# North Hertfordshire College Workshop

Presented by the UCL iGEM 2026 Team

# What is iGEM?

**International Genetically Engineered Machines Competition**

- The World’s Largest Synthetic Biology Competition
- Over 60 Countries & 450 Teams Participating
- Composed of High School Students, Undergraduates, Postgraduates and Commercial Institutions.
- An opportunity for students to develop a synthetic biology project which tackles an everyday issue we face in the world.
- University College London has won 11 Gold Medals out of their 14 times participating



Before we Continue...

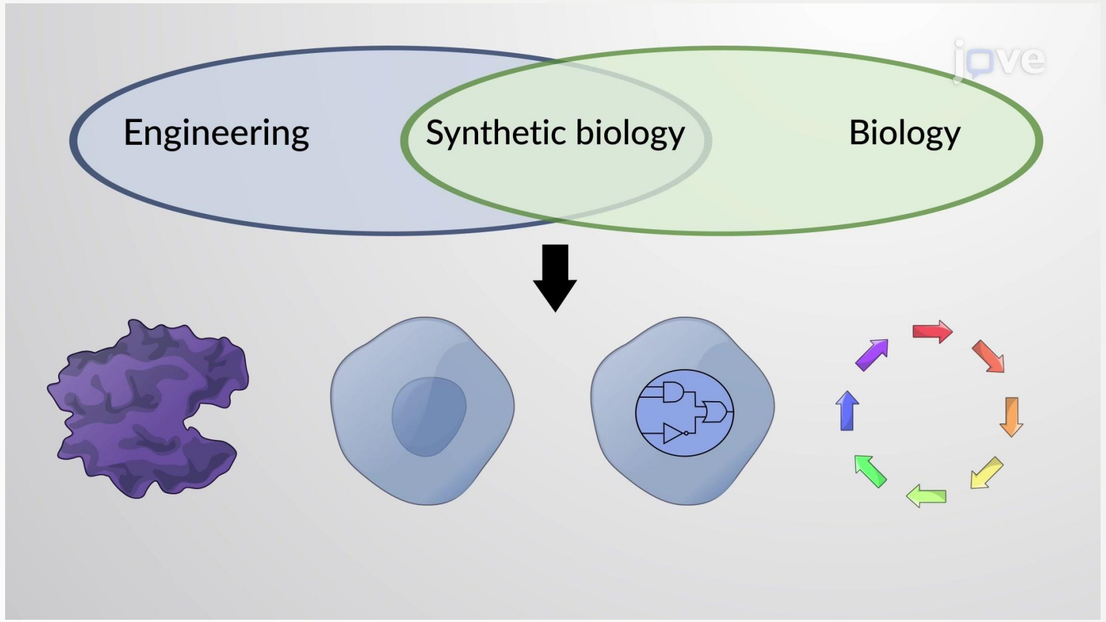
# What is Synthetic Biology?

Head to Mentimeter

# Synthetic Biology

**Breaking it down to simpler terms**

- Think of cells as tiny biological software made out of DNA.
- With all computer software, having the correct knowledge and expertise, allows you modify the code to return an output you desire.
- In Essence, Synthetic Biology is the science of programming cells to do specific jobs.
- This could be making a certain protein, sensing a chemical, stopping a protein expression.
- We bring the code together to create a functional and modified organism. (GMO's)



# Examples of Synthetic Biology




KYMRIAH (CAR-T Therapies for Cancer Treatment)

