr. Nagasaki inhabits is very inhospitable to human life; the currents that surround the island are so dangerous that local fishermen do not venture out to that area. There are also no amenities on the island and no natural water.

Since setting up home there, Mr. Nagasaki has to collect rainwater caught in a system of battered cooking pots. He has had to brave powerful typhoons and biting insects without much of a stable shelter to protect him. As soon as he had settled on the island, a massive typhoon swept through and ended up removing most of the vegetation that he had relied upon for shade, as well as carrying away the simple tent he lived in.

"I just scorched under the Sun," he said; "it was at that point I thought this was going

to be an impossible place to live". But he soon adapted to the new pace of life; he became attuned to the cycle of nature. He said: "I do not do what society tells me, but I do follow the rules of the natural world. You cannot beat nature so you just have to obey it completely; that is what I learned when I came here, and that is probably why I get by so well".

Living by yourself on an isolated island is bound to have you relying heavily on your senses. You would have to be well attuned to the sounds of nature, and have a good eye spotting weather changes, since at any moment you might have to scurry quickly to shelter in order to avoid an oncoming typhoon. Your sense of taste will have to reacclimatize to a very different taste palate, since sugar and salt and other spices and additives make us accustomed to certain tastes and their absence will cause you to perhaps not enjoy your food as much.

The most important thing you will have to develop are your instincts and common sense since they will be the ones to help you out in such arduous living circumstances. So do you think, like Mr. Nagasaki and Chuck Noland (Cast Away), you would be able to weather living by yourself on an isolated island far away from it all?

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By: Ahmed Ghoneim



Additional



SENSES

When you hear the words “sixth sense”, what do you think of? If you have seen the movie with that title you would think “I see dead people”! If you have seen or read any kind of supernatural work you would think that it is seeing the future, knowing secrets of the past, or anything related to discovering the unknown.

Scientifically speaking, you can never know the future if something in the past did not leave a trace, you would not know anything about it either. Does that mean we can only have the five known senses?

Magneto

There are times in my life that I wished I were magnetic; whether to attract the ladies or because I was frustrated with my screwdriver, it has always been a fantasy of mine.

I never knew that for some years now there have been developments in exactly that area. It is not as horrific as Magneto’s strength; you cannot just move metals as you wish, but you can have magnetic fingertips.

Through a surgical procedure in which a small magnet is implanted into your fingertip, you can attract paper clips, bottle caps and much more. The procedure was reported to have been done to a small number of people; some were happy with it and some requested to have it removed due to discomfort in their fingers.

The most interesting story of magnetic fingertips by far is that of Dann Berg. At first, Dann’s finger was numb from the operation; once his finger got back to normal, he began to feel the magnet inside, “it has unlocked an entirely new world; one that he could touch and interact with in a very real way”.

Whenever he came near a strong electromagnetic field, he would feel his finger vibrate; he could tell how strong the field was, and how far it is from the strength and texture of the vibration. Different metal and electronic devices started to mean something to the senses in a much different way than they did before.

Would you get your fingers a magnet implant?

Spiderman

If you are a comic book geek you would be familiar with the spider-sense, for Spiderman relies on it in his numerous endeavors. Whenever

something is fishy or out of sort, he can sense it; if someone is lurking around or following him, he will feel it. The researchers at the University of Illinois in Chicago were able to do just that; guess what they named it? Spider-sense.

A group of ultrasonic sensors are positioned from top to bottom on the subject’s body. Ultrasound is sound waves at a frequency higher than the range our ears can hear; they have a fixed speed with which distances can be calculated based on the time it takes for a wave to reflect from a body it falls upon.

The simple formula $speed = distance / time$ is rearranged to give $distance = speed \times time$. Knowing the speed of the wave and the time a reflected wave reaches back to the sensor, the distance of objects from the subject at different points can be detected. The sensor is connected to a device that exerts pressure on the subject at differing strengths to imply how far or close someone—presumably an attacker—is.

The subjects were tested in different environments. In open environments with not too many close objects, the subjects were able to accurately detect people who approached them from all directions, and were even able to hit them with a cardboard weapon. When tested in closed environments such as a library, however, the subjects were confused between the library’s shelves and books, and actual attackers.

