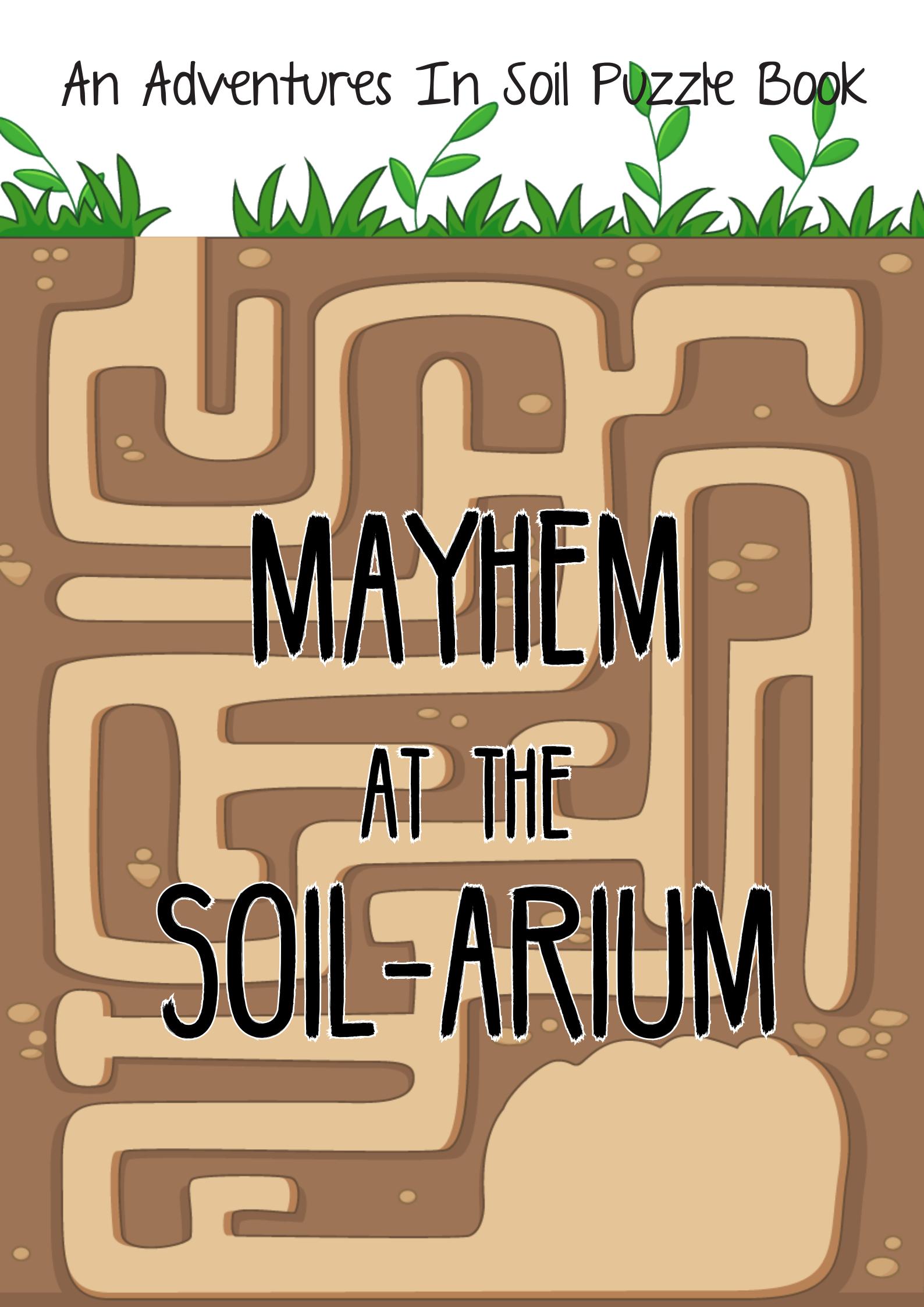


An Adventures In Soil Puzzle Book



MAYHEM AT THE SOIL-ARIUM

About this book

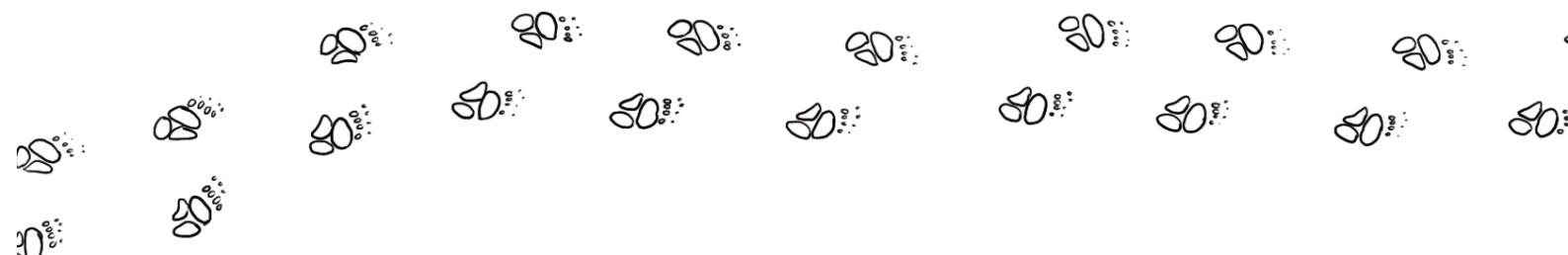
Mayhem at the Soil-arium a puzzle and activity book. Read the story and solve the puzzles to fill in the answer page at the back of the book.

Puzzle instructions are written *in italics* throughout the book.

The find-a-word on the next page is an example puzzle. It is not part of the story.

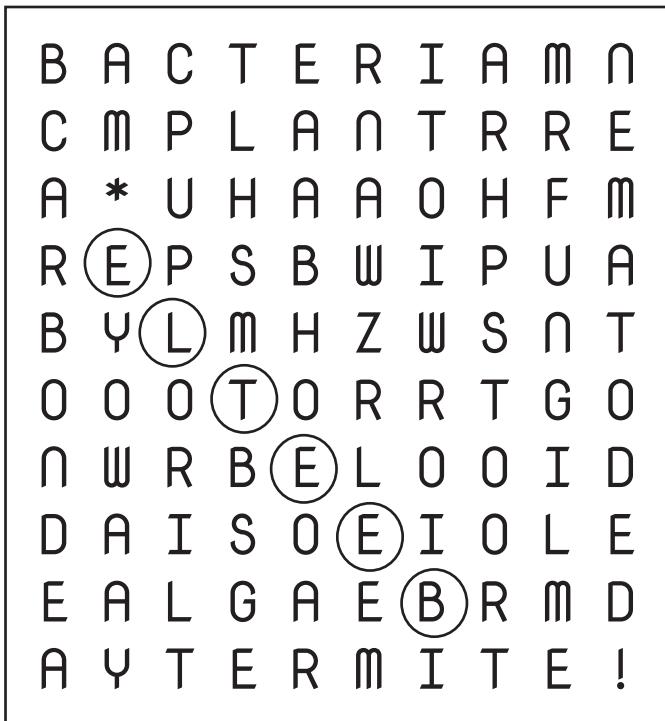
Suggested age: 8 - 10 years old.

Some students may prefer to complete this book with help from an adult or older student.



Find-a-word

1. Find all the words listed to the right of the grid. Words can go in any direction (forwards, backwards and diagonally). One word has already been found.
2. Circle or mark out the leftover letters. Use a different coloured pen or pencil to make the leftover letters easier to see.
3. Write out the remaining letters below the puzzle to reveal the secret message. Start from top left and work acrosss the rows, finishing at the exclamation mark (!) Do not include the *.
4. Write the message on the answer page at the back of the book.



Words to find:

ALGAE
BACTERIA
~~BEETLE~~
CARBON
EARTHWORM
FUNGI
MUSHROOM
NEMATODE
PLANT
RHIZOBIA
ROOTS
TERMITES
WOMBAT

The school bell rings

Finally.

