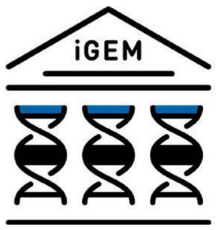
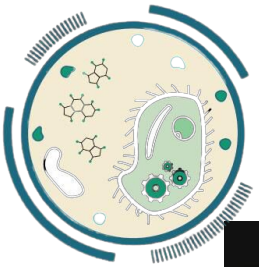
PUZZLE BOOK

THANKS TO THE iGEM TEAMS THAT HAVE COLLABORATED IN MAKING THIS PUZZLE BOOK!





INTRODUCTION

We are the iGEM MSP-Maastricht team from Maastricht University. iGEM is a synthetic biology competition organized by MIT in which teams from all over the world try to find solution to problems by using genetically modified bacteria. This puzzle book is made to inform more people about what synthetic biology is and how it can be used to solve current world problems. Therefore we contacted many iGEM teams from all over the world to share their project to us and participate in making this puzzle book.

Table of Contents

Synthetic biology 1
iGEM MSP-Maastricht 3
iGEM Aachen 5
iGEM Wego_Taipei 7
iGEM Bio-Brussel 9
iGEM Estonia_TUIT 11
iGEM Patras 13
iGEM PuiChing_Macau 15
iGEM Freiburg 17
iGEM Barcelona_UB 19
iGEM Unicamp_Brazil 21
iGEM BOKU-Vienna 23
iGEM Bonn-Rheinbach 25
iGEM MiamiU 27
iGEM William_and_Mary 29
iGEM Uni-Hamburg 31
iGEM Montpellier..... 33
iGEM Warwick 35
iGEM Crete 37
iGEM Patras_Uni_Hellas 39
iGEM WLC-Milwaukee 41
iGEM TU_Braunschweig..... 43
iGEM MIT_MAHE 45

Synthetic biology

Q	E	A	T	B	E	E	N	A	T	N	N	I	B
S	O	R	R	S	S	O	G	O	S	M	N	N	I
C	S	Q	A	E	A	N	S	R	S	H	C	O	O
S	E	A	N	N	N	B	F	C	B	S	T	E	C
E	N	H	S	C	I	E	N	C	E	Y	G	T	O
Q	G	G	F	C	A	S	S	E	M	B	L	Y	N
U	I	N	O	G	E	N	E	T	I	C	S	C	T
E	N	R	R	N	T	B	E	I	S	M	C	N	A
N	E	I	M	N	H	I	T	I	C	I	E	B	I
C	E	G	A	G	I	E	T	B	C	I	L	T	N
I	R	G	T	I	C	M	M	T	T	N	R	F	M
N	I	R	I	S	S	S	S	I	E	E	E	Y	E
G	N	C	O	E	M	S	S	A	F	E	T	Y	N
E	G	B	N	D	I	O	O	G	Y	I	O	E	T

TRANSFORMATION
SAFETY
ENGINEERING
ASSEMBLY
SEQUENCING
BIOCONTAINMENT
GENETICS
DESIGN
SCIENCE
ETHICS

SYNTHETIC BIOLOGY IS A DEVELOPMENT IN SCIENCE ON HOW ORGANISMS CAN BE GENETICALLY ENGINEERED BY ALTERING THEIR GENE SEQUENCES TO PROVIDE THEM WITH THE ABILITY TO CONDUCT A NEW OR CHANGED TASK. IGEM HAS PROVIDED THE PLATFORM TO USE THIS PARTICULAR FIELD OF SCIENCE TO COMBAT PROBLEMS THAT THE WORLD AND PEOPLE CURRENTLY FACE. IT IS A FIELD OF SCIENCE THAT PROVIDES HOPE.

Synthetic biology

How the found words relate to the project?