One aspiration of the researchers is to one day help blind people navigate places better.

Synesthesia Strikes Back!

Synesthesia is the peculiar phenomenon of someone perceiving one sense as another. Some people can identify each number in their mind as a color; others can imagine sounds when seeing objects of different shapes. Synesthetes are born with it; what Neil Harbisson did, however, was turning himself into one.

Founder of the Cyborg Foundation, Harbisson believes that humans do not need to evolve naturally anymore. He believes that with the current state of technology; he imagines having more and more senses through electronic devices.

Born color-blind, he was always unable to distinguish colors. To remedy this, he used a

device attached to his skull that reads the different colors in front of his eye. It then translates each color to a certain sound frequency and sends this sound to his ear through the skull, using what is known as bone conduction.

This way, not only can he distinguish colors, he says he can also see non-spectral colors normal humans cannot.

Why Ask for Directions?

Are you good at remembering directions? Do you often find yourself lost, or can you navigate your way around places with ease? If you are as clumsy as I am, you would find yourself in need of a map, a compass, or GPS. What if you yourself were like a compass? What if like migrant birds you could instantaneously tell which way is north, east, west or south? Wouldn’t that make things much easier for you?

Peter König, a scientist at the University of Osnabrück in Germany, created a device called feelSpace. It is made of a belt with 13 vibrating pads all around it. The pad pointing north buzzes and vibrates telling the subject which direction north is.

One of the subjects reports that after using it for six weeks he had an impeccable sense of direction. He could be miles away from home and know exactly at what direction his house is and imagine its current location relative to his.

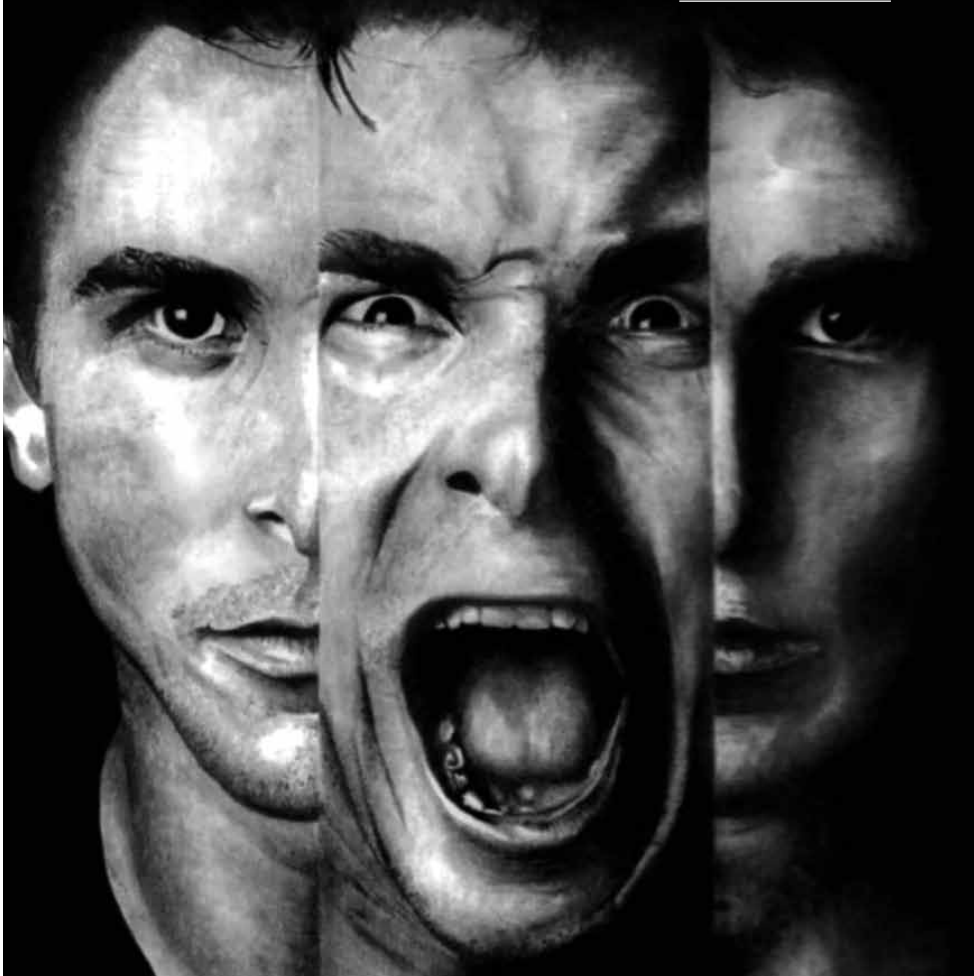
The downside to this experiment, however, was its end; after the subjects removed the belt they were not the same without it. They started feeling claustrophobic and disoriented; one of the subjects is obsessively using GPS devices to make up for the belt experience.

