

## University of Dundee

### Images of Microbiology Activity Book

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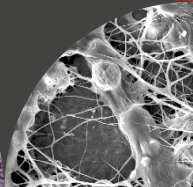
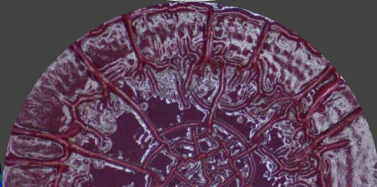
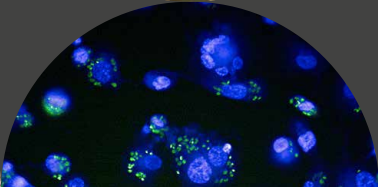
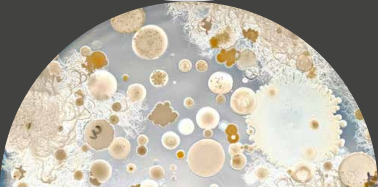
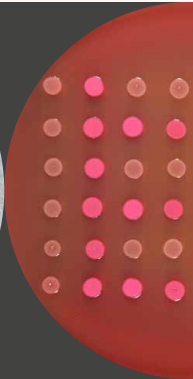
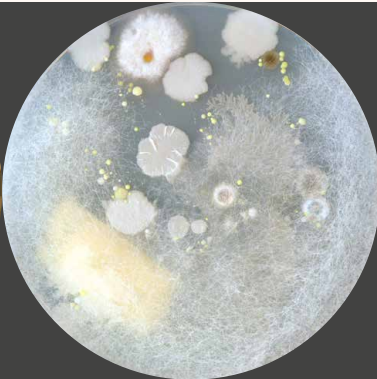
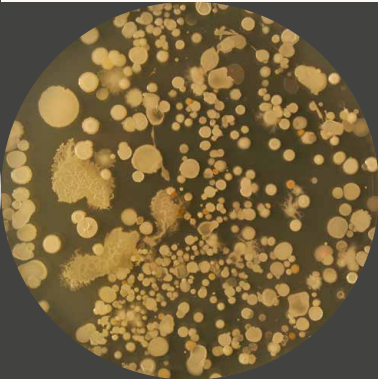
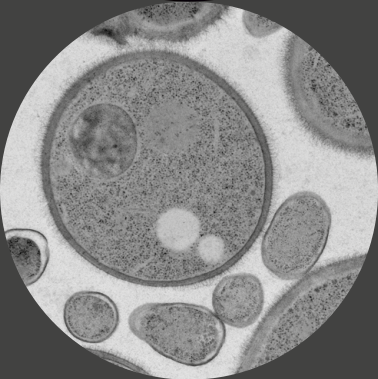
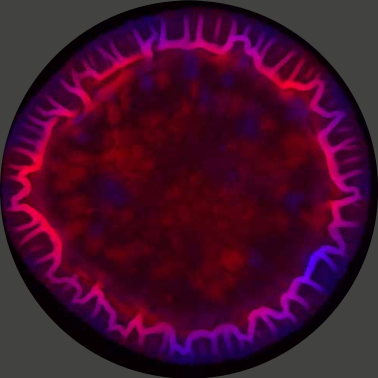
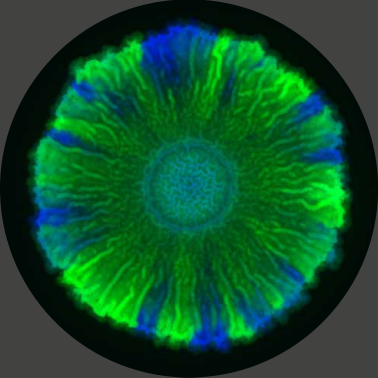
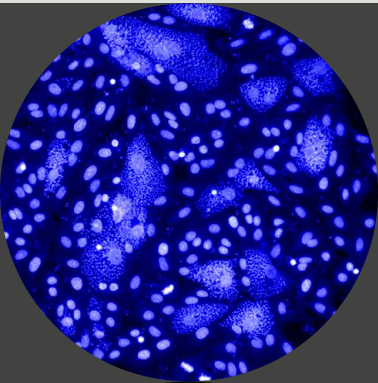
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School of Life Sciences  
University of Dundee

# Images of microbiology activity book





# Introduction

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This booklet accompanies the *University of Dundee Images of Microbiology* book.

It contains activities that are suitable for various learning stages.

You will need your *University of Dundee Images of Microbiology* book to help you complete these activities.

We hope you have fun!

**Senga and Nicola**



Dr. Senga Robertson-Albertyn is a researcher based in the Division of Plant Sciences at the University of Dundee and she designed these activities. Her research focuses on the interactions between plants and microbes, and the beneficial roles microbes can play in plant health and how the plant controls its microbiota. She is supported by the Horizon 2020 Framework Programme Innovation Action 'CIRCLES' (European Commission, Grant agreement 818290) awarded to the University of Dundee.



Prof. Nicola Stanley-Wall is a microbiologist who studies how bacteria form social communities called biofilms. She and her daughter (age 10) provided input during the development of the booklet.

## Making minerals

Match the descriptions in your *Images of Microbiology* booklet to help colour these microbes (or use any colours you like).