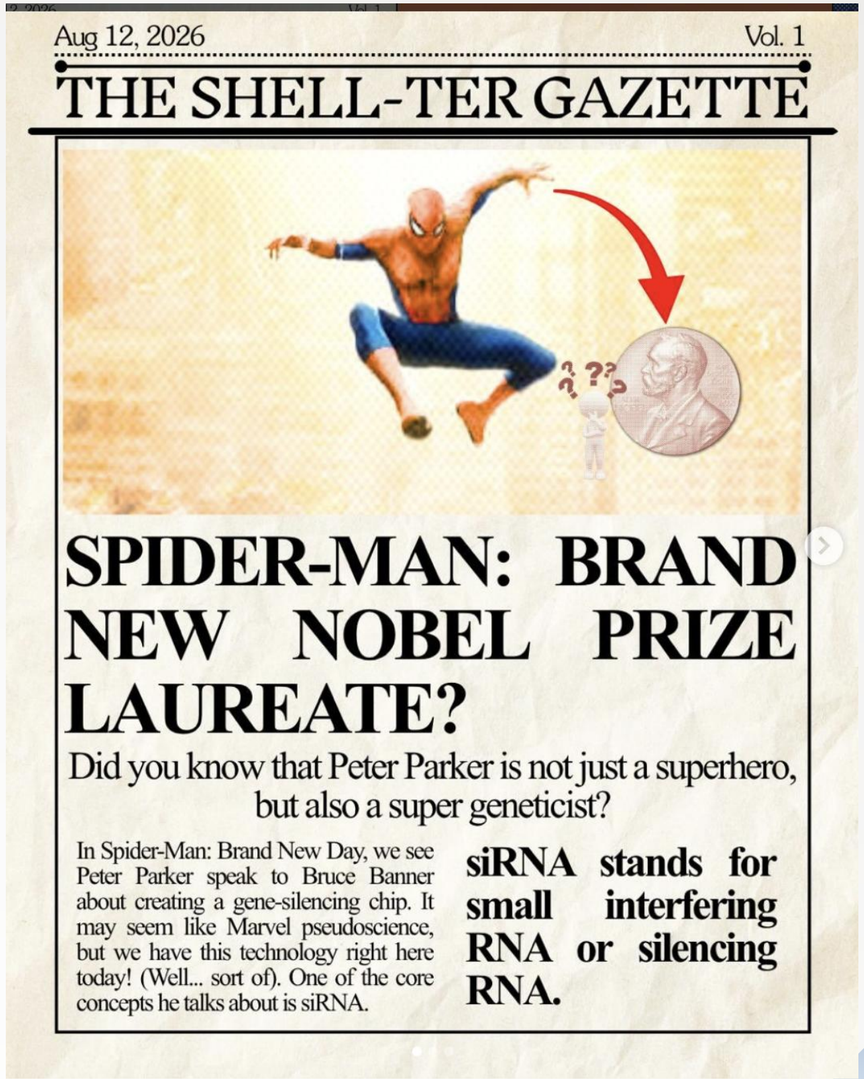


QCAV4 Cavendish Banana (Resistant to Panama Disease)

# Examples of Synthetic Biology




**We consume more knowledge about synthetic biology than you think**



Aug 12, 2026 Vol. 1

THE SHELL-TER GAZETTE

SPIDER-MAN: BRAND NEW NOBEL PRIZE LAUREATE?

Did you know that Peter Parker is not just a superhero, but also a super geneticist?

In Spider-Man: Brand New Day, we see Peter Parker speak to Bruce Banner about creating a gene-silencing chip. It may seem like Marvel pseudoscience, but we have this technology right here today! (Well... sort of). One of the core concepts he talks about is siRNA.

**siRNA stands for small interfering RNA or silencing RNA.**

! THE BIG QUESTION !

# How do you get started with building a Synthetic Biology Project?

## Most people would say: I NEED A LAB



When in fact laboratory testing only occurs once you have a SOLID understanding of your solution

# Identifying the Problem

**The Mistake Most Students Make:**

- I want to do super cool biology and use it to solve cancer / save the world!!!!!!

*Often times this is unrealistic, too generalised and not a real need. There are MANY cancer therapies in development, how does yours differ?*

**Start by asking yourself:**

**What problem near me is worth solving?**

- The best projects start from a specific, local and real problem in the community. Projects Expand from this.



Before we Continue...

# What are some problems in your local community?

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# Preliminary Research

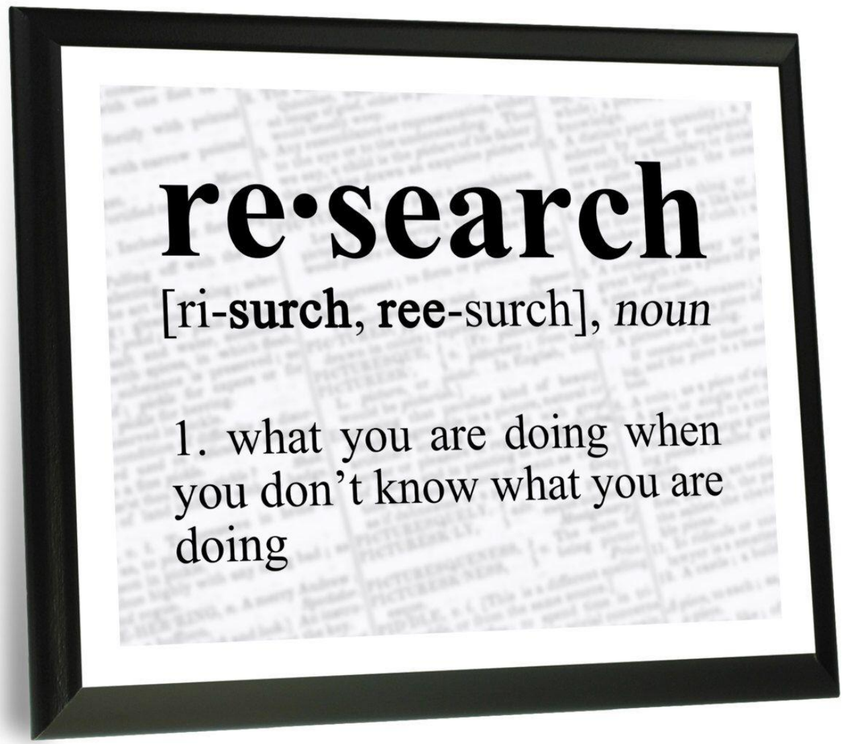
**What can a living thing do about that problem?**

Bacteria can be engineered to do a variety of things. Such as produce therapeutic medication, break down unwanted waste, sense pollution.