We are at the advent of very futuristic technologies; one day we may evolve from what we are into super cyborg humans. What will humans be like in 50 years? Will we be better, or will these developments be the end of us? Do you think such unnatural developments should be attempted in the first place, or would they be an abomination? Until now, when nothing has yet been perfected, one can only wonder.

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By: Ahmed Ghoneim



TRICKY SENSES

The five senses are our gateway to the world; they are the only way through which we can know what is going on around us. We believe that they accurately show us the truth; however, they can sometimes betray us.

When you open your eyes in the morning, what do you expect to see? You expect to see a normal scene; perhaps the inside of your room. So, unless your room is a messy disaster, or there has been a natural disaster while you were sleeping, all should seem well in the morning. For people like me, it does not always go this way.

WHILE YOU WERE SLEEPING

As someone who considers sleeping the most important part of my day, it was odd that there were days when I was terrified of sleeping. Some people have nightmares, but what makes them feel safe is that they know when they wake up it will

all be fine. Unfortunately, I wake up to see my nightmares in front of me.

The Witch Riding Your Back

It starts with a tingling sensation; you cannot move your legs or arms, you feel paralyzed. You see your room clearly but you are incapable

of talking; you want to call out, to scream, but you are unable to. There is an ominous presence in the room; you may see or hear it, you may feel it is going to attack you, abduct you. It might even sit on your back and smother your breathing.

How long are you going to stay this way? Who is this evil presence and what is it going to do to you? Will this paralysis ever end? It does in a few minutes; it is fine now, but what was that? That was a condition called "sleep paralysis".

Sleep paralysis—a condition more common than you might think—affects about 6% of the general population; it is one of several phenomena that occur during hypnagogia; the transitional

state between wakefulness and sleeping or vice versa. It happens either when you are entering sleep or waking up, due to a disruption in one of the stages of sleep known as Rapid Eye Movement (REM).

REM sleep is the stage in which you have most of your dreams. To protect you from acting them out and possibly hurting yourself, your nervous system shuts down most of your muscles in this stage by deactivating the release of certain neurotransmitters. The absence of these transmitters render you almost completely paralyzed in a state known as REM atonia.

Normally, when you wake up, your body will snap out of the REM atonia and you will be able to move. In cases of sleep paralysis, however, you wake up, but you are still partly in REM sleep. The two phases—sleep and wakefulness—overlap, leading your body to take more time than expected to release the neurotransmitters, the absence of which is paralyzing you.

This is how a sleep paralysis episode starts. Aside from the paralysis, you will probably hallucinate and feel a sense of danger, or imagine a heavy presence suffocating you. Some people even imagine leaving their bodies and floating above them!

I have had this condition ever since I was young, and I never understood it until recently. Thanks to the Internet, now I know what it is and how it happens, and I have understood what behavior aggravates it.

First of all, sleep paralysis is increased by stress and irregular sleeping. Secondly, its frequency is higher when you are sleeping on your back. Thirdly, it can be brought on by the overuse of stimulants such as coffee. In the end, scientists have discovered that it exists in some of us for purely genetic reasons.

