

PLANT COGNITION

How Plants Feel, Learn, and Fight Back

Name: _____

Date: _____

Class: _____



Mimosa pudica — the 'sensitive plant' that folds its leaves when touched

PART 1 — Key Vocabulary

Study these words before reading the passages below.

Word	Definition
stimulus	something in the environment that causes a reaction in a living thing
calcium wave	an electrical-like signal that spreads through a plant when it is damaged
habituate	to get used to something and stop reacting to it because it is not dangerous
neurobiology	the study of how signals and nervous systems work in living things
consciousness	the state of being aware of oneself and one's surroundings
electrical signal	a message carried by charged particles through living tissue
defensive	designed to protect against attack or danger
secretion	a substance produced and released by a living organism
perception	the way a living thing senses and understands its environment
adaptation	a feature that helps a living thing survive in its environment
carnivorous	describes an organism that feeds on other animals or insects
chlorophyll	the green pigment in plants that captures sunlight for photosynthesis
competition	the struggle between living things for the same limited resources
plant blindness	the human tendency to overlook plants and underestimate their importance

PART 2 — Vocabulary Matching

Match each word on the left to its correct definition on the right.

- | | |
|--------------------|---|
| 1. stimulus | A. a substance produced and released by a living organism |
| 2. habituate | B. the tendency to overlook and underestimate plants |
| 3. consciousness | C. to get used to something and stop reacting to it |
| 4. secretion | D. an organism that feeds on other animals or insects |
| 5. adaptation | E. the state of being aware of oneself and one's environment |
| 6. plant blindness | F. a feature that helps a living thing survive in its environment |
| 7. carnivorous | G. something that causes a reaction in a living thing |

Fill in the blank with the correct vocabulary word.

1. When a caterpillar bites a leaf, a _____ travels across the plant.
2. A Venus flytrap is _____ because it catches and digests insects.
3. After being dropped many times without harm, the Mimosa plant began to _____ to the fall.
4. Scientists who study signals in plants work in the field of plant _____ .
5. Many people suffer from _____ — they walk past plants without noticing them.
6. The bitter oil a plant releases when attacked is a type of _____ .



A monarch caterpillar feeding on a leaf — triggering the plant's electrical defence signals

PART 3 — Reading Passage 1: Can Plants Feel?

Can Plants Feel?

When a caterpillar bites into a leaf, something remarkable happens. Within seconds, an electrical signal travels through the plant — similar to signals in your own nervous system. A glowing wave of calcium ions spreads from the damaged leaf down the stem and into the roots. Scientists at the University of Wisconsin filmed this process for the first time in 2019, using a fluorescent dye that glows when it detects calcium. The wave moved visibly across the whole plant in under two minutes, triggering bitter defensive chemicals. The plant was fighting back.

Researchers at the University of Missouri found that plants can also respond to sound. When scientists played the recorded sound of a caterpillar chewing near a plant — with no caterpillar present — the plant began producing defensive mustard oils. It had detected vibrations in the air and prepared its defences before any damage occurred.

Plants That Learn

Dr. Monica Gagliano ran an extraordinary experiment with *Mimosa pudica* — the 'sensitive plant' that folds its leaves when touched. She dropped the plants repeatedly from a small height. At first, every plant curled defensively. But after many drops with no harm, the plants stopped folding — they had habituated, learning that this was not dangerous. When tested a month later, they still remembered. To rule out fatigue, Gagliano then shook the plants sideways: they immediately folded again. They had genuinely learned.

Pea Plants in a Maze

In a separate study, Gagliano gave pea seedlings a Y-shaped tube. One arm was lit; the other dark. Every plant grew toward the light. Then she placed a fan blowing from the direction of the light — but blocked the light itself. The plants began growing toward the fan in complete darkness. They had learned to associate air movement with light — and used that memory to anticipate the future.

Comprehension Questions — Passage 1

1. What happens inside a plant within seconds of being damaged by a caterpillar?

2. What did University of Wisconsin scientists use to make the calcium wave visible?

3. How did the plant respond to the sound of chewing in the University of Missouri experiment?

4. What does it mean to 'habituate'? Give an example from the passage.

5. How did Gagliano prove the Mimosa plants were truly learning — not just tired?

6. In the pea plant experiment, what did the plants learn to associate with light?



Venus flytrap (Dionaea muscipula) — snaps shut on insects in under a second

PART 4 — Reading Passage 2: Consciousness, Blindness, and Battle

Are Plants Conscious?

Consciousness — being aware of your own existence — is something we associate with brains. Plants have no brain, no eyes, no ears. Yet they detect light, touch, sound, and chemical signals with extraordinary sensitivity. A growing field called plant neurobiology studies plant signalling networks as a kind of distributed intelligence: instead of one central brain, information is processed across a whole-body web of chemical and electrical signals. Most scientists are careful not to call plants 'conscious' as humans are, but they increasingly accept that plants show intelligent behaviour — sensing the environment, making growth decisions, and changing behaviour based on past experience.

Plant Blindness

Most people walk through a forest and notice the birds, the insects, maybe a deer. The plants — which make up over 80% of all living matter on Earth — barely register. Scientists call this 'plant blindness.' Our brains evolved to track moving things that could be predators or prey. Plants are stationary and seem passive, so we ignore them — with real consequences. It is harder to conserve what you do not notice.

The Battle for Survival

Plants compete aggressively for light, water, and space. Some species use allelopathy — releasing chemicals into the soil that poison competing plants. Black walnut trees produce juglone, which kills most plants in their root zone. Strangler figs take an even more dramatic approach: germinating high in another tree's canopy, dropping roots to the ground over decades, and slowly tightening them until the host tree is dead. As shown in BBC's *The Green Planet*, even the plants we call weeds are highly evolved survivors in a constant, silent war.

