

Follow Your Gut: A Story From the Microbes That Make You

CREATED BY

BRIONY BARR AND DR GREGORY CROCETTI

AUTHORS

AILSA WILD AND DR LISA STINSON

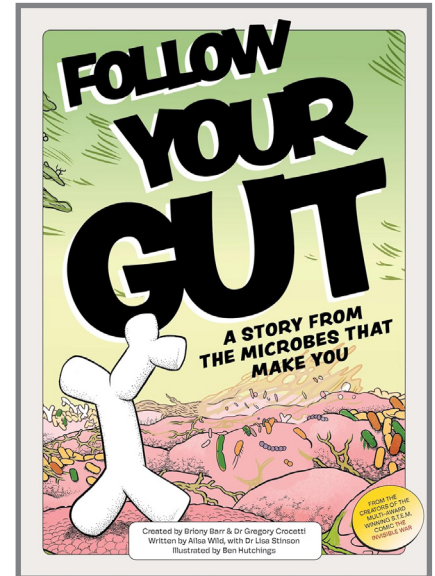
ILLUSTRATOR

BEN HUTCHINGS

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RECOMMENDED FOR: Lower to Mid Secondary



SYNOPSIS

Meet the ecosystem inside you . . .

A timid Bifidobacterium named Biffy is forced to leave their family and become part of a new community, in the gut of a newborn human baby.

Follow Your Gut is a comic that ate a biology textbook. It's an epic adventure set over the first three years of a new life, exploring one of the most important relationships you will ever have—the one with your gut microbiome.

Created by artists, scientists and educators, this story is for anyone who's curious about the human–microbe symbiosis, and what all those trillions of bacteria are doing down there in your intestines!

Inspired by the latest research, *Follow Your Gut* includes a fascinating and detailed appendix that explains the amazing science behind the story.

ABOUT THE CREATORS

Briony Barr is a visual artist who uses process-based drawing to explore ideas around structure, emergence, and the impact of different boundaries and generative limits. She regularly collaborates with scientists, writers, musicians and dancers on a diverse range of interdisciplinary projects including making picture books and graphic novels about symbiotic microbes, designing large-scale, participatory drawings exploring complex systems, and performing live drawing to improvised music. She is co-founder of Scale Free Network.

Dr Gregory Crocetti is a microbial ecologist, science educator, writer and advocate for microbes. His PhD and post-doctoral research explored the roles of different populations of bacteria in a range of environments—including those found in mouse intestines, sponges, seaweed, stromatolites and sewage—with his peer-reviewed scientific articles having been cited over 1,000 times. He is co-founder of Scale Free Network.

Gregory also co-creates award-winning picture books and graphic novels about microbes and their symbiotic partnerships with larger forms of life, including the Small Friends Books series <www.smallfriendsbooks.com>.

ABOUT THE AUTHORS

Ailsa Wild is an author and performer with a history of circus performance and deep collaboration. She has written two junior fiction series, the Squishy Taylor books and the Naughtiest Pixie books, and is the lead writer for Scale Free Network, where she works with scientists to translate complex science into compelling illustrated narratives. Ailsa has two non-fiction books for adults, *You'll Be a Wonderful Dad: advice on becoming the best father you can be* and *The Care Factor: a story of nursing and connection in the time of social distancing*. She has been published in Spain, Brazil, the US, the UK, Egypt, South Korea, Israel and China.

Dr Lisa Stinson is a perinatal microbial ecologist at the University of Western Australia. Her research interests include the infant and human milk microbiomes and the developmental origins of health and disease. In 2020, she was selected as one of the ABC's Top 5 Scientists. Lisa is currently a Research Fellow in the Australian Breastfeeding and Lactation Research and Science Translation (ABREAST) group, where she co-directs the Human Milk Biobank and the BLOSOM birth cohort. Lisa's work aims to support and improve early microbial assembly for lifelong health.

ABOUT THE ILLUSTRATOR

Ben Hutchings is co-founder of Melbourne's first comic studio, Squishface Comic Studio, where he works as a comic book publisher, animator, and coin designer. His previous works include *Avanti! Tutta!* for Lingopont, *Mini Mel & Timid Tom*, and *The Invisible War: a tale on two scales*.

STUDY NOTES

BEFORE READING

- Look at the cover of the book and take a quick look inside.
 - Does it look more like a picture book, a graphic novel, or a textbook?
 - Do you think it is a fiction or non-fiction book . . . or something in-between?

The authors suggest this graphic novel fits into the genre of 'narrative non-fiction'. What do you think this means?