Could today have gone any slower?

You grab your bag and run out the school gates, across the cracked pavement.

Today the professors are going to try out their shrink ray and you get to help. More than help. You are going to operate the shrink-ray and shrink the professors!

“Happy Earth Day to you,

“Sand, silt and clay too,

“Together make soil,

“Dirt, dust and mud too,” sang a voice to the tune of happy birthday as you push open the door to the soil-arium. The voice comes from a stuffed meerkat to your left. It is Professor C’s version of a doorbell. He has recorded himself and installed a sensor in the meerkat to make it seem like the meerkat is singing. He thinks it is hilarious. No-one else does.

As you walk through the corridor you rummage in your bag for the container you have been carrying around all day. It is a special treat for Orson - his favourite mix of sweet potato, apple, and carrot.

The soil-arium is hot today, making the earthy, slightly sweet smell even stronger than normal. The professors have installed some heat lamps over the bilby enclosure to keep them warm, and now the rest of the laboratory is hot too.

Orson turns as you enter, nose in the air, sniffing. The professors are frowning up at an enormous machine.

“There seems to be something wrong with the starter button,” Professor C says, his frowning so much he could probably hold a coin between his eyebrows. “The shrink-ray won’t power up.”

Professor B keeps pressing her foot on the big red button on the floor. It makes a clicking sound, but nothing else happens. Something scurries over behind the compost heap, but the shrink-ray stays silent.

“I don’t think we can use it today, maybe we can try next week.” Professor C pats you on the shoulder as he walks out, leaving you and Professor B alone in the quiet soil-arium.

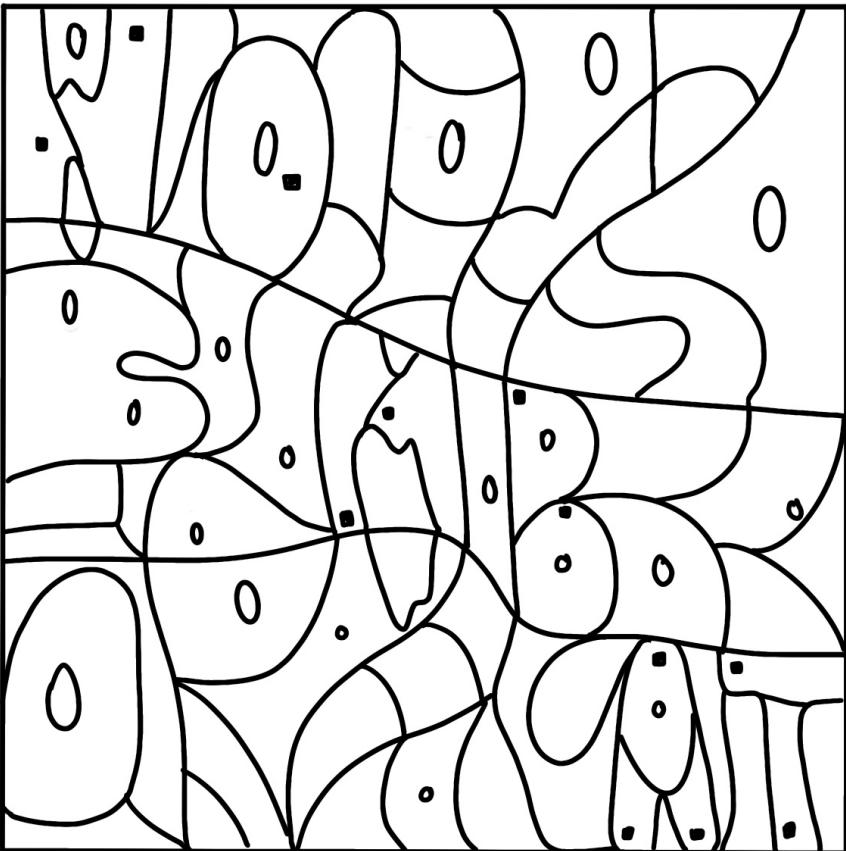
You shift your backpack on your shoulders, trying not to look too disappointed.

