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CAN PLANTS HEAR US?

THE HIDDEN LANGUAGE OF THE GREEN WORLD

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A World We Cannot Hear

Step into a garden early in the morning, before the day is filled with the noise of human activity. Leaves sway gently in the breeze, droplets of dew glisten on petals, roots quietly explore the soil, and bees move from flower to flower. To our ears, the garden seems completely silent. Yet beneath this apparent silence, a remarkable world of signals, responses and interactions is constantly unfolding.

Plants may not have ears, a brain, or a nervous system like animals, but they are remarkably sensitive to their surroundings. They can perceive light, temperature, gravity, touch, water availability, chemicals and even mechanical vibrations. A root can alter its direction when it encounters an obstacle, while a climbing plant responds to touch as it searches for support. When attacked by herbivores, some plants release airborne chemical compounds that can alert nearby plants and activate their own defence mechanisms. Even flowers can detect and respond to vibrations associated with visiting pollinators.

Plants Are Sensitive to Their Surroundings

Though plants remain rooted in one place, they constantly sense and respond to their surroundings. This ability helps them survive, grow and reproduce.

- **Light:** Photoreceptors help plants detect light intensity and duration, influencing photosynthesis, growth and flowering.
- **Temperature:** Plants sense heat and cold and adjust processes such as germination, flowering and metabolism.
- **Gravity:** Through gravitropism, roots grow downward while shoots generally grow upward.
- **Touch:** Plants respond to physical contact. Climbers, for example, use touch to locate and wrap around supports.
- **Water:** Roots sense moisture and can grow towards areas with greater water availability, a response called hydrotropism.
- **Chemicals:** Plants detect nutrients, hormones and chemical signals. When attacked by insects, they may release volatile organic compounds (VOCs) that trigger defence responses.
- **Mechanical vibrations:** Plants can perceive vibrations caused by wind, rain and insects, and some vibrations may influence their growth and defence responses.

Can Plants Really "Hear"?

- When scientists ask whether plants can "hear," they do not mean that plants have ears or hear voices as humans do. Instead, they are exploring whether plants can detect and respond to sound-generated mechanical vibrations.
- Sound travels as vibrations through air or other materials. When these vibrations interact with plant tissues, they may trigger changes in cellular activity and physiological processes. Research has reported that certain sound frequencies or vibrations can influence root growth, seed germination, gene expression and other aspects of plant development.
- For example, studies have shown that roots can respond to specific vibrations, while exposure to certain acoustic frequencies has been associated with changes in seed germination and plant growth. However, the effects depend on factors such as frequency, intensity, duration and plant species.
- It is important to make one distinction clear: detecting vibrations is not the same as hearing like an animal. Plants do not possess ears or an auditory nervous system. Their response is better understood as a form of mechanosensing — the ability to perceive mechanical changes in their environment.
- So, can plants hear us? Not in the way we hear each other. But they may be capable of sensing some of the vibrations that surround them, revealing yet another fascinating way in which plants interact with their environment.

Flowers Can "Listen" to Their Pollinators

- Flowers may look silent, but they can respond to the vibrations produced by visiting insects. Bees, especially bumblebees, generate vibrations while feeding, which can help release pollen from flowers such as tomato and eggplant — a process called buzz pollination.
- Research also suggests that some flowers can respond to pollinator-related vibrations, potentially influencing nectar production and other floral responses. This may help plants make their reproductive resources more efficient.
- Of course, flowers do not "hear" like humans. They detect mechanical vibrations through their tissues. Over evolution, this sensitivity may have helped plants interact more effectively with their pollinators.

Plants Talk Without Words

- Plants communicate without voices, using chemical signals that travel through the air and soil. When attacked by insects or other herbivores, plants can release volatile organic compounds (VOCs) that may alert nearby plants and activate their own defence mechanisms.
- Communication also occurs underground. Roots release root exudates — a mixture of sugars, organic acids and other compounds that influence neighbouring plants and soil microorganisms. These chemicals help shape interactions between plants, beneficial microbes and fungi, influencing nutrient availability and plant health.
- In this hidden chemical world, plants are constantly sending, receiving and responding to signals — not through words, but through chemistry.

