Sarah finished the school year so excited about summer. She had plans to travel to her family's summer home in Maine, hang out with friends and visit family.

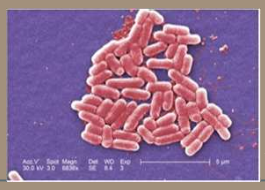
Though Sarah had big plans for many hours of leisure time her parents had been strongly suggesting that she hunt for a summer job since college tuition does nothing but continuously increase.

Sarah's parents Jim and Mary Ellen were so persistent that Sarah get a job that they invited Jim's brother and family for the Fourth of July holiday in hopes to hook Sarah up with a job at the hospital. Over an early breakfast Mary Ellen decided to break the news to Sarah of her uncle's visit.

"Sarah, Uncle Jeremy and Aunt Mo are visiting for the weekend so please clear your schedule and clean your room since they will be staying in it for three nights."

"Mom, are you kidding? It's 10:00 a.m. why did you have to spring this on me now?"

"Honey, it's going to take you hours to clean that pigsty you call a room. You have some serious germs growing in there and they've got to go! TODAY!!"



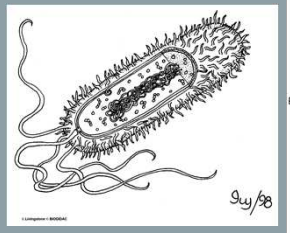
Janice Haney Carr, Centers for Disease Control and Prevention

Bacterial cells are a type of microorganism and are considered prokaryotic. A prokaryotic cell is defined as

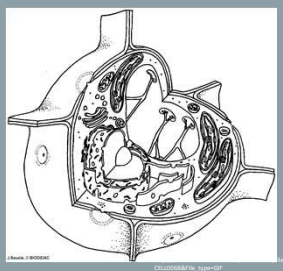
A. A cell with a nucleus and membrane bound organelles
B. A cell that lacks a nucleus and membrane organelles
C. A large cell that contains a nucleus, and mitochondria
D. A cell that has a cell membrane, chloroplast and ribosomes

Cell Comparison

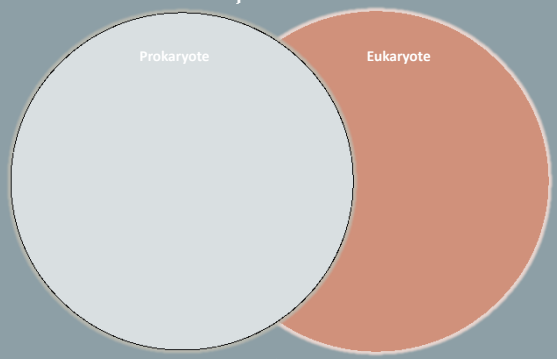
Generalized Prokaryotic Cell



Generalized Eukaryotic Cell



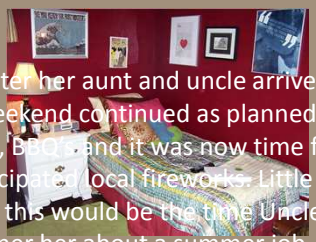
What do you remember about the cell comparisons?



The other day I collected a sample of pond water and examined it using a light microscope. This sample was so cool because there was a population of cells that I had never observed. They were green in color, lacked a cell wall, had a flagellum, a nucleus and chloroplasts. Which of the following best describes the cell I am viewing?

A. Eukaryotic cell
B. Prokaryotic cell
C. Eukaryotic cell; animal
D. Eukaryotic cell; plant
E. Eukaryotic cell; other

Sarah worked that whole day and half of the next cleaning and organizing her room to her mother's satisfaction.



An hour later her aunt and uncle arrived and the holiday weekend continued as planned with a beach trip, BBQ's and it was now time for the much anticipated local fireworks. Little did Sarah know that this would be the time Uncle Jeremy would corner her about a summer job.

http://[illegible]vault.net/Fireworks_g58-Fireworks_p10660.html

"Sarah, your mom says you are looking for a job and I've been thinking I just may be able to help you. As you know I am a gastroenterologist at Beverly Hospital and I asked around about job opportunities and I think I have one for you."

"Gee, Uncle Jeremy that was thoughtful of you but my summer is pretty booked."

"The job would pay fifteen dollars an hour, would that entice you?"

"Wow, fifteen dollars an hour? What would I be doing?"