2



**Fungus**

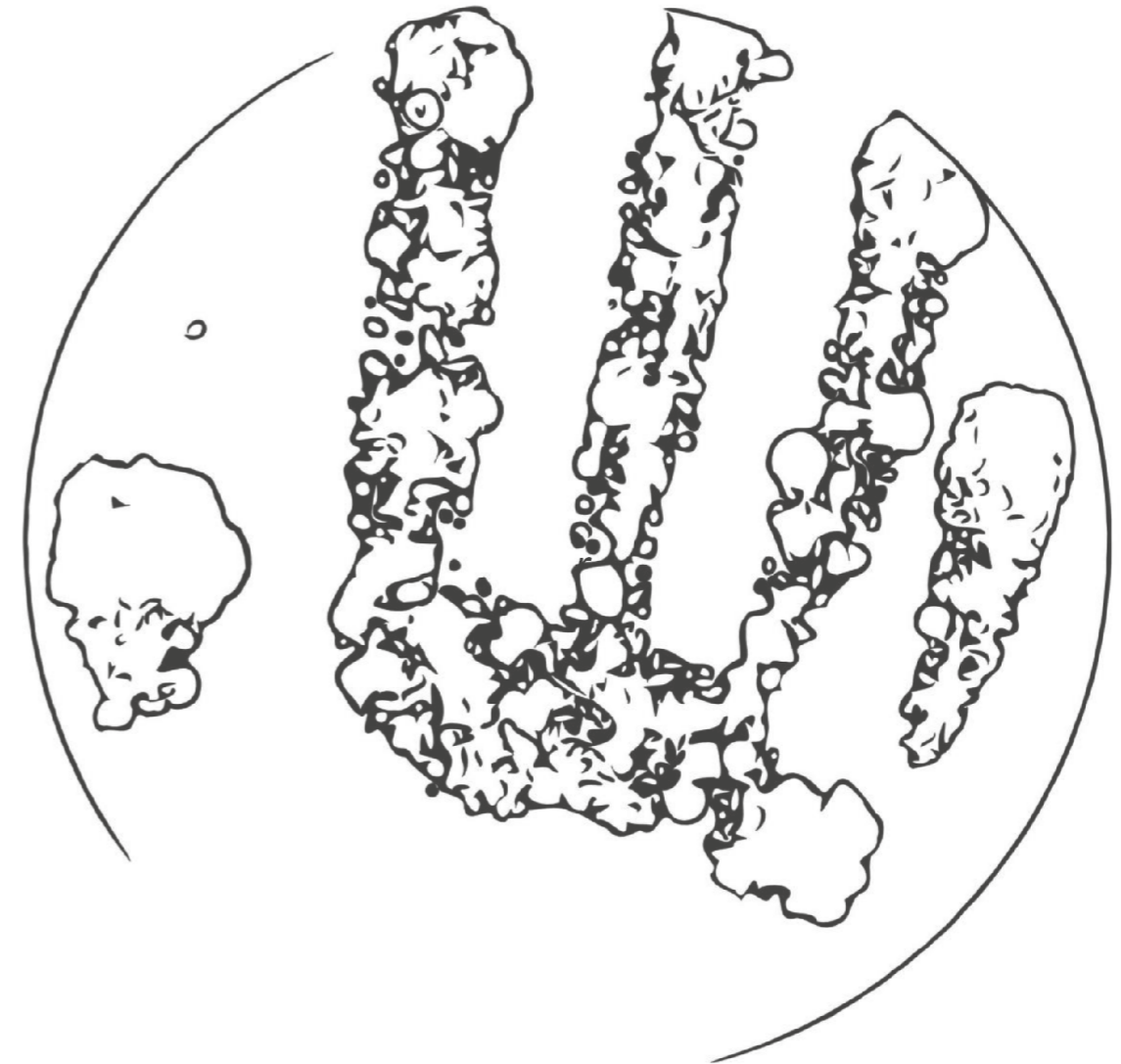
Magnification: 320x

*Beauveria caledonica* can make new minerals. The thin threads (hyphae) are the growing and branching “body” of the fungus. Sometimes these threads grow together and make thicker strands covered with a jelly-like coating. The spheres are crystals of a copper mineral that the fungus has made.

## Skin microbes

Match the descriptions in your *Images of Microbiology* booklet to help colour these microbes (or use any colours you like).

3



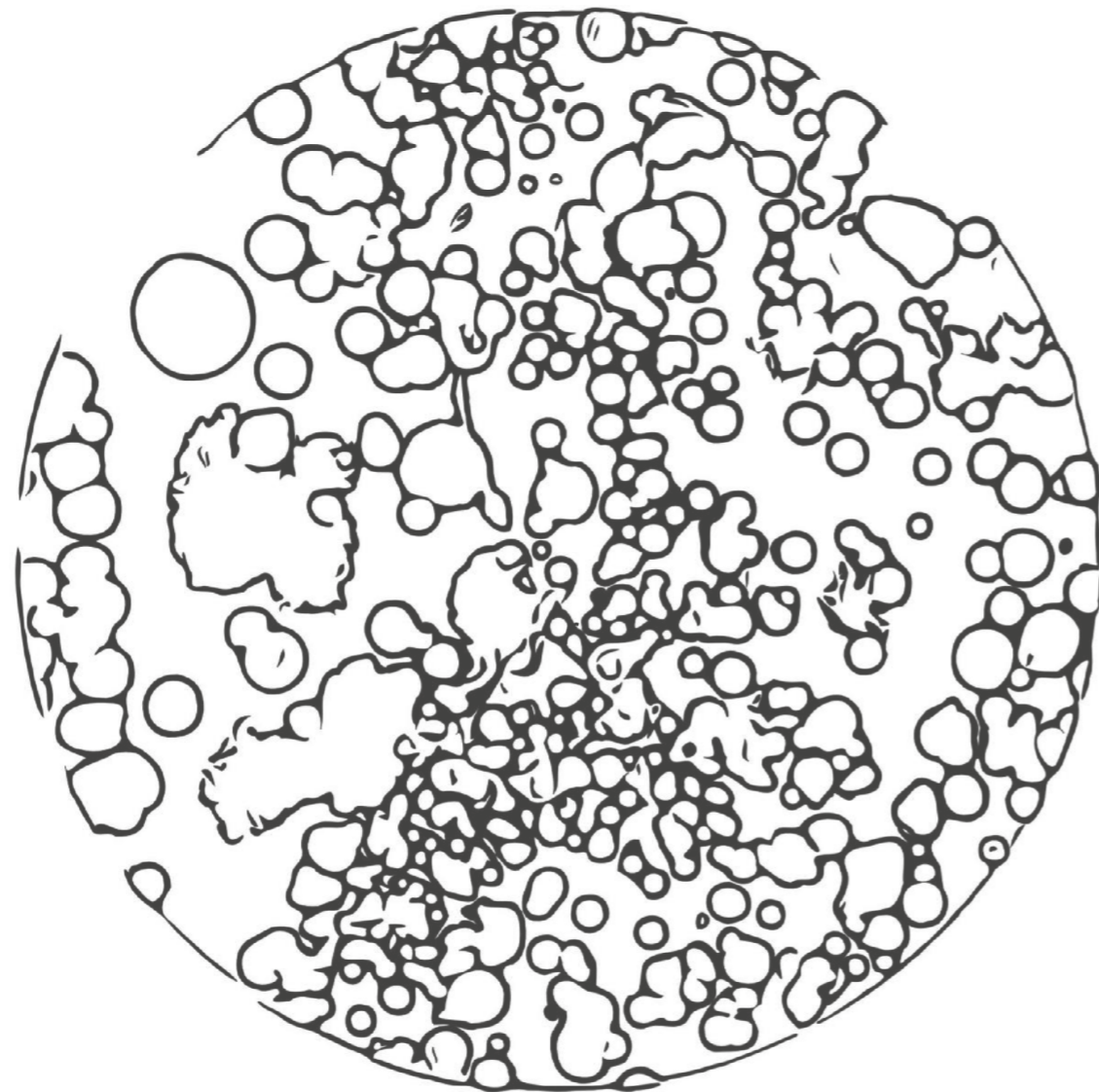
**MIXED SAMPLE**

No magnification

Skin is covered by many different microbes. When we touch a surface, they can be transferred, in this case to an agar plate. Scientists use agar plates to grow microbes in their labs, so they can study them and learn more about them.

