

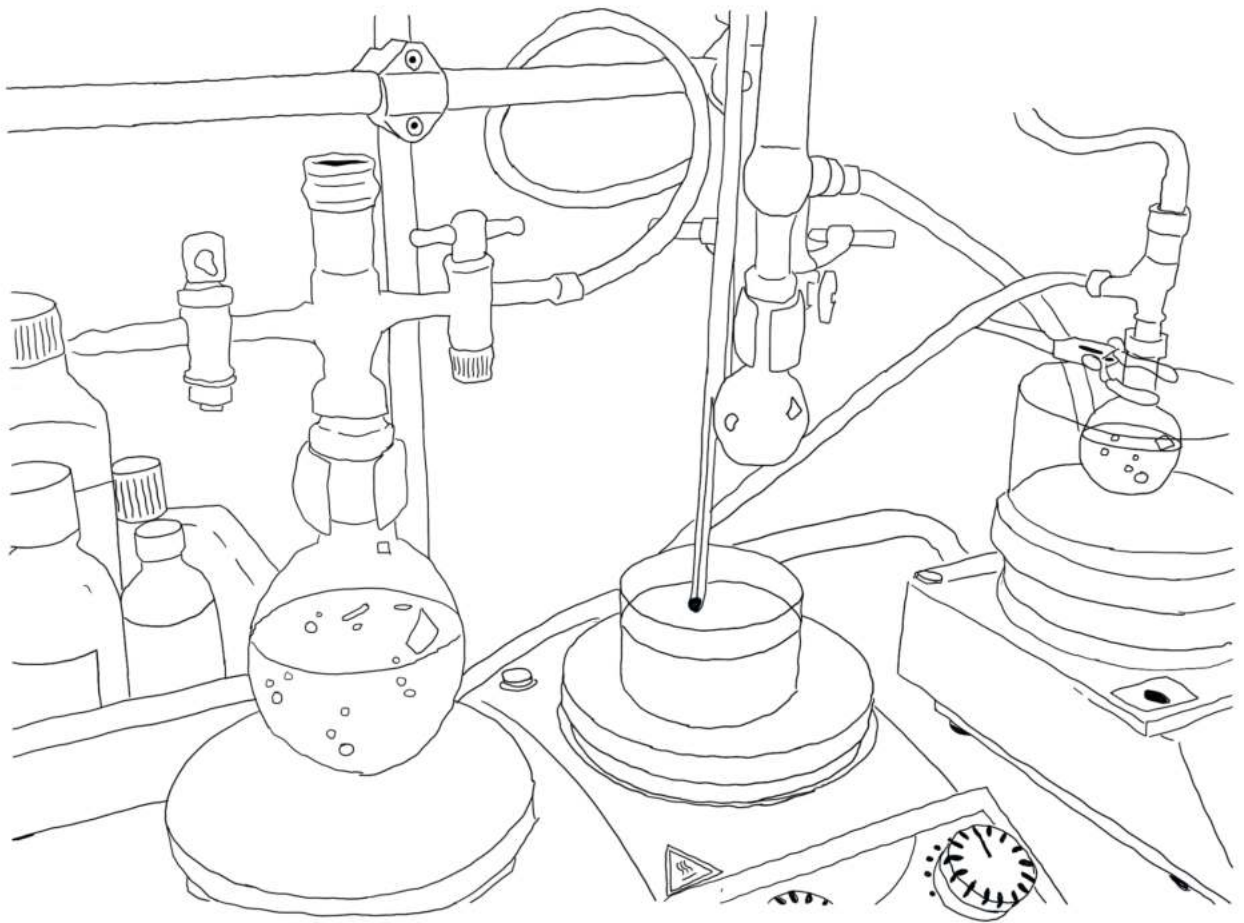
BUILDING BLOCKS of BIOLOGY

COLORING AND ACTIVITY BOOK FOR KIDS

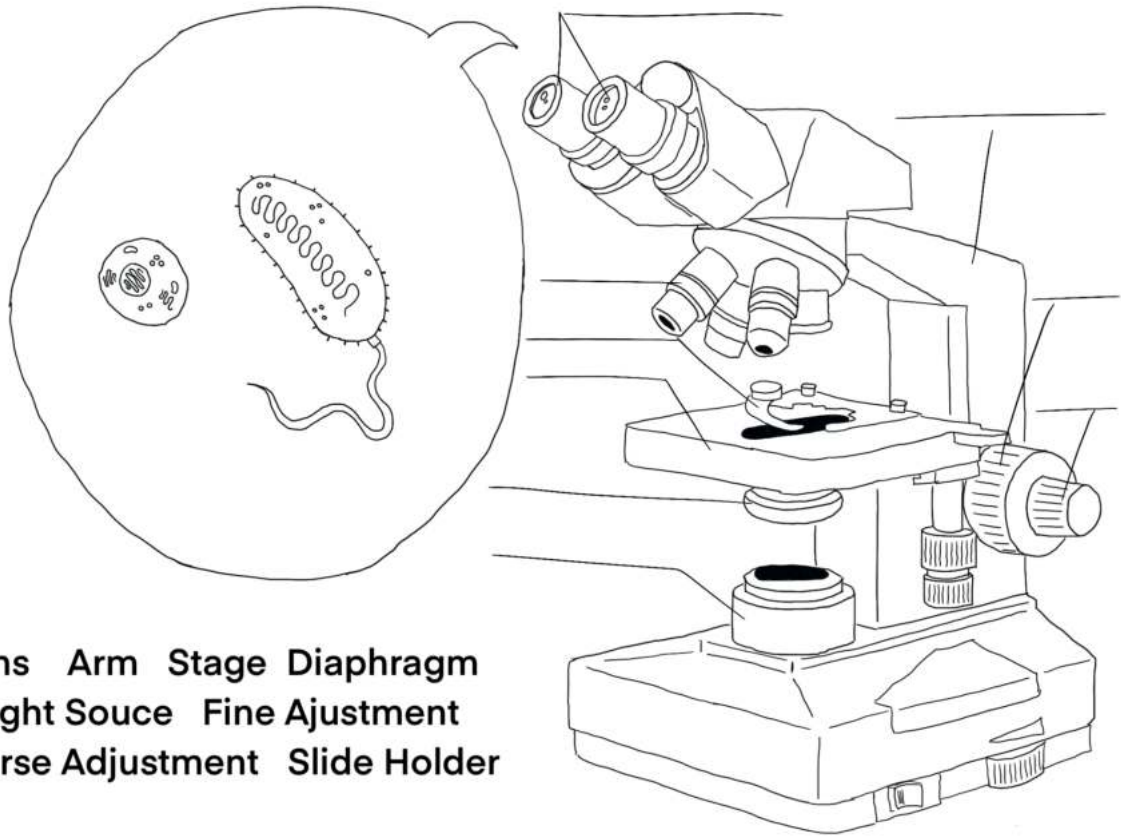
BY 2022 iGEM ROCHESTER SAPTASENSE TEAM AND
STONY BROOK UNIVERSITY PROS TEAM



PART 1: THE LAB



COLOR THE LAB STATION



Lens Arm Stage Diaphragm
Light Source Fine Adjustment
Coarse Adjustment Slide Holder

