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Nature's Secret Languages: How Plants and Animals Communicate
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Every day, the average person says 15,000 words (McClure, 2024), but have you ever wondered how many words animals and plants say? While animals and plants may not speak like humans, they have their own forms of communication.

The Unspoken Language

Figure 1: Plants communicate with each other to warn them of incoming danger.
Hanano et al. (2022)

Just like people are a part of a community, each plant is connected to another, whether they be 'brothers and sisters' or simply a plant of the same species. Plants communicate to others through chemicals transferring through their roots or even the air.

An example of plant communication underground is the 'Wood Wide Web', the term used to describe the symbiotic relationship between mycelium (a fungus) and plants roots. This relationship may allow plants to communicate, warning other plants of pests or disease, differentiating plants between friend or foe, and sending different chemicals and nutrients (The University of South Australia, 2019; Johnston and Brewer, 2023).

A form of plant communication above ground is when chemicals travel through the air. When a plant is attacked, they send out a chemical produced in a chloroplast called methyl jasmonate (MeJA) (Reyes-Díaz et al., 2016). This travels through the air to neighbouring plants and is absorbed through their leaves, activating defence mechanisms to help protect those plants from the incoming danger (Hanano et al., 2022).
Regardless of the type of communication, when a plant communicates with its neighbour, it doesn't trigger an immediate response from the neighbouring plant. Hormones released from a plant can take 1-3 days to reach a neighbouring plant, although some research has found if a plant is stressed enough, the hormones can reach a neighbouring plant within 6 hours (Gorzelak et al., 2015).

A Communication Signal

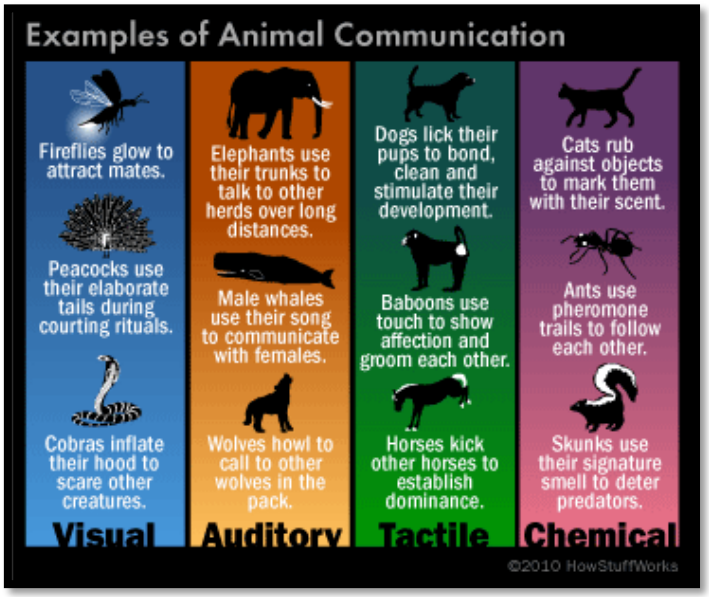

Figure 2: Every species communicates in their own way.
Toothman (2024)

Just like humans, animals communicate in many different ways. Some species communicate using visual movements, like peacocks rattling their feathers. Others use sound, like wolves howling at the moon. Some might use physical communication, like dogs licking your face to show their affection, and others use chemicals, like a skunk releasing their smell to warn you away. Regardless of how a species communicates, their individual ways of communicating play a crucial part in how they live and survive (Toothman, 2024).

While every species has its own form of communication, studies have found even individual colonies of animals have their own ways of communicating. If certain climates or environmental conditions change in a particular area, such as increased noise, certain species have been found to increase the volume of their calls in order to be heard. In some areas, the transfer of whale's calls has been impacted by ships travelling through the ocean. These disruptions may mean a whale cannot contact its pod, and other whales may not be able to hear mating calls, impacting the future population. Other animals, like birds, have been found to increase the volume of calls to be heard over loud noises of urban areas. Unfortunately, this makes their calls less attractive to mates, which can affect reproduction, lowering population numbers (Toothman, 2024).

