

Amazing Facts About Your Senses

Sight, hearing, taste, touch, and smell: Our five senses are what help us make, well, sense of the world around us. But scientists are still discovering how they work—and how you can sharpen yours. Read on for a comprehensive look at the new science of your senses.

SIGHT

The human eye is an exceptional tool for gathering light; it can distinguish among 500 shades of gray and spot the light of a candle 14 miles away. But for all the eye's extraordinary ability, seeing is a function of the brain—humans' visual cortex is more developed than that of any other mammal. Vision demands that the brain differentiate foreground from background, and edges from lines—skills that even the world's most powerful computers have been unable to match. Your brain makes sense of shapes and symbols by putting them together like a jigsaw puzzle, organizing fragments into a coherent whole. (Movies work because the brain stitches a series of frames into an unbroken stream.) We develop this ability as infants—which explains why patients who grew up blind but have had their sight restored often struggle to understand what they are seeing: Their brains can't initially distinguish an object from its background, or accurately separate two overlapping objects. (A chair and desk would be perceived as a single flat image, like an abstract painting made of rectangles.) Optical illusions work by exploiting the mind's tendency to try to find order in patterns—a face in the pockmarks on a cement wall—or make sense of an impossible image, like the endless climbing staircase in an Escher drawing.

HEARING

In south sudan, near the border with Ethiopia, a tribe known as the Mabaan reportedly live in a place of such quiet that their ability to hear has become astonishingly acute. Legend has it that even the oldest Mabaan can make out the words of another tribesman whispering to him from across a wide field. In theory, at least, any one of us could do the same, provided we spent our lives similarly sheltered from noise. At birth, our ears are pristine organs, capable of discerning among more than 300,000 sounds. (After years of exposure to loud noises, the hair cells on the cochlea, in the inner ear, flatten, becoming less sensitive.) Yet even as we age, our eardrums remain finely tuned—they can pick up sounds so faint that the eardrum itself moves a distance less than the diameter of a hydrogen molecule. (This sensitivity developed to protect us from predators.) Our brain processes sounds a thousand times faster than images and registers sounds even as we sleep. This constant bath of noise affects everything from our concentration to our health. Researchers have found that living in loud areas can raise blood pressure by an average of 5 to 8 percent. Even our ancestors understood how sound could damage as well as delight: The word noise comes from nausea, the Latin word for sickness. But sound can also be a positive force. A study conducted on premature infants, for instance, found that they were able to leave the hospital sooner if soft music was played while they slept.

TASTE

Taste, designed in part to help us reject harmful foods, has long served as the body's primary defense against poison. As befits its role, the system is lightning fast: The body can detect taste in as little as .0015 seconds, compared with .0024 seconds for touch and .013 seconds for vision. To be tasted, food molecules must fall into a cluster of cells called a taste bud, more than 10,000 of which are spread over the tongue, palate, and inner cheek. The taste bud sends a signal to the brain, which then determines everything from whether a food tastes "safe"—which in most cases means it's not too bitter—to whether we enjoy it. In a part of the brain known as the anterior cingulate, tastes get married to an emotional reaction: disgust for rotten meat, say, or delight for a sweet strawberry. But while some tastes are innate—nearly all humans are born with a sweet tooth—there's also evidence that taste can be nurtured. Studies have shown that babies prefer foods they first "tasted" in the womb, or while nursing. (Traces of certain flavors, including garlic and vanilla, turn up in amniotic fluid, and also in breast milk.) More recently, food scientists have found ways to manipulate our likes and dislikes. One chemical, extracted from a West African fruit, binds to taste receptors in a way that makes even the sourest lemon taste as sweet as lemon pie. Food scientists have jumped on the discovery, scrambling to devise additives that would trick our taste buds into perceiving sweetness in the absence of actual sugar.

TOUCH

Of all your senses, touch is the most difficult to fathom doing without. With hundreds of nerve endings in every square inch of skin, your body functions like an antenna, receiving a constant stream of information ranging from the firmness of the chair you're sitting on to the heat of the sun through the window. Touch is the first sense we develop in utero, and it is crucial to survival. Babies can die from lack of it, and as adults, touch helps to protect us from harm. Some nerves are specialized to feel texture and pressure, others to detect temperature or register pain. Nerves known as proprioceptors sense the position of our body parts in space—enabling us to cross our arms with ease, or lean out a window without falling. But touch influences us more subtly as well. A recent study from Yale University found that people seated on soft chairs during mock negotiations with a car dealer were likely to make an offer several hundred dollars greater than people who were seated on hard chairs—a

sign of how the brain interprets comfort (the physical sensation) as evidence of broader well-being.

