Cells are the smallest unit of all living things

One of the foundations of modern biology is that all living things are made of cells
We have about 75 trillion human cells in our bodies

...human cells?
We have at least 750 trillion bacterial cells living in our gut and on the surface of our skin (1,000s of different species)—about 4-5 pounds of your body weight is bacteria

Meet Demodex...

This eight-legged arachnid lives in the pores of your facial skin, living off

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Despite the huge diversity of cells we'll see this semester, there is amazing unity in the components we find inside of cells
There is a huge diversity of sizes and functions of cells
Cells are the smallest unit of all living things. There is a huge diversity of sizes and functions of cells. The smallest cells we know of are about 1/12,000th of an inch long… the largest cells in our body are nerve cells that extend from our back to our feet (~3 feet)!

The plasma membrane separates the cell from its environment. Composed of a phospholipid bilayer.
The plasma membrane separates the cell from its environment

Cytoplasmic organelles are suspended in the cytosol

The nucleus is the control center of the cell
Mitochondria are the 'powerhouse' of the cell

Endoplasmic reticulum acts as a minicirculatory system for the cell

There are two types of 'ER': rough and smooth.

Rough ER is covered with ribosomes makes essentially all the components of the cell membrane.

Especially abundant in tissues that make a lot of protein products (e.g. pancreas).
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Rough ER is covered with ribosomes makes essentially all the components of the cell membrane
Especially abundant in tissues that make a lot of protein products (e.g. pancreas)
Smooth ER plays no role in protein synthesis; instead it functions in lipid metabolism and detoxification of drugs and pesticides
Our livers detoxify our bodies, so liver cells are full of smooth ER
Also, cells that make steroids (like testes and ovaries) have lots of smooth ER

The golgi apparatus acts as the cell’s “packaging center”

After proteins are produced, they are modified and packaged in the golgi apparatus

Lysosomes and peroxisomes have specialized jobs in the cell

*Lysosomes* are basically ‘bags’ of digestive enzymes in our cells. They break down *foreign substances* within the cell, as well as *worn out or nonusable substances.*
Lysosomes are the cell’s demolition sites
*Peroxisomes* are responsible for detoxifying a number of poisonous substances, like alcohol or formaldehyde
More importantly, they convert *free radicals* into hydrogen peroxide, which is then converted to water (by catalase)

Study tip: Think about what organs or tissues you would find the most of these organelles in. Which organs are most active in detoxification?
Cytoskeletal elements are the ‘bones and muscles’ of the cell

A group of filaments, in various sizes, act to support the cell as well as provide an internal framework for intracellular transport and cellular movements:

- **Intermediate** filaments act as wires to resist pulling on the cell
- **Microfilaments** tend to be involved with cell motility and shape changes
- **Microtubules** tend to be involved with determining the shape of the cell as well as the distribution of organelles within the cell.

Cilia and flagella are specialized microtubules

As a general rule, cilia move things (usually mucus) across a cell’s surface. Flagella move the flagellated cell. Flagella move the cell itself.

Remember pseudostratified ciliated columnar epithelium from lab?