Let Us Take a Look at Some South Aussie Species:

The Growling Grass Frog- A Species That Needs Help Bouncing Back.

Figure 3: The growling grass frog has a call that can be compared to the sound of a motorbike.
Heard (2024)

The growling grass frog (*Litoria raniformis*) also known as the southern bell frog, is a frog species native to New South Wales, South Australia, Tasmania and Victoria. Unfortunately, due to factors such as predation and habitat loss, this delightful frog is listed as vulnerable on the *IUCN Red list*, meaning many areas that large populations of these frogs used to live have depleted populations or are locally extinct (IUCN SSC Amphibian Specialist Group, 2020).

One reason why the population of growling grass frogs are depleting is communication interference. Most frog species, including the growling grass frog, use calling to communicate with other frogs, making their calls an essential part of their mating ritual. A study conducted by the *Clean Air and Urban Landscapes Hub* found that growling grass frogs struggle to make their calls heard over the noise of urban living. Their active space, the distance their communication can be heard, was dramatically affected by noise such as aeroplanes, industrial construction and even cars (Clean Air and Landscapes Hub, 2021). I recently contacted Clare Wilson; a researcher involved in studying the effects of aircraft noise on growling grass frogs. She explained that growling grass frogs are more susceptible to acoustic interference because they have a low-pitched call. When each frog calls to another, for example a mate, other low-pitched noises, such as aircraft noise or traffic, interfere with the call, making it more difficult for the call to reach the intended recipient (Wilson, Personal Communication, 9 May 2025).

Luckily, there are many efforts helping the growling grass frogs bounce back. One project is a $291,676 grant towards saving the growling grass frogs at Wirra Lo Wetlands, located in Marion, roughly 10km from the Adelaide CBD. This grant, given by the Australian Government as a part of the 2024 Saving Native Species Grant, will take place over 2 years, restoring the native plants and habitat of the area (Wetland Revival Trust, 2024). This will help to increase the habitat for the growling grass frogs, allowing them to survive and reproduce, but also successfully and comfortably communicate to one another, improving the species overall population.

Deception- From Greenhoods to Gnats.

Figure 4: A fungus gnat pollinator on a greenhood orchid.
Hayashi (2022)

We all know that pollinators are the reason why we have many of the plants we have today, but when you think of pollinators, you probably don't think of gnats. An example of gnat pollination is between the male fungus gnat (*Mycomya sp.*) and the common greenhood orchid (*Pterostylis longifolia*). These orchids are found in areas such as Lyndoch, South Australia (IUCN, 2022) or Kosciuszko National Park, New South Wales (IUCN, 2022).

Even though research has been thoroughly conducted on the *Pterostylis longifolia*, most of the orchids in the *Pterostylis* genus, such as the floodplain rustyhood (Pterostylis cheraphila) and the leafy greenhood (Pterostylis cucullata), require pollination from gnats. Unfortunately, many *Pterostylis* species are listed as critically endangered under the *IUCN Red List*, one category before being listed as extinct in the wild (IUCN, 2025). Luckily, further research into this unique form of deception is helping us understand how to help greenhood orchids.

A way to describe the deception by these orchids is like a trap. The male gnats believe the greenhood orchid is a female gnat, so they attach themselves to the flower hoping to mate. Unfortunately for the gnat, the labellum, a lip-like leaf on the flower of the orchid, snatches up the gnat, trapping it in the galea (the hood part of the orchid). Luckily for the gnat, there is a way out, but it requires them to fit through a tight part of the plant. While trying to escape, these gnats will either drop off the pollen from other greenhoods or pick up pollen from this orchid and drop it onto another plant, therefore pollinating it (Congdon, 2022).