"Well, it's a new position but to make a long story short you would be researching microbes associated with the gut. As I am sure you know you have many more microbes that live on or within you than you have actual cells."

"Ewww, Uncle Jeremy, that is disgusting. You're saying that I'm infested with germs and you want me to work with them? No way…count me out!"

Sarah's mom clearly lost the battle on Sarah Getting a summer job and Sarah's biology teacher was going to have her hands full in the Fall.

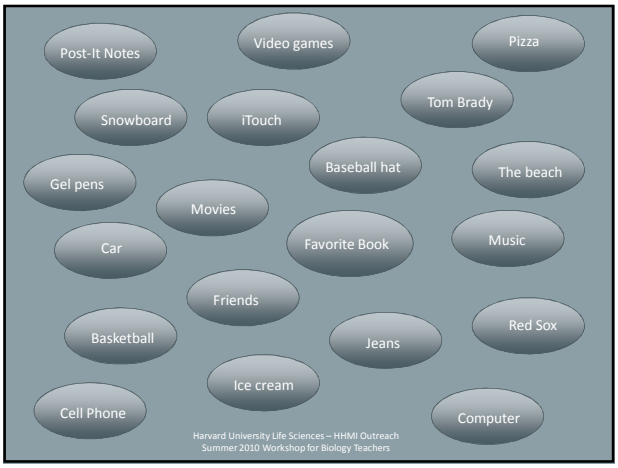
Fast forward two months… to the first day of Biology.

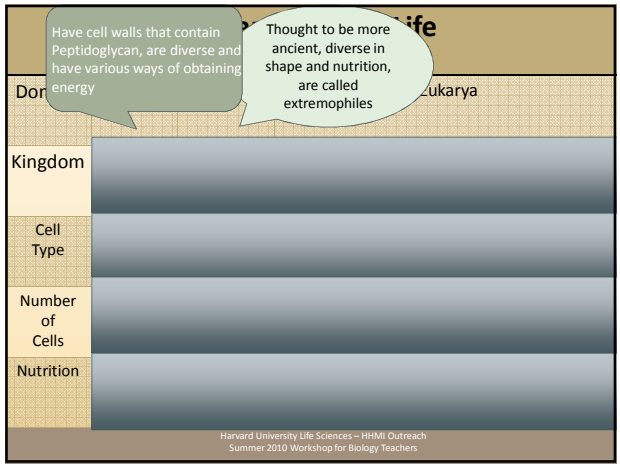
http://upload.wikimedia.org/wikipedia/commons/0/00/School_bus_invasion.jpg

"Miss Frizzle, I have some questions about cells that has been making me crazy for the past two months and I could really use some guidance. My Uncle told me that I have microbes all over me and in me and since he shared with me that I had all of these special friends I have been unable to sleep well. I imagine that they are taking over my body. Is it true that I have all of these tiny cells living with me and if so what are they doing?"

Miss Frizzle was happy to see such enthusiasm so early in the year but Sarah's question was complicated and posed a challenge in how to respond.

"After much thought I've decided that this year we are going to begin our year studying Biodiversity." So, what is biodiversity?



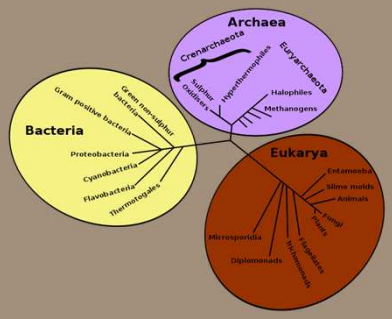


Bacteria

What you know….	Questions about bacteria

Archaea | **Bacteria**

Domain Classification



http://commons.wikimedia.org/wiki/File:Tree_of_life.svg

Which domain includes organisms that are called extremophiles?

A. Animalia
B. Archaea
C. Bacteria
D. Eukarya

Which of the following is a taxon of related phyla or divisions?

A. Class
B. Domain
C. Kingdom
D. Order

Which character distinguishes Fungi from Plantae?

A. presence of membrane-bound organelles
B. presence of membrane-bound nucleus
C. cell walls with chitin
D. multicellular

"Now that we've got a better understanding about how organisms are organized lets focus on bacteria for a bit. Who can tell me where bacteria live?"