Orson lumbers over and pushes his rectangular, hairy grey body into your legs. His big face is nudging at your bag. He can smell his treats.

“Not now Orson,” you try to push him away. You are not very successful. He weighs almost as much as you do.

“It should work,” Professor B says. “Everything is on, the power is connected.”

She scratches her head and adjusts a dial on the shrink-ray.



Colour in the sections with a square marked to reveal what sort of creature Orson is.

Clue: Orson does cube-shaped poo.

Orson is a:

Orson grunts and nudges you again.

“Stop it,” you push him with your knee.

“Wait!” Professor B cries, “I think I see the problem!” She reaches up and adjusts a dial under the ray. It makes a soft ‘click’ sound and the machine starts to hum.

“Let’s test it! You go to the foot switch and I will—”

At that moment Orson, now very hungry and grumpy that you haven’t fed him any treats, lunges at you again. He knocks you into the professor and you both stumble under the ray...

...just as Orson’s big hairy foot steps on the red button on the floor.

ZZZZZZZZAAAAAAAPPPPPPPPPP!

An almighty flash of bright white light hurts your eyes, while hissing and zapping sounds crackle around the room. You crouch on the ground, hands over your head as the air whirls in a vortex around you, whipping up bits of dust and debris.

“Hold on!” Professor B calls out, don’t—”

But the rest of what she says is muffled by the noise.

After what seems like an hour, but might have only been a few seconds, everything suddenly goes silent. Not even the crickets in the insect hotel are chirping. You peek out from between your fingers...

...and find yourself looking at a big, hairy foot.

Oh. No.

"It worked! See how big Orson is!" Professor B claps in delight. She is standing next to Orson. The top of her head does not even reach his knee. Normally Orson is only as tall as your knees.

You gaze up at the wombat who is sniffing at the air and looking confused.

Professor B grabs you by the arm and pulls you back to the base of the shrink ray.

"Orson is clumsy enough when we are normal sized. He might squish us without even realising now."

"Exactly how small are we?" you ask, pressing your back into the metal, hoping Orson will forget about the treats and go to his bed in the corner.

"About the size of a mouse," says Professor B cheerfully. "I knew it would work! What a shame Professor C isn't here."

A horrible thought creeps into your head. *You* were supposed to operate the shrink-ray. But now you have been shrunk and Professor C is gone for the day...

"How do we get back to our normal size?"

Something scurries again near the compost. It sounds much, much louder now.

"We need to use the anti-shrink ray," Professor B says. "I have the code for it in here somewhere..." She pats her pockets and pulls out a torn piece of paper.

"Hmmmm," she frowns. "I keep the code in pieces to make it harder to decrypt. The pieces must have blown out of my pocket when we were shrunk. I only have one piece."

Solve the hieroglyphics puzzle. Write the answer on the answer page at the back of the book. Then help Professor B find and decrypt the rest of the code pieces.



B



C



D



E



F



I



L



M



O



R



S



T



V



W



Y



"Well done! You have solved the first piece of the code," says Professor B. "I can see another piece by the termite mound. Quick, let's go now while Orson is asleep."

Orson has thankfully decided it was time for his afternoon nap and curled up on his bed. Had he always snored that loud?

"I had no idea the floor was this dusty," Professor B says as you both run to the other side of the soil-arium. It makes much longer than normal.

The termite mound, which only an hour ago was the same size as you, looms above. It looks as big as a high-rise building. The code piece is resting on the side, just out of reach. Professor B starts jumping up to try and grab it. Although you have both been shrunk, she is still taller than you.

"I thought termites were a pest," you say, remembering how angry your Uncle was when he found termites busy eating the wooden frames in his house. He had called an exterminator to kill them all.

"Well," says Professor B, puffing from jumping up and down. "We build our houses out of termite food. We can't...really blame them...for wanting to eat it."

You had never thought about it like that before.