The reason male gnats believe the greenhood orchids are female gnats is because of how the greenhood orchid communicates. These orchids produce a chemical which mimics the pheromones that a female gnat would produce. This tricks the male gnat to think it is following the scent of a female gnat and therefore tries to reproduce with the orchid. I recently contacted Dr. Tobias Hayashi, a botanist who dedicated his PHD to researching this deception in orchids. Based on his research, it is believed this pheromone scent can only be detected from less than 10 metres away, limiting the distance that the pollination can be effective. He also believes the male gnats don't gain any benefit from the process, but they also never learn to stop trying to mate with the greenhood orchids! (Hayashi, Personal Communication, 29 April 2025).

Overall, without this remarkable form of communication, greenhood orchids would not be able to reproduce, meaning their populations would cease to exist.

How Can We Help?

Figure 5: How animal communicators help pets find the purrfect homes.
Squittieri (2024)

Even though we may not notice their communication, it doesn't mean it isn't there. Here are a few ways YOU can help animal and plant communication:

1. **Support research projects**- Scientists are trying to find out more about animal and plant communication, but they need donations to make it possible!
2. **Participate in citizen science projects**- You can help scientists discover more about animal and plant communication by observing and recording the behaviours of animals and plants.
3. **Support conservation and protected areas**- Animals and plants cannot communicate if they are not comfortable or if they cannot live in an area at all. Happy vegetation leads to happy communication!
4. **Attend national tree planting events**- Give plants other plants to communicate with by attending tree planting events. If you can, plant trees in your own backyard!
5. **Reduce light pollution**- Artificial light can impact a plant's chloroplast, affecting their ability to communicate. Turn lights off if you don't need them on.
6. **Reduce noise pollution**- Turn noisy devices off when not using them. They could be affecting the communication distance of animals like frogs.
7. **Limit pesticides and herbicides**- Herbicides and pesticides limit plant communication and can kill pollinators. Limit using pesticides and herbicides or stop using them completely.
8. **Join the '*Getting the Dirt on Soil Health*' project**- This is a project accessible to anyone living in the Murraylands or Riverlands of South Australia and allows people to test the health of their soil, which can impact how successful plant communication can be. Find out more at: Landscape South Australia - Murraylands and Riverland | Getting the dirt on soil health.

Conclusion

Without the communication of both animals and plants, our ecosystem would not thrive. Communication is vital to the survival of many plant and animal species, and without it, populations of every living thing would be affected. If we don't start to consider the ways our actions change the environment, communication for both flora and fauna will be impacted, and will continue to vanish. Once they vanish, they are gone forever.

Figure 6: Plants have strong connections underground; we need to be their connection above ground.
An Darach Forest Therapy (2023)

References

ANU College of Science and Medicine. (2022). *Uncovering the oddities of Australian orchids*. [online] Available at: https://science.anu.edu.au/news-events/news/uncovering-oddities-australian-orchids.

Gorzelak, M.A., Asay, A.K., Pickles, B.J. and Simard, S.W. (2015). Inter-plant communication through mycorrhizal networks mediates complex adaptive behaviour in plant communities. *AoB Plants*, [online] 7(7), p.plv050. https://academic.oup.com/aobpla/article/doi/10.1093/aobpla/plv050/201398

Group, S. (2022). *IUCN Red List of Threatened Species: Litoria raniformis*. [online] IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/species/12152/78435466.

Hanano, A., Murphy, C. and Murphy, D.J. (2022). Plants Can 'Speak' to Each Other. *Frontiers for Young Minds*, 10. https://kids.frontiersin.org/articles/10.3389/frym.2022.658692

Hayashi, T. (2024). *The Swan Greenhood and the Gnat*. [online] Tobias Hayashi. Available at: https://www.tobiashayashi.com/the-swan-greenhood-and-the-gnat.

