

# Nature: *What Plants Talk About*

When we think about plants, we don't often associate a term like "behavior" with them, but experimental plant ecologist JC Cahill wants to change that. The University of Alberta professor maintains that plants do behave and lead anything but solitary and sedentary lives. *What Plants Talk About* teaches us all that plants are smarter and much more interactive than we thought!

[Video](#)



## Video Questions

- Out in the field, observing plant behavior is like watching paint dry,  
Unless of course, you speed things up. (3:00)
- One of the ways plants behave is through growth. (3:15)

TROPISMS		
Stimulus	Direction	Response
<b>Light</b> <i>(photo)</i>	<b>Towards (+)</b>	Positive <b>PHOTO</b> tropism
	<b>Away (-)</b>	Negative <b>PHOTO</b> tropism
<b>Water</b> <i>(hydro)</i>	<b>Towards (+)</b>	Positive <b>HYDRO</b> tropism
	<b>Away (-)</b>	Negative <b>HYDRO</b> tropism
<b>Gravity</b> <i>(geo)</i>	<b>Towards (+)</b>	Positive <b>GEO</b> tropism
	<b>Away (-)</b>	Negative <b>GEO</b> tropism
<b>Touch Pressure</b> <i>(thigmo)</i>	<b>Towards (+)</b>	Positive <b>THIGMO</b> tropism
	<b>Away (-)</b>	Negative <b>THIGMO</b> tropism

**(Video: Auxins/Tropisms)**

3. Which nutrient (*organic compound*) do you think the bug provides for the Venus Fly Trap? (4:19)

**nitrogen = amino acids = proteins**

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4. As much as **80** % of a plants total mass lives below the ground. (5:46)

5. What purpose do root hairs serve for the root? **increase surface area**

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6. The major function of roots is to **absorption**

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7. How do plants find the food they are foraging for both above and below the ground when they have no eyes, no ears and no brain? (8:30)

**By increasing their growth rate, roots grow toward their food as they hone in on the food source.**

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8. Briefly describe the experiment designed to see if the Daughter Vine can actually choose between 2 different host plants. (11:00)

*Independent Variable:* **Two different HOST plants: wheat and tomato.**

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*Dependent Variable:* **The number of time the Daughter Vine choose each plant.**

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*Controlled Variables:* \_\_\_\_\_

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What can be done to make this experiment better...more valid (11:50)

**Repeat the experiment - Use more plants - Modify the existing the experiment**

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9. What are green leaf volatiles? **Chemical scents released by leaves as they breathe.**  
*(Animals: Pheromones)*

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10. What did the 2<sup>nd</sup> Daughter Vine experiment reveal about how this plant detects its host? (12:45)

**Plants detect their host by .....**

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11. How does the tomato plant respond to being attacked by a daughter vine? (13:30)

**By releasing the chemical equivalent of a scream or an SOS.**

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12. List 2 ways in which the Wild Tobacco Plant responds to threats in its environment. (16:31)

Wild Tobacco Plant Defense Mechanisms	
Threat	Response
<b>Herbivores (plant eaters)</b>	<b>Secretes nicotine that poisons and paralyzes the invaders muscles.</b>
<b>Horned-Worm Catepillar</b>	<b>Releases a chemical SOS into the air (pheromone) that attract predators (Big Eyed Bug) to the caterpillar,</b>

13. How does the Wild Tobacco Plant know who is attacking it? (20:40)

**The Wild Tobacco Plant analyzes the saliva of the predator attacking it.**

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14. What is a tricone and how do Tobacco Plants use them to protect themselves? (22:00)

**Tricones are sweet, tasty treats produced by the Wild Tobacco Plant that caterpillars like but cause a bad case of body order shorty after eating that attract predators.**

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15. Who is the Wild Tobaccos Plant best friend? (22:30) - The Hawk Moth (The mother of the caterpillars)

