DISCOVERING THE LITTLE THINGS

Little Olivia discovers the immensity of life in some of its smallest representatives.

Cauê Azevedo Tomaz Oliveira
Weslley Ribeiro Nardes
Elisandro Ricardo Drechsler dos Santos
(coordination/organization)

"Alongside Olívia, I was able to feel that initial amazement again of understanding that everything is alive. With this piece, one can discover, be thrilled and learn in a fun way!"

Giuliana Furci
Fungi Foundation, Chile

I read curiously about Olívia's adventure and her discoveries whilst looking at the small things that we have in nature. The authors, biologists that are passionate about what they do, knew how to explain complicated things in a simple way, thus helping children to get to know and better understand the fungi that live all around us, play such an important role in nature and also contribute towards the wellbeing of mankind.

Books about Mycology for children are not common in Brazil, and their production should be encouraged considering the necessity to train young people with a broader knowledge about the components of life on Earth. Fungi are just as important and abundant as other groups of living things and need to be better studied and understood. Sharpening the curiosity of children and seeing that they also pay attention to fungi, especially those that are "hidden", can contribute to awakening the calling of new mycologists.

I congratulate the authors for this initiative and hope that this is just the first of many future publications from the MIND.Funga team for children, whom will certainly be happy with the new discoveries about the life of fungi.

Dr. Leonor Costa Maia
Federal University of Pernambuco

This piece represents a lot for our children, for future education, for the people of the regenerating world, where children and adults will learn to respect, understand and live with nature.

Prof. José Luiz Bezerra
Federal University of the Recôncavo of Bahia

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Hello, friends!

Do you want to hear a story about nature, curiosity and new discoveries? Join us on the adventure of a clever girl, Olivia, who is faced with something very strange. Her curiosity transforms into an incredible journey with lots of lessons. Alongside Olívia, you can feel like a true scientist with this story!

We form part of MIND.Funga (mindfunga.ufsc.br), an initiative of the Laboratory of Mycology at the Federal University of Santa Catarina (UFSC), which, aside from research, carries out scientific outreach activities. This book was conceived as part of the study of the diversity of fungi that our research group developed in São Joaquim National Park in Urubici, Santa Catarina. Through this book, we also want to contribute to the expansion of knowledge on the Funga, that is, the diversity of fungi in a given "place".

In addition to the invitation, we would like to thank Dr. Paulo Roberto Petersen Hofmann for the text revision; the environmental analysts from the Chico Mendes Biodiversity Institute (ICMBio) that manage São Joaquim National Park, especially biologist, Michel Omena. We also thank the schools, teachers and all of the students from the Urubici municipality for welcoming our research group.

We are very grateful to the Brazilian Society for Scientific Progress (SBPC), who funded the publication of this book and made the project "MIND.Funga citizen science: children's literature meets taxonomy of fungi in schools" possible via the "SBPC Go to School 2020" grant.

This book is dedicated to the children, whose natural curiosity persists in adult scientists. We also dedicate this piece to the mycologists, who are fungi scientists, especially to our MIND.Funga and MICOLAB/UFSC colleagues.