COLOR AND LABEL THE MICROSCOPE

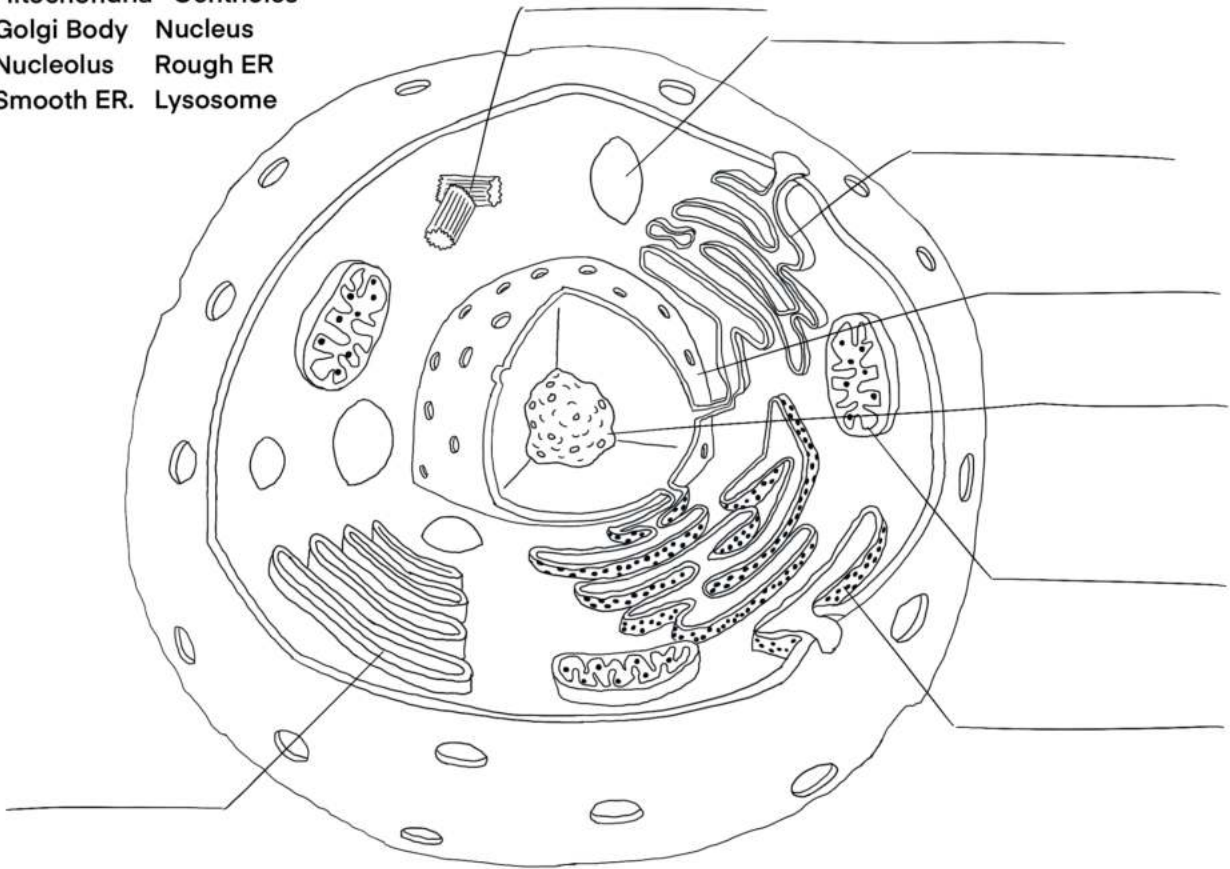
Biology laboratory safety

Fun fact sheet

- Did you know that every lab has its own shower? If a chemical splashes on somebody in the lab, they can jump right under the shower!
- Did you know that every lab has its own shower... but for the eyes? It's called an eye wash! If a chemical splashes into a scientist's eyes, they can wash it out using the eye wash.
- Most laboratories have a nitrogen tank and special gloves to protect from the extreme cold of the liquid nitrogen. They use it to flash-freeze cells, which means that the liquid nitrogen is able to freeze them within seconds.
- Did you know that most biology laboratories have several refrigerators and freezers? There is one at 4°C, -20°C, and at least one at -80°C which is equivalent to -112°F!
- In the laboratory, never forget to wear plastic gloves. They protect you! However, they also help protect what you are working with, in example: cells in your experiment from the bacteria on your hands!
- Never forget to wear plastic goggles in the lab. They will protect your eyes from unsafe chemicals!