- SCIENCE: THE PROCESS OF UNDERSTANDING THE WORKINGS OF THE WORLD.
- GENETICS: A FUNDAMENTAL BASIC TO UNDERSTAND SYNTHETIC BIOLOGY.
- DESIGN: DESIGNING YOUR GENE CONSTRUCT IS VITAL FOR THE START OF THE SYNTHETIC BIOLOGY JOURNEY.
- ENGINEERING: SYNTHETIC BIOLOGY INVOLVES GENETICALLY ENGINEERING ORGANISMS.
- SEQUENCING: AN IMPORTANT TECHNIQUE TO GUIDE AND CONFIRM YOUR SUCCESS IN THE SYNTHETIC BIOLOGY PROCESS.
- ASSEMBLY: IN RELATION TO THE TECHNIQUES USED TO INSERT THE NEW DNA FRAGMENT INTO THE PLASMID OF CHOICE THAT WILL ULTIMATELY BE USED TO MAKE GENETICALLY MODIFIED ORGANISMS (GMO'S).
- TRANSFORMATION: TO FINALLY GET GENETICALLY MODIFIED ORGANISMS WE NEED TO CONDUCT TRANSFORMATION.
- BIOCONTAINMENT: AN ESSENTIAL COMPONENT TO ENSURE THAT GMO'S DO NOT GET OUT INTO THE SURROUNDINGS.
- ETHICS: MORALITY IS VITAL IN STICKING TO THE AVAILABLE LIMITS OF SYNTHETIC BIOLOGY
- SAFETY: ENSURING THAT THE USAGE OF A PARTICULAR GMO IS SAFE FOR EVERYONE.

MSP-Maastricht

C	S	W	N	E	I	B	T	N	A	P	T	Y	H
C	U	A	I	N	I	O	R	F	A	M	I	L	Y
Y	S	T	S	C	L	A	U	A	E	B	C	N	N
A	T	E	P	A	O	I	S	H	L	A	P	L	Y
N	A	R	O	P	I	A	G	U	T	N	R	E	A
O	I	S	D	S	G	R	E	H	N	T	R	R	E
B	N	C	O	U	O	T	N	Y	T	I	O	C	A
A	A	A	H	L	T	O	A	I	S	P	N	R	R
C	B	R	R	A	B	C	C	A	R	O	N	S	R
T	L	C	O	T	N	T	L	S	R	R	H	Y	H
E	E	I	L	I	D	S	R	A	I	T	S	I	B
R	B	T	A	O	S	R	L	W	T	E	I	N	O
I	D	Y	H	N	Y	R	C	H	N	R	R	C	A
A	C	R	O	W	D	F	U	N	D	I	N	G	A

ANTIPORTER
FAMILY
CYANOBACTERIA
SUSTAINABLE
CROWDFUNDING
HALORHODOPSIN
WATERSCARCITY
LIGHT
ENCAPSULATION

In our project we wanted to make it possible to create freshwater out of seawater in a way that is environmentally friendly. To achieve that we genetically modified bacteria that are naturally present in the sea to give them an ability to "eat" salt out of seawater. The bacteria are trapped in a material that allows the water to flow through it but keeps the bacteria in one place. Our bacteria are only activeted under special conditions - a specific light color will determine whether bacteria take up salt or release it outside. This allows us to reuse our salt filtering organisms - when they are already full of salt, they can be taken out of water and placed in another place where they will release all the salt that can be further used in the industry. The newly created freshwater can be then used in industry, agriculture, and in the future, even as drinking water!

MSP-Maastricht

How the found words relate to the project?

- **Antiporter:** A type of protein we use to move sodium ions into the bacteria.
- **Family:** Although our MSP-iGEM team started as a couple of colleagues, working towards a common goal made us so close that we like to call ourselves a family.
- **Cyanobacteria:** Also known as blue-green algae, they are the group of bacteria we use to filter salt out of seawater.
- **Sustainable:** Our process of desalination does not require any fossil fuel energy and the bacteria can be reused.
- **Crowdfunding:** Our research has been possible thanks to the donations we received, however to enable us to work on our project further, we still need funds. If you would like to help, please donate using the QR code below.
- **Halorhodopsin:** The protein we use that takes up Chloride ions from seawater when exposed to green light.
- **Waterscarcity:** An issue we hope to solve with our new biodesalination method.
- **Light:** The bacteria that desalinate the water are "controlled" by the color of light they are exposed to.
- **Encapsulation:** A method of immobilization we use to ensure that our bacteria do not escape into the water they are desalinating.

iGEM Aachen

V	D	E	D	E	E	N	H	C	U	M	I	I	D
P	R	O	G	R	E	S	S	I	V	E	I	N	E
I	I	L	L	U	M	I	N	A	T	I	N	G	T
G	I	L	R	R	O	N	I	I	I	M	G	E	N
R	U	E	M	A	B	T	C	L	I	E	E	O	E
I	S	L	U	N	M	R	V	M	B	A	C	V	I
I	E	V	I	T	A	V	O	N	N	I	V	U	R
I	V	O	N	T	N	N	A	E	G	N	B	E	O
I	E	N	L	I	G	H	T	E	N	I	N	G	E
I	G	L	G	N	I	T	E	L	P	M	O	C	R
E	D	E	L	B	A	N	I	A	T	S	U	S	U
U	P	G	C	E	D	E	U	L	O	G	I	M	T
A	M	I	I	L	D	O	E	T	I	T	I	V	U
N	R	N	A	B	E	U	N	P	I	E	T	A	F