# Soil microbes

Match the descriptions in your *Images of Microbiology* booklet to help colour these microbes (or use any colours you like).



**MIXED SAMPLE**  
Magnification: 2x

There can be more microbes in a teaspoon of soil than there are people on Earth! They help plants to grow by making it easier for them to get important elements like nitrogen and phosphorus from the soil.

# Microbe word search

Can you find all 17 microbe related words in this word search? Words can be found left to right, up and down and diagonally - keep an eye out for the tricky ones that are backwards.

C K Q Q S V N S L A Y O P J T R E R D W  
 K H L G J M Z N U T Z N T V O N G M D A  
 P Z P V M X N M I G U V I Y I W K I A K  
 W S E A V L D N Y I N D V C R Y F C W C  
 Q H G I U S U W S T H U I F V G Z R P X  
 Z U R Y H M H O Z B D D F W E O Y O E X  
 P U C D M S G X I O E A Y H S L D B X C  
 S Q H O L C C I W M S G Y K B O T I D C  
 D P C F M U F I R W E B O R C I M O C V  
 O J G Y D P Y Y E M Q Q X S W B A M K M  
 X N H X B W E I F N T M H E C O C E U L  
 J A S G B X U T E F C L O I A R Y R A I  
 X K S Q I U K N I Y L E T N G C Z D I F  
 G X N U T R I E N T S O N O P I C A R O  
 X P G P G C X Q F R I X D L D M T K E I  
 W P I W C J J Z T B M O G O A S R J T B  
 H T W A R A X C I J I E N C B G R X C P  
 F E V P Q I K T U Z Y E Q Y J R A G A Q  
 I W O T M S N P J A L L E G A L F O B S  
 D Y F Q G A J J K E R R V B U A Z E V Z

AGAR  
 BIOFILM  
 COMPETITION  
 MEDICINE  
 MICROBIOME  
 VACCINE

ANTIBIOTIC  
 COLONIES  
 FLAGELLA  
 MICROBE  
 NUTRIENTS  
 VIRUS

BACTERIA  
 COMMUNITY  
 FUNGUS  
 MICROBIOLOGY  
 SCIENCE

# Bacterial structures

Match the descriptions in your *Images of Microbiology* booklet to help colour these microbes (or use any colours you like).

6



## BACTERIA

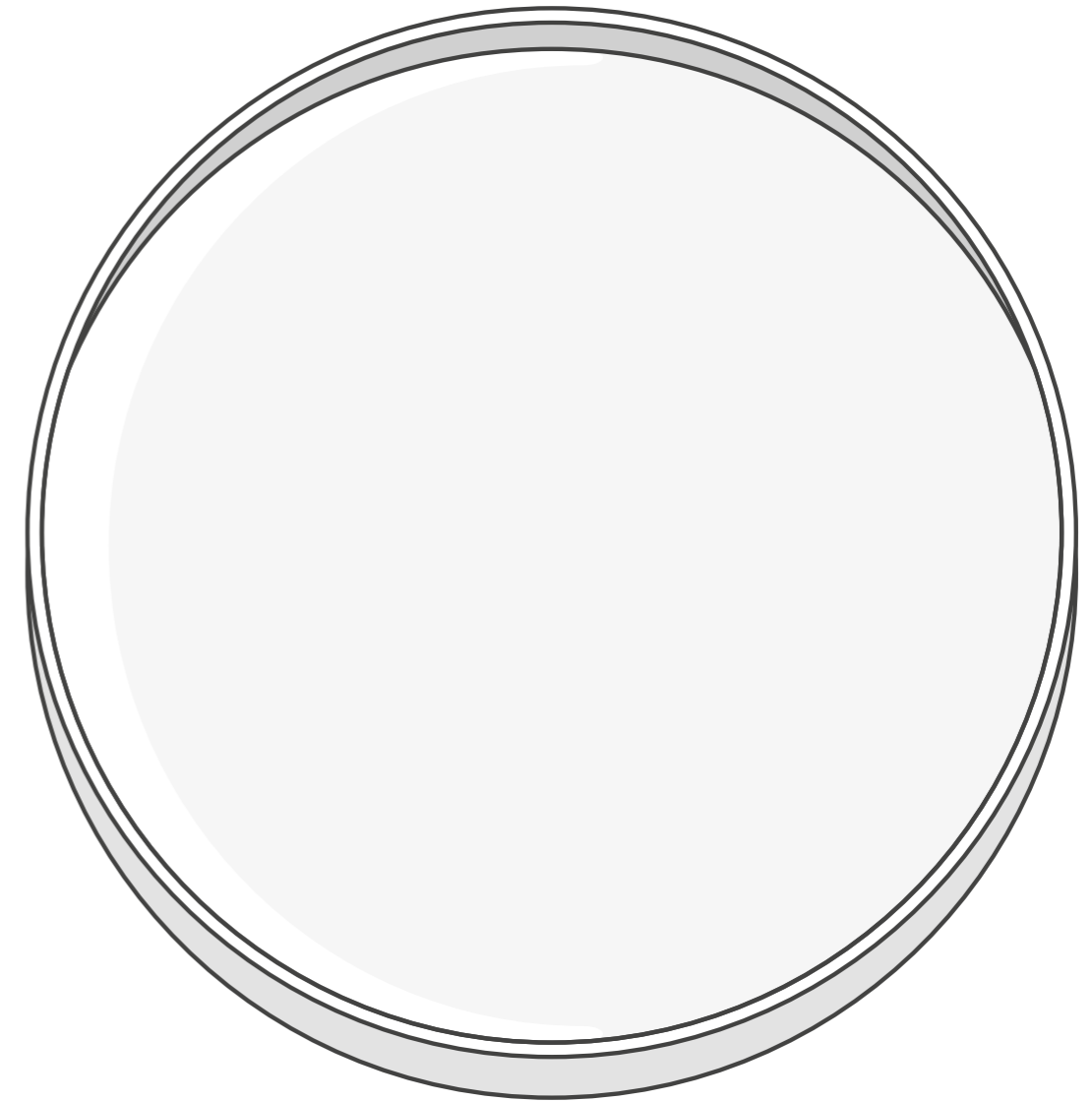
Magnification: 8x

Many bacteria form elaborate, wrinkly structures when they grow as large groups on a solid surface. There are billions of individual bacteria piled on top of each other in this image, and they are thought to form these structures to improve the access of the cells to fresh air.

