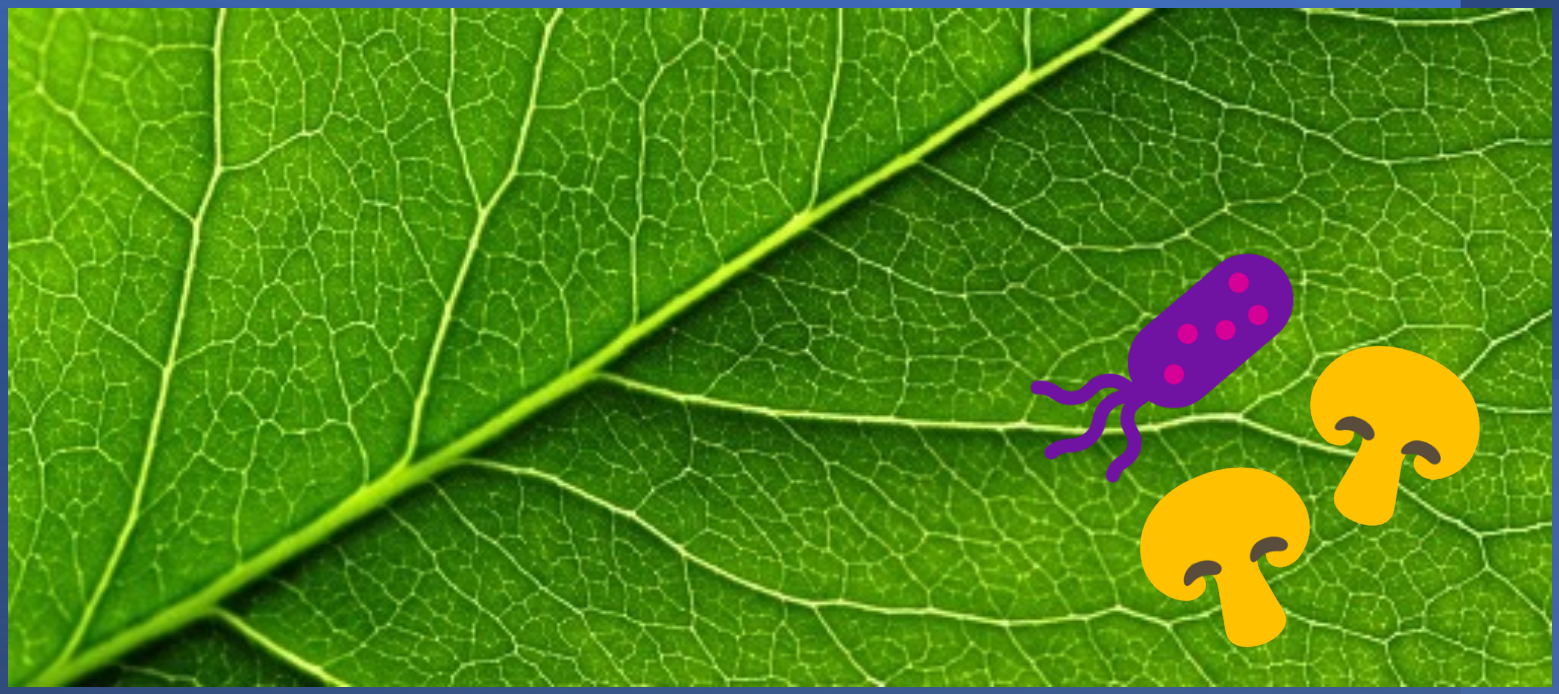
All About Microbes That Live Inside Of Plants

Do microbes help or hinder plants?

What do you think?