"I think I need a run up." She takes a few steps back and runs towards the mound, managing to run part of the way up the gritty side of the mound. Her finger tips just

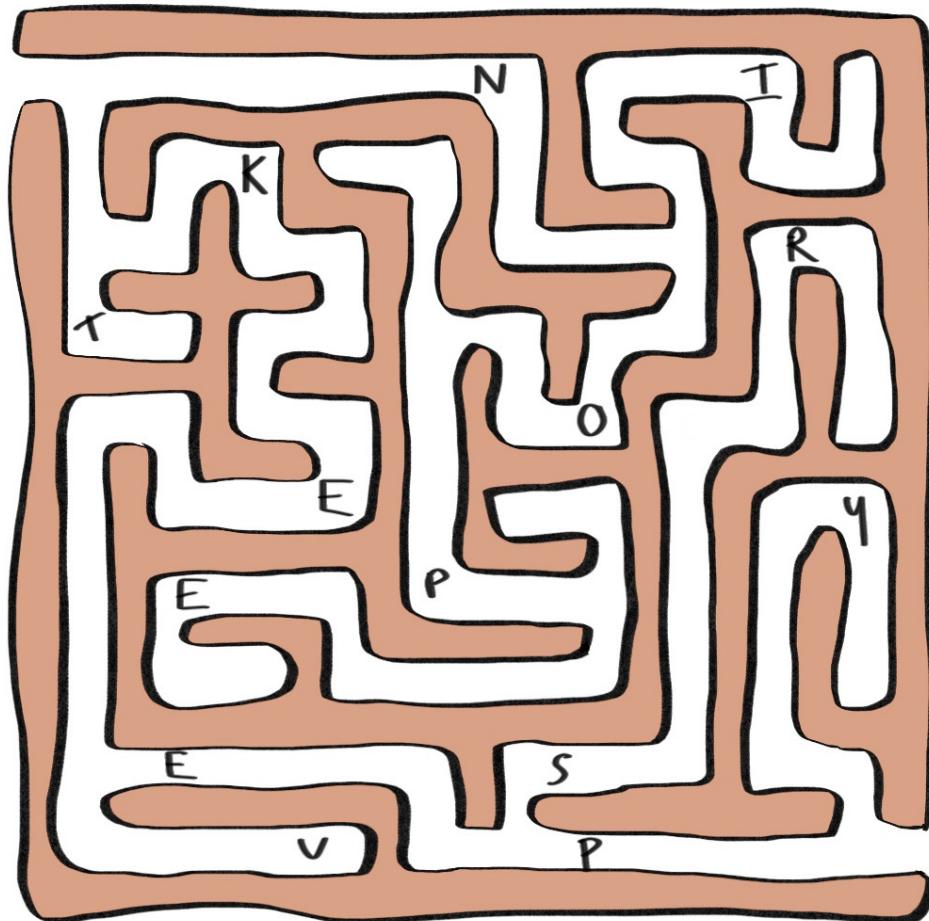
Termites are a type of decomposer. Decomposers are Earth's cleanup crew. They feed on dead things such as dead leaves, sticks, animal carcasses, and droppings (faeces). While they are decomposing dead things, they release the nutrients into the soil for plants to use.

Draw a picture of a termite. How are termites different to ants?

grasp the cover of the paper as she slides back down the side and tumbles to the ground.
“Got it!”

Professor B hands you the code piece while she tries to dust herself off. You don’t tell her it is a bit pointless. She is always covered in soil or dust or sand.

Start at the top left side of the maze. The correct route through the maze has letters that spell part of the code. Write them out in order.



“Two down, two to go. Do you have any idea where the last two pieces are?”

You scan the room. Something flutters over in the fungi forest.

“There!” you point.

Professor B nods. “Good eyes. And I can see the last one in the bilby desert. Let’s start with the fungi forest - it is closer.”

Although you are no longer tall enough to see out the window, you can tell it is starting to get dark outside. You cross your fingers, hoping you can get un-shrunk before it is completely dark. There is no way you could reach the light switches at this height.

As you approach the fungi forest, you shiver. "It's colder here." And darker.