# Design your own microbes

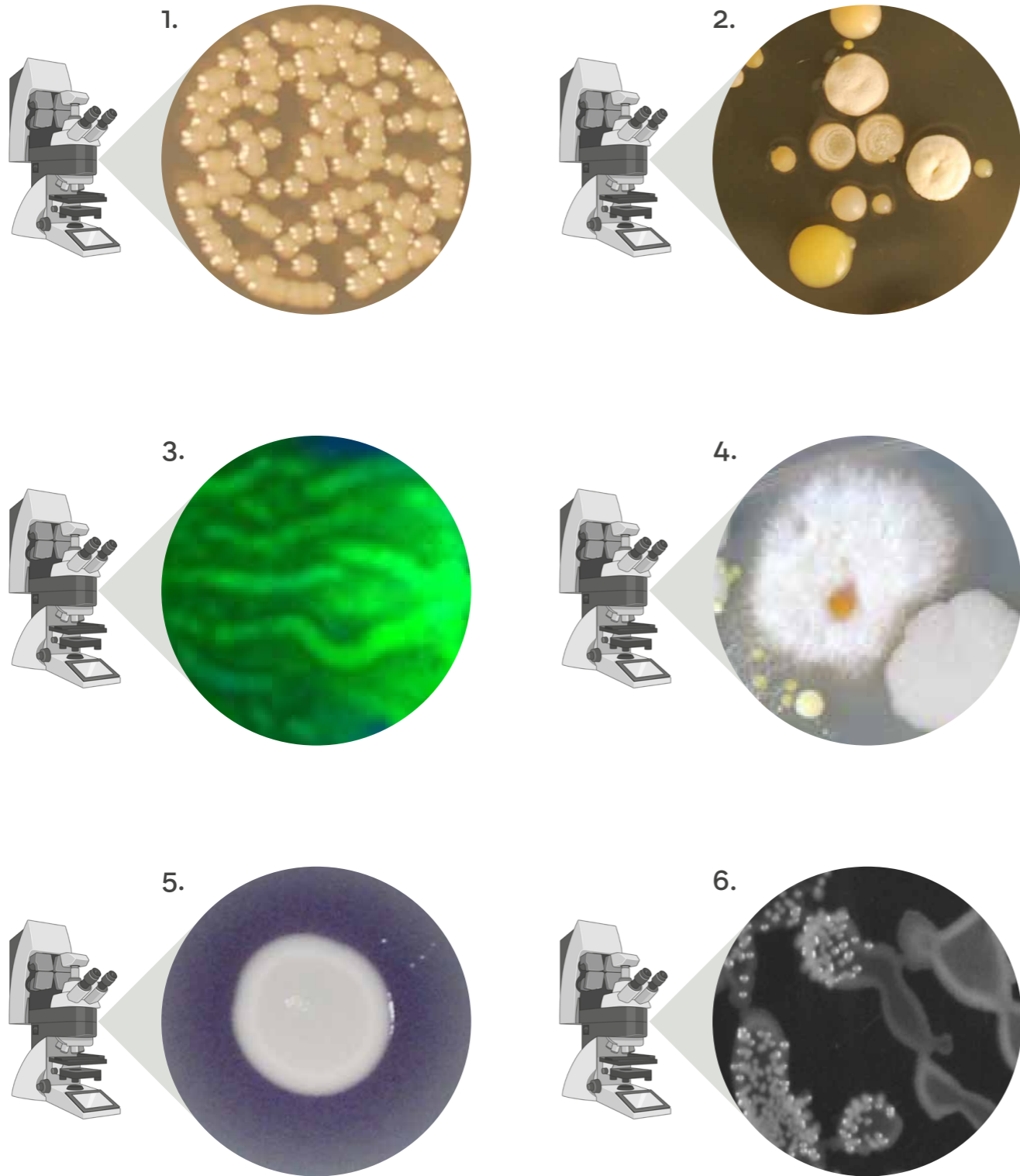
Think about what you have learned so far and create your own agar plate below. Be as creative as you like, microbes come in all colours, shapes and (small) sizes!

7



# Magnified microbes

We have zoomed in on some of the images. Can you match them with the photographs in your *Images of Microbiology* booklet?