Around the world and throughout history, sleep paralysis has been known and recorded. It has always been connected to paranormal explanations such as magic and demonic possession. The most common connotation it has is with a malevolent being suffocating a person on their back; this being has been named a *mare*, from which the world nightmare emerged. In Arabic it is called *Al-Gathoom*; African and Southern American cultures call the phenomenon "The witch riding your back".

Wizard of Oz Mornings

Another even more common hypnagogic hallucination that occurs due to an eye phenomenon not involving paralysis is “phosphenes”. This phenomenon involves seeing light, and by extension, images where there is none; it is possible that your eye may see things that do not exist at all.

Phosphenes exhibit themselves in the most normal of circumstances, such as when you apply a little bit of pressure on your closed eyes and see moving patterns in front of you. You may have also experienced “seeing stars” when you sneeze or stand up too fast; these are the typical, expected manifestations of phosphenes. The unexpected one is, however, when you have just woken up.

It can take any form your brain fathoms; a small dark spot or a colorful detailed image akin to something from the fantasy world of the Wizard of Oz. You are not paralyzed this time, and there is nothing pressing against your back; you can even get up. It will not last very long and you are not expected to panic as much as you would with sleep paralysis.

Sleep Crashing

You may not only see things during hypnagogia; there are also common cases in which one hears things. Have you ever gone to sleep and heard a sound as if someone was calling you? Has this feeling been possibly accompanied by a sensation that you are falling, after which you jerked yourself awake?

Auditory hallucinations occur while going to sleep, and can range from light music, to a loud crash or bang, or speech of course. An associated phenomenon to hypnagogia is the hypnic jerk, which is like that dream in which you keep falling and wake up before hitting the ground, except that it usually happens when you are still entering sleep and your body will jerk waking you up.

It is not exactly known why a hypnic jerk occurs, but there is a

theory about it. When you are drifting into sleep, your body undergoes a few changes; your breathing starts to become rhythmic, your body temperature drops, and your muscles start to relax as well, which is not the same as the paralyzed state of REM sleep. In fact, some of those changes are very similar to what happens to someone who is falling; the theory suggests that this tricks your brain into thinking that you actually are falling, startling you into waking up.

WHILE YOU ARE AWAKE!

The comforting thing about all those hypnagogic hallucinations is that they happen around the time you are sleeping. When you are fully awake and on your way to work, you will just tell yourself that this was a silly little dream-like incident and forget all about it; after all, it did not really interfere with your waking life. However, what if your senses could trick you even when you are completely awake and out of bed?

Seeing Things

If you have watched the film “A Beautiful Mind”, you would have seen how wakeful hallucinations are like; from Hollywood’s perspective, anyway. Rather than fleeting images or incidents that are very closely related to sleep, these hallucinations happen when you are totally awake and could have disastrous consequences. The most popular culprit behind those hallucinations is schizophrenia; a mental disorder that affects about 24 million people in the world as of 2011.

Paradoxically, schizophrenics who hallucinate have a much better chance at recovering than the ones who do not. The fact that hallucinations are not something normal you might experience if you are sane makes a person more ready to get rid of them; they are just not typical enough to be accepted and lived with.

People with schizophrenia and experience depression, anxiety, and emotional problems, but not

hallucinations, are the ones who have more trouble getting better. That is because those symptoms are something they have already normally experienced before; they are thus not atypical enough.

Schizophrenics may think that their hallucinations are real; even if they are told that these things are not, they may not believe it. This is because their actual consciousness believes that they are seeing or hearing these things. What is peculiar is when you have a hallucination that you know is not true and your mental health is normal.

In 1926, French neurologist Jean Lhermitte diagnosed the first case of a neurological disorder “Peduncular Hallucinosis”. His 76-year-old patient told him that she saw images of colorfully dressed people who were not there. The woman did not have any signs of mental disorder and she saw these visions at a normal conscious state.

The cause for Peduncular Hallucinosis (PH) is not mental disorder; it is purely neurological. What happens is that certain parts of your nervous system relating to your vision start to develop lesions—a form of tissue damage—that cause their function to be impaired. In most cases, however, the subject was aware that their hallucinations are not real, and did not usually have or develop psychosis.