True or False

Write **T** for True or **F** for False.

1. ___ Plants have a central brain that processes all information.
2. ___ Plant neurobiology studies electrical and chemical signals in plants.
3. ___ Most people naturally notice plants more than animals when outdoors.
4. ___ Allelopathy is when plants release chemicals to harm competitor plants.
5. ___ Strangler figs slowly kill their host trees by blocking light and nutrients.
6. ___ *The Green Planet* showed that plants never compete with each other.

7. ___ Plant blindness makes it harder for people to care about plant conservation.

8. ___ Plants make up over 80% of all living matter on Earth by weight.

Comprehension Questions — Passage 2

1. What is 'plant neurobiology' and what does it study?

2. Why do most scientists not say that plants are 'conscious' the same way humans are?

3. What is plant blindness? Why do scientists think it happens?

4. Give one real-world consequence of plant blindness mentioned in the passage.

5. What is allelopathy? Name one plant that uses it and describe the effect.

6. In your own words, describe how a strangler fig kills its host tree.

PART 5 — Fill in the Blank

Use the word bank to complete each sentence.

calcium wave · habituate · allelopathy · plant blindness · consciousness · neurobiology · carnivorous · defensive

1. When a leaf is damaged, a _____ spreads through the whole plant.
2. After being dropped many times safely, a Mimosa plant will _____ to the stimulus.
3. The Venus flytrap is _____ — it traps and digests insects.
4. Black walnut trees use _____ to poison competitors in their root zone.
5. The tendency to overlook plants is called _____ .
6. Scientists who study signals in plants work in the field of plant _____ .
7. When a plant releases bitter chemicals after attack, it is showing _____ behaviour.
8. Whether plants possess _____ remains one of science's deepest questions.

PART 6 — Discussion Questions

Discuss with a partner or your class.

1. If plants can learn and remember, does that change how you feel about eating them? Why or why not?
2. What is the difference between reacting to something and truly feeling it?
3. Why do you think humans tend to notice animals more than plants in nature?
4. Is it fair to call a plant 'intelligent' if it has no brain? What does intelligence really mean?

Sources & Further Reading

Academic Articles

Gagliano, M., Renton, M., Depczynski, M., & Mancuso, S. (2014). Experience teaches plants to learn faster and forget slower in environments where it matters. *Oecologia*, 175(1), 63–72.

Gagliano, M., et al. (2016). Learning by association in plants. *Scientific Reports*, 6, 38427.

Appel, H. M., & Cocroft, R. B. (2014). Plants respond to leaf vibrations caused by insect herbivore chewing. *Oecologia*, 175(4), 1257–1266.

Trewavas, A. (2003). Aspects of plant intelligence. *Annals of Botany*, 92(1), 1–20.

Hedrich, R., Salvador-Recatalà, V., & Dreyer, I. (2016). Electrical wiring and long-distance plant communication. *Trends in Plant Science*, 21(5), 376–387.

Books & Videos

Chamovitz, D. (2012). *What a Plant Knows*. Farrar, Straus and Giroux. · Mancuso, S., & Viola, A. (2015). *Brilliant Green*. Island Press.

Do Plants Feel Pain? — youtu.be/LeZtPvcQofQ · Are Plants Conscious? — youtube.com/watch?v=Xm5i53eiMkU

The Green Planet (BBC) — youtube.com/watch?v=k99irWyeobo

ANSWER KEY — PLANT COGNITION

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Part 2 — Vocabulary Matching

1.	G — something that causes a reaction in a living thing
2.	C — to get used to something and stop reacting to it
3.	E — the state of being aware of oneself and one's environment
4.	A — a substance produced and released by a living organism
5.	F — a feature that helps a living thing survive in its environment
6.	B — the tendency to overlook and underestimate plants
7.	D — an organism that feeds on other animals or insects

Part 2 — Fill in the Blank

1.	calcium wave
2.	carnivorous
3.	habituate
4.	neurobiology
5.	plant blindness
6.	secretion

Part 3 — Comprehension: Can Plants Feel?

1.	An electrical calcium wave spreads from the damaged leaf through the stem and into the roots, triggering defensive chemical production.
2.	A fluorescent dye that glows when it detects calcium ions.
3.	The plant began producing defensive mustard oils before the caterpillar touched it — in response to the sound of chewing.
4.	Habituate = get used to a stimulus and stop reacting. Example: the Mimosa stopped folding after being dropped many times with no harm.
5.	She shook the plants sideways — a new stimulus — and they immediately folded again, proving they weren't tired, they had genuinely learned.
6.	They learned to associate air movement from the fan with the presence of light.

True or False

1.	F
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2.	T
3.	F
4.	T
5.	T
6.	F
7.	T
8.	T

Part 4 — Comprehension: Consciousness, Blindness, and Battle

1.	Plant neurobiology studies electrical and chemical signalling networks in plants as a form of distributed intelligence.
2.	Plants have no subjective awareness or central brain; they show intelligent behaviour but not consciousness as humans experience it.
3.	Plant blindness = tendency to overlook plants. Happens because human brains evolved to track moving animals (predators/prey).
4.	It makes it harder to care about plant conservation, leading to deforestation and habitat destruction going unnoticed.
5.	Allelopathy = plants releasing chemicals to harm competitors. Black walnut trees produce juglone, which kills most nearby plants.
6.	A strangler fig germinates in the canopy, drops roots to the ground, and gradually wraps them tighter around the host tree until it dies.

Part 5 — Fill in the Blank

1.	calcium wave
2.	habituate
3.	carnivorous
4.	allelopathy
5.	plant blindness
6.	neurobiology
7.	defensive
8.	consciousness

Discussion and essay questions are open-ended. Accept well-reasoned responses supported by evidence from the passages.