*This is the stage where you start designing your biological system.*

- **Identify the Organism**
- **Identify its Role / Purpose**
- **Identify what “biological parts” are required to build your desired system**

All can this be done with a piece of paper and a search engine!!



# Building with Biobricks

**BioBricks are standardised biological parts that snap together. Just like LEGO bricks!!**

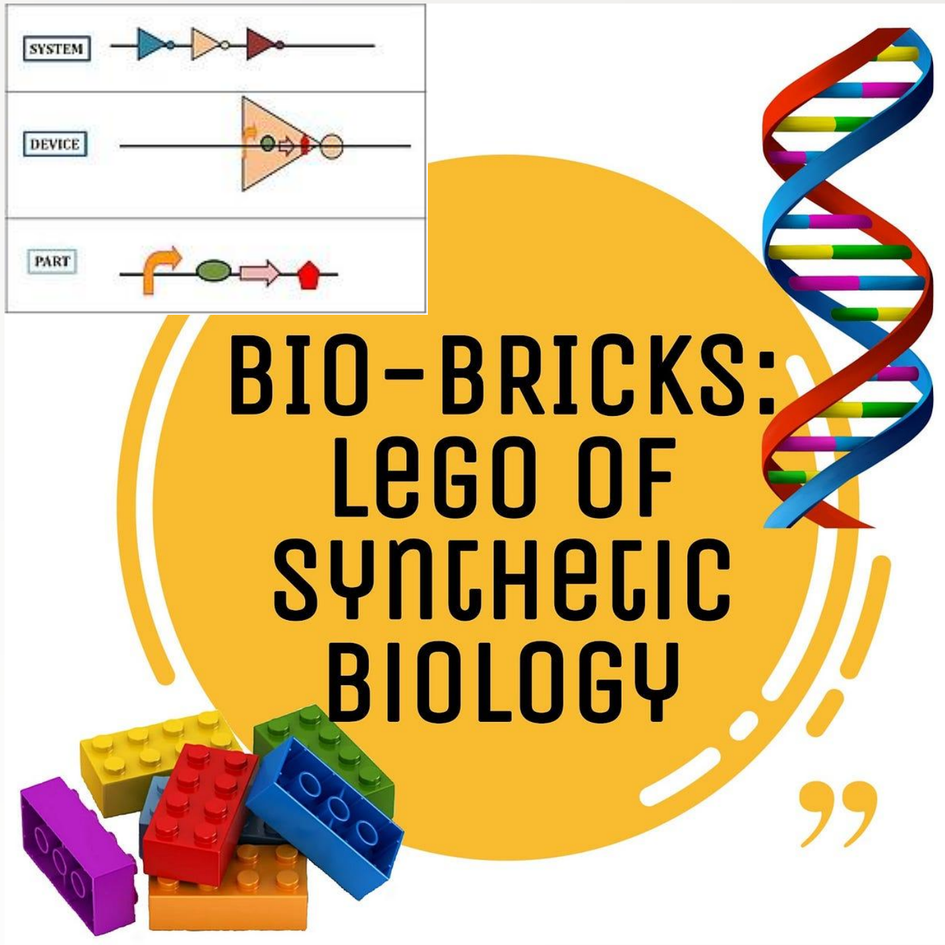
Each Biobrick is essentially a string of DNA with a specific function.

Similarly to Lego bricks, Biobricks can be combined together to design and assemble larger synthetic biological circuits.

*Different Bricks can have different roles, the same way some lego bricks have different purposes:*

- Biobricks which act as instructions
- Biobricks which act as a switch
- Biobricks which stop instructions

***Its like someone combined lego with programming!***



# iGEM Registry of Standard Biological Parts

**A Common Problem:**

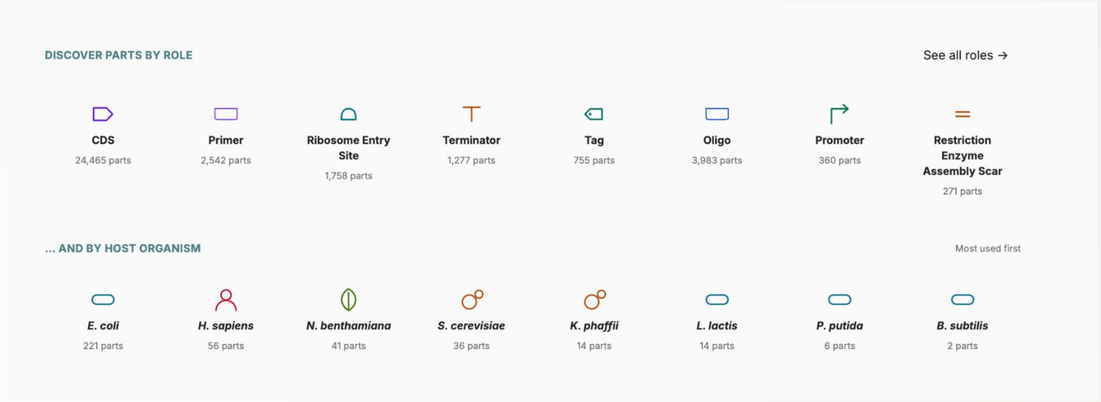
”I understand what Biobricks are but I still don’t know where to start”