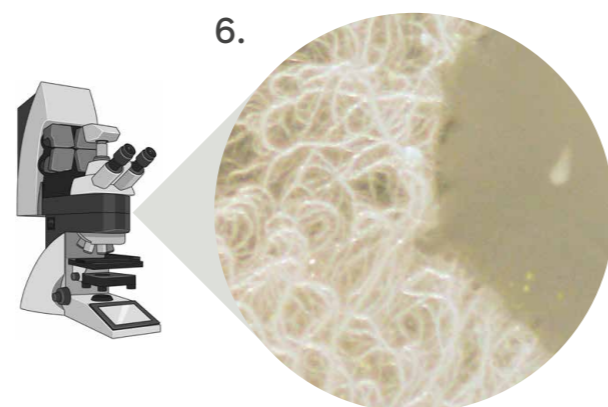
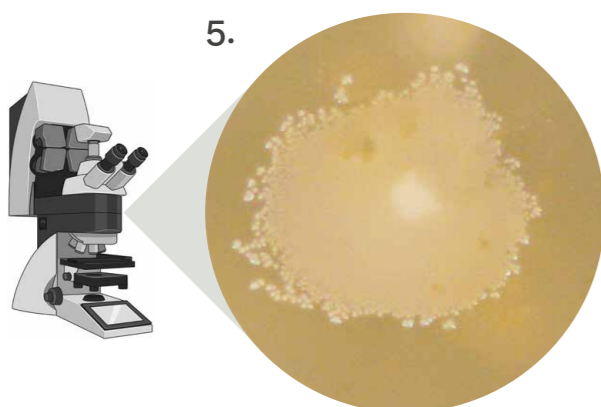
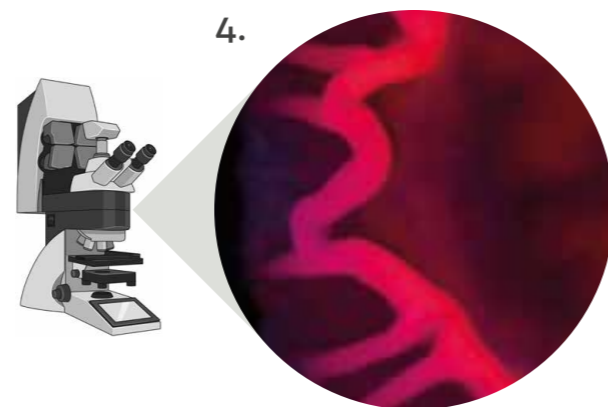
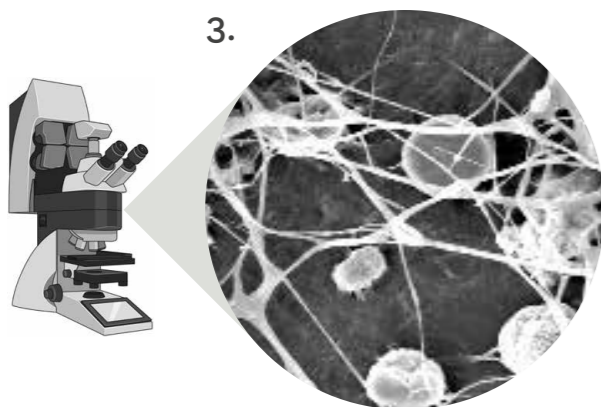
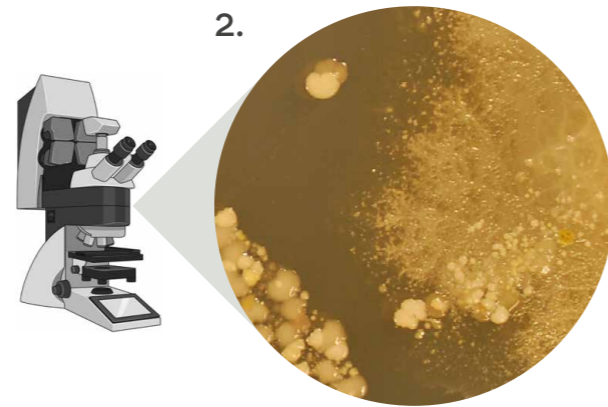
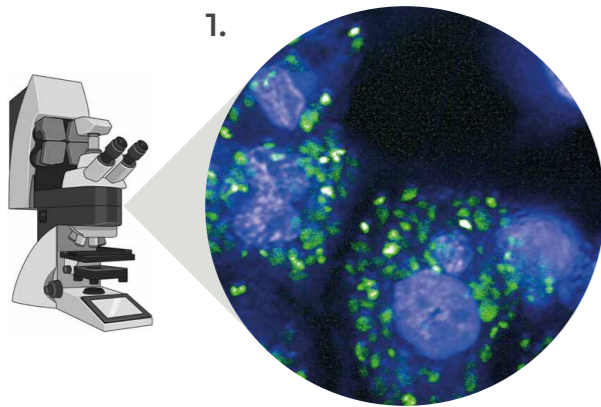
# Design a hand print

Think about the handprint images in *Images of Microbiology* booklet. Why not add microbes to the hand below? Be as creative as you like as microbes come in all colours, shapes and (small) sizes!



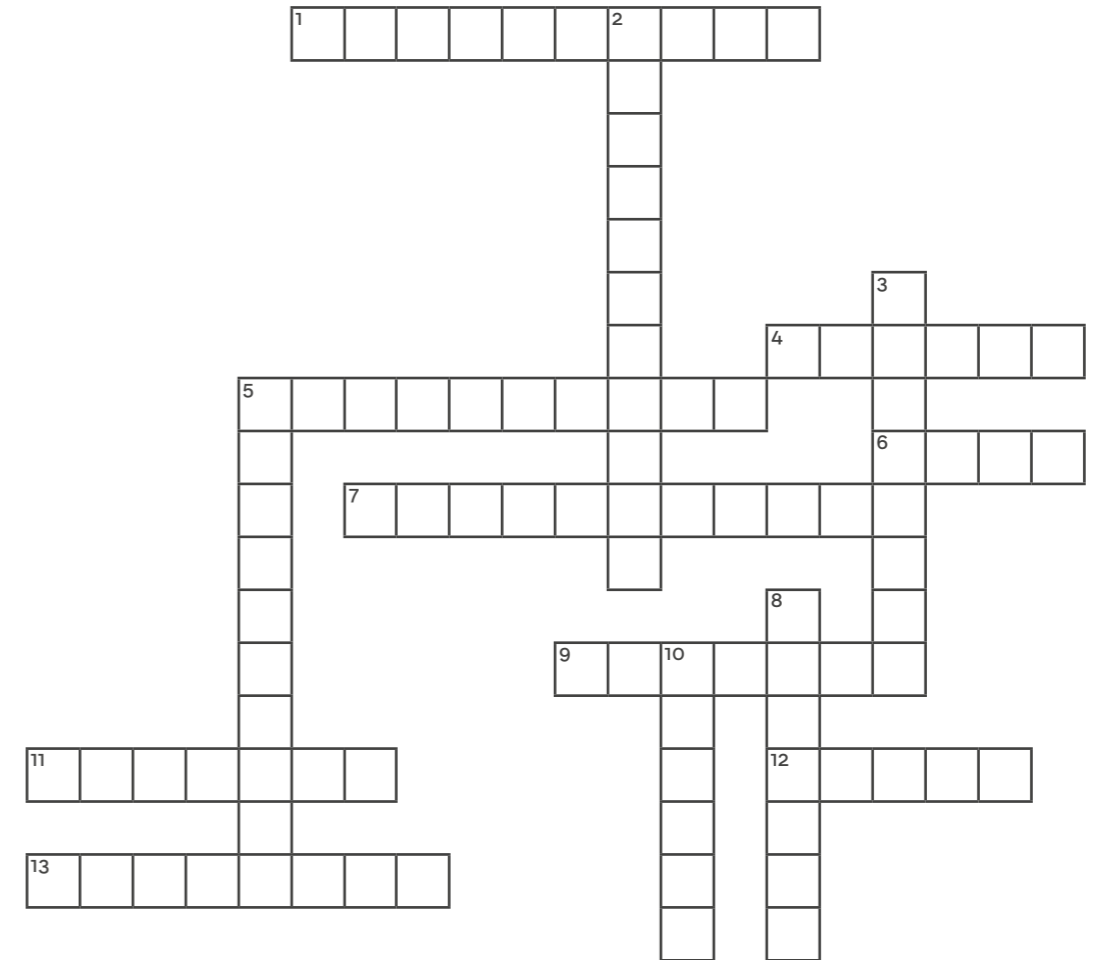
# Magnified microbes

We have zoomed in on more of the images. Can you match them with the photographs in your *Images of Microbiology* booklet?



# Microbe crossword puzzle

Your *Images of Microbiology* booklet contains all the answers to these crossword clues. Can you answer them all?