The "Wood Wide Web"

- Beneath the soil lies a hidden network formed by mycorrhizal fungi, which connect with plant roots and extend far into the surrounding soil. These fungal threads can help plants obtain water and nutrients, particularly phosphorus, while receiving carbohydrates from their plant partners.
- Through these interconnected networks, plants may also influence one another by exchanging chemical signals and resources. Such underground connections can affect how neighbouring plants respond to stress, competition and environmental changes.
- Often called the "Wood Wide Web," this underground network reminds us that a forest is not simply a collection of individual trees — it is an intricate community connected beneath our feet.

Plants Can "Feel" Touch

- Plants may not have nerves, but they can sense and respond to physical contact. This fascinating phenomenon is known as thigmomorphogenesis — changes in plant growth and form caused by mechanical stimulation.
- Climbing plants, for example, can detect contact with nearby structures and alter their growth to find support. Roots can sense obstacles in the soil and change their direction, while repeated touching, wind or mechanical movement can cause plants to develop shorter, stronger stems and altered growth patterns.
- These responses help plants adapt to their surroundings and survive challenging conditions.

Do Plants Have Intelligence?

- If plants can sense their surroundings, communicate, remember previous conditions and adjust their growth, can we call them intelligent?
- Plants constantly receive environmental information and respond through complex chemical, electrical and hormonal signals. Some can show forms of environmental memory, such as responding differently to stress based on previous exposure. These adaptive responses allow plants to adjust to drought, touch, temperature and competition.
- However, plants have no brain or conventional nervous system like animals. This has led scientists to debate whether terms such as "plant intelligence" and "plant cognition" are appropriate.
- Perhaps plant intelligence does not mean thinking as humans do. Instead, it may refer to their remarkable ability to sense, process information and adapt without a brain.

What About Music and Talking to Plants?

- Many people believe that talking to plants or playing music can make them grow better. While some experiments have reported changes in plant growth under certain sound or vibration conditions, the scientific evidence is still limited and inconsistent.
- Plants can detect mechanical vibrations, so sound waves may influence physiological processes under particular conditions. However, this does not mean that plants understand human speech or that classical music automatically makes them healthier.
- The important distinction is between scientific evidence and personal observation. A plant growing

well after being exposed to music does not necessarily prove that music caused the improvement. Factors such as light, temperature, water, nutrition and humidity can have a much greater influence.

From "Listening to Plants" to Plant-Based Technology

- Understanding how plants sense and signal their environment could transform modern horticulture. Scientists are developing sensors that can detect subtle changes in plants before visible symptoms appear, helping identify water stress, nutrient deficiency and disease at an early stage.
- Combined with AI, sensors and smart greenhouse systems, plant signals could guide precision irrigation, fertilization and climate control. Electrical and chemical signals produced by stressed plants may eventually allow growers to monitor plant health almost in real time.
- The future may therefore be less about simply looking at plants and more about listening to what they are telling us.

Why Understanding Plant Communication Matters

- Understanding how plants sense and respond to their environment is more than a scientific curiosity — it could become an important tool for sustainable horticulture and agriculture. As climate change increases heat and water stress, understanding plant signals may help us identify drought stress earlier and develop more climate resilient crops.
- Plant communication can also contribute to precision irrigation and reduced pesticide use by allowing growers to detect stress or disease before serious damage occurs. Understanding plant pollinator interactions may help protect pollination systems, while smarter green spaces and urban horticulture can improve the resilience of cities.
- The deeper we understand the hidden language of plants, the better we may become at working with plants rather than simply working on plants.

Conclusion: The Garden Is Not Silent

A garden may appear quiet, but beneath its silence lies a world of vibrations, chemical signals, electrical responses and hidden connections. Plants sense their surroundings, respond to touch, interact with microbes, communicate through chemical cues and respond to the organisms that depend on them. They may not speak in words or think as humans do, but their ability to sense, respond and adapt reveals a remarkably complex living world. Perhaps the real question is not whether plants can communicate, but whether we are finally becoming intelligent enough to listen.