**A Giant Open Source Library of Biobricks for anyone to view.** Every part is built to the same rules, so they fit together predictably,

You can start by building on bricks that people have already made and make modifications as you become more experienced.

Eventually you’ll be contributing your very own bio bricks yourself!

iGEM | Registry BETA



# YOU'RE BASICALLY READY TO HEAD TO THE LAB*...

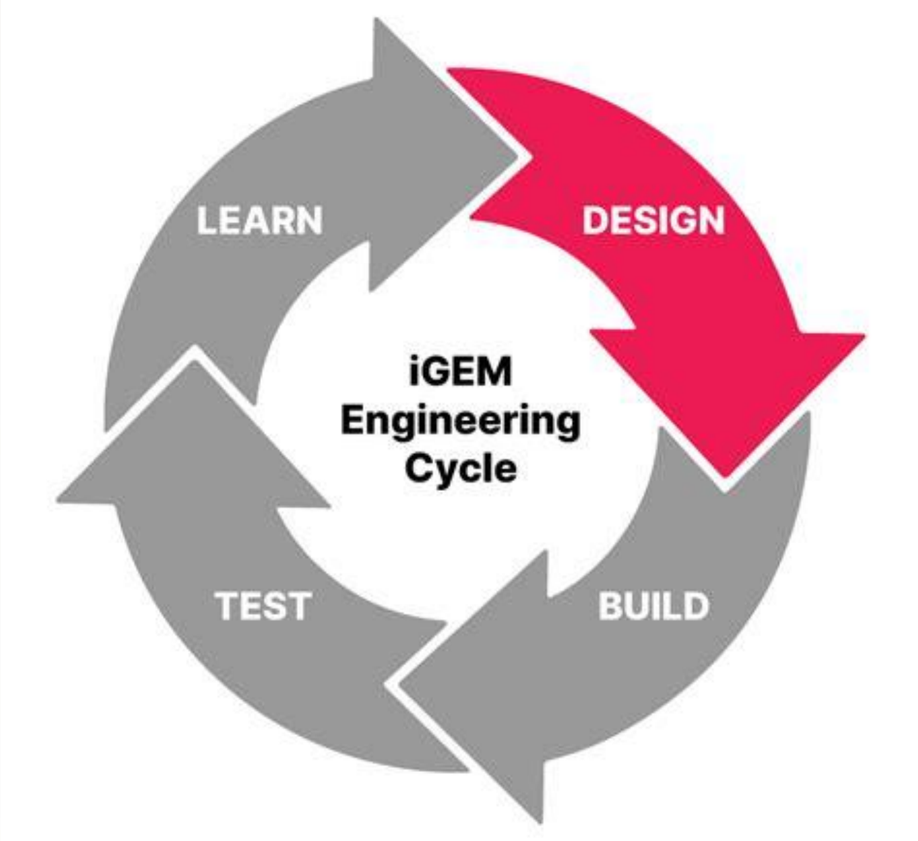


**You would still need to perform a risk assessment, undergo a safety induction, plan your lab protocols, make your hypothesis, order your parts.*

