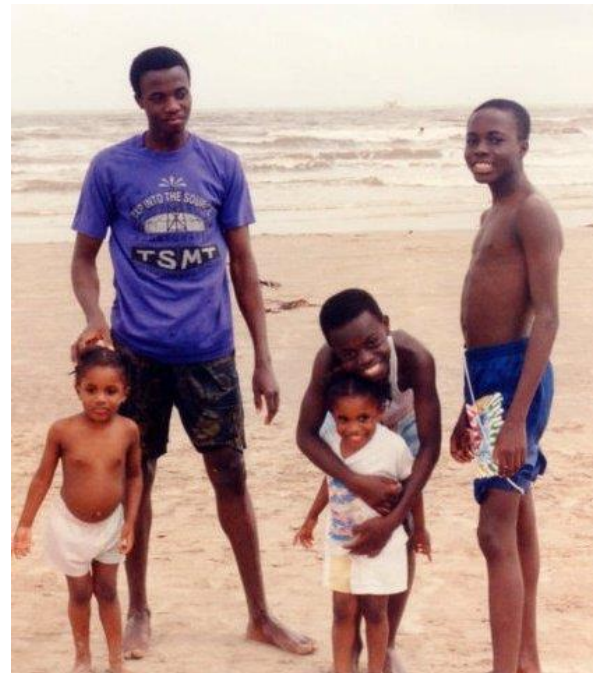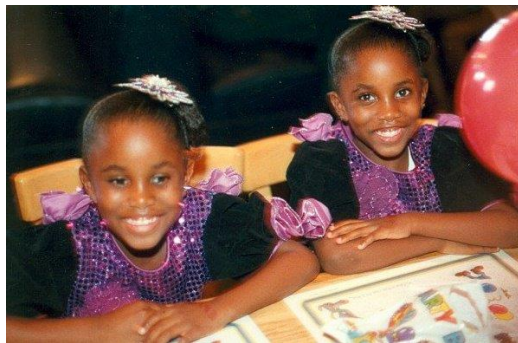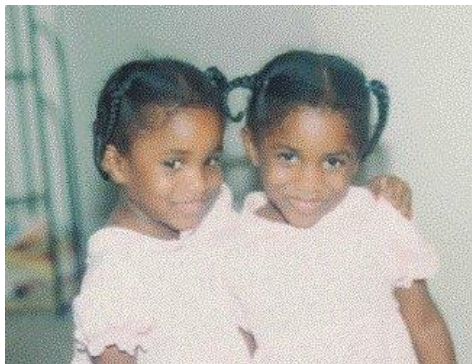# TEEN SCIENCE CAFÉ

Why and how I became a scientist
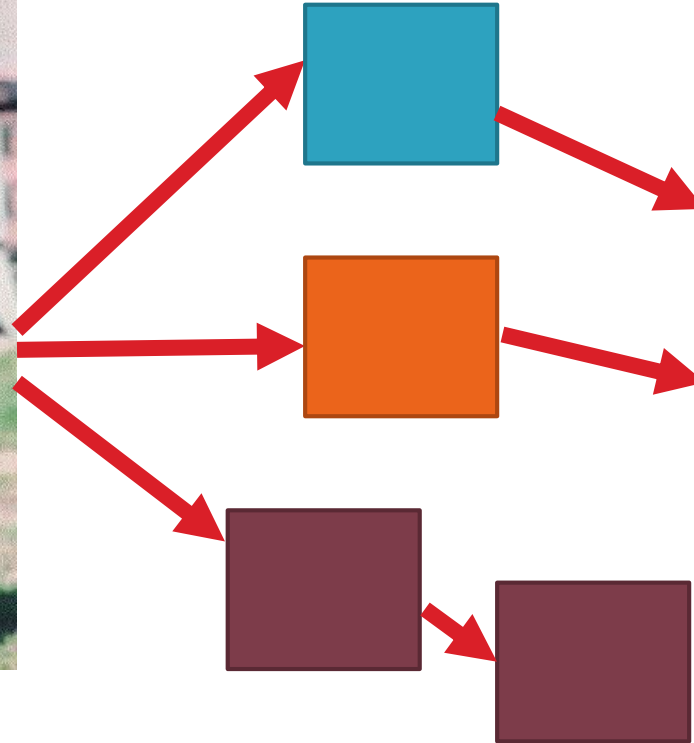
My Beginning……

My Initial Dreams

My Reality

How was I going to make my family proud?

Dream School

Middle School– High School– College

What should I major in?