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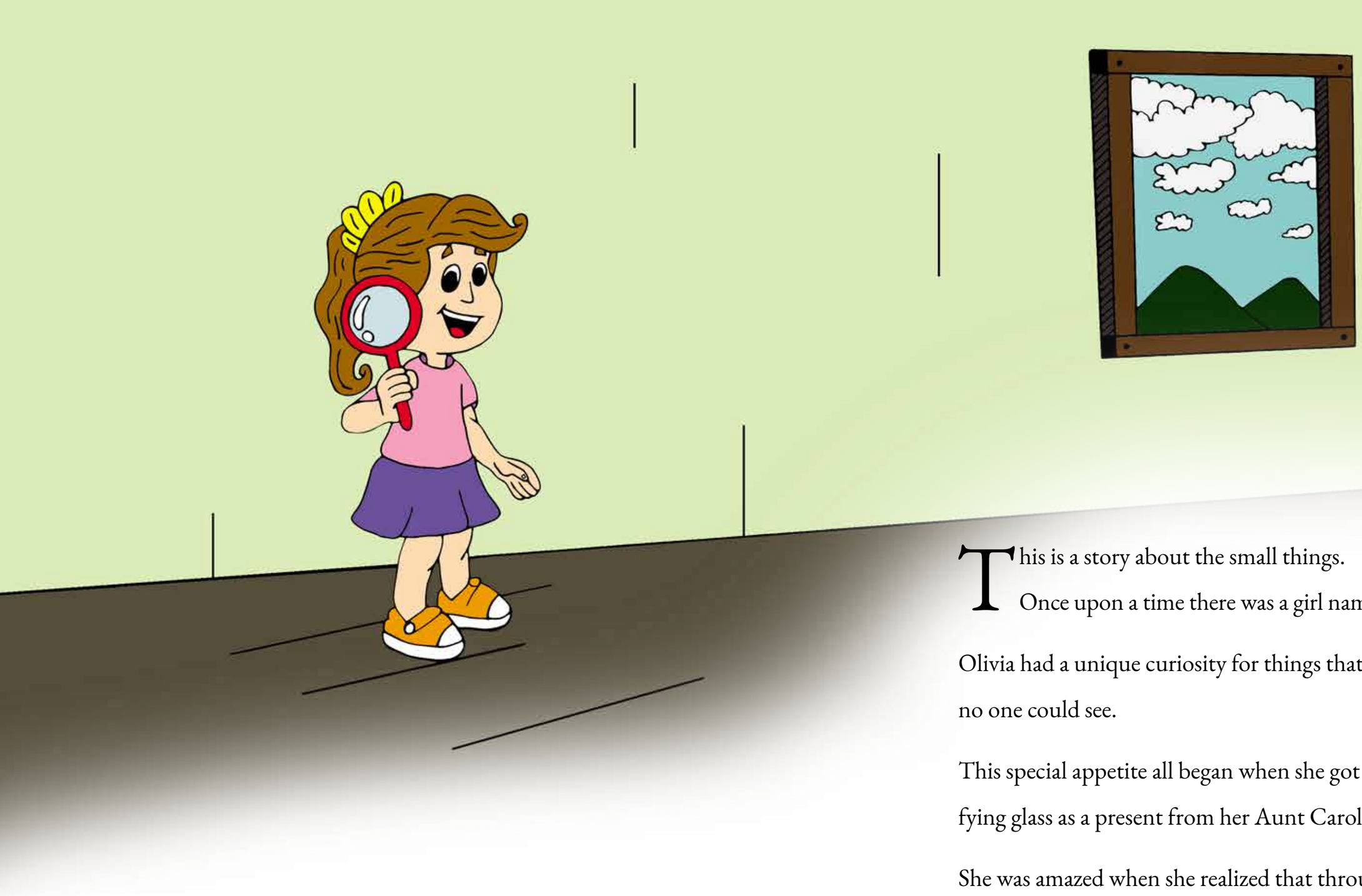
* *Just as Fauna refers to animals and Flora is indicative of plants, Funga is associated with fungi.*

FOREWORD

Do you know why everything we love has a name? Because we love what we know and what we know has a name. Olivia's adventure to find a name for the fungus that makes a zombie ant will help you to get to know and love the Kingdom Fungi. It is a kingdom that is full of medicines and poisons, serves as food for us and cleans the forest by devouring dead plants. Did you know that the largest creature in the world is a fungus? That one of the most expensive foods in the world is a fungus? And that the first antibiotic discovered was a fungus?

We hope this beautiful story helps you to look closely at the little things, and to discover the treasures they hold.

Sônia Bridi *a journalist that was*
(and still is) a curious girl.



This is a story about the small things.

Once upon a time there was a girl named Olivia.

Olivia had a unique curiosity for things that almost no one could see.

This special appetite all began when she got a magnifying glass as a present from her Aunt Carolina.

She was amazed when she realized that through that little glass disc, she could see things in places that seemed like they were empty before.

With her magnifying glass, Olivia watched how the ants marched in a very organized line through her aunt's orchard.

She had never seen a little bug so close.

She counted three pairs of very thin legs and laughed at how the ants seemed to be talking by leaning their little antennas against each other.

Without letting go of her magnifying glass, the girl followed the ants. All of a sudden, she had reached the back part of the yard, which led to the forest entrance, and where she had found the ant's nest.

This small world was no longer a secret and Olivia felt happy because she had learned a lot.

However, the girl came upon something different through the magnified view of her lens.