# Creating a Synthetic Biology Project

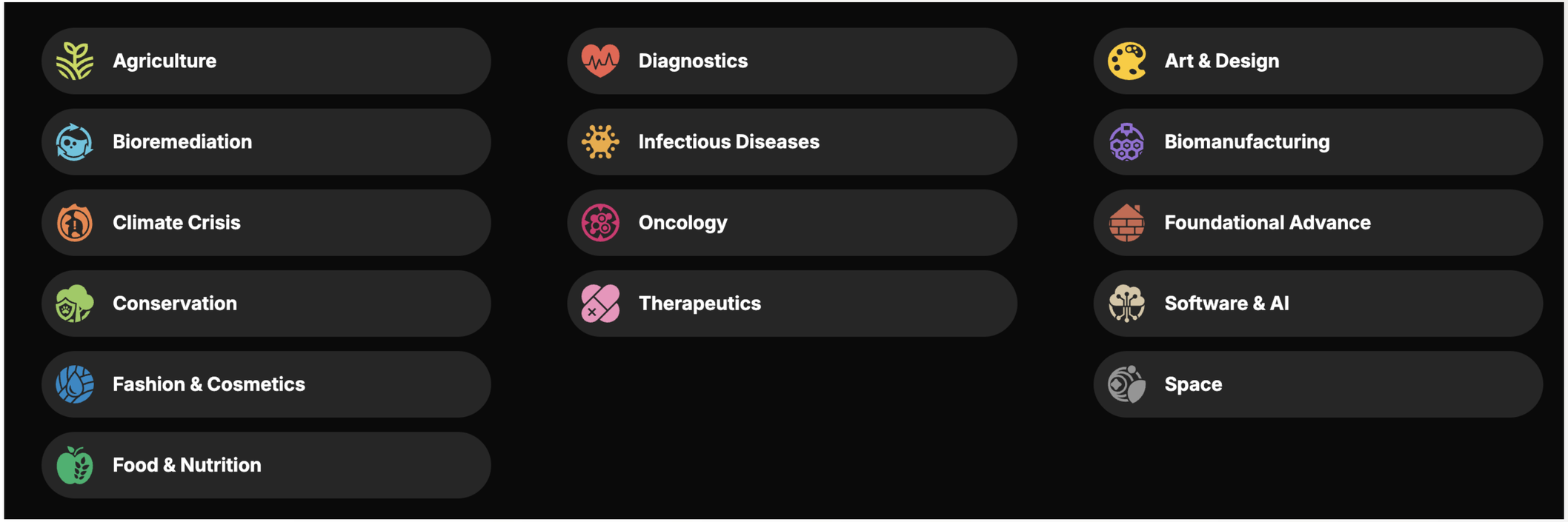
**BUT Congrats you've officially gone through your first iteration of the Engineering Cycle!**

- Every Engineering Type of Project begins with TONSSSS of background research and conceptualisation.
- And even after you've Design, Build and Tested. It may still fail → **In Fact, it is very likely!!!**
- The most important step in this design process is **understanding how to learn.**
  - How do you critically evaluate the meaning behind your results, what does it inform you and what faults have you isolated if any.
  - Decide what to do next. It is the hinge of the whole cycle.

