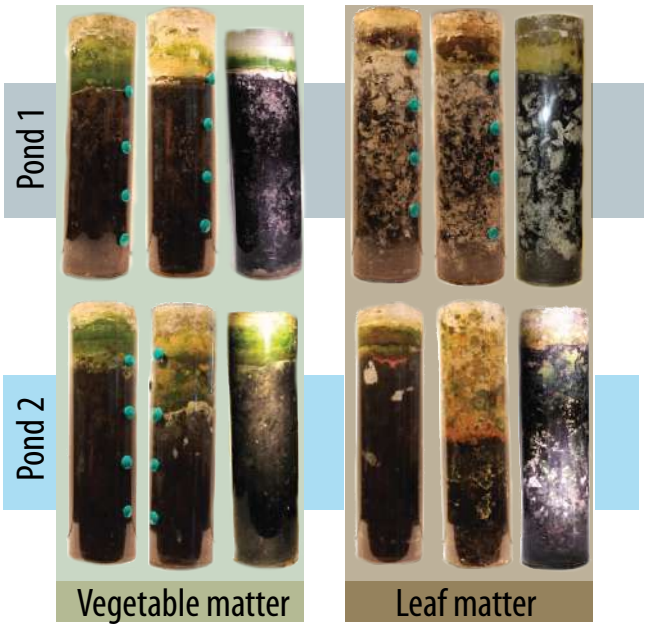
How can I experiment with microbiomes?

• Experimenting with microbiomes can be as easy as collecting samples from your environment and identifying similarities and differences in what grows. A classic microbiome culturing experiment is a Winogradsky column, which creates habitat for a diverse range of microorganisms. Here's how to make one: https://bit.ly/2GUuVsP

• One can also learn about microbiomes by breaking apart all the microbial cells and recovering their DNA. The DNA can be sequenced to see who is there. Here's an experiment for extracting DNA from the environment: https://bit.ly/2J48uC3

These Winograsky columns were made from different sources of pond water and types of organic matter: vegetable waste or leaves. The colours are from different microorganisms. Do you notice any similarities? How about differences?



Recommended Resources

"The Invisible Universe of The Human Microbiome"
https://bit.ly/1fpZuGN

"How Bacteria Rule Over Your Body"
https://bit.ly/2xU9tlp

"I Contain Multitudes - The Microbes Within Us and a Grander View of Life"
https://nyti.ms/2J13lui

"Soil Biology (Microfauna) with Terry Tollefson"
https://bit.ly/2Ie7x92

"Myxococcus xanthus preying on an E. coli colony"
https://bit.ly/2Id4pSo

"How many living things are in a drop of water?"
https://bit.ly/2GkcrRi

MicrobeWiki
https://bit.ly/2pOgNJm

Further Information

Professor Tory Hendry @ https://bit.ly/2E7xog9
Professor Daniel Buckley @ https://bit.ly/2uFM5rJ
Professor Ilana Brito @ https://bit.ly/2IePhfC

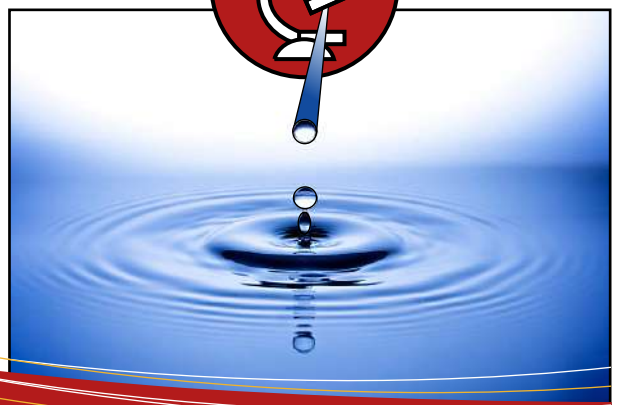
Image Sources

Microscopy (David Littschwager)
Droplet (No Cited Author; NCA)
Forest (NCA)
Moss on Rock (Eric Chan/Getty)
EM of Moss (Georgia Tech)
Magnification (The Eames Office)
Skin Microbiome (Darryl Leja, NHGRI)
Factors affecting skin (Allyson Byrd, NIH)
Skin @ 1000x (visualphotos)
Coat (CL Davis; M. Yokoyama; MA Cobos)
Nematode (Dirksen, BMC Biology. 14:38)
Soil/Plant Microbiomes (Martin Oeggerli)
Microbial mat (Chane, Frontiers 7;796)
Animals (Aleksandra Sabelskaia)
Insects (NCA)
Biomes (Cloudinary.com)
Rundell. PLoS ONE 9(8):e104134

Funded by the National Science Foundation

Microbiomes

Worlds within Worlds



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What is a microbiome?