## Across

1. Where are microbes found?
4. Microbes that live in soil can help \_\_\_\_\_ to grow better
5. The name given to a community of microbes living in a particular environment
6. In a laboratory what are microbes often grown on?
7. Some microbes produce these compounds to prevent other microbes from growing
9. Something that is given to you to help protect you from infection
11. An organism that is composed of just one cell

12. These microbes can grow long filaments called hyphae to search for nutrients
13. Some microorganisms use these to move around

## Down

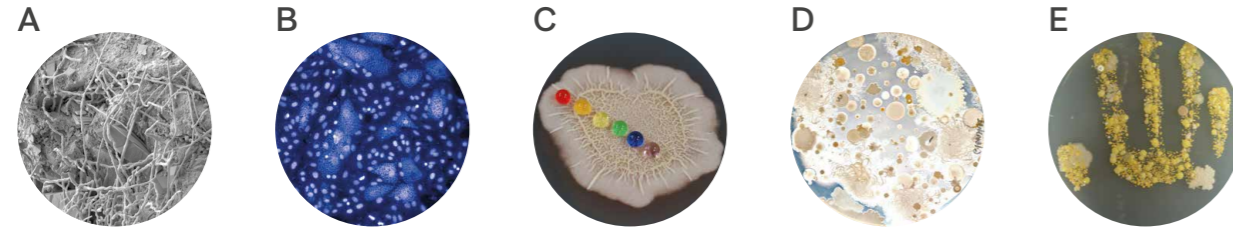
2. Another word for waterproof
3. *Trypanosoma cruzi* is an example of what type of microbe?
5. We use these to be able to see microbes
8. These are composed of billions of bacteria living together and can be waterproof
10. A food that can be made with the help of microorganisms



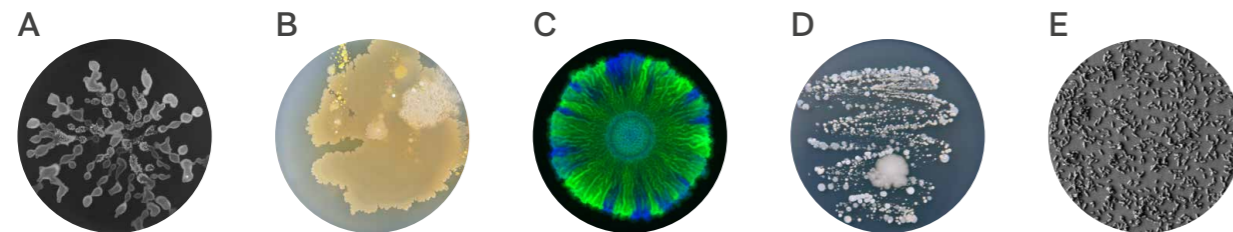
# Guess who

Use the descriptions in the *Images of Microbiology* booklet to work out which microbe fits each description.

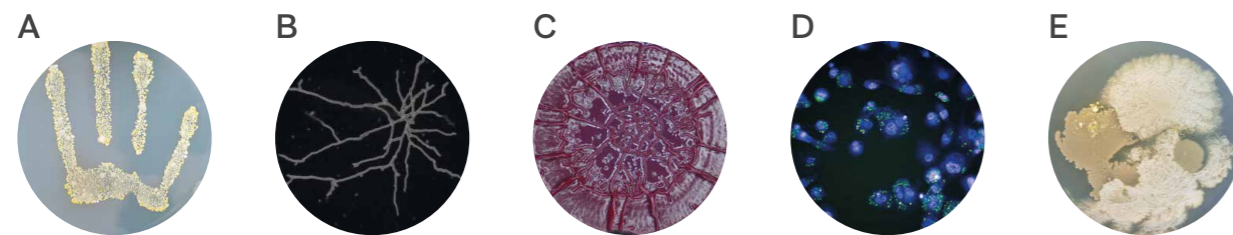
1. Which of us is waterproof (hydrophobic)?



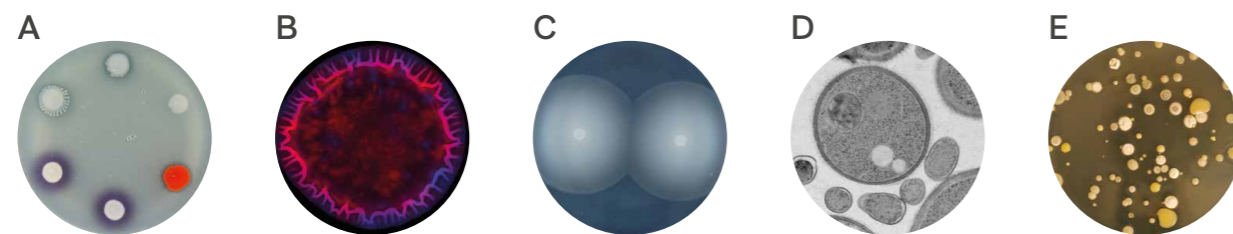
2. Which of us uses a "tail" (called flagella) to swim around?



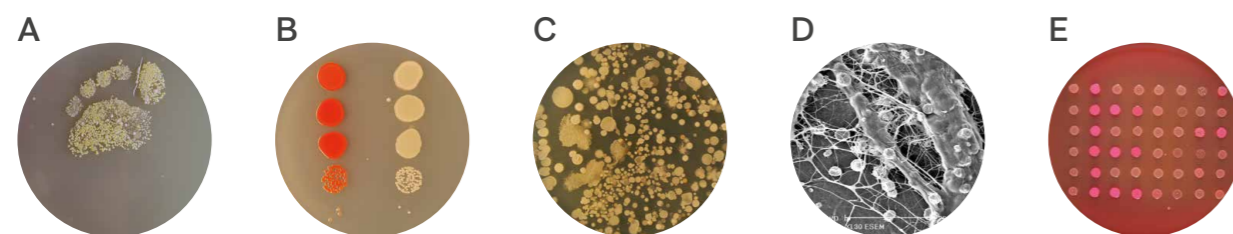
3. Who grows threads (hyphae) to explore for food (nutrients)?