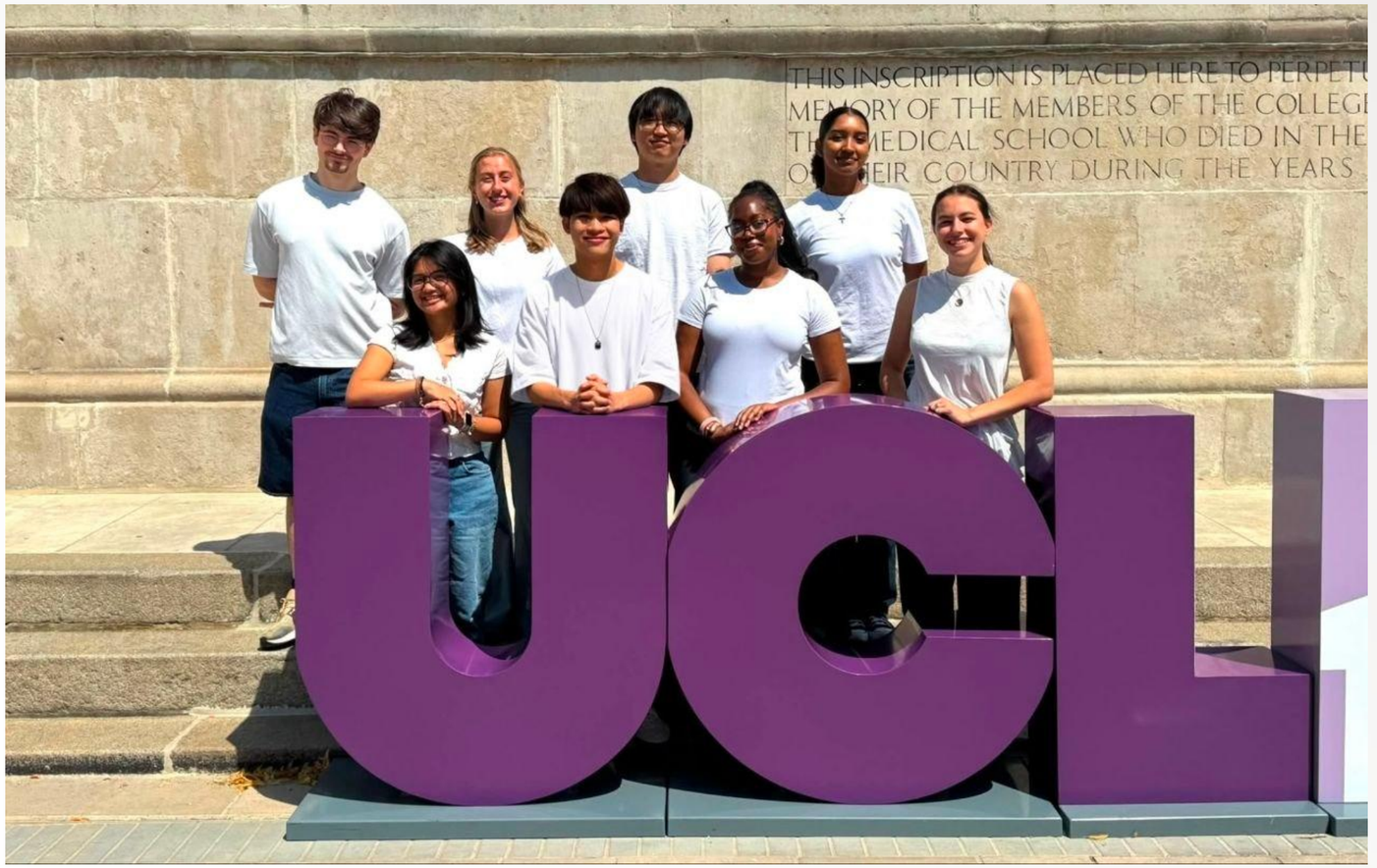


# iGEM Villages

iGEM Teams build their projects around central themes




The teams work together to design, build and test, a system of their own design using interchangeable biological parts and molecular biology techniques to solve a need in that “village”




# So what did our team build?



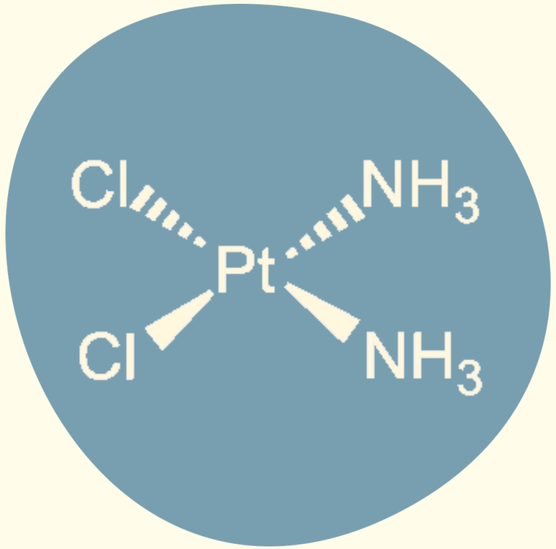

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UCL

Before we talk through our project...

# What happens to medication after a patient consumes it?

Write the first thing which comes to mind on mentimeter

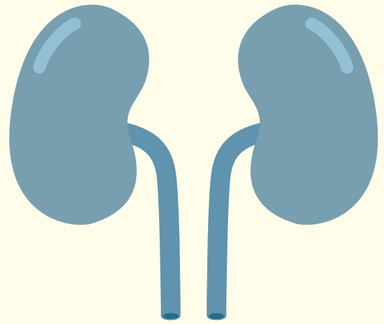



*This is*

# cisplatin.

***Although it is a life-saving chemotherapy drug, it is incredibly toxic to all life!***

***90% of it is excreted by the kidneys, leading to expensive medical wastewater treatment. This also leads to the end of the drug's use.***