FUTURE-ORIENTED
COMPLETING
BIG
SUSTAINABLE
ENLIGHTENING
ILLUMINATING
PROGRESSIVE
MUCH-NEEDED
INNOVATIVE

PHOSPHATE IS AN IMPORTANT BUT FINITE RESOURCE AND IS USED ON A LARGE SCALE, FOR EXAMPLE IN AGRICULTURE, AS IT IS AN ESSENTIAL GROWTH FACTOR FOR PLANTS. HOWEVER, RESERVES ARE DWINDLING AND MASSIVE USE IS CAUSING ACCUMULATIONS OF THE SUBSTANCE IN GROUNDWATER. THIS IS WHERE METAPHOS COMES IN - MODIFIED ENZYMES TARGETING PHOSPHATE RECYCLING. WE ADDRESS BOTH OF THESE PROBLEMS BY RECOVERING VALUABLE PHOSPHATE FROM GROUNDWATER AND PROCESSING IT FOR INDUSTRIAL REUSE. THIS IS ACHIEVED BY USING MODIFIED PHOSPHATE BINDING PROTEINS WHICH CAN BE ACTIVATED AND DEACTIVATED BY BLUE LIGHT IRRADIATION.

iGEM Aachen

How the found words relate to the project?

- FUTURE-ORIENTED: WE URGENTLY NEED A SOLUTION FOR THE PHOSPHATE PROBLEM, AS THE PHOSPHATE RESERVES ARE ESTIMATED TO LAST 50-130 MORE YEARS. IN ORDER TO SECURE THE FUTURE OF NOURISHMENT, WE AIM TO PROVIDE THE SOLUTION FOR THAT.
- SUSTAINABLE: WITH METAPHOS, PHOSPHATE ACCUMULATED IN SEWAGE CAN BE RECYCLED AND, THEREFORE, BECOME A RENEWABLE RESOURCE.
- COMPLETING: WE ADD ON TO THE PHOSPHATE CYCLE BY ADDING A COMPLETELY NEW, COMPLETING PATH TO IT.
- MUCH NEEDED: BECAUSE THE PHOSPHATE RESERVES SHRINK CONSEQUENTLY AND WE WILL NEED TO FEED 10 BILLION PEOPLE ON EARTH SOON, A CHANGE IN THE WAY WE TREAT PHOSPHATE IS MUCH-NEEDED.
- PROGRESSIVE: WITH NEW METHODS OF PROTEIN ENGINEERING AND TECHNOLOGIES, WE IMPLEMENT OUR NEWLY INVENTED APPROACHES TO DRIVE SCIENCE A BIT FURTHER.
- INTERDISCIPLINE : OUR TEAM MEMBERS COME FROM ALL DIFFERENT SUBJECTS OF SCIENCE: WE ARE BIOLOGISTS, BIOTECHNOLOGISTS, MECHANICAL ENGINEERS, MATHEMATICIANS, AND COMPUTER SCIENTISTS. THAT'S ALSO THE STRENGTH OF THE RWTH AACHEN: BEING AN INTERDISCIPLINARY AND INCLUSIVE UNIVERSITY.
- INNOVATIVE: WE USE MODERN, INNOVATIVE METHODS AND TECHNOLOGIES OF SYNTHETIC BIOLOGY TO CREATE A SWITCHABLE PHOSPHATE BINDING PROTEIN TO BE ABLE TO RECYCLE PHOSPHATE FROM SEWAGE.
- BIG: OUR TEAM CONSISTS OF 24 MEMBERS- A REALLY BIG TEAM! ALSO, IGEM FOR MOST OF US IS THE BIGGEST PROJECT WE HAVE DONE SO FAR.
- ILLUMINATING: OUR ENGINEERED PROTEINS THAT BIND AND RELEASE THE PHOSPHATE ARE TRIGGERED BY LIGHT IRRADIATION TO DO SO. WE BUILD A BIG REACTION STIRRER WITH BUILT-IN LED LIGHTS TO CONTROL THE PROCESS.
- ENLIGHTENING: ALSO REFERRING TO THE LIGHT-ACTIVATED PROTEIN DOMAINS, THIS WORD ALSO ENVISIONS THE BRIGHT FUTURE OF PHOSPHATE RECYCLING.