An ant behaved very strangely amidst such organization.

Instead of following the whole group, this ant got lost on its way through the orchard and took another route towards the darker and foggier side of the forest.

This led Olivia and her magnifying glass to enter the dense forest in a mysterious cloud, where there were various ferns, conifers and other small trees with twisted branches and trunks covered with lichens and mosses.

Olivia was in a Cloud Forest!

“Hey, what a strange ant!”, exclaimed the girl.

That ant doesn’t seem lost anymore, seeing as it had gone up the tree trunk, stopped, bitten some moss and stayed put right there.

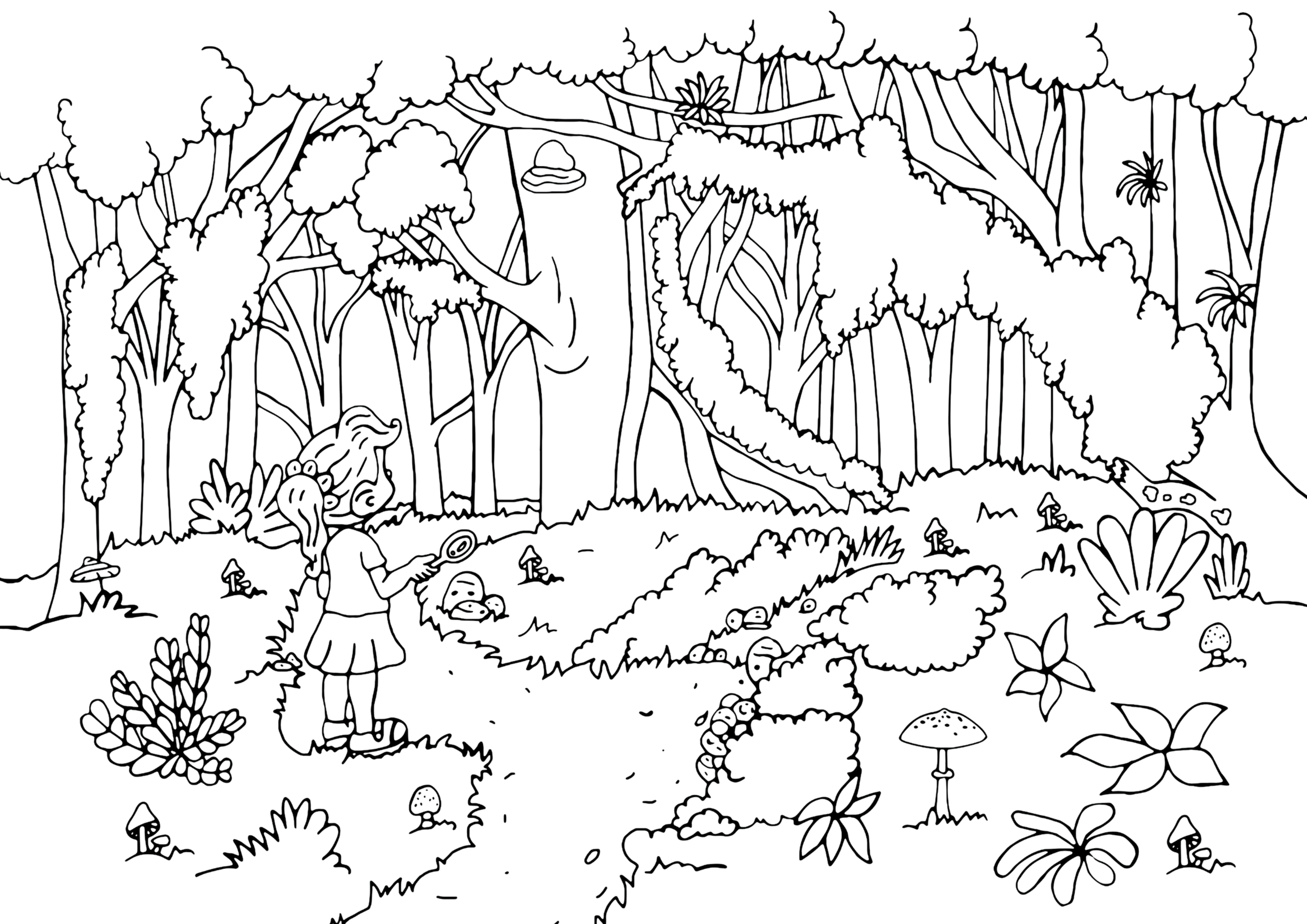
The girl was scared because she saw that there were other ants hanging in the same way.