Hearing Things

We all have a voice in our head. While reading this article, you are most probably not moving your lips, but reading it with that voice. Sometimes we converse with ourselves when making a tough decision, but in the end you know that is just you inside there.

If the voice in your head is telling you to do something, you will do it because you know that is you thinking of it. Or is it? How can you be sure it is your voice in there? What if you started hearing someone else in your head? Someone telling you to do something terrible, perhaps?

It is not necessarily a sign of mental illness; it is something that a lot of people have reported happening to them at least once in their lifetime. Research has shown that there are many who have lived their whole lives with this phenomenon without ever seeking medical assistance. Some even find those voices comforting and inspirational; but they all agree that it is not their own voice and they do actually hear it as if someone else “inside” them was speaking to them.

A voice hearer, as mental health professionals call them, may find their experience a little bit darker than usual. The voice might start to issue them commands; these commands may very well be dangerous to the person hearing them or the people around him/her. It has been a common defense in lots of criminal cases that the defendant was hearing a voice that told them to commit the crime.

The murder of John Lennon, one of the most famous murders of all time, was committed by a man named Mark Chapman. Mark had read a book entitled “The Catcher in the Rye”; he was carrying it with him on the day he murdered Lennon. Mark sat in front of Lennon’s house for hours until he emerged, and shot him four times. Apparently, he was thinking that the main character from the book was talking to him; he said in an interview that he heard a voice telling him to “do it”.

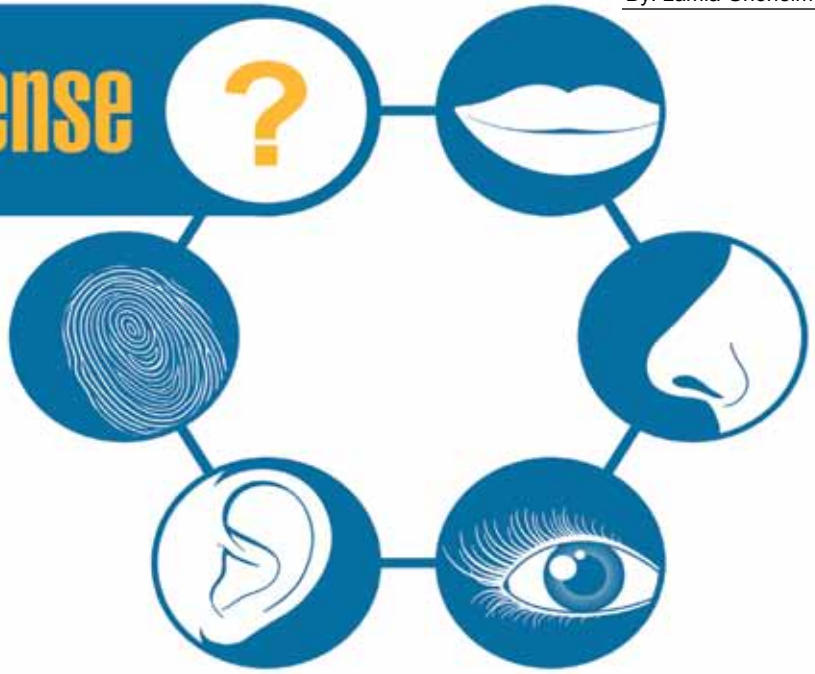
It is a scary world out there; with all these diseases and possible causes of hallucination, it is a wonder that most of us lead normal lives. You could go crazy just worrying about the numerous things that may go wrong with your brain. So, instead of worrying, just let it be! If something happens, it happens; you will deal with it if the time comes.

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The Sixth Sense



I do not claim to hold the ultimate answer to this centuries-old question. Years of youth wasted away watching psychic thrillers, and reading pocket novels of doctors chasing the supernatural does not make one an expert on paranormal activities, neither do days of vigorous Internet research on the extra sensory make one fit to give a definite, indisputable answer to this mystery.