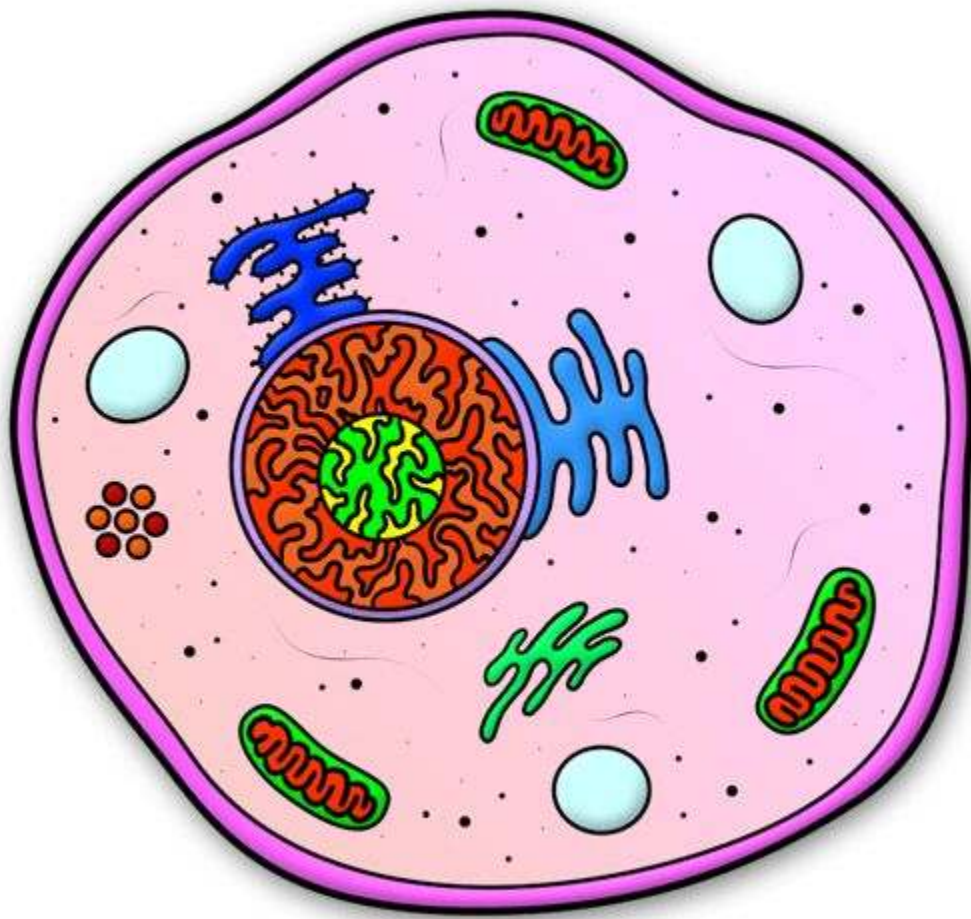
PART 2: THE CELL

Mitochondria Centrioles
Golgi Body Nucleus
Nucleolus Rough ER
Smooth ER. Lysosome



COLOR AND LABEL THE CELL

MAKING CELLS OUT OF SLIME



Materials:

For the slime

- 8oz of white glue
- 1 ½ - 2 tablespoons of contact lens solution
- 1 Tablespoon baking soda
- Plastic bag
- Food coloring, optional

For the cell organelles:

- Lysosome - Glass beads
- Nucleus/Nucleolus - Rubber ball
- Golgi Body - Pipe cleaners
- Endoplasmic reticulum - Rubber bands
- Ribosome - Glitter
- Microtubules - Lollipop sticks
- Mitochondria - Cotton Balls
- Get creative! What are other household things that you can use to represent cell organelles

Instructions:

To make the slime:

- Add glue and food coloring (if using) to a bowl
- Stir until combined
- Add baking soda to the mixture and mix well
- Add 1 ½ Tbsp of contact lens solution and mix well
- If the mixture gets too sticky, add another ½ Tbsp of contact lens solution
- Get hands on! Knead the slime mixture until it comes together and is no longer sticky
- Congratulations! You have successfully made the cytosol of your cell

What does the cytosol do?

The cytosol gives a cell its shape, enables organelles to move within the cell, and provides a mechanism by which the cell itself can move.