Amazing Advisors

Exploring Research: *Dictyostelium discoideum*

3 published papers as an undergraduate
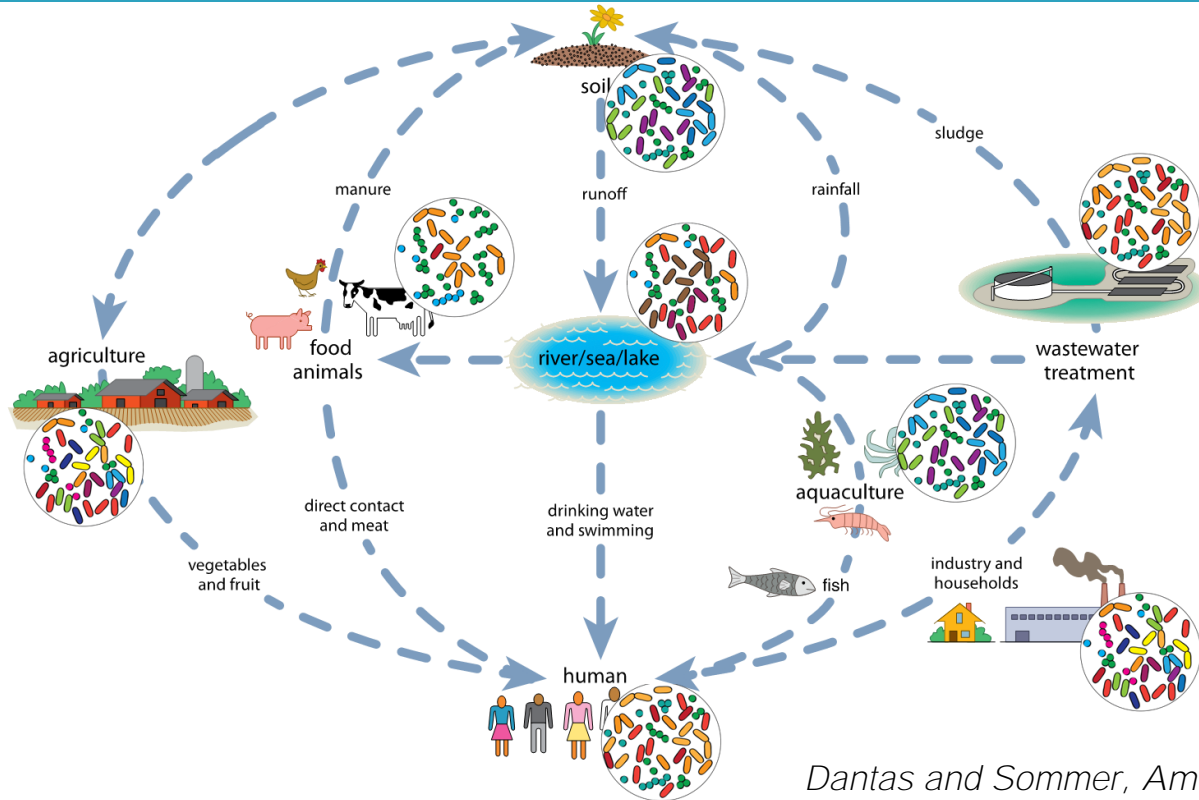
Exploring Research

Exploring Research

Microbial communities are highly diverse, abundant and serve important functions in almost every environment

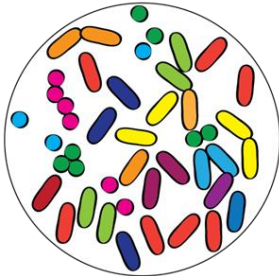# Highly connected network of microbial communities across habitats

adapted from:
Dantas and Sommer, American Scientist (2014)

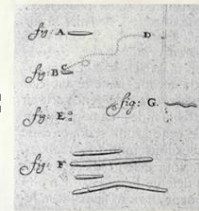# Microbes are traditionally studied by culture-dependent methods