# Furthermore...



## 8 million tonnes

*of shellfish waste is produced annually.*

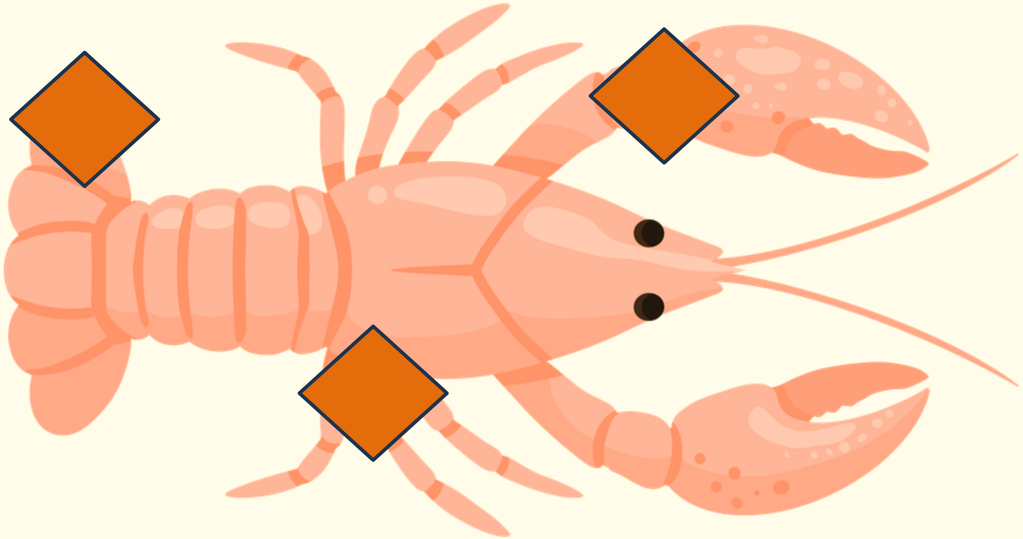
## 99%

*of this ends up in landfills, polluting freshwater streams.*

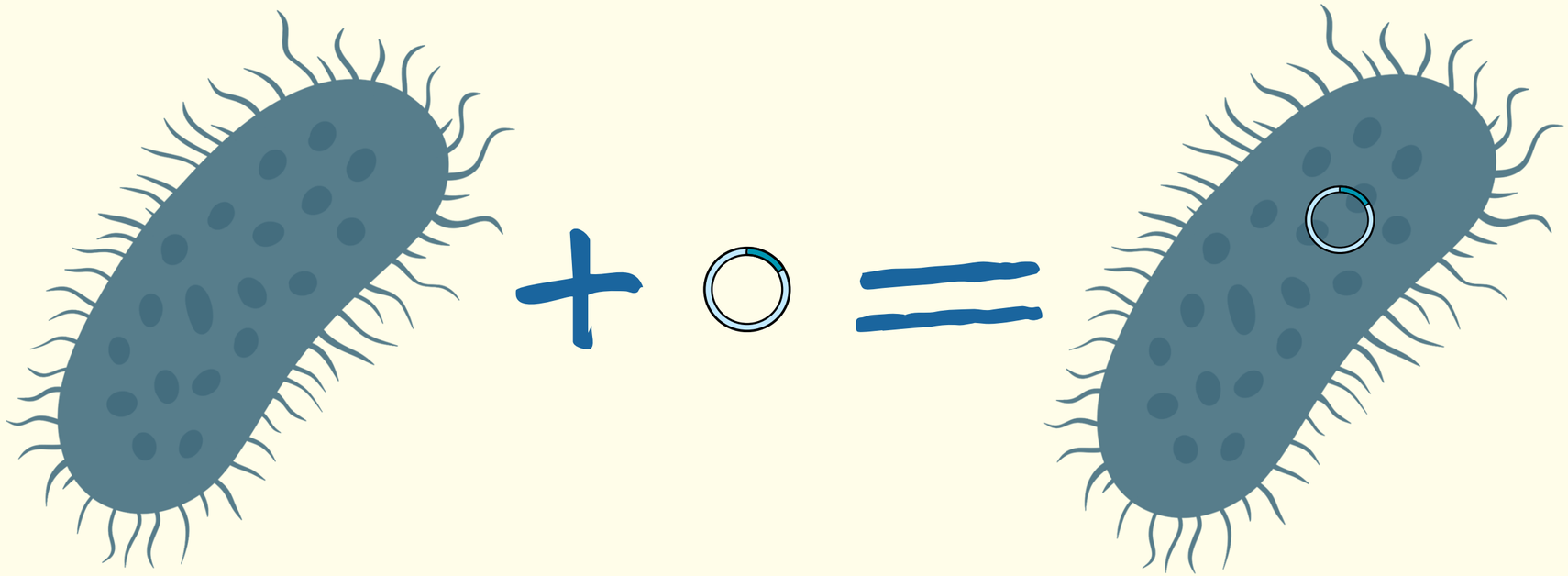
What if we could solve
both problems with a

**single**

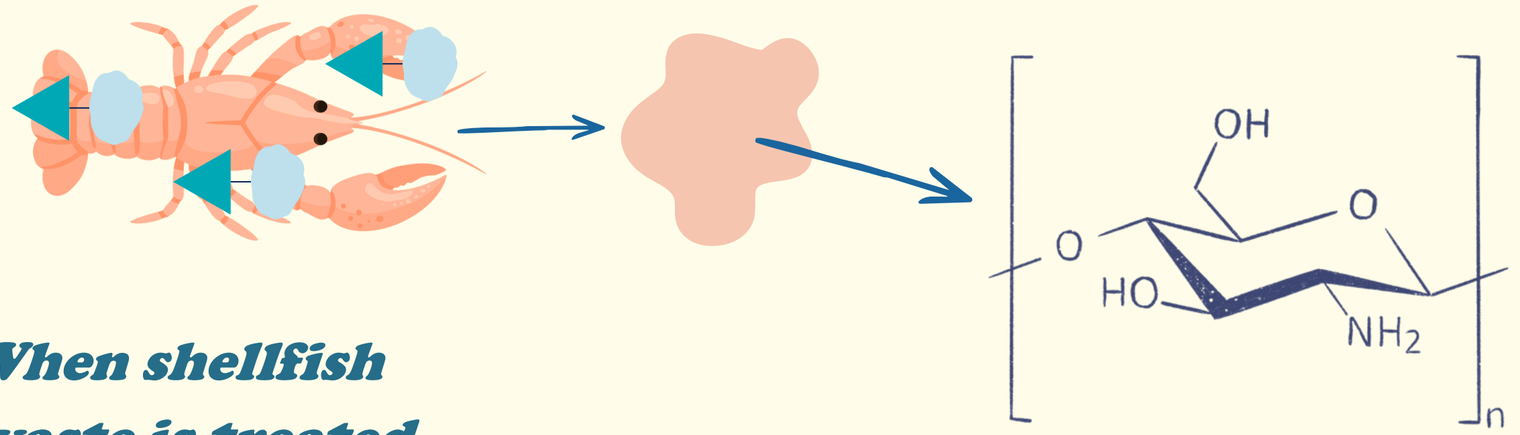
solution?