Adding the cell organelles:

- Using the color sheet that you've completed, place the cell organelles into the slime into their respective locations
- Make sure to label the organelles so that you know which one is which

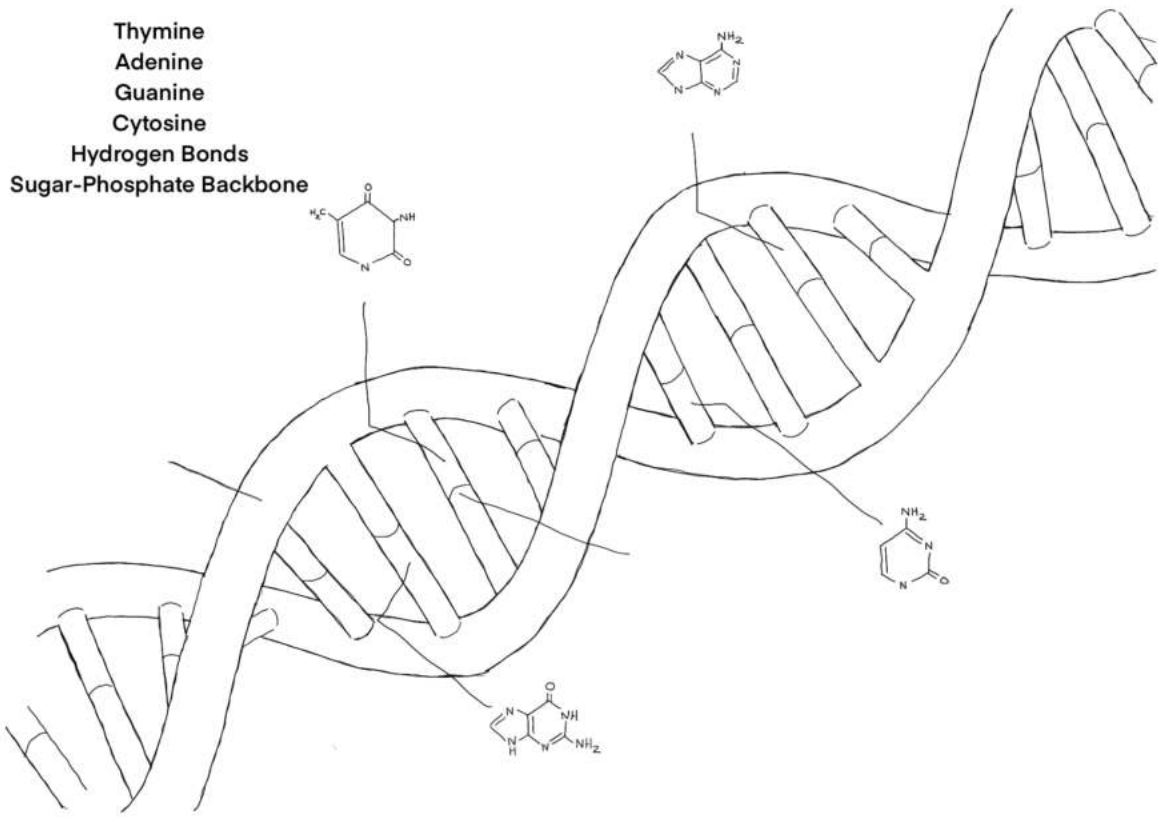
When you're finished, it's time to package your "cell" into a plastic bag, which will act as your cell membrane.

What does the cytosol do?

The cell membrane keeps the insides of your cell (the cytosol and the organelles) away from the outside. It helps to keep the whole cell together.

**YOU HAVE FINISHED MAKING YOUR VERY OWN MODEL
OF A CELL OUT OF SLIME!**

PART 3: DNA



COLOR AND LABEL THE DNA MOLECULE

DNA: THE BLUEPRINT OF LIFE

Materials:

- Pencil
- Crayons

Learning goals:

- See how DNA is the blueprint of life
- Demonstrate the principle of genomic equivalence
- Learn how various body cells become different from each other