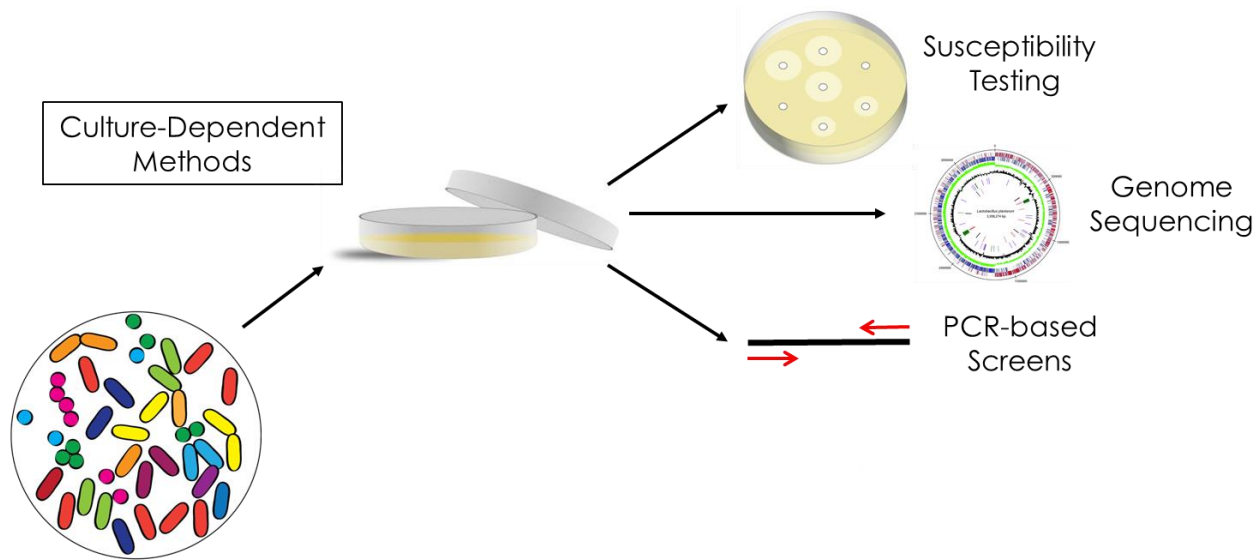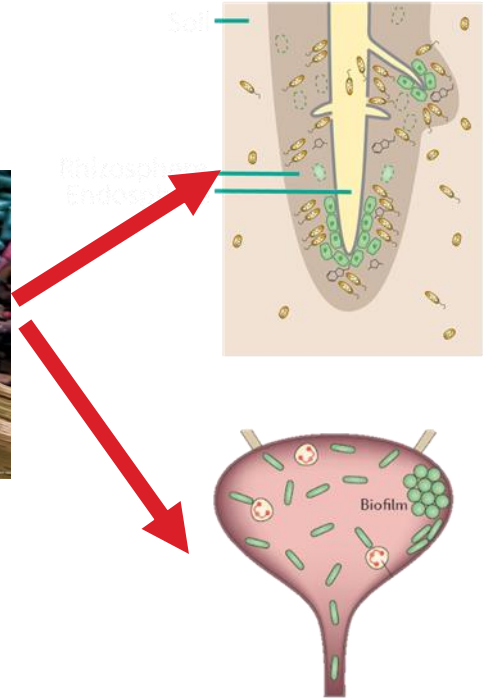**99 - 99.9% of bacteria in most habitats are not easily cultured!**

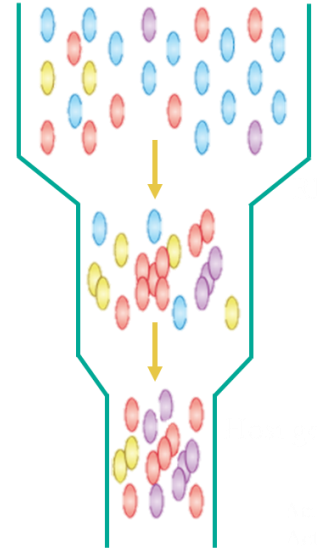"...animalcules were in such enormous numbers, that all the water...seemed to be alive." — van Leeuwenhoek (1683)
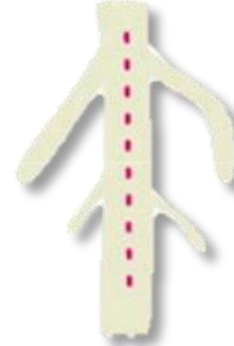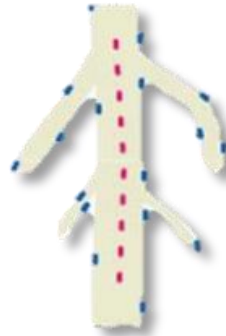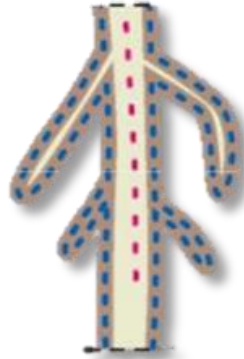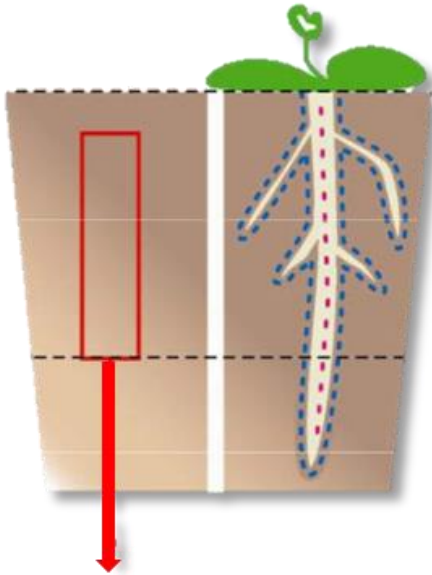
Metagenomics: study microbial communities through direct DNA sequencing