"That's because of all the plants. They make it cooler than the bare soil of the termite mounds." Professor B points upwards at shade sail stretched above. "And the shade, most fungi don't like lots of light or sun."

The professors call this area a 'forest' but it looks more like a meadow or a fairy garden. It is mostly grass, with some stones and flowers. One side of a large log is covered in yellow, knobbly blobs. Some tall, silvery mushrooms grow out of a patch of grass.

"There aren't many fungi in your forest, Professor."

"Oh yes there are!" she grins. "You just can't see them. Most fungi live underground. There is a huge network growing right underneath our feet, like the biggest, most complex spideweb you have ever seen. Only some have parts that grow above ground - which are the mushrooms. Like that one," Professor B points at a tall, slender mushroom which has a piece of paper on the ground near its stalk.

As you walk over to pick it up, Professor B pulls on your sleeve. "Careful! It's poisonous."

You snatch your hand away and take a step back. "Why are you growing it then?" you ask indignantly. What on earth is she doing with poisonous mushrooms?

"The edible ones are tasty," Professor B shrugs. "And the rest are for research. Fungi, even the poisonous ones, are an important part of the ecosystem, just like the termites. They break down dead things into nutrients for other plants to use. Think of them like a recycling system."

"Alright," you mutter, still annoyed - and a bit nervous - about having to go near the poisonous mushroom.

Very carefully you reach forward and manage to pluck the piece of paper free without touching the mushroom. Scuttling back to a safe distance you shiver again - and not because of the cold this time.

This piece of the code is hidden in the text. Hint: some letters look a bit different to the others. Write them out in order.

Fungi are very important for life on earth.
Many are nature's recyclers, breaking down dead plant material into minerals for plants to use as nu-
trients.

The largest living organism is the honey fungus in the Blue Mountains in Oregon. It is 3.8km (2.4 miles) wide.

— — — — —

"Great work!" Professor B says. "Let's get the last piece from the bilby desert and unshrink ourselves. Talking about mushrooms is making me hungry!"

Thankfully the heat lamps above the bilby desert are also lights, so it is not too dark. But just as you step onto the sand there is a 'click' and the lamps turn off.

"Oh, I forgot," says Professor B. "I put the lamps on a timer so I wouldn't accidentally leave them on overnight."

Without the light and the heat the bilby desert looks like the surface of the moon - and scary. Normally you hope you can catch sight bilby, with its long furry ears and cute little paws. That's when you are normal-sized...and it is daytime.

"The bilby will be waking up soon," says Professor B. "It is nearly her dinner time." Gulp. "What do bilbies eat?"

"Mostly seeds and insects. But they do like to snack on the occasional spider."

Would the bilby will think you are a spider.

The last code piece is lying just inside the burrow. As quietly as possible you move across the sand towards the dark opening. You can't see or hear the bilby, but that doesn't mean she is not waiting in the dark, ready to pounce. You crawl as close as you dare to the burrow opening, stretch out your hand, snatch the paper, then scuttle backwards away from the burrow...just as a furry pink nose pokes out from the darkness.

"It's awake. RUN!" You sprint away from the desert and around the other side of the worm farm. Catching your breath you realise Professor B isn't with you. Had she become a bilby snack?

Peering around the edge of the worm farm you see Professor B walking casually away from the bilby. She smiles.

"She doesn't think we are spiders," Professor B says. "Maybe a type of strange mouse. She wasn't interested in me really, just one sniff then off to find a proper dinner."

I	B	I	S	A	P	R	E	N	Q
H	R	H	E	T	L	T	D	T	S
G	J	Y	Z	D	I	M	A	I	X
F	P	E	C	K	H	C	L	O	P
E	T	F	O	H	A	J	C	B	Y
D	U	W	G	O	B	Y	E	V	H
C	X	G	S	M	U	Z	R	O	L
B	O	V	C	I	L	C	G	W	A
A	R	E	M	K	I	F	N	E	L
	1	2	3	4	5	6	7	8	9

Use the coordinates to find the letters and spell the next clue. Use the letters along the left (A - I), then the numbers along the bottom (1 - 9). For example G4 = D

I5 = _____ C7 = _____ D4 = _____ E1 = _____ A2 = _____ F3 = _____ H8 = _____

"Good work! Now we have found and decrypted all the code pieces," says Professor B. "We will be back to our normal size soon. The fastest way to the anti-shrink ray is around the compost heap."