On their heads, it seemed like there was a third little antenna, something that she hadn’t noticed about the other ants from the yard.

The girl went home sad with her little ant with “three antennae”. Olivia knew, however, that she could find an explanation for this from her aunt, who is a Biology professor.

Olivia’s aunt said that what seemed to be a third antenna was actually a fungus, a living thing related to mushrooms, but that has a different shape and takes control of insects.

On the next page, use your colored pencil to bring the Cloud Forest to life.

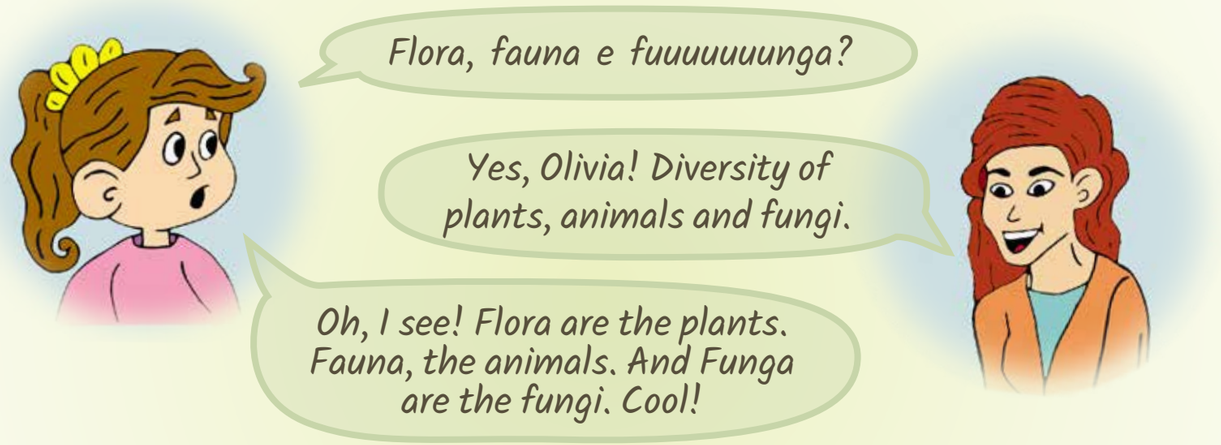


The next day, Olivia's aunt woke her up with news of a trip they would take together.

They would travel down the mountain to the University, where they would meet her aunt's friend, a scientist that specializes in that same type of ant fungus.

The road weaved through the sides of the mountains and Olivia observed everything carefully, especially the changes in the landscape.

The road they travelled passes through the Atlantic Forest, one of the most biodiverse places in the world, with an abundance of flora, fauna and funga that must be preserved by everyone.



Aunt Carolina explained that more than 20 thousand different species of plants exist in the Atlantic Forest. Of that immense variety, almost half are endemic, or in other words, they only exist in this environment and not in any other place in the world.

She went on to say that trees are important for the whole forest because they serve as a house and as food for animals and fungi. Besides that, they are necessary for the lives of other plants that grow on top of them, like orchids and mosses.