Current Research

Root Microbiome Study

Root Microbiome Study

Root Microbiome Study

A. Adonis p < 0.001
$R^2 = 0.11002$

- Monarda fistulosa
- Conyza canadensis
- Heliopsis helianthoides
- Ratibida pinnata
- Carduus nutans
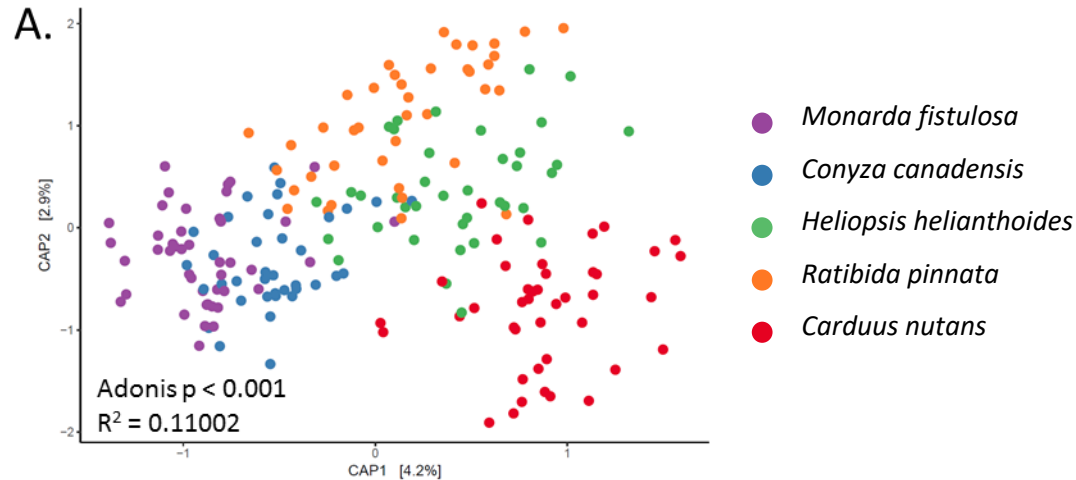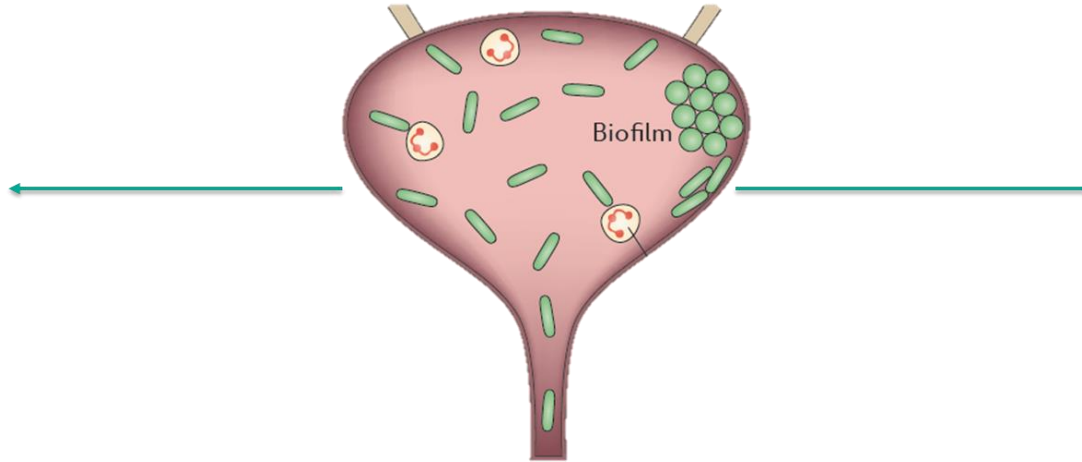
Plants are selecting bacteria from the soil
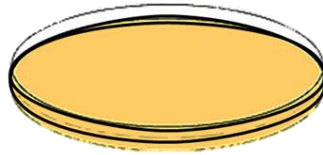
Urine Microbiome Study

Healthy Urine

Infected Urine

Biofilm

Urinary Tract Infection = Culture growing a uropathogenic bacteria in the presence of symptoms or signs compatible with a Urinary Tract Infection
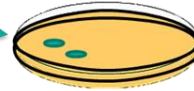
Urine Microbiome Study