iGEM Wego_Taipei

L	M	E	A	S	U	R	A	B	L	E	A	R	V
C	V	D	D	A	E	E	C	A	Y	I	E	R	V
P	O	T	E	L	S	L	T	A	L	L	U	A	A
S	A	N	D	A	D	A	V	E	D	E	V	C	C
C	S	L	I	R	C	C	O	V	N	L	T	O	C
E	I	A	C	E	C	I	C	I	E	I	N	H	O
C	S	U	A	E	U	T	T	T	I	I	E	E	U
C	C	N	T	M	T	C	E	A	R	D	I	S	N
O	I	I	E	E	D	A	M	V	F	O	L	I	T
L	T	T	D	T	R	R	O	O	O	I	I	V	A
A	A	Y	S	A	I	P	T	N	C	E	S	E	B
E	T	E	L	E	V	R	D	N	E	A	E	E	L
B	I	I	I	I	E	I	E	I	T	N	R	E	E
V	L	A	O	S	N	L	A	L	E	R	L	U	E

COHESIVE
PRACTICAL
INNOVATIVE
RESILIENT
ACCOUNTABLE
DRIVEN
ECO-FRIENDLY
DEDICATED
UNITY
MEASURABLE

In the 2022 competition, our team launched a project called Eutro in Vitro, which aimed at solving Eutrophication. Eutrophication is a process caused by the gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in the biosystem, which are introduced into the ecosystem primarily when streams wash away soils from land. Our approach to solving eutrophication is a filtering device containing engineered E. coli with the ability to hydrolyze organic phosphate and overtly absorb, as well as fixate, inorganic phosphate. Our ultimate goal is to decline the external phosphorus level, which is the main reason behind eutrophic waters. We hope to approach such a multifaceted issue from a different angle and develop a creative but feasible solution through synthetic biology

iGEM Wego_Taipei

How the found words relate to the project?

- UNITY: OUR TEAM IS LIKE A UNITED FAMILY, SUPPORTING EACH OTHER IN MANY ASPECTS.
- RESILIENT: THE WORD RESILIENCE PERFECTLY DESCRIBES OUR TEAM. IN THIS YEAR, WE FACED DIFFERENT PROBLEMS SUCH AS PANDEMICS OR OTHER FINANCIAL CONCERNS. HOWEVER, WE FINALLY TURNED INTO A GREAT RESULT.
- DRIVEN: ALL 15 OF US ARE EQUALLY DETERMINED TO ACHIEVE THE SAME GOAL.
- COHESIVE: COLLABORATIVE - THROUGHOUT THE PROJECT, OUR TEAM HAS TAKEN PART IN MANY COLLABORATIONS, WHICH HAVE STRENGTHENED OUR CONNECTION TO THE IGEM COMMUNITY AND HELPED US IMPROVE OUR PROJECT.
- ACCOUNTABLE: EVERY SINGLE MEMBER OF OUR TEAM HAS ACCOUNTABILITY AND A SENSE OF RESPONSIBILITY TO COMPLETE TASKS THAT COULD KEEP THE TEAM ON SCHEDULE.
- DEDICATED : WE ARE A TEAM OF YOUNG SCIENTISTS DEDICATED TO ACHIEVING NOT ONLY SUCCESS IN OUR EXPERIMENTS AND PROJECT WITH HARD WORK AND PERSEVERANCE.
- ECO-FRIENDLY: OUR PROJECT IS ECO-FRIENDLY AIMING AT SOLVING EUTROPHICATION ISSUES AND PROVIDING A STABLE ECOLOGY IN GLOBAL COMMUNITY.
- MEASURABLE : OUR PROJECT IS MEASURABLE IN TERMS OF ITS BENEFITS AND ACHIEVEMENTS. IT IS NOT ONLY ACHIEVABLE IN MONETARY ASPECTS, THE PRECISE PLAN AND OBJECTIVE MEASUREMENTS MAKE THE IMPLEMENTATION POSSIBLE TO SOLVE REAL-WORLD SCENARIOS.
- INNOVATIVE : OUR PROJECT IS INNOVATIVE BECAUSE EVERY STEP OF THE RESEARCH PROCESS REQUIRES US TO THINK OUTSIDE THE BOX.
- PRACTICAL: OUR PROJECT IS PRACTICAL THAT WE APPLIED OUR PROJECT TO OUR REAL WORLD TO SOLVE EUTROPHICATION INSTEAD OF THE THEORETICAL METHOD.