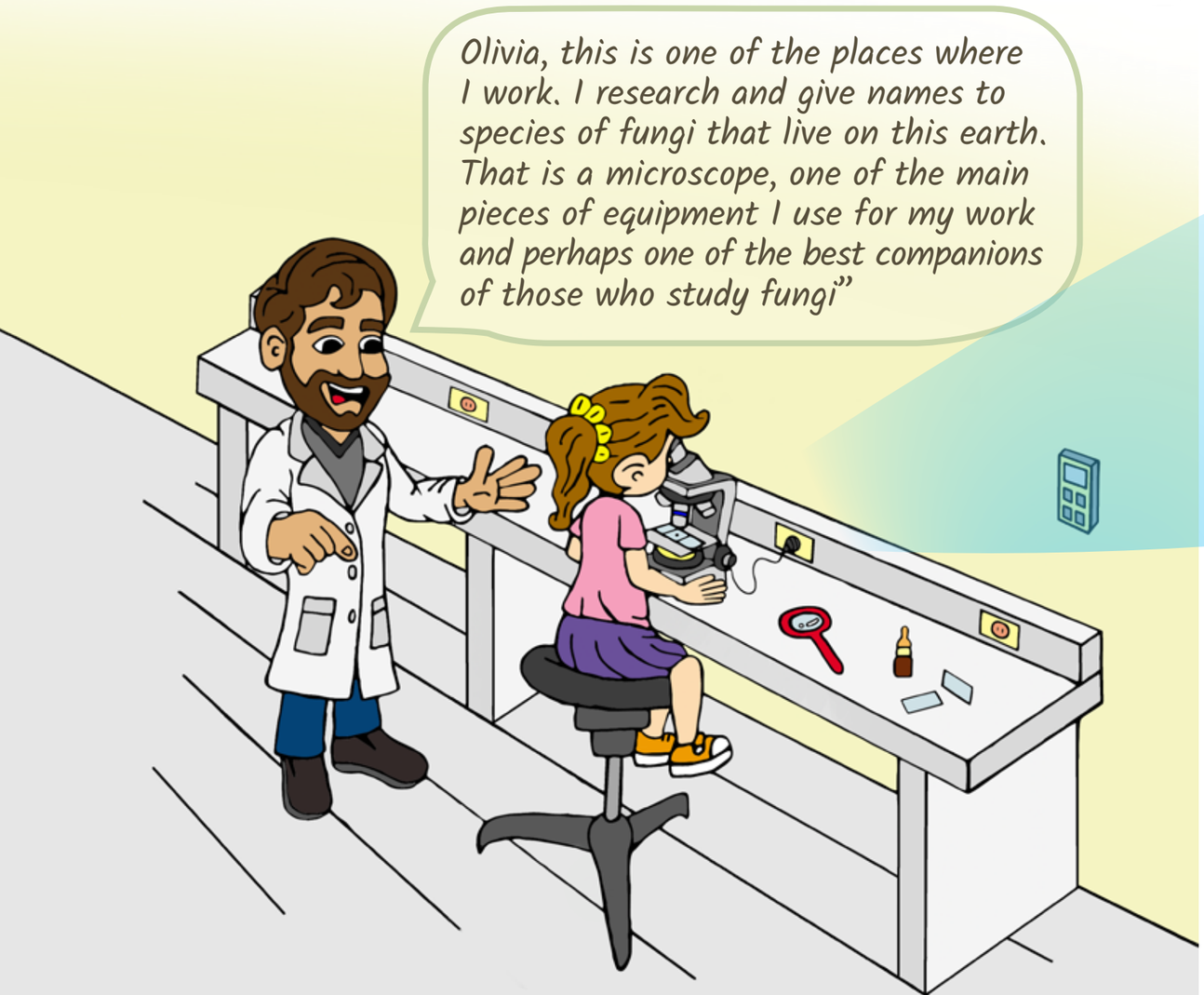
Olivia was daydreaming about the diversity that exists in the forest, when all of a sudden her aunt announced:

– We're here, Olivia! My friend João is going to help us discover the name of the fungus you found.

João was already waiting for Olivia with a smile on his face, when he said "Welcome to the Laboratory of Mycology".

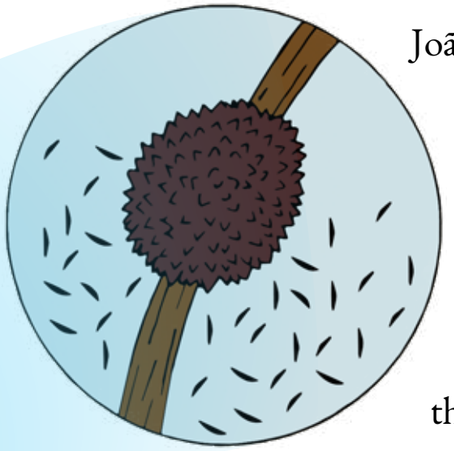
Aunt Carolina's friend explained that he is a mycologist, or in other words, a person who studies fungi; and that what he likes to do is figure out the name of each species, making him a fungal taxonomist.

He also said that he uses a microscope, which is a piece of equipment with various lenses that works like a magnifying glass, but is even more powerful.



João showed the girl how the fungus grew from the head of the ant, under the apparatus. Then he pointed to the spores, some really small little things that were magnified a thousand times under the microscope.