- The subtitle of the book is: 'A Story from the Microbes That Make You.' Do you know what a microbe is?
 - What do you think this subtitle is trying to suggest?
- The gut is part of your digestive system. What do you already know about digestion?
 - Which part of your digestive system do the authors describe as your gut?
- Why is it important to understand digestion?
- Some people think it's rude to talk about pooing, farting and vomiting. Why do you think this is? Do you think it's rude to discuss these body functions? Why/Why not?

WHILE READING

- While reading the story, write down the following:
 - Any words you don't understand.
 - Any concepts you don't understand.
 - Anything you'd like to discuss or learn more about.

Check the appendix to see if any of your questions are answered there.

AFTER READING

- After reading the story, consider:
 - What is a microbe?
 - Can you name any microbes (either their character name or scientific name)?
 - What are three ways that our gut microbes can help make us healthy?
 - What are three surprising things you learned in the book?
 - What are three surprising things about the immune system you learned in the story?
 - Do you think differently about your gut now? . . . How?

SCIENCE

- After reading the story, lead students through a discussion of important parts of the human digestive system by recalling parts of Biffy's adventure.
 - On p 43, Biffy enters their new host:
 - What is the starting point of their journey? (The mouth).
 - Where do they end up next? (The stomach).
 - What's the tube connecting the mouth and stomach? (Oesophagus).
 - On p 44, Biffy is now in the stomach:
 - What's the liquid Biffy is floating in? (Hydrochloric acid).
 - Where does Biffy exit the stomach? (The pyloric sphincter).
 - On p 45, Biffy has entered the small intestine:
 - What do the bile acids do in the small intestine? (Break apart fats like a detergent).
 - What are the walls of the small intestine lined with? (Villi).
 - What does the finger-like shape of villi help with? (Makes more surface area = absorption).
 - On p 48, Biffy is about to finish their journey:
 - What organ does Biffy arrive into? (Large intestine, also called the gut or the colon).
 - On p 152, a brave Bifidobacterium leaves Biffy on an adventure:
 - What is the exit of the gut or colon called? (The anus).
- Unleash your inner scientist and get ready to digest some fun facts about your body with this 20-question quiz: <https://forms.gle/SRZJ4j5NY898kgPM7>

Research Projects

Gut Microbiome Research Projects

- Assign students to research specific aspects of gut microbiome, such as:
 - The role of gut bacteria in digestion, immunity, or mental health
 - The effects of diet on the gut microbiome
 - The role of prebiotics and probiotics in digestive health
 - The impact of antibiotics on microbial communities.

They can create multimedia presentations or posters to summarise their findings and present them to the class.

Health Campaign Posters

- Task students with creating health campaign posters promoting awareness of the importance of gut health and microbiome diversity. They can design visually appealing posters featuring scientific information, tips for maintaining a healthy gut and funny slogans to encourage healthy habits, such as eating lots of dietary fibre. Posters could be designed from the microbial point of view and advocate for humans to take better care of their microbiomes.

Digestive System Diagrams or Sculptures

- Have students work in groups to create a poster-sized diagram showing the journey of your food from the time it enters your mouth, to the time it exits at the other end. Label the diagram with the different parts of the digestive system, including everything they have learned about how digestion works and the microbes found there.
 - Also, students could work in small groups or as a whole class, to make a 3D sculpture of the digestive system using toilet rolls, plastic bags, plastic bottles, rubber bands or any other accessible recycled materials.
 - Challenge: If you 'feed' the system at one end, can you successfully get it through to the other end?

Gut Infographic

- Challenge students to design infographics that visually represent key scientific concepts related to gut bacteria and human health. They could design graphs, charts or diagrams to illustrate the functions of gut microbes, factors influencing microbial diversity, and strategies for maintaining a healthy microbiome.

Science and Ethics Debate

- Organise a debate on ethical considerations surrounding gut microbiome research and interventions. Students can research and present arguments for and against topics such as genetic engineering of gut bacteria, faecal microbiome transplants, the use of probiotics, and the overuse of antibiotics in human medicine and agriculture.
 - Hygienic practices, and the use of antibiotics over the last century, have dramatically reduced the rates of death and disease caused by bacteria. However, at the same time, we are seeing epidemic levels of food allergies, hay

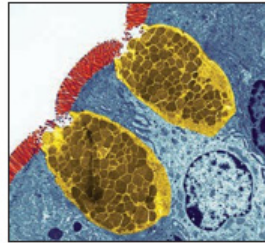
SCHOLASTIC TEACHING NOTES

fever, asthma and other auto-immune diseases emerging in children, particularly in the Global North. Some scientists are now questioning whether we have pushed hygiene too far, sometimes described as the ‘Hygiene Hypothesis’ or ‘Old Friends Hypothesis’. Organise students to debate whether we have become too clean for our own good.