4. Who can produce antibiotics and colour pigments?



5. Which of us grow in soil and help plants to get nutrients?



# Answers

## Microbe word search

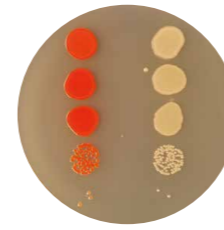
C K Q Q S V N S L A Y O P J T R E R D W  
 K H L G J M Z N U T Z N T V O N G M D A  
 P Z P V M X N M I G U V I Y I W K I A K  
 W S E A V L D N Y I N D V C R Y F C W C  
 Q H G I U S U W S T H U I F V G Z R P X  
 Z U R Y H M H O Z B D D F W E O Y O E X  
 P U C D M S G X I O E A Y H S L D B X C  
 S Q H O L C C I W M S G Y K B O T I D C  
 D P C F M U F I R W E B O R C I M O C V  
 O J G Y D P Y Y E M Q Q X S W B A M K M  
 X N H X B W E I F N T M H E C O C E U L  
 J A S G B X U T E F C L O I A R Y R A I  
 X K S Q I U K N I Y L E T N G C Z D I F  
 G X N U T R I E N T S O N O P I C A R O  
 X P G P G C X Q F R I X D L D M T K E I  
 W P I W C J J Z T B M O G O A S R J T B  
 H T W A R A X C I J I E N C B G R X C P  
 F E V P Q I K T U Z Y E Q Y J R A G A Q  
 I W O T M S N P J A L L E G A L F O B S  
 D Y F Q G A J J K E R R V B U A Z E V Z

AGAR	ANTIBIOTIC	BACTERIA
BIOFILM	COLONIES	COMMUNITY
COMPETITION	FLAGELLA	FUNGUS
MEDICINE	MICROBE	MICROBIOLOGY
MICROBIOME	NUTRIENTS	SCIENCE
VACCINE	VIRUS	

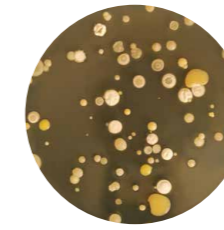
## Microbe crossword puzzle

1 e v e r y w h e r e  
 y  
 d  
 r  
 o  
 p  
 h  
 3 p  
 4 p l a n t s  
 5 m i c r o b i o m e  
 i  
 b  
 6 a g a r  
 7 a n t i b i o t i c s  
 c  
 i  
 8 b  
 9 v a c c i n e  
 10 c  
 h  
 11 m i c r o b e  
 p  
 e  
 12 f u n g i  
 s  
 l  
 e  
 m

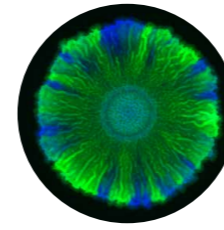
## Magnified microbes - page 8



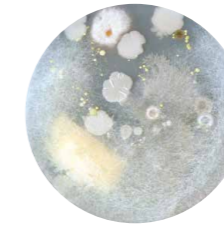
1. Antibiotic resistance



2. Antibiotics from soil



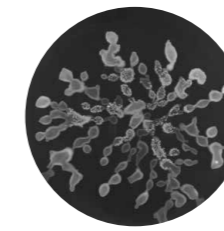
3. Biofilm building



4. Bacterial colonies

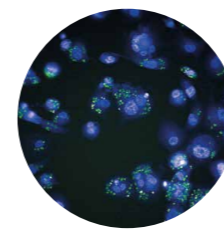


5. Bacterial reactions

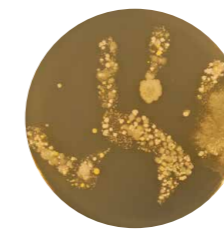


6. Moving bacteria

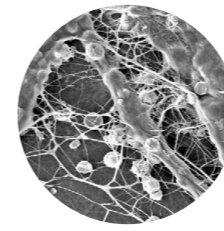
## Magnified microbes - page 10



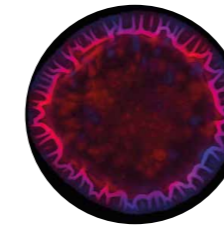
1. Leishmaniasis



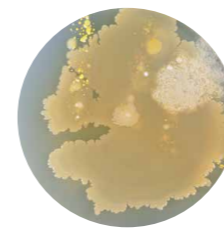
2. Skin microbes



3. Making minerals



4. Living together



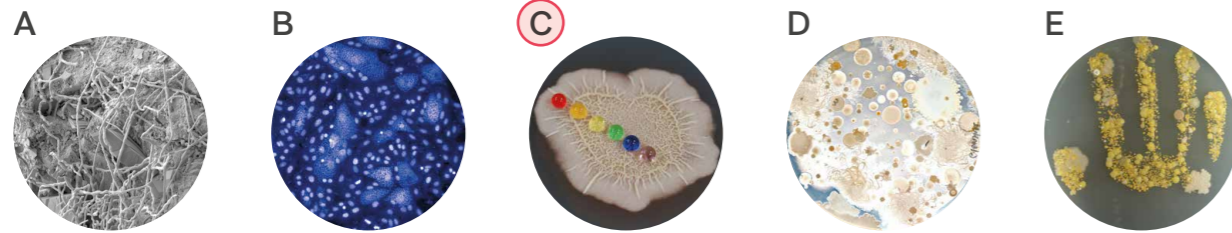
5. Microbes competing



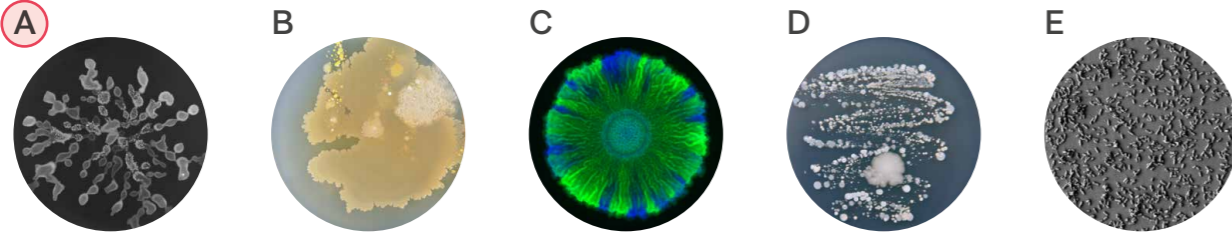
6. Microbe care

# Guess who

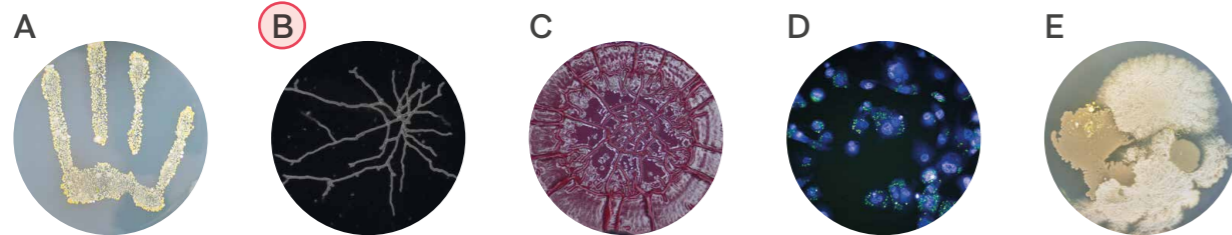
1. Which of us is waterproof (hydrophobic)?