Personally, I lean towards believing in the existence, and in the power of this confounding phenomenon. My reasons for swaying to this side of the argument, both scientific and spiritual as you will soon discover, might help you make up your own mind on the matter, using your own creative thinking and open-minded wisdom.

What I am referring to here is not the same "sixth sense" of Bruce Willis's blockbuster movie of the same name—in my opinion, the movie unjustifiably gave the phenomena bad reputation; I mean what scientifically literate adult would believe that spirits who are unaware they are dead have come to visit a lonely nine-year-old boy who can "see" dead people?

The sixth sense referred to here is actually the ability of a human being to see a glimpse of the future, or gain some kind of knowledge of the unknown, through a mysterious sense that is beyond the recognized physical senses—without the help of unknowingly dead spirits that is.

Truth be said, the phrase itself is quite misleading, since it implies that there is only one additional sense besides the five traditional physical senses, which we already established was one big misconception. However, since the belief in the "sixth sense" dates way back before the additional physical senses were discovered, the old phrase has stuck as the layman term for Extrasensory Perception (ESP) phenomena.

The phenomena includes different "powers", mainly telepathy, or thought transference between persons; clairvoyance, or supernormal awareness of objects or events not necessarily known to others; and precognition, or knowledge of the future. It also refers to intuition, or that hunch or gut instinct some people—myself included—claim to have saved them from many misfortunes.

The study of such phenomena is parapsychology, which dates back to the late 19th century. Since then, parapsychologists have conducted numerous studies and experiments in an effort to provide compelling evidence for the existence of ESP. These experiments have explored all kinds of ESP, mostly focusing on mindreading.

In the most typical of these experiments—such as the famous Ganzfeld technique—one person, the sender, goes through a deck of cards, each depicting one of five symbols, while another person, the receiver, tries to determine what symbol

the sender is looking at. To eliminate any tips from body language, the sender is often shielded from view. If the receiver correctly identifies the symbol more often than could be explained by chance, it suggests that ESP does exist.

The consensus of the Parapsychological Association is that certain types of ESP phenomena such as psychokinesis⁽¹⁾, telepathy, and astral projection⁽²⁾ are well established. They point to several studies that cite evidence of the phenomenon's existence.

Yet, this view is not shared by the rest of the scientific community, which remains skeptical of the phenomena and lists it as pseudoscience. They dispute the positive interpretation of results obtained in the studies, as they argue that they were not successfully replicated, small in effect, and not set in a strictly controlled setting.

Whether the laboratory evidence proves the existence of the ESP phenomena or not, the real reason for the widespread belief in its authenticity are the more remarkable reports of spontaneous and stronger ESP experiences and psychic abilities. Over the millennia, numerous people everywhere in the world have reported strong ESP experiences and/or psychic abilities, some more convincing than others.

One of the most famous psychics of all times, Nostradamus (1503-1566), is said to have collections of psychic predictions that apparently foretold significant historical events such as the rise of Napoleon, the French Revolution, the Great Fire of London, the rise of Adolf Hitler, and the 9/11 terrorist attacks.

The reason why his prophecies are not justified as evidence for the existence of the sixth sense is that they are undated, and are subject to both poor translation and misinterpretation. Nevertheless, his predictions and the predictions of others with similar proclaimed abilities provide valid argumentative ground supporting the existence of the ESP phenomena.

Back to modern times, in the 1970s, the world was surprised to discover that the US Government, among others, has been investigating ESP, and has reportedly spent millions of dollars recruiting and training psychic spies during the Cold War.

Similarly, in the year 1989, Sony secretly founded a lab named ESPER, with the sole purpose of investigating ESP. Years later, the lab closed down, but when asked about the ESPER lab's research, Sony Labs spokesman said in his memorable statement to the South China Morning Post: "We found out experimentally that: Yes, ESP exists, but that any practical application of this knowledge is not likely in the foreseeable future".

More recently, following the Asian tsunami, scientists struggled to explain reports that primitive aboriginal tribesmen had somehow sensed the impending danger in time to join wild animals in a life-saving flight to higher ground.