SMELL

Smell may be our most evocative sense. Studies have shown that people can recall a scent with 65 percent accuracy after one year; visual memory sinks to 50 percent after just a few months. And because smells are processed by the same part of the brain that handles memories and emotions—the temporal lobe—we respond to them with rare intensity. Decades later, a passing scent may summon a memory of our first-grade classroom, one so vivid that we seem transported across time and space. Though not on a par with our canine friends', the human nose is still something of a marvel. An ordinary person can pick up a whiff of skunk when the amount of scent in the air is less than one ten-trillionth of an ounce. The nose can also determine where a smell is coming from, pointing you—for better or worse—toward the source. Still, our sense of smell is deeply individual: Some people can't smell mushrooms; others can't sniff out freesia. These differences are mostly genetic, but simpler things—small physiological changes and factors like mood and medication (antibiotics, statins, and blood pressure drugs can all affect our sense of smell)—enhance or diminish our ability to detect odors. In fact, it's believed that we never experience a smell the same way twice, since the sensitivity of our nose changes from hour to hour and day to day.

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1. Having 20/20 vision, the standard for normal visual acuity, means you can clearly see an image—like the letters on an eye chart—from a distance of 20 feet. (Having 20/100 vision means you need to be five times closer, just four feet away, to see the same letter clearly.)
2. The world record for human vision was set by Dr. Dennis Levi in 1985. He was able to identify a bright line a quarter of an inch thick from one mile away.
3. Sitting too close to the TV may give you a headache, but it won't wreck your vision. The same is true of reading in dim light.
4. One in 20 men is at least partially color-blind, and color-blindness is 10 times more common in men than in women. All babies are color-blind at birth.

5 Things You Didn't Know About ... Hearing

1. Even small noises cause the pupil of the eye to dilate. This may be why surgeons, jewelers, and others who perform delicate manual operations tend to be bothered by uninvited noise: It subtly blurs their vision.
2. A large meal will temporarily make your hearing less sharp.
3. Your ears can determine the direction from which a sound comes quite well, but are less adept at assessing how far away the source is.
4. Ninety percent of a young child's knowledge is attributable to hearing background conversation. More than a third of children with even slight hearing loss, researchers estimate, will fail at least one grade.
5. Tinnitus—a buzzing or ringing sound in the ears—afflicts roughly 15 percent of the U.S. population. The condition is ancient; it's described on clay tablets from Assyria.

4 Things You Didn't Know About ... Taste

1. The taste map you learned growing up (the one that showed the tip of the tongue registering sweet flavors; the back, bitter; and the sides, salty and sour) is a myth. While receptors for the five basic tastes do exist, they're not confined to specific areas but are distributed across the tongue.
2. French nutritionist Philippe Besnard recently discovered taste buds that seem to respond specifically to the flavor of fat..
3. It's believed that roughly one-quarter of all Americans are "super-tasters," and another quarter are "non-tasters." Super-tasters have

more taste buds and are often sensitive to bitter foods. Non-tasters have fewer taste buds and tend to have a high tolerance for spicy foods.

4. Your taste buds die off and regenerate every few days. As you age, the cycle slows, dulling your ability to taste—which explains why older people tend to like their foods saltier and spicier.

5 Things You Didn't Know About ... Touch

1. The skin is your body's largest organ and contains more than 4 million sensory receptors.

2. Among the body's most sensitive areas are the lips, the back of the neck, the fingertips, and the soles of the feet. The least sensitive is the middle of your back.

3. Being touched can reduce stress, by lowering levels of hormones like cortisol.

4. Pain is the body's warning system, and it's thorough: People have more receptors for pain than for any other sensation.

5. Thermoreceptors perceive sensations related to temperature. But they stop being stimulated when the surface of the skin drops below 41 degrees (which is why your skin starts to feel numb in icy temperatures) or rises above 113 degrees (at which point pain receptors take over to avoid burns).