Cultured Urine Microbiome
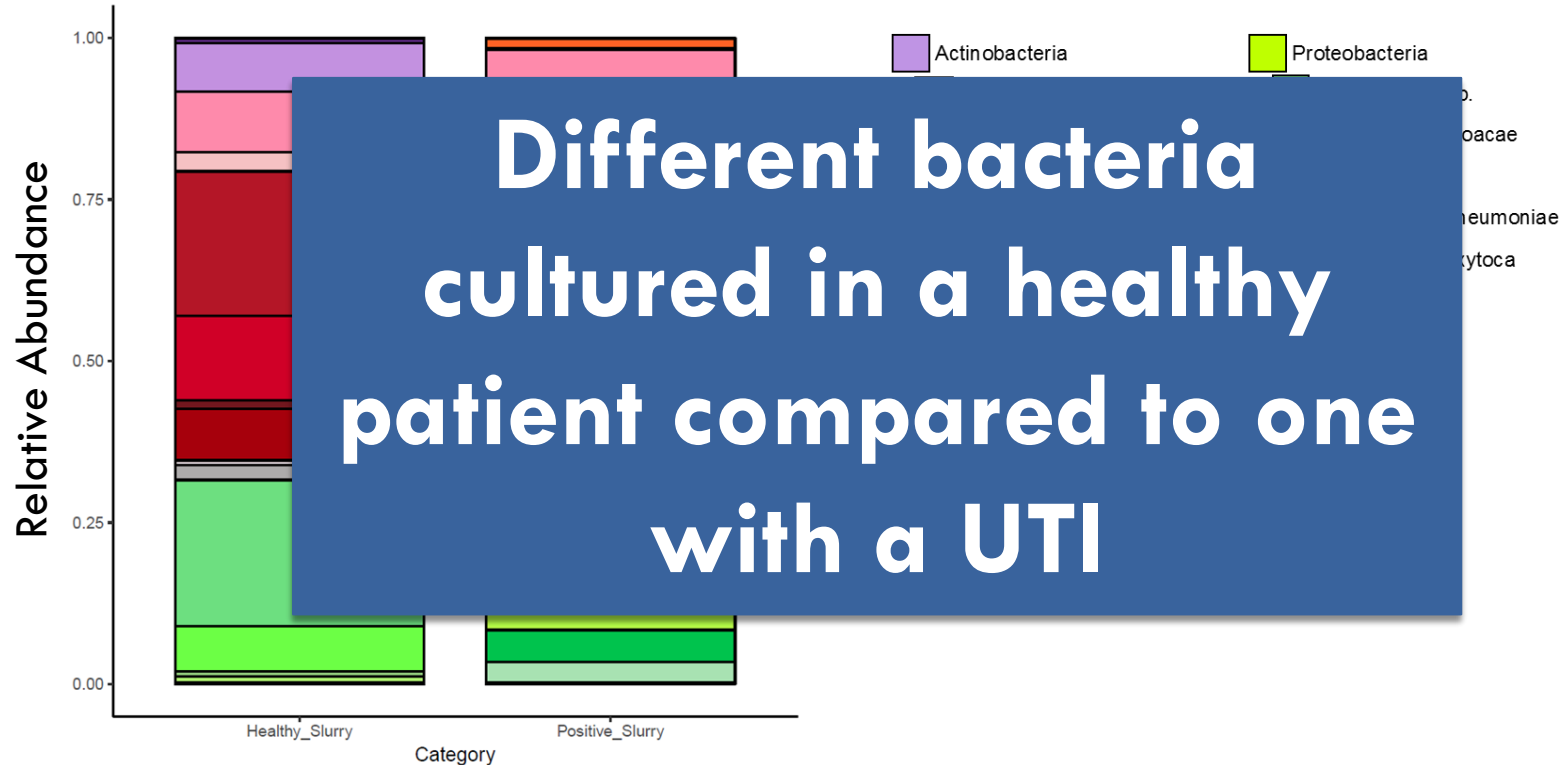
Direct Sequencing of