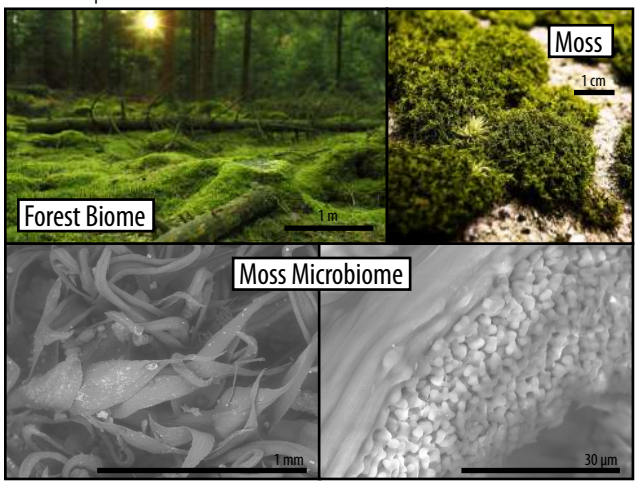
• A 'microbiome' is all the microorganisms living in a specific habitat or host organism.

• Microbiome is short for 'microbial biome.'

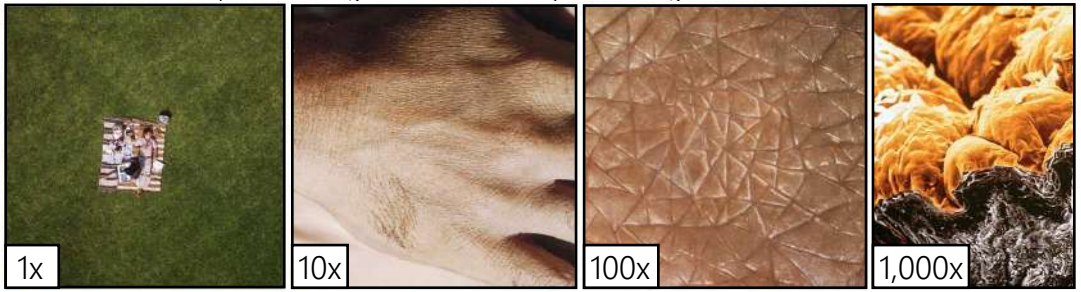
• The miniature environments inhabited by microorganisms are as complicated and as full of life as any landscape, city or wilderness is to us.

• Microorganisms evolve the capability to make use of or survive conditions in their micro-habitat.

An example of a 'biome' and a 'microbiome.'



An illustration of the powerful magnification necessary for viewing a microbiome.



Microbiomes and You

(1) You have a microbiome.

• The human microbiome consists of ~50 trillion microbial cells, which is ~1.3 per human cell

• Our microbiome protects us from infection, improves digestion, supplies us with essential nutrients, and trains our immune system.

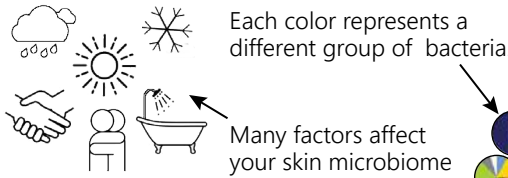
(2) What you eat has a microbiome.

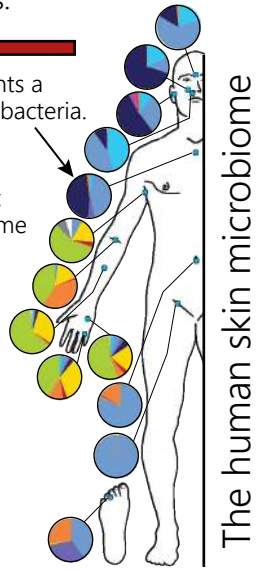
• Every plant has a unique microbiome that can provide nutrients like nitrogen and phosphorus.

• 95% of plants depend on fungi that live in and on roots for good health.

(3) Your home has a microbiome.

• Homes in cities have more microorganisms associated with humans, while homes in the country contain more from outdoors.

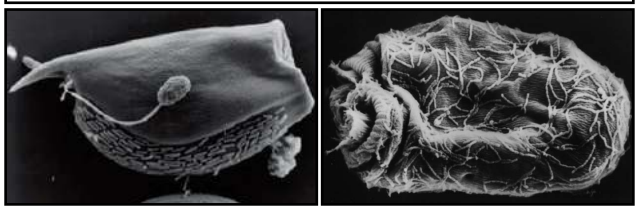




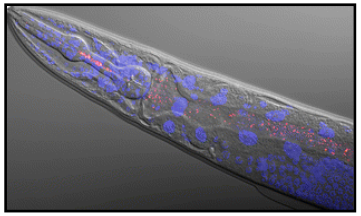
Which microbiomes have we explored?

• Microbiomes have great stories that involve natural history, evolution and the relationships between organisms and their environment.

Bacteria-coated Protista in a Cow Rumen



Nematode Gut Microbiome

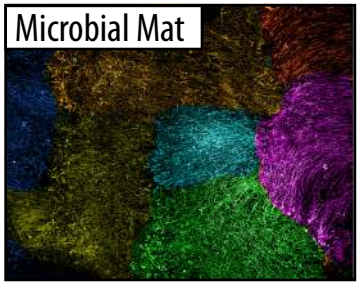


& Other Animals

Soil/Plant Microbiomes

& Other Insects

Microbial Mat



& Other Biomes