The spores have a job that is similar to the seeds of plants. However, they are much, much smaller, and when they are cast out into the air, they go everywhere.



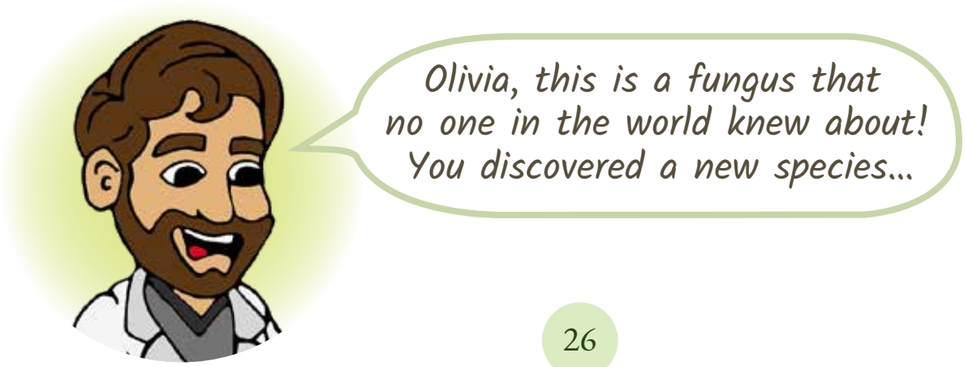
João went on to explain that the ants end up being contaminated by the spores that come flying through the air. When the ant comes in contact with the spores, they start acting differently, just like the ant Olivia had observed that seemed sick.

The fungus grows inside the bodies of the ants, and the poor guys act like zombies. They walk in a disoriented manner, sick, until they reach the place where they will die.

The dead little ant usually can be found hanging from a leaf or branch of a plant. And close to its head, a new part of the fungus emerges from its body; the same thing Olivia had mistaken for a third antenna.

This part of the fungus allows it to reproduce, casting new spores into the air, and like a never-ending cycle, this species of fungus can then contaminate another ant in another place.

"Eureka!!", exclaimed Aunt Carolina's friend, just as the Greeks did when they discovered something! João looked at the girl and said:



Life cycle of the ant fungus..

Choose the right answer.

1

Why do ants leave their nest?

a) To go for a stroll.

b) To look for food.

2

Ants that make contact with the spores transform into?

a) Super-ants.

b) Zombie ants.

3

Why do the zombie ants go up in the trees?

a) To fly.

