

The Forest Underground

Most of a forest is not the part you can see.

8 min read

Before you read

- **fungus** — a living thing such as a mushroom or mould, neither plant nor animal (more than one: fungi)
- **network** — a set of things joined together so they can pass something along
- **nutrient** — a substance a living thing needs in order to grow
- **seedling** — a very young plant grown from a seed
- **canopy** — the roof of leaves and branches at the top of a forest
- **exchange** — to give one thing and get another in return
- **isotope** — a form of an element that can be tracked as it moves



A Douglas fir forest in British Columbia. The interesting part is below the moss.

¹ Dig a handful of soil out of a forest floor and shake it loose. Among the needles and the crumbs of bark there will be pale threads, finer than cotton, running in every direction. Those threads are **fungus**, and there may be kilometres of them under a single footstep.

² The threads wrap around tree roots, and in some species they grow into the root itself. This is not an attack. It is a trade. The tree makes sugar in its leaves using sunlight, which the fungus cannot do. The fungus reaches into the soil far more finely than any root can, gathering water and **nutrients** the tree would never find. Each one has something the other lacks, so they **exchange**.



Fungal threads on a root tip. Trade happens at the join.

³ One fungus does not stop at one tree. Its threads run on and join the roots of the next tree, and the next, until a stand of trees is linked into a single **network** below the ground.

⁴ Researchers in British Columbia wanted to know whether anything actually travelled along those links, or whether the trees simply shared a neighbour.

⁵ To find out, they fed carbon dioxide containing a traceable **isotope** to one tree, sealed in a bag so no other tree could take it up. Days later they tested the trees around it. The marked carbon was in them. It had gone down through the first tree's roots, along the fungal threads, and up into its neighbours.

⁶ What moved was small — nobody is feeding a whole tree this way. But the direction was interesting. More of it travelled towards **seedlings** growing in deep shade under the **canopy**, which receive very little light and make very little sugar of their own, than towards healthy trees in the open.

⁷ It is tempting to describe this as kindness, and some writers do. The evidence is better explained more simply. A fungus lives on sugar from trees, so a fungus with many living partners does better than one whose partners are dying. Carbon moving towards a struggling seedling may be the fungus looking after its own supply rather than the forest looking after its young.

⁸ The argument is not settled. Some scientists think the networks have been oversold, and point out that the famous experiments involved small numbers of trees in particular forests, and that results from a Canadian fir wood may not hold in a Malaysian rainforest or a Scottish pine plantation. Others say the measurements are real and the doubters are arguing about the words rather than the findings.

⁹ Both sides agree on the part that matters for anyone cutting trees down. A forest is not a collection of separate trees standing near each other. It is joined underneath, and when you remove the big trees you are also removing whatever the small ones were connected to.

Part A Choose the best answer

Circle the letter next to the right answer.

1. What does the tree give the fungus in their trade?
 - A Water from deep in the soil
 - B Sugar made in its leaves
 - C Shelter from the rain
 - D Nutrients gathered by its roots
2. How did researchers prove that carbon moved between trees?
 - A They dug up the roots and followed the threads
 - B They weighed the seedlings before and after
 - C They fed one tree traceable carbon and later found it in its neighbours
 - D They cut down a tree and watched the others change
3. Where did more of the marked carbon travel?
 - A To the tallest trees in the stand
 - B To seedlings growing in deep shade
 - C To trees growing in open sunlight
 - D To the fungus alone, and no further
4. Why does the writer say “kindness” is not the best explanation?
 - A The carbon moved in the wrong direction
 - B The fungus benefits from keeping its partners alive
 - C Trees cannot sense each other at all
 - D The experiment was never repeated
5. What do both sides of the argument agree about?
 - A That the networks have been oversold
 - B That results from one forest apply everywhere
 - C That a forest is joined underground, which matters when trees are cut down
 - D That seedlings cannot survive in shade

Part B Write your answer

Answer in two or three sentences.

6. Explain the trade between the tree and the fungus in your own words, saying what each one cannot do for itself.

7. The passage offers two explanations for carbon moving towards shaded seedlings. Describe both, and say which the writer finds more convincing.

8. Why does it matter that the famous experiments used small numbers of trees in particular forests?

Part C Think deeper

There is no single right answer here. Say what you think, and say why.

9. The writer separates what was measured from what people say it means. Why is that separation worth making? Use one example from the passage.

10. If a forest is joined underground, should the people who cut trees be made to change how they work? Give your view and support it with something from the passage.

Answer key

For parents and teachers

Part A

1. B — sugar made in its leaves | 2. C — traceable carbon found in neighbours | 3. B — shaded seedlings | 4. B — the fungus benefits from living partners | 5. C — the forest is joined underground

Part B

6. The tree makes sugar from sunlight but cannot reach water and nutrients finely enough; the fungus reaches through the soil but cannot make sugar. Each supplies what the other lacks. Both halves needed for full credit.

7. (a) Trees help their young — generosity. (b) The fungus protects its own food supply by keeping partners alive. The writer finds (b) more convincing because it explains the same evidence more simply.

8. Because a result from a few trees in one kind of forest may not hold in other forests, so the finding may be true but narrower than it sounds. Accept any answer about not over-generalising from a small study.

Part C

These answers vary. Mark the reasoning, not the answer.

9. A strong answer explains that the measurement (marked carbon moved) is agreed, while the meaning (kindness, or self-interest) is argued about, and that mixing the two makes a claim look more certain than it is. Credit any example used accurately. Prompt with: which part is anyone actually disagreeing about?

10. Either position is acceptable with support. The strongest answers use the final paragraph — removing big trees removes what small ones were connected to — and acknowledge that the science is still disputed. Mark the reasoning.

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