***Chitin is a polymer which can form up to 42% of shellfish shells***



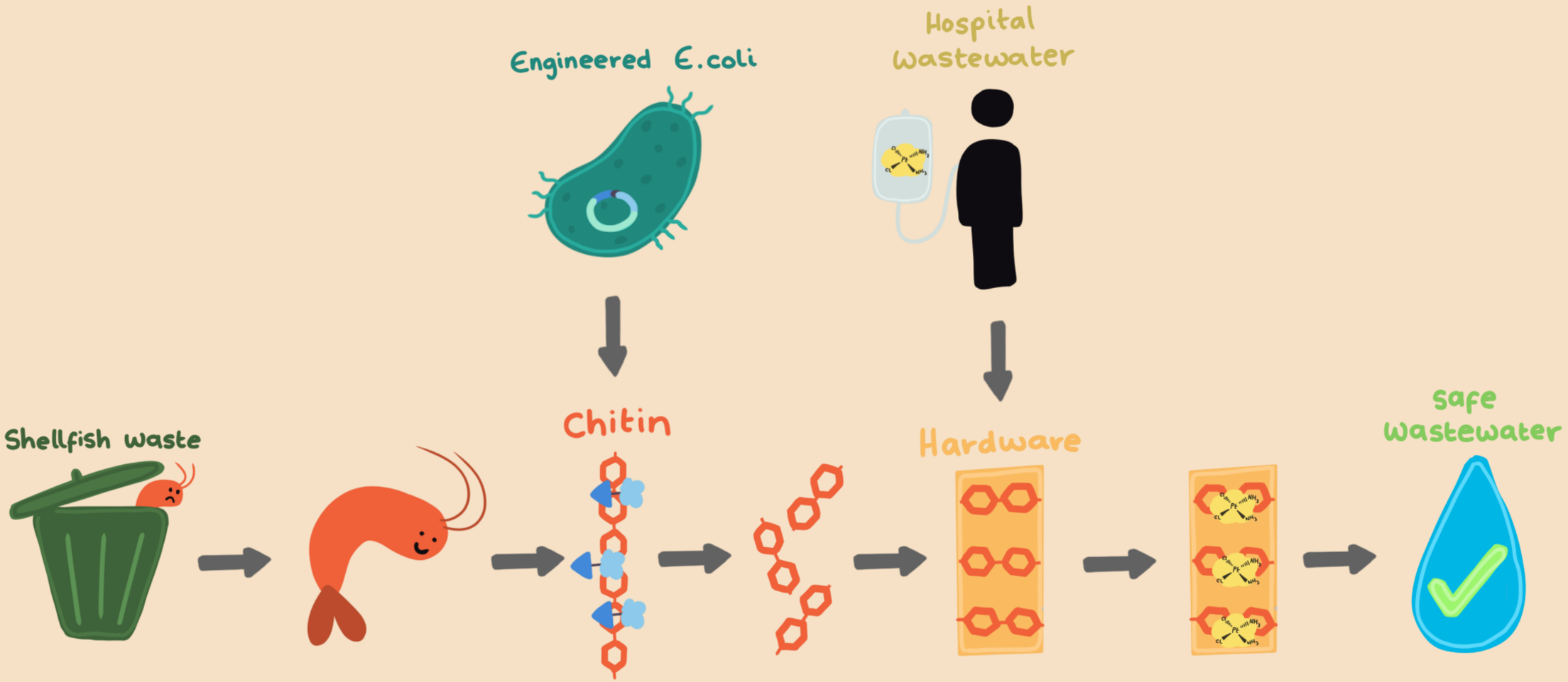
***Our project will involve genetically modifying bacteria to produce enzymes which can effectively degrade chitin***




***When shellfish waste is treated with these enzymes, we can break the chitin into a simpler form known as: chito-oligosaccharides (COS)***

***Our Chelating Agent which can bind to heavy metals such as platinum within chemotherapy drugs such as cisplatin***

# How would this work?






# UCL iGEM 2026

Upcycling *shell*fish waste to fil*ter* chemotherapy residues from wastewater

To close of...

# What is one thing that you found out / surprised you today?

Write the first thing which comes to mind on mentimeter