Sense and Sensibility

By Kirsten Weir

A new look at the weird and wonderful senses of taste and smell

Look. Listen. When it comes to the senses, eyes and ears get most of the attention. But don't count out your nose and tongue. The senses of smell and taste are just as remarkable.

The flavor of a strawberry and the stench of dirty socks are actually made up of invisible, natural compounds. "Smells and tastes are chemicals," explains Charles Wysocki, who researches smell at the Monell Chemical Senses Center. At that scientific institute in Philadelphia, dozens of scientists study nothing but smell and taste. Most people think of chemicals as bad things, Wysocki says. But if we couldn't detect them, we'd never experience the flavor of chocolate or the delicious aroma of baking bread.

The Nose Knows

Smelling serves some important purposes, says Wysocki. Scientists believe that early life-forms developed the sense to help them recognize other members of their species. Sniffing also helped our early ancestors locate foods that were safe to eat.

Scientists say the human nose can detect about 10,000 different scents. Sometimes, we're not even consciously aware of those odors. Lab studies have found that people can tell the difference between the scents of friends and strangers as well as between those of men and women. We can even smell fear. When volunteers smelled sweat samples taken from freaked-out first-time skydivers, the fear centers in the sniffers' brains switched on. Scientists say tuning in to other people's alarm could help us avoid danger.

Have you ever caught a whiff of a certain scent and had an old memory pop up? Despite popular belief, Wysocki says, smells in and of themselves aren't actually more memorable than other sensations are. But the part of the brain that processes smells is located next to the limbic system—the area in charge of memory and emotions. When you smell something, "it's basically like taking an interstate highway" from the nose to the limbic system, explains Wysocki. Sensory information from the eyes and ears, on the other

hand, must travel farther to reach the limbic system—"like taking county roads." That's why smells are so often emotional, Wysocki says.

Tasty Basics

We can detect a wide range of smells, but our taste buds pick out only a few flavors. For a long time, scientists believed only four basic tastes existed: sweet, salty, sour, and bitter. Recently, they added a fifth taste to the list: umami. Umami is described as the savory taste in foods such as soy sauce, mushrooms, and tomatoes. Not all scientists agree that umami is one of the basic tastes, though. And some scientists argue that many more basic tastes have yet to be discovered. The taste case isn't closed yet.

Scientists do agree that the sense of taste evolved to keep us healthy, says Linda Bartoshuk, a taste researcher at the University of Florida. We like sweets because in the ancient world, sugar was a sign that food contained a lot of energy and was probably safe to eat. On the flip side, toxic plants often taste bitter. Our ancestors developed a dislike for bitter food to protect them from poisons.

For some people, bitter foods taste especially awful. About 15 percent to 25 percent of people are supertasters. Those folks "have more taste buds. They experience taste much more intensely than other people do," Bartoshuk says. Do you detest veggies such as broccoli or Brussels sprouts? If so, you might be a supertaster!

The sense of taste doesn't change much as you get older, Bartoshuk adds. But fortunately for supertasters (and regular tasters who just don't like broccoli), there's one exception to that rule. The ability to taste bitter flavors tends to fade with age.

Partners in Sense

The senses of taste and smell work hand in hand. Much of a food's "flavor" actually stems from its smell. When you bite a lemon, your tongue just tells you it's sour. The fruit's aroma tells your brain whether you've swallowed a lemon or a lime. "The sense of smell is providing a lot of information about what you're eating," says Wysocki. That close link explains why foods often taste a bit off when you've caught a cold and your nose is congested; smell information is being blocked.

As interesting—and important—as the chemical senses are, there's still a lot we don't know about them. One mysterious smell condition is phantosmia, in which people experience phantom smells. One woman who wrote about her

case in *The New York Times* smelled the imaginary odor of dirt every day for a year—until it was replaced with the aroma of burned chili.