the Urine Microbiome
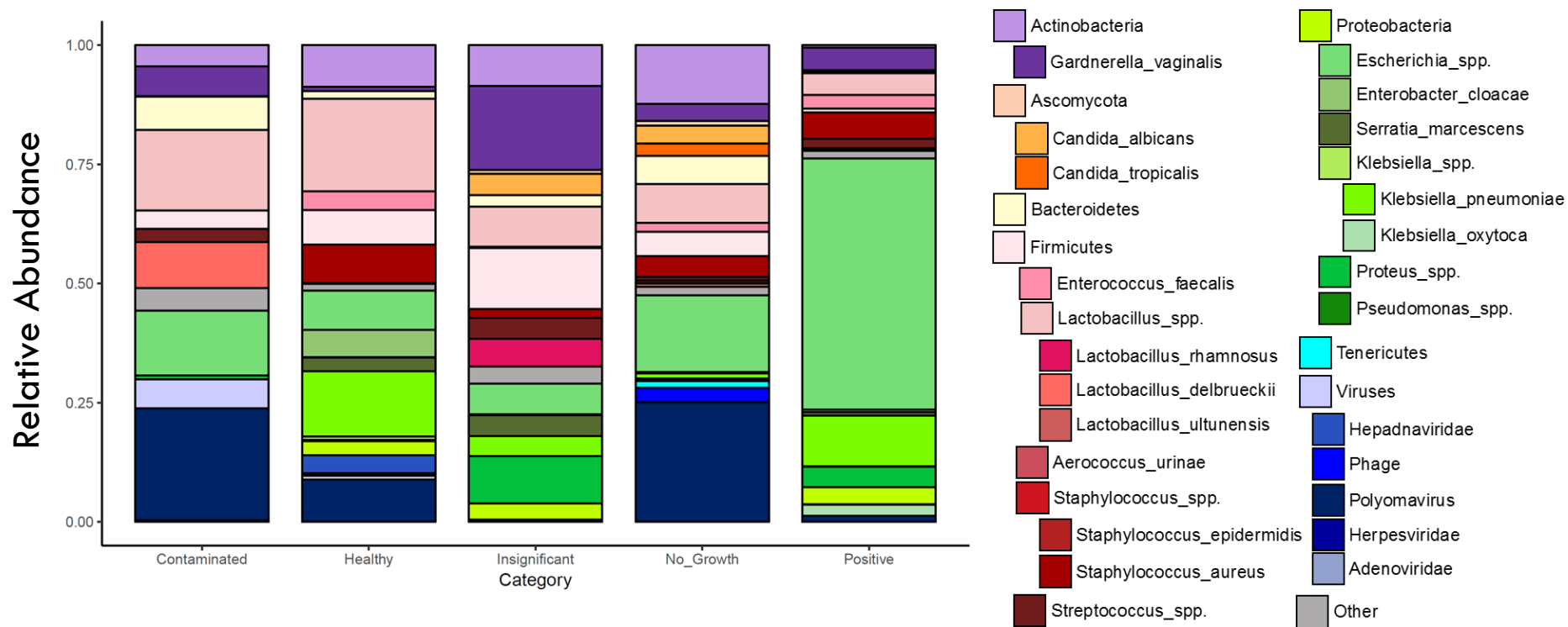
Thank you!! Questions?