You try not to groan. The compost heap is your least favourite part of the soil-arium. Mostly because it stinks.

As you get closer to the compost, the air gets hot and damp.

"Why do you even have a compost heap?" you ask, covering your nose. The smell seems one thousand times worse than normal.

"I use it to turn my food scraps, and Orson's droppings, into fertiliser. Compost makes great plant food. Plus I want to study all the microbes in the compost. There are billions and billions in there, breaking down the scraps and droppings. I have built an ever stronger shrink-ray so I can be as small as a microbe. Can you imagine meeting a microbe? It will be fascinating."

How small are microbes?

Draw the smallest dot you can with your pen or pencil.

Microbes are, much, much smaller than that.

You can't see them with your eyes or a magnifying glass.

Complete the dot-to-dot on the next page to find out what piece of equipment you need to use to see the tiny soil microbes.

You can see quite a few problems with being shrunk that small, but the Professor will do what she wants to do.

"Is it the microbes that make the compost smell so bad?" you ask, still covering your nose.

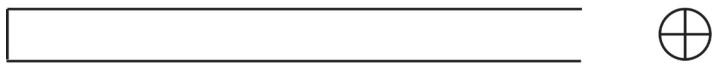
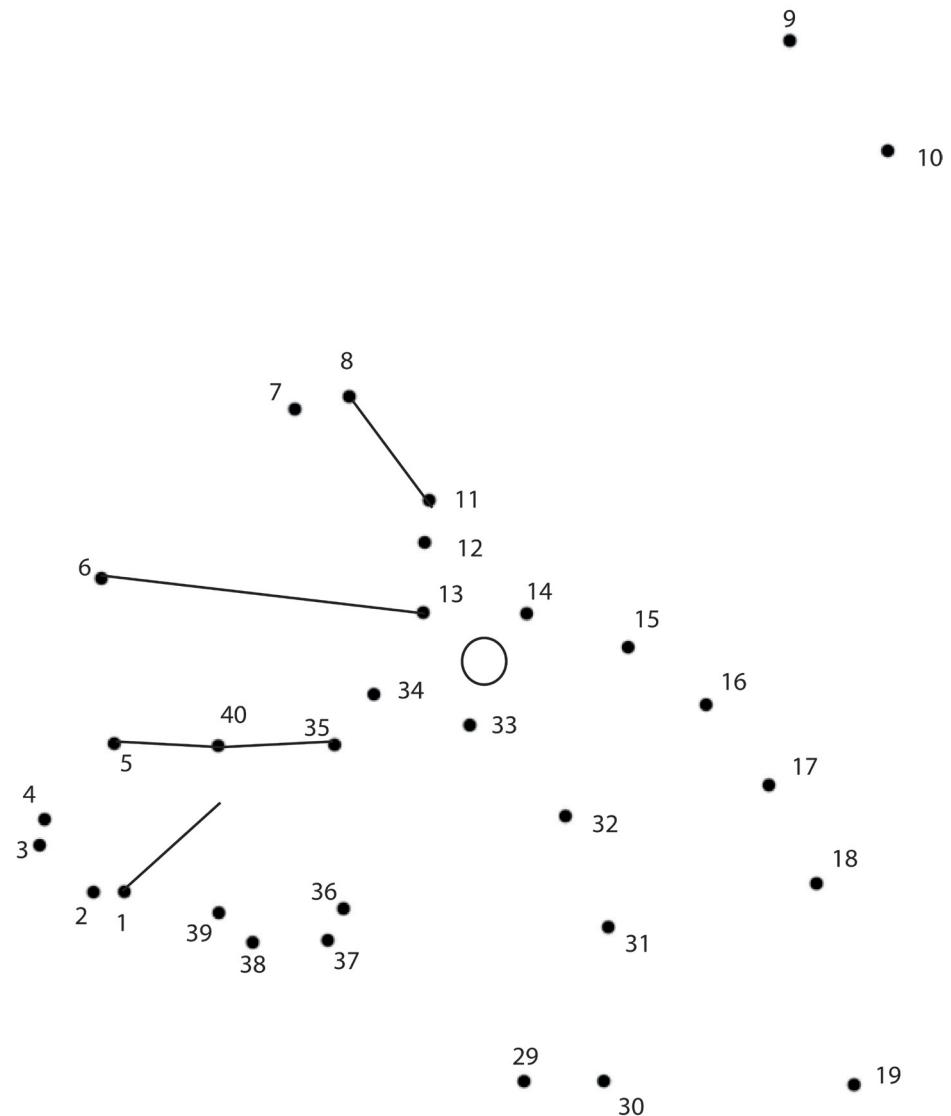
"Partly," says Professor B. The smell doesn't seem to bother her at all. "The microbes are what make the compost heap hot. It can get over 50 degrees celcius in there, sometimes hotter. Do you remember the fire?"