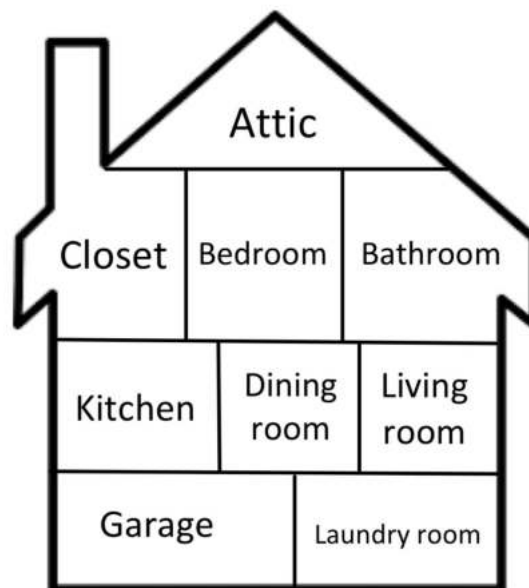
Review:

- The human body is made up of tiny units called cells
- Nearly all of the cells in your body contain DNA, and DNA contains the code for all of the proteins in your body
- DNA makes RNA during transcription, and RNA makes proteins during translation. The overall process of transcription and translation is known as gene expression.

Pre-activity questions:

- Have you ever wondered how your body knows to make skin cells on your skin, brain cells in your brain, or heart cells in your heart?

You are building a new neighborhood from the ground up. To make construction easier, you are using the same set of blueprints for every house. However, you let your future homeowners customize their homes based on their needs. Here's the generic blueprint you are using:

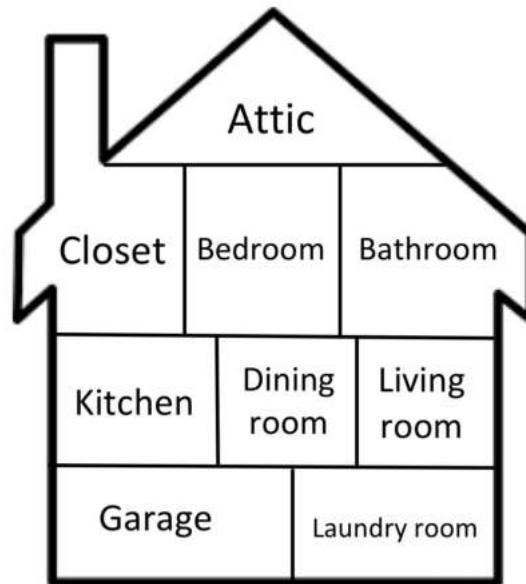


You have three homeowners who would like their homes to contain variations on the generic design. Unfortunately, your printer is broken, but luckily you have a few extra copies of the original blueprint. This means that all of the homes will be based on the generic blueprint, and you will have to change the existing blueprints to match the homeowners' wishes.

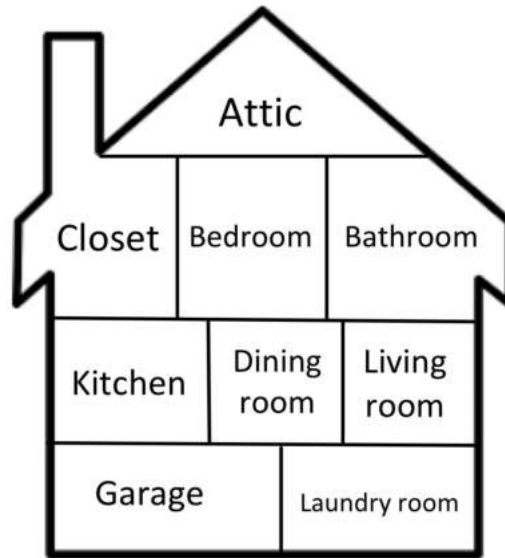
Changing the blueprints

Directions:

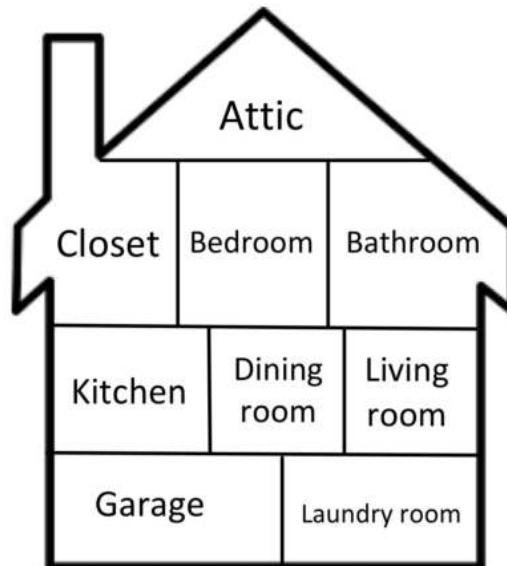
For each house, cross out the parts that the homeowner doesn't want.