Help

Positive interaction between plants and microbes

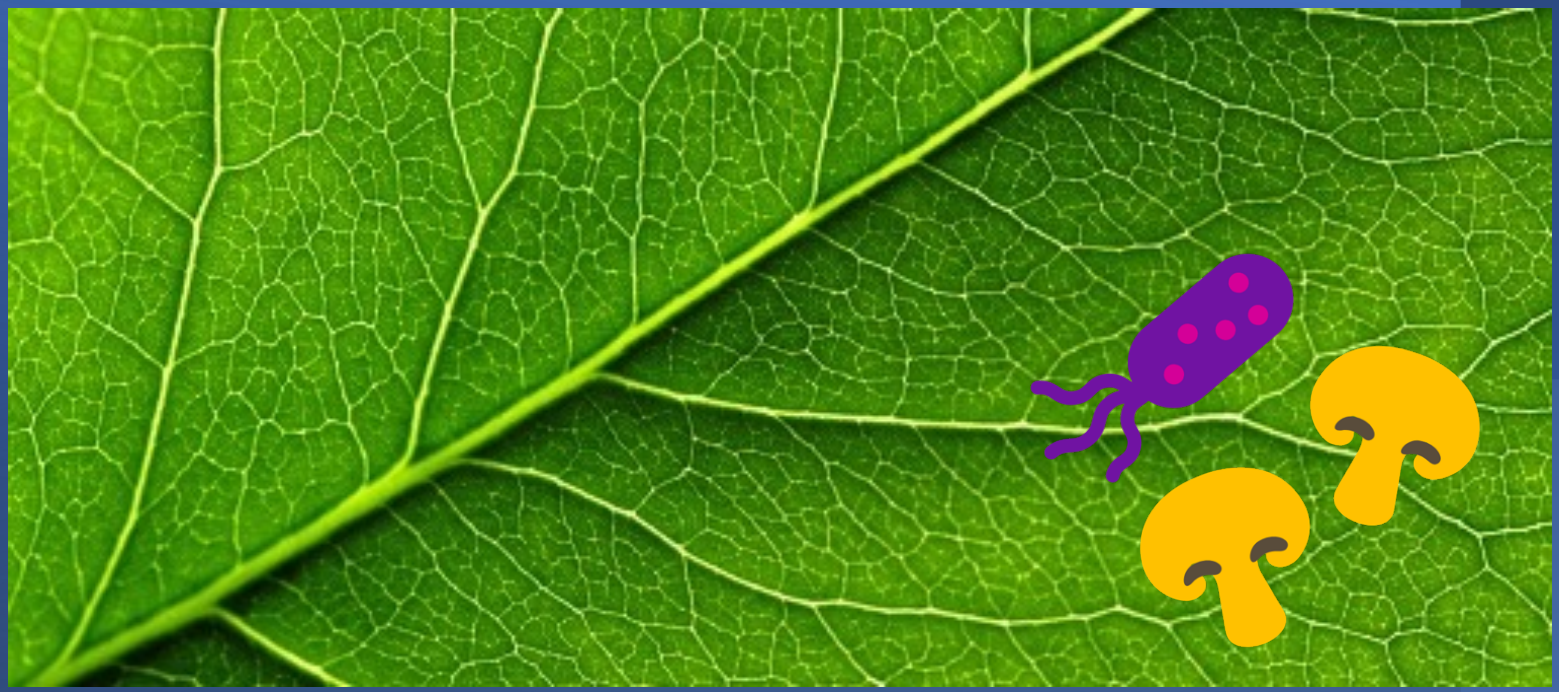
--Mutualism

Bacteria:

- Stimulate plant and seed growth
- Help plants to survive cold

Fungi:

- Help plants survive drought
- Enable plants to grow in soils post wildfire



Hinder

Negative interaction between plants and microbes

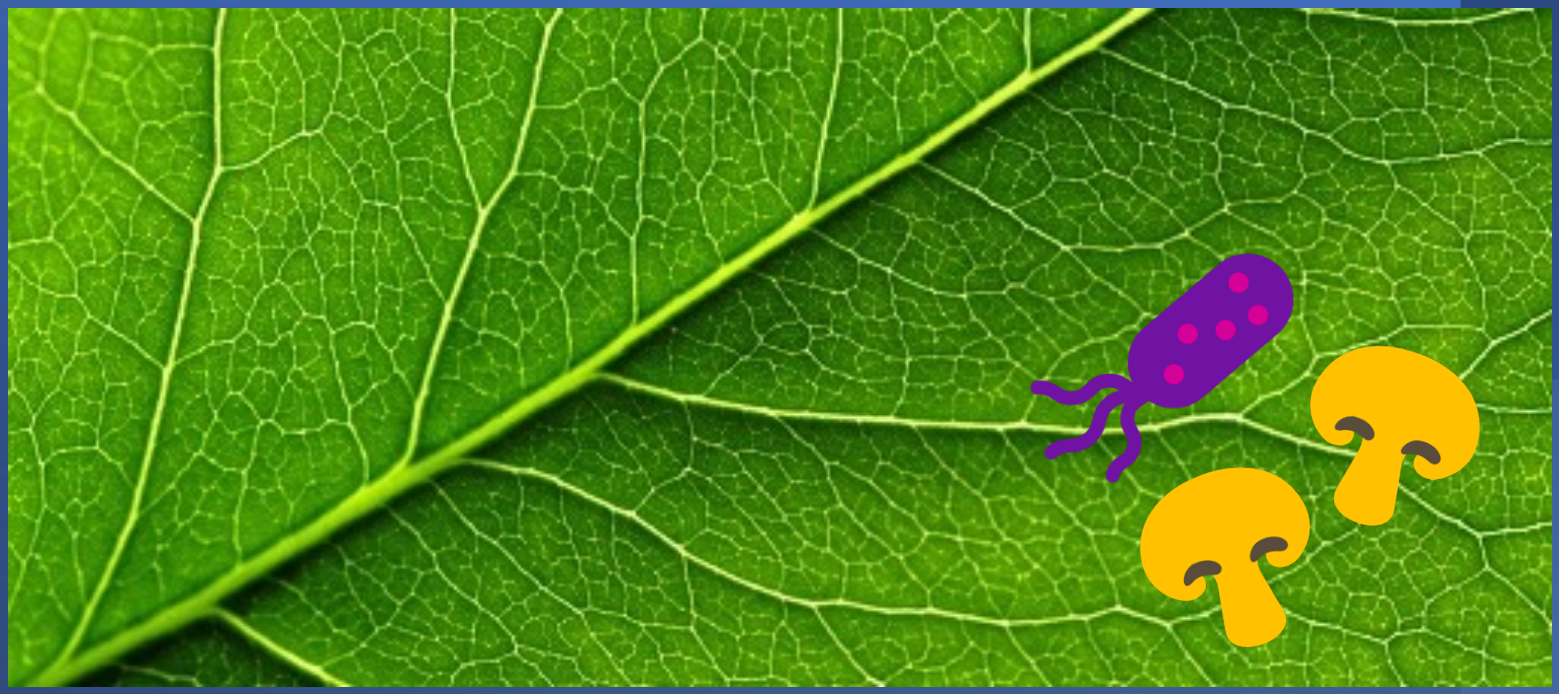
--Pathogens

Bacteria:

- Cause roots to die and rot
- Simulate overgrowth of some plant tissues (like cancer)

Fungi:

- Restrict water uptake in seedlings
- Eliminate seed production on plants



Sometimes microbes do neither

--Commensalisms

--or the relationship is unknown

And Sometimes the relationship shifts:

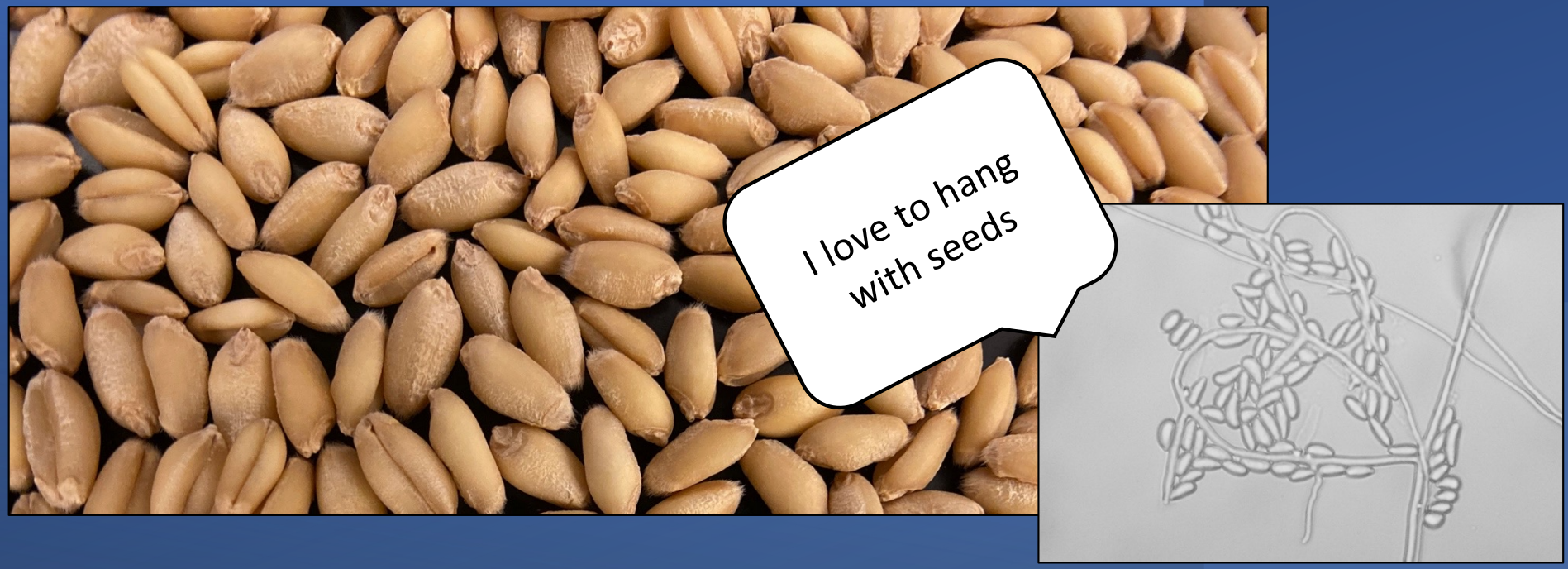
- Example…
  - No impact at seed stage but positive at later life stage