You nod. Last summer the professors had added too much dry paper and straw, and made the compost heap too big. It had spontaneously burst into flames. Luckily nothing else had caught fire.

It is nearly completely dark when you finally make it back to the anti-shrink ray.

You gaze up at the huge chunk of grey steel above, and see a big problem.

"Ummmm....Professor? How do we reach the button?"



Complete the dot-to-dot to find out what piece of equipment you need to use to see tiny soil microbes.

Professor B just grins at you and taps the side of her nose.

"I did think about that, just in case there was an accident like today. The anti-shrink ray is voice activated. We need to speak the code. We will have to say it very loud, maybe even shout it."

Check the answer page. If you have solved all the puzzles correctly you will have the same message as below.

You and the professor take a deep breath, then shout the code.

"KEEP SOIL ALIVE. PROTECT SOIL BIODIVERSITY"

The anti-shrink ray jumps and buzzes.

"It's working. Say it again!"

"KEEP SOIL ALIVE. PROTECT SOIL BIODIVERSITY"

The air starts to whip and flip, throwing you to the floor. A deep boom and groan sounds, and you start to feel like you are a balloon - expanding, expanding expanding. You really hope you don't pop.

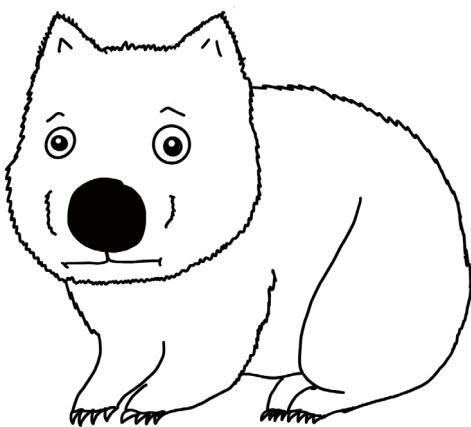
There is a crack and a bang, then once again the soil-arium is very silent. And dark.

Then you hear a click and there's a flash of light.

Oh no. Did Orson step on the shrink-ray button again?

But it is just Profssor B turning on the lights. Orson has woken up and is rubbing his head against your legs. You are all back to normal size.

"What an adventure!" Professor B rubs her hands together. "Everything turned out just fine. Maybe next week we can try out the super duper shrink ray?"



THE END

Answer Page

Crossword puzzle answer

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Anti-Shrink Ray Code

Termite maze answer

Fungi forest answer

SOIL

Bilby desert answer

Hierolyphics

SOIL



Glossary

Below are some key words from this book. Research and write down in your own words what each word means.

Bilby:

Compost:

Decomposer:

Fungi:

Fertiliser:

Microbe:

Microscope:

Mushroom:

Organism:

Wombat:

MAYHEM AT THE SOIL-ARIUM