16. When does the Wild Tobacco Plant bloom and why is this a good thing? (23:00)

**The Wild Tobacco Plant blooms at dusk which is the perfect time for nocturnal pollinators like the Hawk Moth to fertilize the Wild Tobacco.**

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*(BUT the moth lays eggs that turn into the caterpillars that, in turn, eat the Wild Tobacco Plant.)*

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17. How does the Wild Tobacco Plant prevent itself from being pollinated by the Hawk Moth? (24:18)

**The Wild Tobacco Plant prevent itself from being pollinated by the Hawk Moth by blooming at dawn, changing the biochemistry of its nectar and shape of flower and thus attracting different pollinators.**

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18. In the table below, list the biochemical, physiological and behavioral changes that take place in the Wild Tobacco Plant that allow it to communicate with and be pollinated by the Humming Bird. (25:00)

<b>Changes in the Wild Tobacco Plant to Attract Humming Birds</b>	
<i>Biochemical</i>	Changing the chemical makeup of its nectar and green leaf volatiles. (pheromones: air-borne chemical messengers).
<i>Physiological</i>	Changing the shape and color of its flower.
<i>Behavioral</i>	Changing its blooming time from dusk to dawn.

19. Why is being fertilized by a Humming Bird better for the Wild Tobacco Plant? (25:45)

Being fertilized by a Humming Bird avoids a whole host of other predators (*herbivores*).

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20. Why is continuously yelling for pollinators an evolutionary advantage (*adaptation*) for the Wild Tobacco Plant? (27:00)

The continuous yelling for predators increases the plants reproductive success.

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21. Spotted Knap Weed is an invasive species from Eastern Europe. (28:20)

22. What *biological control* has the rancher utilized to combat the spread of Spotted Knap Weed? (29:55)

Sheep

23. How does the Spotted Knap Weed capture and hold huge pieces of territory? (32:49)

Spotted Knap Weed capture and hold huge pieces of territory by having its roots release chemicals that kill off native grasses.

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24. Spotted Knap Weed is waging chemical warfare with its neighbors. (34:15)

25. Wild Lupin plants are immune to the chemical warfare of the Spotted Knap Weed and, in fact, release their own chemical called oxalic acid that not only protects itself, but also protects the plants around it from the Spotted Knap Weed. (35:00)
26. What is the dominant form of social interacting between plants?  
The dominant form of social interacting between plants is Kin-Recognition,
27. What 2 things do animals use **Kin-Recognition** for? (37:30)
- a) To recognize relatives and avoid mating with them.
- b) To benefit relatives in social interactions - give off warning calls when predators are near.
28. Why is mating with a relative a bad thing (*genetically speaking*)?  
Making with members of the same gene pool increases the chances of homozygous recessive disorders.
29. What is **altruistic behavior** (*altruism*)?  
Altruism is the selfless concern for the well-being of others.
30. How did the Sea Rocket siblings exhibit altruistic behavior? (40:00)  
Sea Rocket siblings exhibit altruistic behavior by having lower root allocation (decrease root growth) when growing near siblings.
31. Altruism can be defined as - doing a benefit to others at some cost to yourself.  
(40:23)
32. Douglas Fir trees can live up to 1000 years. (43:30)
33. The gills of fungi are filled with tiny spores used in reproduction. (43:50)

34. The tree provides the fungi with (PGA - Glucose)  
carbon-based sugar and the fungi provide the trees with nutrients (47:17). This is symbiotic relationship is an example of mutualism.

35. Why was C14 used in the tree communication experiment?

C14 is a radioactive isotope of C12 and used by the plant for photosynthesis and its location can be tracked using a Geiger Counter.

36. What did the C14 experiment reveal about who benefits the most from this carbon (*food*) sharing network? (50:00)

The youngest, most vulnerable tress benefits the most.

37. List 4 different examples (from the film) of how different species in an ecosystem interact with one another.

(1)

(2)

(3)

(4)

38. List 2 behaviors that some plants exhibit, which are what we perceive as very animal like behaviors.

(1)

(2)