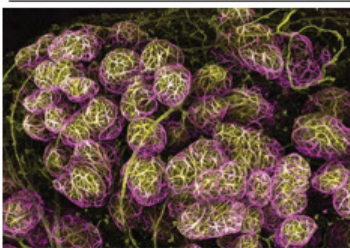
- The following pictures are electron micrographs of creatures and landscapes from inside the human body that helped to inspire characters and scenes from *Follow Your Gut*. Guess what each of the images represents. Discuss answers as a group afterwards.



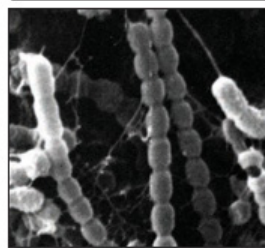
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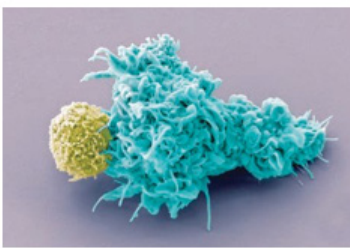
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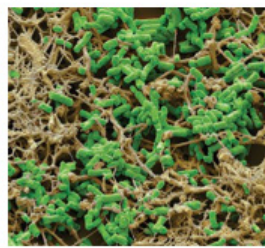
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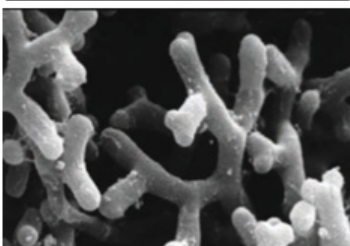
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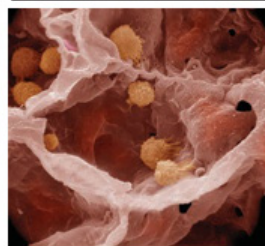
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6.



7.



8.

Answers

- Layers of human skin
- Goblet cells full of mucus
- Alveoli in the human mammary glands
- Ruminococcus bacteria
- Dendritic Cell presenting sample to a T Cell
- Bacteria on a layer of mucus
- Bifidobacterium bacteria
- Macrophages patrolling alveoli in the lungs

LITERATURE

- The authors have attempted to make the story as scientifically accurate as possible, depicting microscopic characteristics with details such as flagella, pili, membranes and visualising molecular interactions. But they also used their imaginations to help tell the story. What elements of the story world do you think they made up and why?
- Assign students to write a literary analysis essay analysing the themes, symbolism and narrative techniques used in the graphic novel. Encourage them to explore how the story’s structure and imagery enhance its exploration of scientific concepts and themes related to gut bacteria.
- Even though the authors describe this book as narrative non-fiction, the book uses some of the tools of fiction to make much of the scientific knowledge easier to understand. What are some of the ways the book does this?

- Did you find anything funny in the story?
- Can you give an example where humour helped you connect with an idea or character in the story?
- Why would the authors try to use humour in this story?
- *Follow Your Gut* uses a mixture of written and visual languages. Explore some of the different kinds of language used across the book and how they work together to engage with the story and convey a wider understanding of the scientific subject matter.
- Picture books, comic books and graphic novels use a mixture of text and images to tell a story. However, many people consider comic books and graphic novels to be a more sophisticated format for storytelling. After reading *Follow Your Gut*, describe three differences between a picture book and a comic book/graphic novel.
- *Follow Your Gut* is designed to be educational and contains a lot of science information, much like a science textbook. Discuss the similarities and differences between a textbook and a comic book.

Discussion Questions and Activities

- Ask students to create character profiles for the main characters in the book, including information about their roles, personalities, and relationships. Have them research the real-life scientific counterparts of these characters, such as different types of gut bacteria, and compare and contrast their traits.
- Have students imagine they are journalists interviewing characters from the book, based on their experience and knowledge of gut bacteria from the story. Ask them to write interview transcripts or record mock interviews to explore character perspectives and deepen their understanding of the scientific concepts presented. Alternatively, students could imagine talking to microbial or immunological characters from their own gut.
- Ask students to write short science fiction stories inspired by the book. This could involve placing the existing characters into new situations or new environments.
 - Alternatively, students could write works that explore futuristic scenarios involving advances in gut microbiome research and technology, speculating on the potential implications of manipulating gut bacteria for human health and society.
- Ask students to create collages that combine artistic representations of gut bacteria with scientific diagrams and illustrations. Encourage them to use mixed media to convey the complexity and diversity of interconnections within the gut microbiome. Consider the gut microbiome spread on pp 122–123 as a possible starting point.
- Organise students into groups to write a song, or a whole script, for a musical featuring characters and themes from the story. Students could write lyrics to existing tunes or make up their own melodies.