Like vision and hearing, the sense of smell becomes less accurate as we age. Some people even develop anosmia, a loss of the sense of smell that can be caused by infections, diseases, pollutants, and some medications. Smoking cigarettes can also damage the sense of smell. People who don't smell things well are often bored by food, and they may have trouble eating enough to stay healthy.

Humans have always had the ability to taste and smell. But clearly, we haven't completely figured out the chemical senses. There's much to learn and scientists are making discoveries. Still, when it comes to what we know about the senses, this is just a taste.

Take a Whiff

When you sniff a strawberry, invisible chemicals are drawn into your nose. Those odors make contact with receptor cells lining the nasal cavity, a large fluid-filled space behind the nose. The chemicals attach to the cells and switch them on. Information about the chemicals runs through nerves to the olfactory bulb (the brain's processing center for odors), which translates the information and interprets it as the scent of a strawberry.

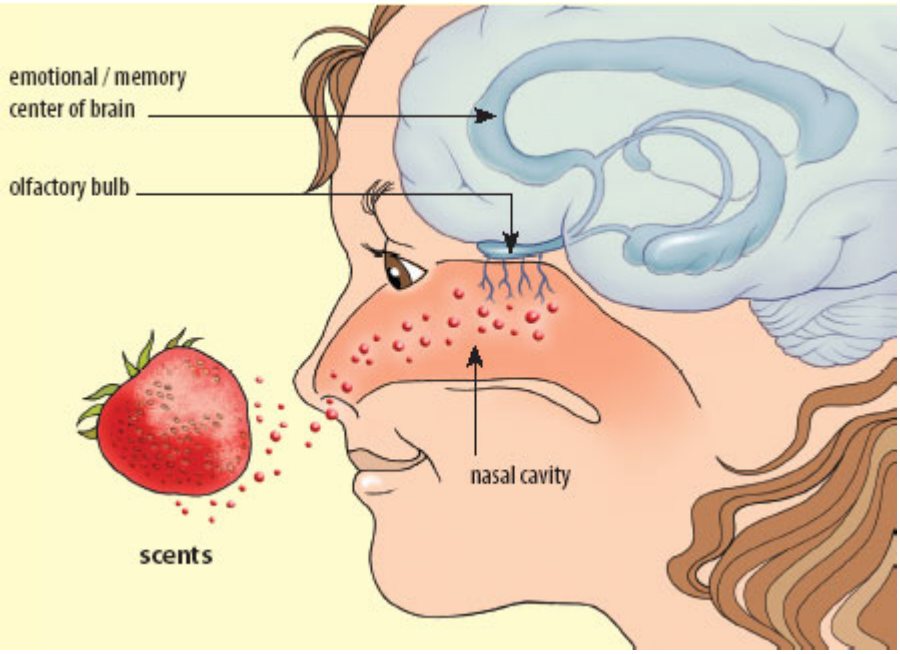

Illustration by Marcia Hartsock

It's a Miracle

What if everything you ate tasted as sweet as candy? The miracle fruit can make it happen. The small red berry, known in scientific circles as *Synsepalum dulcificum,* doesn't taste like much on its own. But it contains a protein that interferes with the taste receptors on your tongue, blocking the ability to detect sour flavors. For an hour or so after eating miracle fruit, grapefruit taste like jelly beans and lemons taste as sugary as lemon pie. How sweet is that?

Stick Out Your Tongue

Your tongue is covered with bumps called papillae. About six taste buds are buried inside each papilla. Each taste bud, in turn, contains hundreds of taste receptors. When a food, such as a lemon, touches your tongue, chemicals in that food activate the receptors in the taste buds. The taste buds send the taste information through nerve cells to the brain. It takes less than a second for the brain to translate that information, telling you that what you taste is sour. Pucker up!