Activity Time!

What environment did we sequence?

DNA is the building block of all living organisms

- Adenine (A) - Thymine (T)
- Guanine (G) –Cytosine (C)
- Forward sequence 5' –3'
- Reverse sequence 3' – 5'
- For example:
  - 5' – AGGACGT – 3'
  - 3' – TCCTGCA – 5'
  - Reverse complement - ACGTCCT

Living things on our planet are classified into three domains

How do we classify living organisms?

Kingdom
Class

Kings Play Chess On Fat Green Stools
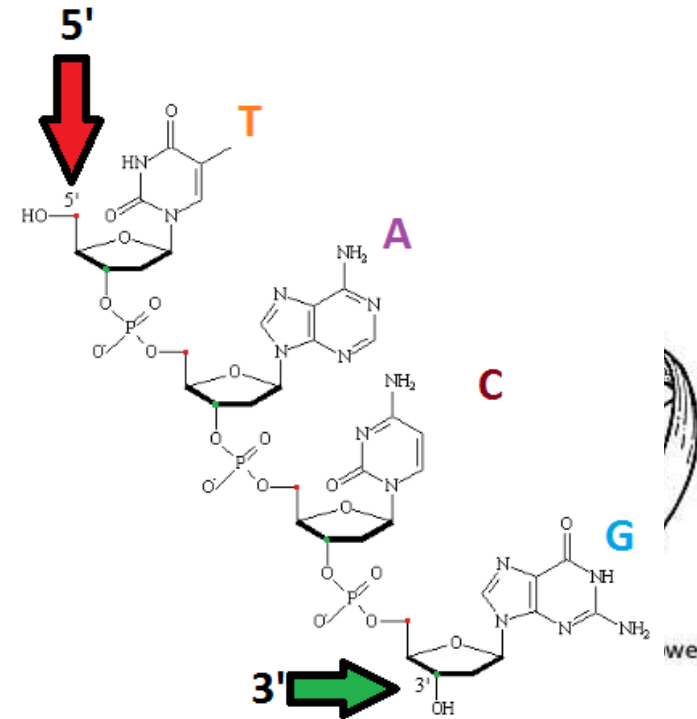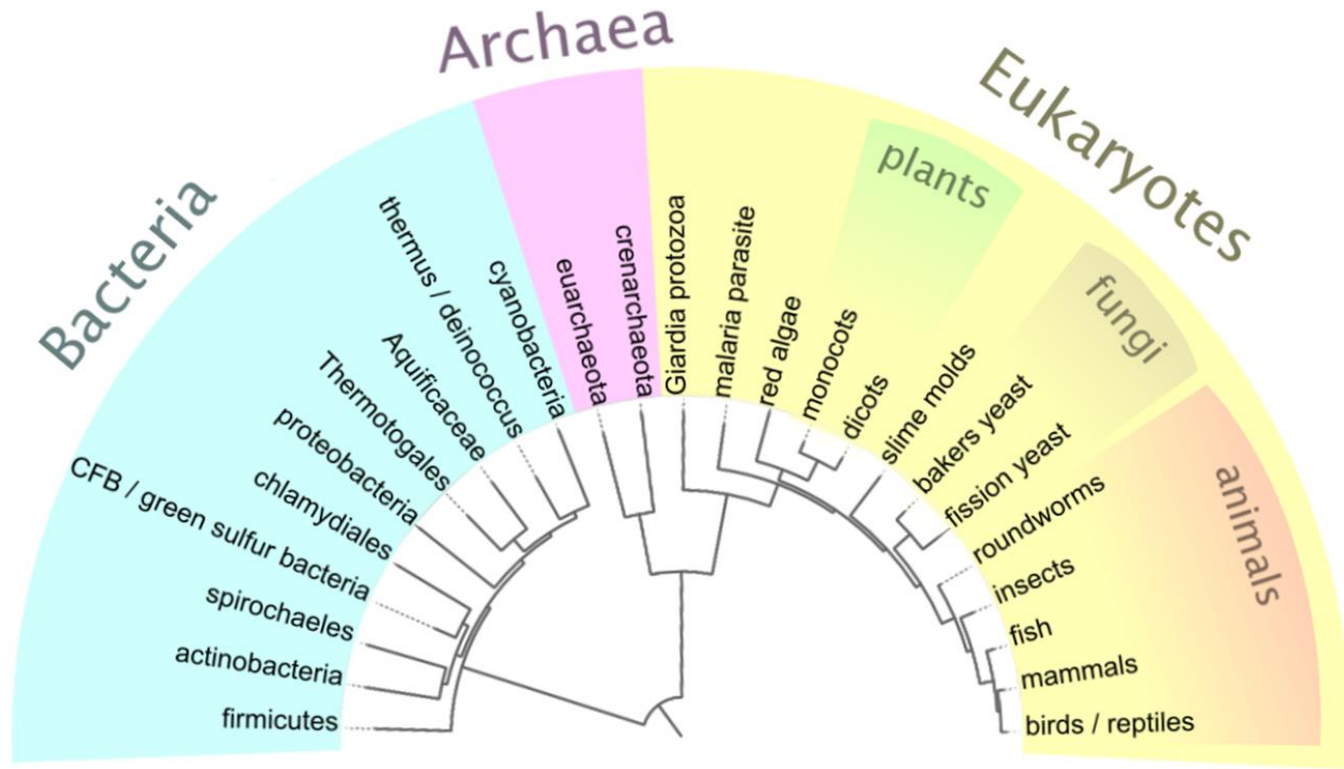
Genus
Species

Very General

Very Specific

Grizzly bear   Black bear   Giant panda   Red fox   Abert squirrel   Coral snake   Sea star