Of course, our account does not essentially account to all kinds of reported ESP phenomena—many of which are more likely to be acts of fraud than premonitions or genuine abilities—but it is enough to prevent one from dismissing the whole sixth sense concept as an illusion, and to rather think of it as a mystery that is open for discussion and research.

Glossary

(1) **Psychokines** is refers to the direct influence of mind on a physical system that cannot be entirely accounted for by the mediation of any known physical energy.

(2) **Astral projection** is an interpretation of out-of-body experience that assumes the existence of an "astral body" separate from the physical body and capable of traveling outside it.

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In Egypt, most of us are familiar with natural remedies; however, our perceptions usually tend to be bound with foods or beverages. For instance, if you are suffering from high-blood pressure, you will be advised to drink cold hibiscus, or if you are constipated, you will find plenty of people telling you to eat dried apricots or figs to ease your digestion. When it comes to remedies that have to do with other senses though, our knowledge is pretty limited.

Concepts such as aromatherapy or music therapy are being used in many contexts recently. You might have spotted any of those phrases while reading an advertisement about a spa or a relaxing resort, or even while checking out the label of a beauty product.

What do such terms mean exactly? Are such remedies beneficial and helpful as some people claim them to be? If yes, where can you go to ensure that you get professional help? Are there any certified therapists who are licensed to practice such treatments?

Aromatherapy refers to the use of essential oils that are extracted from plants in healing. These oils are usually inhaled, but there are certain cases where such oils are taken by mouth or even used during a massage; the composition of each oil affects its use and benefits.

In ancient Egypt, Rome, and China, people extracted oils from plants that were available at the time for therapeutic purposes as well as in the manufacturing of beauty products. However, scientists did not pay much attention to the benefits of essential oils until the beginning of the 20th century, when Renee Maurice Gattefossee, French chemist, discovered the benefits of some natural oils.

While working in his laboratory, he had an accident and burnt his hands; coincidentally, he had lavender oil, which he applied to the burn, gradually noticing that his condition was getting better. Later on, the discovery became the new trend in healing wounds, burns, and gangrenes that were prevalent during World War I.

Although it has been a long time since the establishment of "Aromatherapy" as a discipline, many researchers are still not sure

By: Noha Rahhal



BACK TO NATURE: ALTERNATIVE THERAPIES!

about the mechanism of essential oils. In case the oils are inhaled, it is believed that smell receptors communicate with parts of the brain responsible for preserving memories and emotions; that is why some smells remind us of certain memories or incidents. However, there is another hypothesis that the molecules that construct essential oils interact in the blood's hormones and/or enzymes.

When it comes to aromatherapy conducted through massage, there are assumptions that essential oils are not the only therapeutic agent in the process, to the fact that there is some sort of physical therapy involved. In this case, oils are only absorbed through skin, and thus their effects are limited to relaxation purposes only.

As mentioned, **lavender oil** is said to help heal wounds and burns; it is also used as a source of relaxation. **Jasmine, chamomile, and peppermint** are also used for fighting stress, as well as anxiety and depression; **mandarin oil** is believed to reduce agitation; while **rose, sandalwood, and cedar wood** are said to ease feelings of fear and anxiety.

On the other hand, **sage oil** has been claimed to boost short-term memory performance; **lemon, orange, and grapefruit oils** are used as antioxidants and are also believed to help revitalize and uplift a person's spirits; while **bergamot and rosemary oils** are believed to boost self-esteem and confidence.

Although essential oils are purely natural, they have to be used under professional guidance. If massaged, some highly concentrated oils can cause skin irritation; moreover, some oils may cause reactions on the skin if used excessively.

Nevertheless, massaging oils are considered the safest method of aromatherapy; inhaling or even taking oils orally can be life-threatening processes if safety measures are not considered. Some oils, such as Eucalyptus oil, are very toxic; that is why professional help is needed when opting for aromatherapy.

This is not easy though; aromatherapy's efficacy is still not scientifically proven. Moreover, there are not any universities or boards that certify aroma therapists. However, there are many organizations where aromatherapy

is taught as part of other disciplines, such as massages or chiropractic.