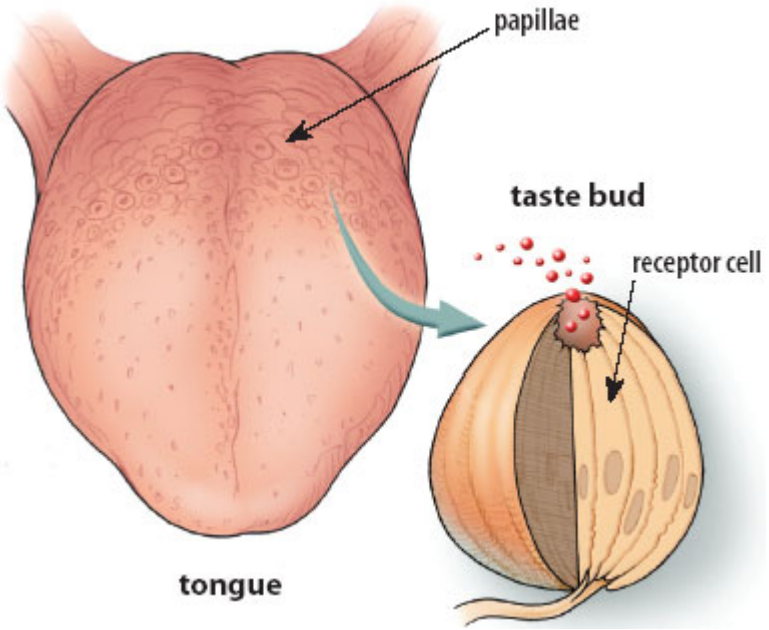

Illustration by Marcia Hartsock

Name: _____ Date: _____

1. According to the passage, how long does it take for the brain to translate the information taste buds send to it?

A an hour
B about 10 seconds
C less than a second
D about a minute

2. According to the passage, which of the following is NOT a cause of anosmia?

A infections
B some medications
C boredom with food
D pollutants

3. Based on the passage, it can be inferred from the passage that people who hate broccoli and Brussels sprouts have a good sense of which of the following tastes?

A sweet
B bitter
C umami
D sour

4. Read the following sentences and answer the question below "Most people think of chemicals as bad things, Wysocki says. But if we couldn't detect them, we'd never experience the flavor of chocolate or the delicious aroma of baking bread."

As used in the passage, **aroma** means

A crunch
B sight
C smell
D taste

5. What is the main idea of this passage?

A Miracle berries can change the way something tastes.
B Human tongues have many taste buds.
C Smell and taste are important senses that work together.
D As humans get older, their sense of smell and taste get better.

6. According to the passage, why do humans like sweets?

A. Because it gives you a rush
B. It tells us that plants are rich in sugars
C. Lets us know that it is poisonous.

7. The passage states that humans can smell fear in the sweat of other people. Why would it most likely be helpful for humans to smell other people's fear?

A. It allows us to take advantage of others.
B. Helps us to know when there might be danger around
C. Helps us to know who to help

8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

Toxic plants taste bitter, _____ early humans developed a dislike of bitter foods to protect them from poisons.

A. but
B. because
C. so
D. After

9. Answer the following questions based on the sentence below.

One woman smelled the imaginary odor of dirt every day because she had phantosmia.

Who? one woman

A. odor, everyday
B. imagines, day
C. Smelled, every day
D. woman, had

(did) What? _____

When? _____

Why? She had phantosmia

Directions: Read the vocabulary word and definition below to complete questions 10a, 10b, and 11.

Vocabulary Word: **detect** (de·tect): to notice something.

10a. Read the sentences below and underline all forms of the word **detect**.

1. Supertasters have more taste buds that allow them to detect specific tastes.

2. A dog has a very strong nose that allows it to detect smells that even humans can't smell.

3. Putting on my glasses helps me detect things better because it is hard to see without them.

4. Bats that fly around at night require a good sense of smell or hearing to detect objects so they won't fly into them.

5. My mom can always detect when I've done something wrong, even when I try to hide it.

10b. Which object is helpful for detecting something?

11. Which of the following would be more helpful to detect something at night in the woods: a flashlight or a jacket? Why?