KINGDOM Animalia

PHYLUM Chordata

ORDER Carnivora

FAMILY Ursidae

GENUS Ursus

SPECIES Ursus arctos
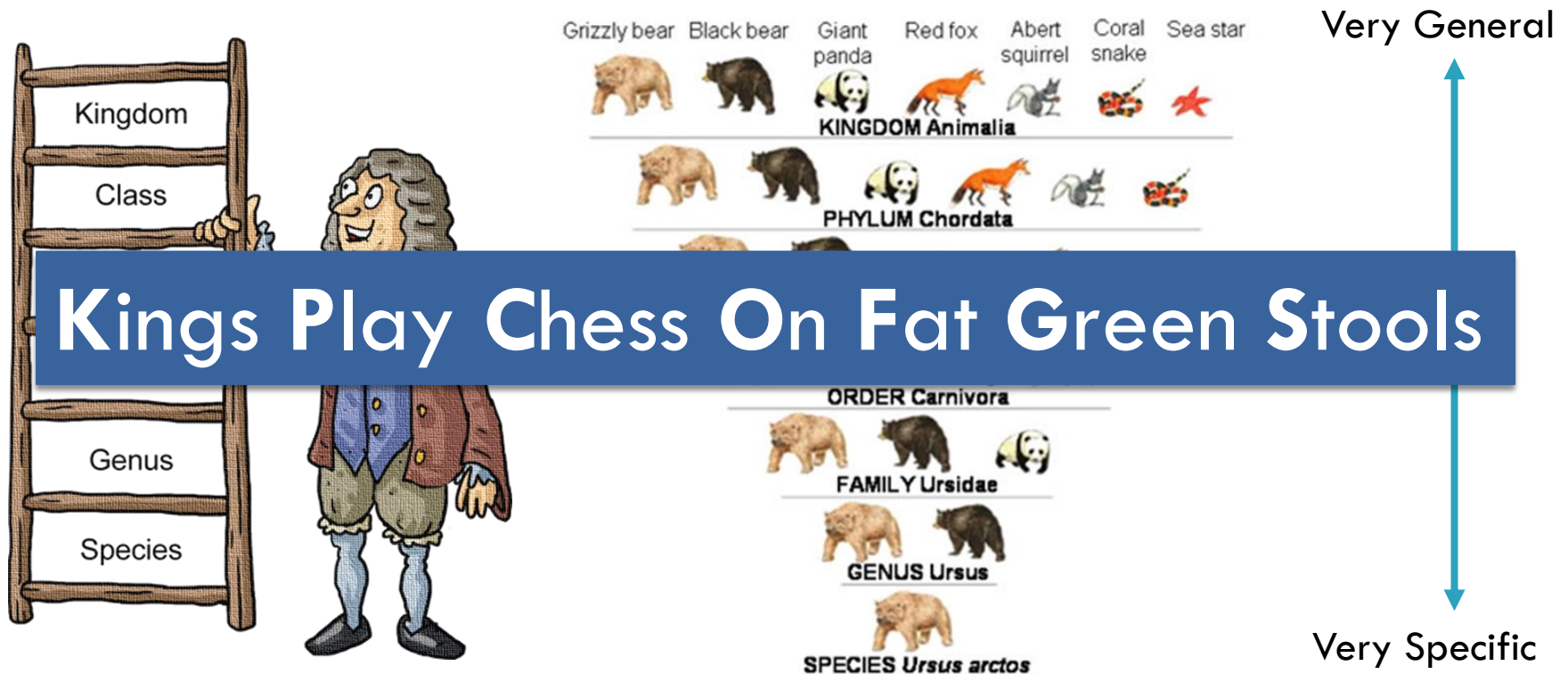
How do we classify bacteria?

16S ribosomal RNA gene

Conserved Areas Targeted by Primers
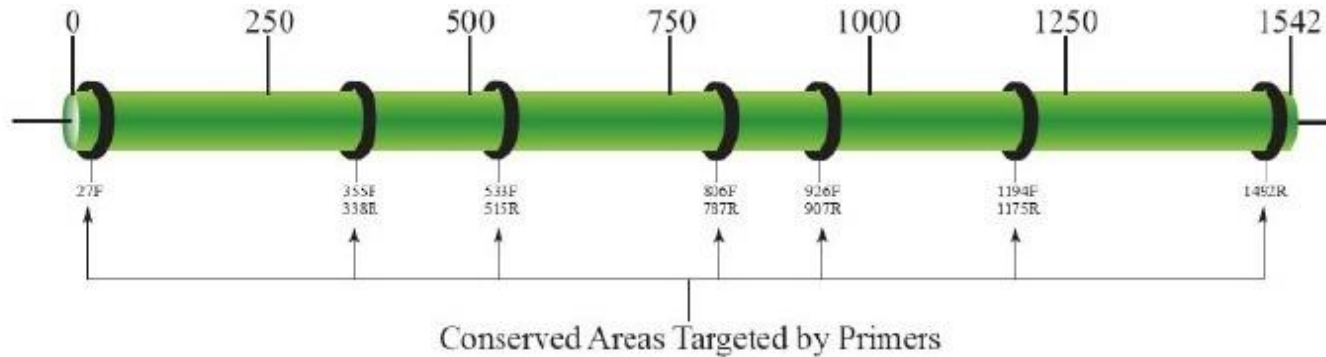
How to calculate relative abundance

Relative abundance is the percent composition of an organism of a particular kind *relative* to the total number of organisms in the area.
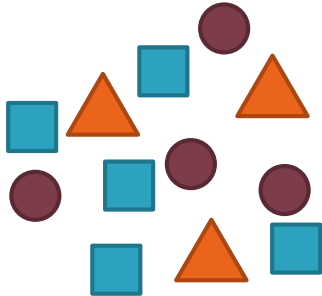
How many circles?	4
How many squares?	5
How many triangles?	3
Total number of individuals?	12

Circles RA?	33%
Squares RA?	41.6%
Triangles RA?	25%

$$\text{Relative abundance} = \frac{\#\ of\ individuals}{total\ number\ of\ individuals} \times 100$$

Wrapping up

Why is it important to study all of the species in the environment?

Why is it important to study bacteria that live on this planet?

How will global warming affect bacteria?

Why is sequencing bacteria better than culturing?
Why is culturing bacteria better than sequencing?