EVERYWHERE

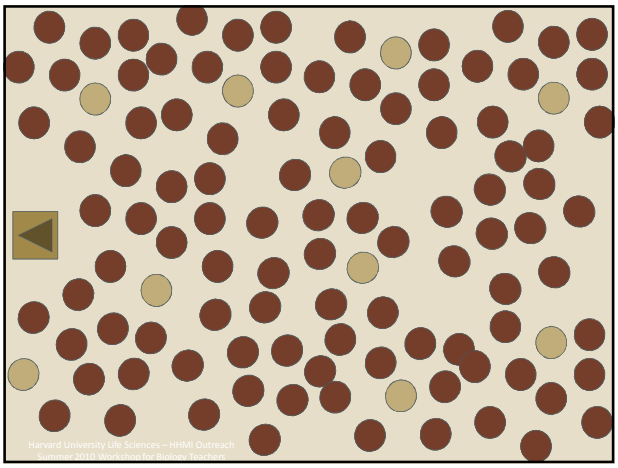
Including….

YOU…

Scientists claim that there are 10x more bacterial cells than body cells.

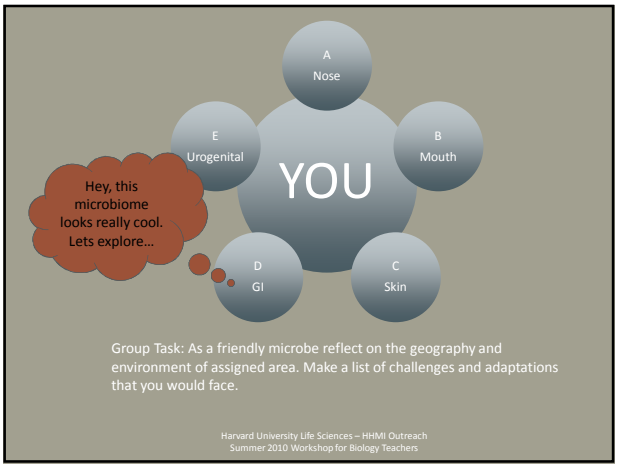
Lets begin by examining cell size…

http://learn.genetics.utah.edu/content/begin/cells/scale/



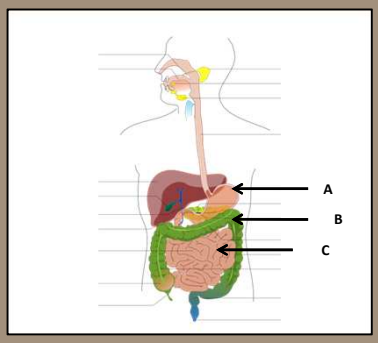
Which best describes adaptation?

A. Reproducing as a species
B. A short-term change in behavior in response to stimuli
C. Inherited changes in response to environmental factors
D. Change in size as an organism ages



Group Task: As a friendly microbe reflect on the geography and environment of assigned area. Make a list of challenges and adaptations that you would face.

Human Digestive System



http://commons.wikimedia.org/wiki/File:Digestive_system_diagram_no_labels_arrows.svg

Ecology Word Splash

microbiome community bacteria competition niche population biofilm mutualism habitat

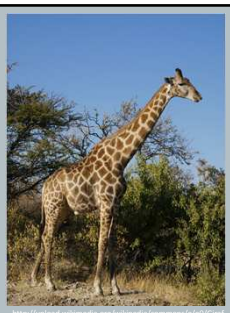
Which of the these levels of organization includes all the other levels?

A. Community
B. Ecosystem
C. Individual
D. Population

A bacterium obtains its nutrients from the food you digest while at the same time aiding you in carbohydrate digestion. What does this relationship represent?

A. Predation
B. Commensalism
C. Mutualism
D. Parasitism

http://upload.wikimedia.org/wikipedia/commons/8/82/Royal_White_Bengal_Tiger_headshot_at_Cougar_Mountain_Zoological_Park_2.jpg



http://upload.wikimedia.org/wikipedia/commons/e/e0/Giraffa_camelopardalis_angolensis.jpg

http://en.wikipedia.org/wiki/File:Igel01.jpg

Each of these organisms can be defined based on their diet. Reflect on how the digestive system of each of these organisms has been adapted for their diet.

Harvard University Life Sciences – HHMI Outreach
Summer 2010 Workshop for Biology Teachers