E.P Dermis



Sarah Bellum



Stu Mack

What does this mean?

In this activity, each house represents a cell, and the blueprint represents DNA. Like blueprints, DNA provides instructions for how a cell is made. Just like how all three houses were based on the same generic blueprint, all of the cells in an organism contain the same exact DNA. Each room in the house represents different genes in your DNA. Like each person needing a different combination of rooms, each type of cell needs different genes to be active. For example, skin cells need the genes for skin to be expressed, but they have their heart genes turned off because those genes are not needed in your skin.

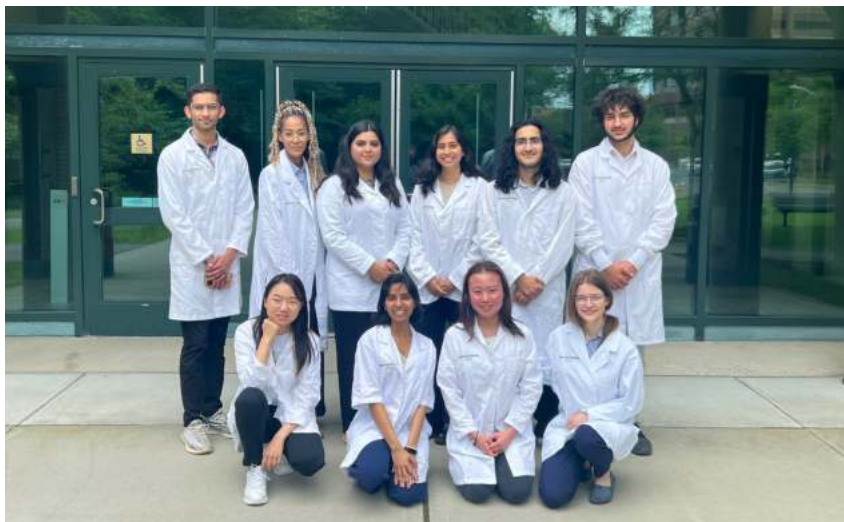
Tying it all together: Synthetic biology

What can we do with DNA and cells? A really cool thing that we can do is synthetic biology. Just like how we can make changes to change the blueprints of the houses to meet the needs of the homeowners, we can do the same thing to DNA so that the cells containing the DNA would meet our needs. By altering DNA to include genes that would produce things that we want, we can make cells do really cool things, essentially becoming a biological factory!

ABOUT THE AUTHORS



2022 Rochester iGEM Team Saptasense



2022 Stony Brook University iGEM Team PROS

What is iGEM?

The International Genetically Engineered Machine (iGEM) is a worldwide competition in which teams compete to create projects using synthetic biology to solve from local to global important issues in fields such as agriculture, medicine, and environment



Who is Team Saptasense?

Team Saptasense consists of 12 undergraduate students at the University of Rochester. Together, we have developed three sugarmaker-targeted tools to help alleviate financial and environmental costs of syrup and sap defects: a novel method for repurposing ropy syrup into dextran, a sensor kit that detects buddy sap before it is boiled into syrup, and a high-sensitivity glucometer that accurately shows producers precise syrup glucose levels.

Who is Team PROS?

Team PROS consists of 10 undergraduate students at Stony Brook University. We have developed a therapeutic injectable to treat a wide variety of disorders characterized by protein S deficiency. Protein S is a clotting factor in the bloodstream, and a lack of it causes abnormal blood clots, and is associated with disorders including COVID-19. We have created an accessible and inclusive platform for protein S treatment, and also worked to streamline the diagnostic procedure for the disorder.