_____

_____

_____

_____

Teacher Guide and Answers

Passage Reading Level: Lexile 970

Featured Text Structure: Descriptive – the writer explains, defines or illustrates a concept or topic

Passage Summary: This passage explains how a human's senses of smell and taste work, and some of the special things these senses can do. The passage also describes how smell and taste work together to help us taste food.

1. According to the passage, how long does it take for the brain to translate the information taste buds send to it?

- **A** an hour
- **B** about 10 seconds
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2. According to the passage, which of the following is NOT a cause of anosmia?

- **A** infections
- **B** some medications
- **C** **boredom with food**
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3. Based on the passage, it can be inferred from the passage that people who hate broccoli and Brussels sprouts have a good sense of which of the following tastes?

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- **B** **bitter**
- **C** umami
- **D** sour

4. Read the following sentences and answer the question below: "Most people think of chemicals as bad things, Wysocki says. But if we couldn't detect them, we'd never experience the flavor of chocolate or the delicious aroma of baking bread."

As used in the passage, **aroma** means

- **A** crunch
- **B** sight
- **C** **smell**
- **D** taste

5. What is the main idea of this passage?

- **A** Miracle berries can change the way something tastes.
- **B** Human tongues have many taste buds.
- **C** **Smell and taste are important senses that work together.**
- **D** As humans get older, their sense of smell and taste get better.

6. According to the passage, why do humans like sweets?

Suggested answer: Humans like sweets because our sense of taste evolved to recognize sugar as a sign that plants contain a lot of energy and are safe to eat. [paragraph 7]

7. The passage states that humans can smell fear in the sweat of other people. Why would it most likely be helpful for humans to smell other people's fear?

Suggested answer: The passage states that tuning into other people's alarm helps us avoid danger. This ability to smell fear helps us avoid danger because if someone else is feeling fear, we will become more cautious, which may help us avoid danger. [paragraph 4]

8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

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C **so**
D after

9. Answer the following questions based on the sentence below.

One woman smelled the imaginary odor of dirt every day because she had phantosmia.

Who? one woman

What? **smelled the imaginary odor of dirt**

When? **every day**

Why? **because she had phantosmia**

To the Teacher: ReadWorks recommends that you teach this vocabulary word to the whole class out loud using the four steps listed below.

Vocabulary Word: **detect** (de·tect): to notice something.

Step 1: Introduce the word

a. Teacher writes the word on the board and divides it into syllables: (de·tect)

b. Teacher says: "This word is detect. What is the word?" [All students reply together out loud: "detect."]

Step 2: Provide a child-friendly definition

a. Teacher says: "Detect means to notice something."
b. Teacher says: "In the passage, the writer talks about the ability for the tongue to detect or notice flavors. Sometimes when we have a cold, it is harder to detect or notice the flavor of our food because taste depends a lot on smell as well."

c. Teacher says: "What is the word?" [All students reply together out loud: "detect."]

Step 3: Practice the word

Teacher provides examples and additional opportunities to repeat the word. Read the first sentence out loud to your students. Begin reading it again and when you come to the vocabulary word prompt students to say the vocabulary word out loud. Then, finish reading the sentence out loud to your students.

Directions: Read the vocabulary word and definition below to complete questions 10a, 10b, and 11.

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5. My mom can always detect when I've done something wrong, even when I try to hide it.

Step 4: Check for student understanding

To the Teacher: This step can be completed as a whole class activity or as an independent practice.

10b. Which object is most helpful for detecting something?

11. Which of the following would be more helpful to detect something at night in the woods: a flashlight or a jacket? Why?

Suggested answer: A flashlight would be more helpful to detect something because it would help you see, which is good for noticing something. A jacket would not help you detect anything.

Suggested Additional Vocabulary: attention, remarkable, stench, invisible, compounds, aroma, recognize, odors, avoid, sensations, memorable, sensory, flavors, savory, toxic, congested, infections, diseases, pollutants, sniff, interprets, miracle, interferes, ability, detect, receptors, activate