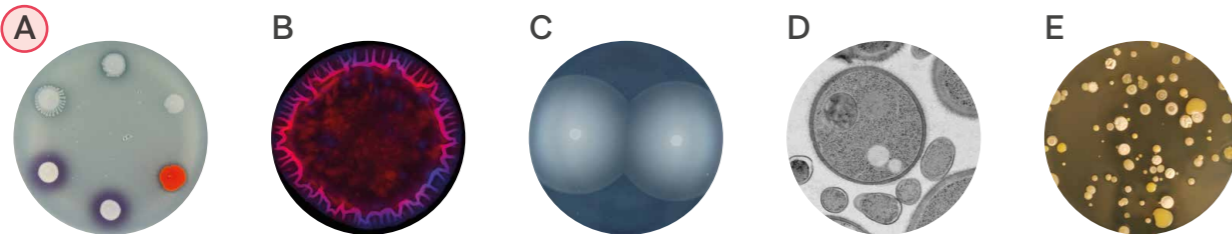
2. Which of us uses a "tail" (called flagella) to swim around?



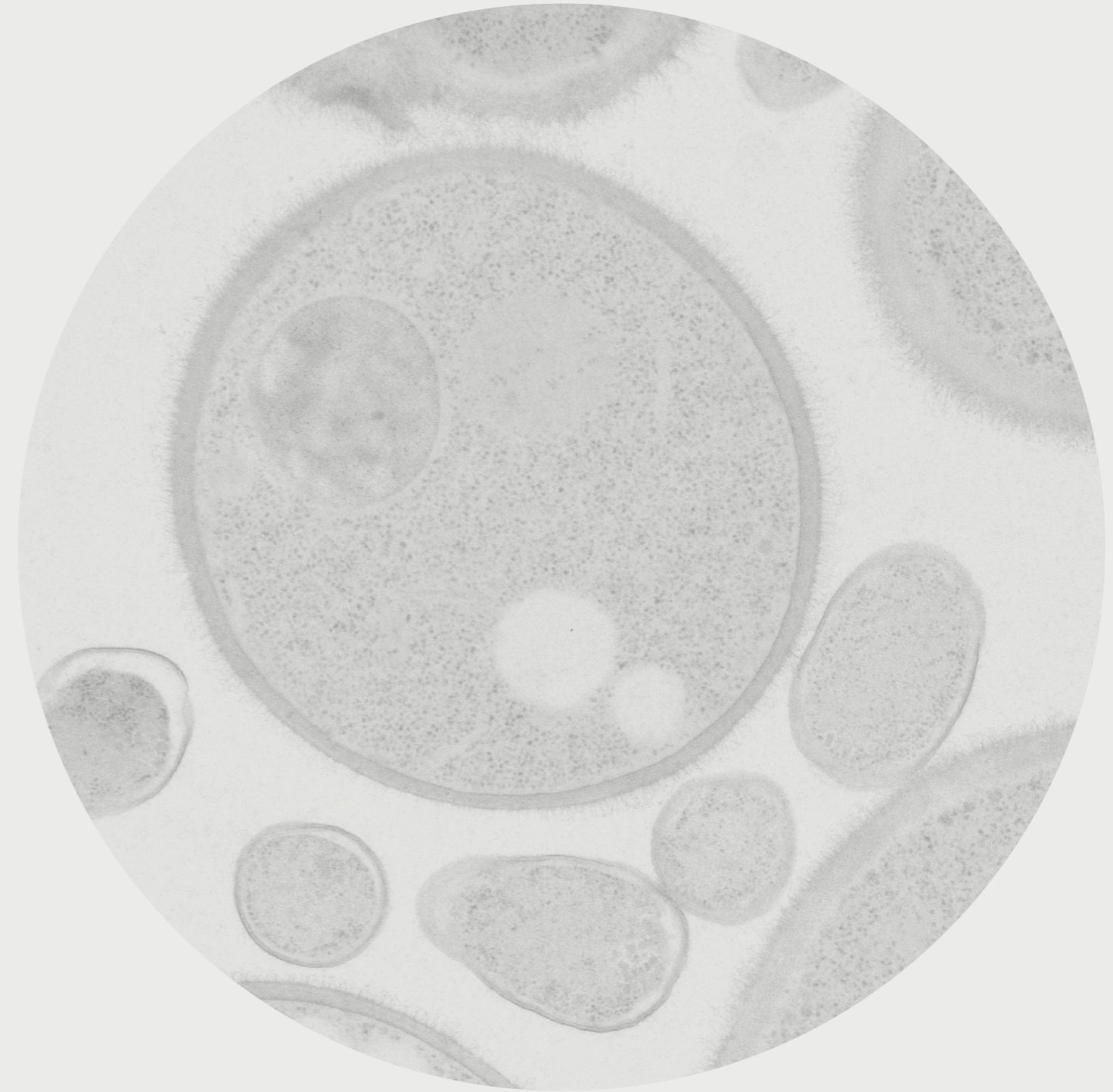
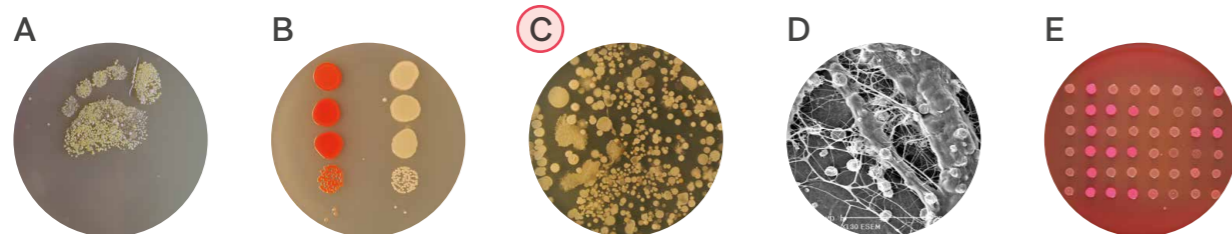
3. Who grows threads (hyphae) to explore for food (nutrients)?



4. Who can produce antibiotics and colour pigments?



5. Which of us grow in soil and help plants to get nutrients?





These worksheets were designed by Dr. Senga Robertson-Albertyn who is a researcher based in the Division of Plant Sciences at the University of Dundee. Her research focuses on the interactions between plants and microbes, more specifically Senga investigates the beneficial roles microbes can play in plant health and how the plant controls its microbiota.

The work of the scientists featured in this booklet was funded by:




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The project was developed in partnership with:  
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contactus@dundee.ac.uk

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and photographs:

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