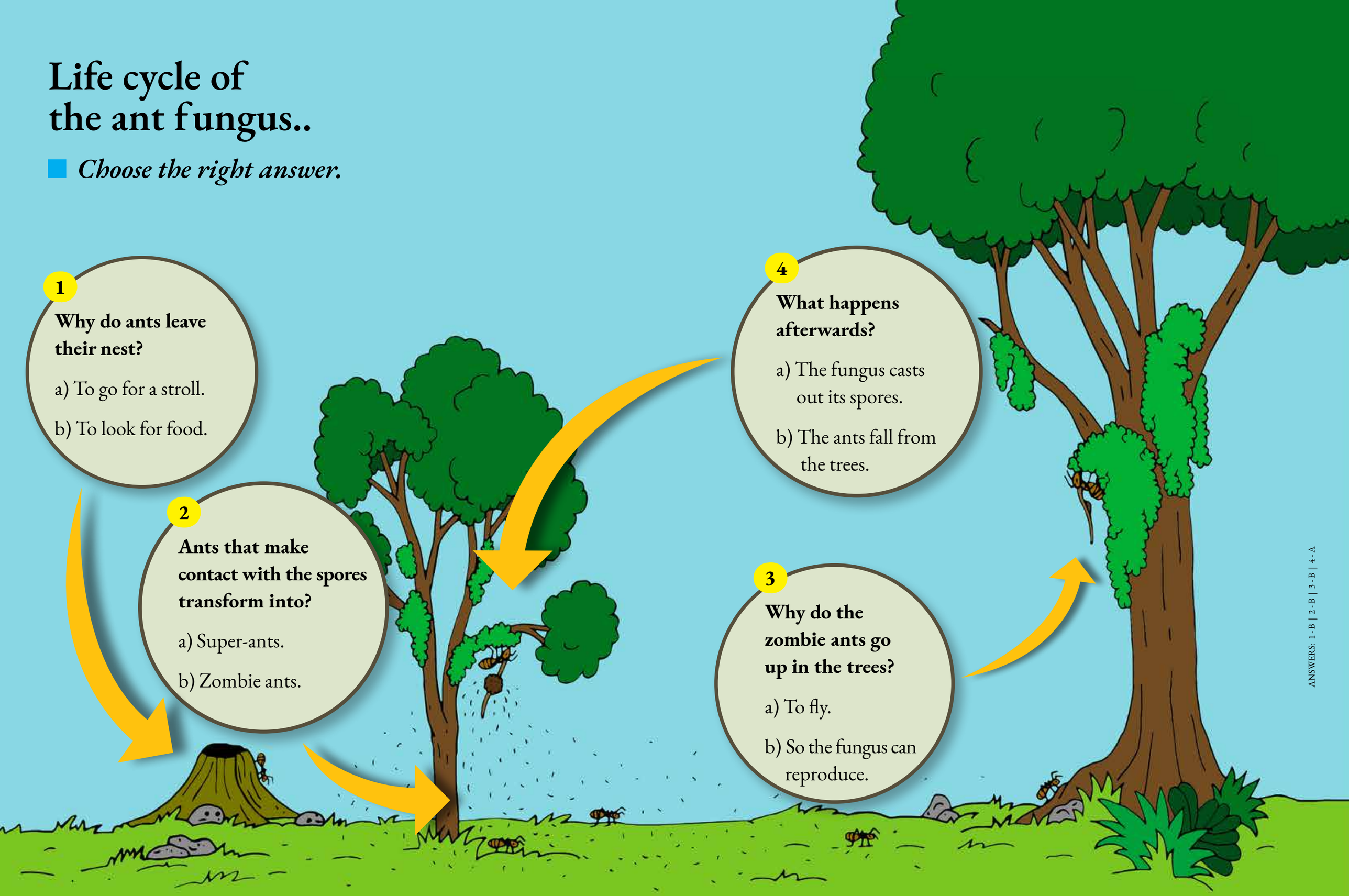
b) So the fungus can reproduce.

4

What happens afterwards?

a) The fungus casts out its spores.

b) The ants fall from the trees.



ANSWERS: 1 - B | 2 - B | 3 - B | 4 - A

Now João would have to do a thorough job observing, measuring, taking notes and describing everything that he sees under the microscope.

After everything is observed and noted, the moment would come that the new species that Olivia discovered would receive its name. Would it also have a last name?

João said that it would be published in a journal. Any and every specialist would certainly become familiar with Olivia's discovery.

All that was missing was a name to complete the identity of the fungus that lives way back in the forest behind her aunt's house.

THE END

A scientific name has two words, like *Homo sapiens*, which is the scientific name for the human species.

The first word is the genus that the species belongs to. In the case of Olivia's new species, we will call the genus *Ophiocordyceps*. You can help Olivia with the second name, which is the epithet. Use your imagination and choose something really creative about the species.

So, the name of the species will be:

Ophiocordyceps _____.

What is the meaning of the name you chose?

_____

_____

_____

_____

_____ .

AUTHORS

TEXT

Cauê Azevedo Tomaz Oliveira is a journalist, professor in the sciences and a biologist who specializes in the identification and cultivation of fungi. Cauê is responsible for the creation of the text of this book and believes that the best way to awaken the interest of children in science is through literature, art and communication.

ILLUSTRATIONS

Weslley Ribeiro Nardes is a biologist and an excellent illustrator. Weslley conducts research on entomopathogenic fungi (*Cordyceps* s.l.) and describes species of these organisms, which attack insects and are the topic of this book.

ORGANIZATION/COORDINATION

Elisandro Ricardo Drechsler dos Santos has his PhD in the biology of fungi, is a professor at UFSC and coordenates the MIND.Funga research group. He has taught and researched about fungi for more than 20 years and believes in the popularization of mycology as a tool to conserve biodiversity. He is responsible for the idea of the book and the coordination required to make it a reality. Olivia, also shown in the photo, is his daughter.

TRANSLATION

Ellie Bergstrom is a biologist who specializes in the ecophysiology of marine macrophytes. She is currently doing her PhD at Griffith University in Brisbane, Australia..

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