As Aromatherapy, sound therapy has been used since ancient times. In Asia, for instance, sound has been used in prayers and meditation to promote relaxation and boost wellness. Music therapy was also addressed in the 10th century by the Turco-Persian Alfarabius who discussed the effect of music on the soul in his *Meanings of the Intellect*.

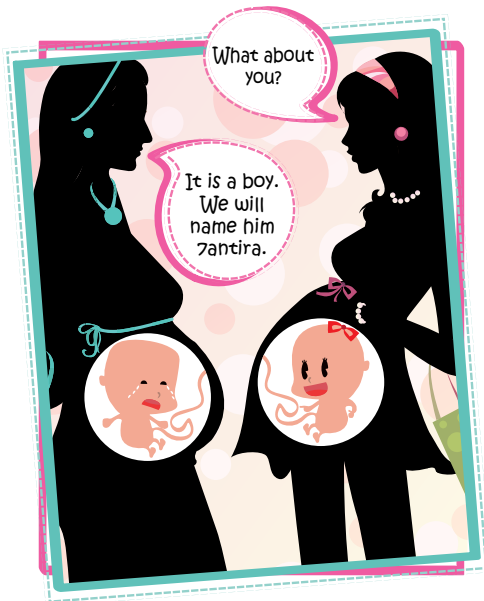
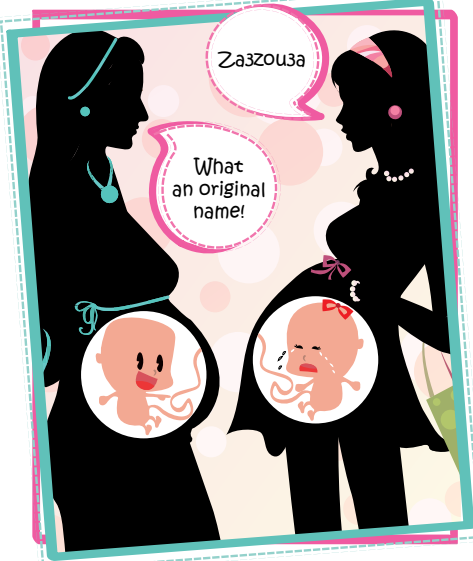
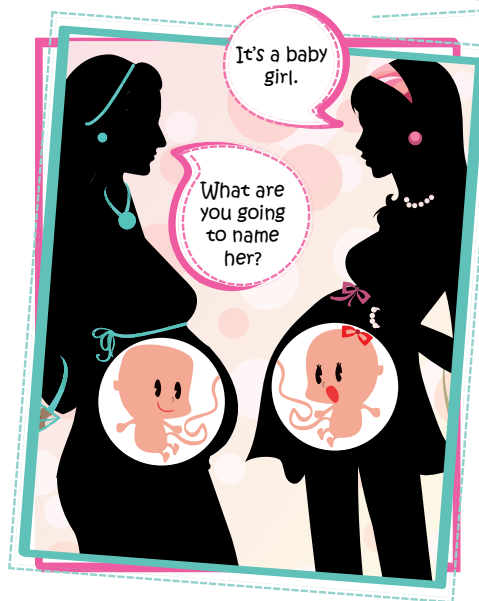
Seven centuries later, Robert Burton, English Scholar, addressed the same topic in his book *The Anatomy of Melancholy*. Despite being recognized as a form of therapy since ancient times, sound therapy has not been recognized until the beginning of the 21st century.

Sound therapy practitioners believe that all human beings are made up of different energy frequencies. Thus, they use sound and music frequencies to rebalance and interact with people's own frequencies, and thus affect their energies and moods.

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WOMB'S CAN HEAR!



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The five senses of the embryo keep developing all along pregnancy. By week 32, the sense of touch becomes developed and almost every part of the baby's body is sensitive to temperature, pressure, and pain. Taste buds fully develop by weeks 13 to 15, allowing the baby to taste the amniotic fluid. By week 18, the retinas of the eyes can detect small amounts of light, and by week 33 the pupils allow the baby to see dim shapes. The baby can smell by week 28, and can hear and recognize voices by the end of the second trimester.