Hayashi, T, Personal Communication, 29 April 2025

Home. (2019). *Can Trees Talk, Think and Heal?* [online] Available at: https://unisa.edu.au/connect/hawke-centre/events-and-exhibitions/events/2019/plants/

Impacts of urban noise on acoustic communication in the growling grass frog Litoria raniformis across Greater Melbourne: A preliminary assessment. (n.d.). Available at: https://nespurban.edu.au/wp-content/uploads/2021/03/Impacts-of-urban-noise-on-acoustic-communication-in-the-growling-grass-frog-Litoria-raniformis-across-Greater-Melbourne.pdf.

IUCN Red List of Threatened Species. (2025). *The IUCN Red List of Threatened Species*. [online] Available at: https://www.iucnredlist.org/search?query=greenhood&searchType=species

Johnston, E. and Brewer, G. (2023). *Mycelium: Exploring the hidden dimension of fungi | Kew*. [online] www.kew.org. Available at: https://www.kew.org/read-and-watch/fungi-hidden-dimension.

Landscape South Australia - Murraylands and Riverland. (2025). *Landscape South Australia - Murraylands and Riverland | Getting the…*. [online] Available at: https://www.landscape.sa.gov.au/mr/projects/community-projects/getting-the-dirt-on-soil-health.

Reyes-Díaz, M., Lobos, T., Cardemil, L., Nunes-Nesi, A., Retamales, J., Jaakola, L., Alberdi, M. and Ribera-Fonseca, A. (2016). Methyl Jasmonate: An Alternative for Improving the Quality and Health Properties of Fresh Fruits. *Molecules*, [online] 21(6). https://pmc.ncbi.nlm.nih.gov/articles/PMC6273056/#notes1

Toothman, J. (2010). *How do animals communicate?* [online] HowStuffWorks. Available at: https://animals.howstuffworks.com/animal-facts/animals-communicate.htm.

Water, A. (2011). *IUCN Red List of Threatened Species: Pterostylis oreophila*. [online] IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/species/206712484/206712889#geographic-range.

Water, A. (2015). *IUCN Red List of Threatened Species: Pterostylis psammophilus*. [online] IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/species/206712498/206712894.

wikiHow. (n.d.). *How Many Words Does the Average Person Say a Day?* [online] Available at: https://www.wikihow.com/How-Many-Words-Does-the-Average-Person-Say-a-Day.

Wilson, C, Personal Communication, 9 May 2025

Wetland Revival Trust - Protecting and restoring high value wetlands. (2024). *Saving the Growling Grass Frog - Wetland Revival Trust*. [online] Available at: https://wetlandrevivaltrust.org/saving-the-growling-grass-frog/.

Figures

Figure 1: Hanano, A., Murphy, C. and Murphy, D.J. (2022). Plants Can 'Speak' to Each Other. *Frontiers for Young Minds*, 10. https://kids.frontiersin.org/articles/10.3389/frym.2022.658692

Figure 2: Toothman, J. (2010). *How do animals communicate?* [online] HowStuffWorks. Available at: https://animals.howstuffworks.com/animal-facts/animals-communicate.htm.

Figure 3: msa.vic.gov.au (2024). *Growling grass frog*. [online] msa.vic.gov.au. Available at: https://www.msa.vic.gov.au/plants-animals-and-ecosystems/growling-grass-frog

Figure 4: ANU College of Science and Medicine. (2022). *Uncovering the oddities of Australian orchids*. [online] Available at: https://science.anu.edu.au/news-events/news/uncovering-oddities-australian-orchids

Figure 5: Squittieri, S.J. (2024). *How Animal Communicators Help Shelter Pets Find Their Perfect People*. [online] Two Bear Healing Arts. Available at: https://twobearhealingarts.com/how-animal-communicators-help-shelter-pets-find-their-perfect-people/.

Figure 6: An Darach Forest Therapy. (n.d.). *The Wood Wide Web*. [online] Available at: https://silvotherapy.co.uk/articles/the-wood-wide-web.

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