Microbes that live within the tissues of plants are called **Endophytes**

Endo = within

Phytes = plants

- Plant provides a place for the endophytes to live
- Endophytes often benefit the plant, but some can turn into pathogens

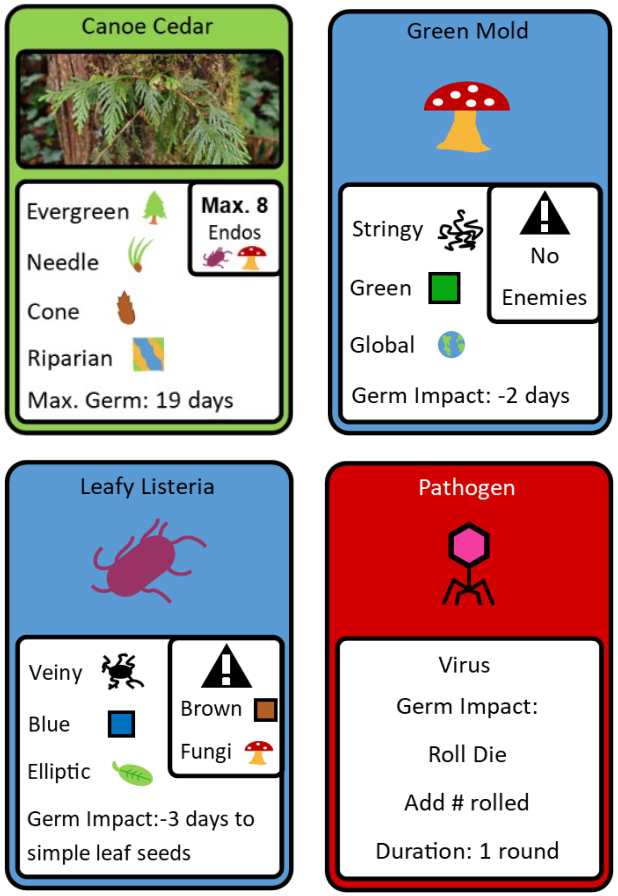


Endophytes Can Help Seeds To Germinate

- Reduce the number of days to germinate and benefit the seed
- BUT pathogens can interfere with germination progress
- Endophytes (the good and the bad) also interact with each other

How To Play Glorious Germination

Playing The Card Game



Glorious Germination

YouTube Video How to play (5 minutes):

https://www.youtube.com/watch?v=gUXCDYw8F4E

Wrap Up

Do microbes help or hinder plants?

What do you think?

Do Microbes Help or Hinder Germination?

Can endophytes help solve problems today?

What did you learn about pathogens?


All About
Seeds For The
Future

Exploring seed-microbe applications for natural resources and agriculture



What kind of careers are associated with this game activity?



GONZAGA UNIVERSITY

Summer 2022 – Research Projects

- Effects of Abiotic Stressors on Germination and Seedling Growth of Native Yarrow and Invasive Cheatgrass
- Germination and Electrolytes Leakage on Seeds After Heat and Freeze Abiotic Stressors
- The Antagonistic Effects of Seed Endophytes
- The Effect of Bacteria Media on Seed Germination of Native Plant Species

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Glorious Germination

Game Designers: Dylan Eisenbrandt and Julie Beckstead

Game Development Assistance: Erik Hallstrand, Alexandrite Greenhouse, Mackenzie Rowley, Margarita Washington, and Abbey Shuster

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Photos: Zack Berlat, Anna Muhich, and Julie Beckstead

Location of Research Program: *Seeds For The Future* at Gonzaga University, Spokane WA

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For Copy of the Game: www.gonzaga.edu/SeedsforTeachers

Information for Seeds For The Future Program:

www.gonzaga.edu/SeedsForTheFuture.

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