iGEM Bio-Brussels

O	S	Y	N	T	H	E	T	I	C	B	I	O	G
C	A	C	O	O	N	L	I	C	S	N	N	T	O
C	B	S	L	A	C	T	O	C	O	C	C	U	S
E	A	N	R	L	T	T	F	S	T	E	E	I	D
C	P	C	C	A	L	R	C	E	C	S	R	O	S
S	E	E	O	B	R	U	S	S	E	L	S	H	R
G	R	G	C	S	E	U	I	A	E	U	E	E	S
G	D	T	S	E	N	C	W	A	T	E	R	S	E
E	D	E	N	D	O	S	P	O	R	E	I	O	I
B	I	O	E	N	G	I	N	E	E	R	I	N	G
E	S	G	S	G	S	S	E	A	N	O	L	T	D
C	D	G	R	T	A	O	S	O	C	S	C	C	R
Y	I	G	O	A	L	B	E	G	T	N	D	E	I
E	R	B	I	U	T	F	I	B	E	R	S	S	O

EGGS
CACO
LACTOCOCCUS
BIOENGINEERING
FIBERS
ENDOSPORE
SYNTHETIC BIO
WATER
SALT
BRUSSELS

AS A TEAM WE WERE INSPIRED BY THE HARD WATER WE DEAL WITH ON A DAILY BASIS HERE IN BRUSSELS. SINCE CURRENT SOLUTIONS ARE NOT ENVIRONMENTALLY FRIENDLY, WE WANTED TO SEE IF WE COULD DEVELOP A BIODEGRADABLE, PROTEIN BASED SOLUTION TO HARD WATER.

iGEM Bio-Brussels

How the found words relate to the project?

- **Water:** Our project is centered around softening water to offer better water quality around the world.
- **Endospore appendages:** are the scaffold we are using to present our constructs.
- **Calcium carbonate (CaCo3):** Is what we're trying to remove from water.
- **Eggs:** the shell of eggs inspired our project.
- **Brussels**: The city where our project took place and inspired our topic.
- **Lactococcus lactis:** Our final expression strain.
- **Bioengineering:** Our background education and basically what we're doing.
- **Salt:** The ecological impact of non-environmentally friendly water softening is the salination of water.
- **Fibers:** our scaffold is fiber shaped
- **Synthetic biology:** Core part of what we do.
- **Bioengineering**: Our background education and basically what we are doing.

iGEM Estonia_TUIT

L	E	R	B	E	D	G	V	S	C	D	O	R	E
I	N	V	N	G	U	S	E	Y	C	I	N	N	V
N	Y	G	I	D	U	G	N	I	Z	A	M	A	I
N	E	E	V	T	Y	I	R	F	T	I	I	G	T
O	I	C	D	O	C	I	L	I	C	A	G	F	A
V	N	N	Y	G	M	U	E	A	B	T	C	A	R
A	C	E	E	G	E	E	R	G	F	T	C	M	O
T	R	T	S	R	R	C	I	T	M	V	E	I	B
I	E	S	A	A	M	E	U	I	S	I	S	L	A
O	D	I	G	U	C	N	N	T	I	N	E	Y	L
N	I	S	O	A	T	N	L	Y	T	R	O	C	L
T	B	R	E	S	O	I	I	O	S	I	I	C	O
S	L	E	V	L	E	O	A	G	C	I	N	P	C
S	E	P	A	M	B	I	T	I	O	U	S	G	M

FAMILY
CONSTRUCTIVE
EDGE-CUTTING
INNOVATION
PERSISTENCE
COLLABORATIVE
AMBITIOUS
AMAZING
SYNERGY
INCREDIBLE

THIS YEAR, TEAM ESTONIA_TUIT'S PROJECT AIMS TO IMPROVE THE SURVIVABILITY OF SACCHAROMYCES CEREVISIAE YEAST, A POPULAR MODEL ORGANISM, IN CONDITIONS OF HIGH RADIOACTIVITY, AND FIND THE BEST WAY TO SYNTHESIZE MELANIN THAT WILL PROTECT IT IN SPACE. OUR MELANIN-SYNTHESIZING YEAST CAN BE USED AS RADIATION-RESISTANT BIOFACTORIES IN SPACE FOR SYNTHESIZING SUPPLEMENTS NECESSARY FOR LONG-TERM SPACE MISSIONS AND FUTURE COLONIZATION OF OUTER SPACE. AS WELL AS THAT, OUR PROJECT CAN ALSO BE USED ON EARTH. FOR EXAMPLE, SACCHAROMYCES CEREVISIAE IS DISCOVERED TO BE THE MOST SENSITIVE STRAIN FOR HEAVY METAL UPTAKE. AND OUR MELANIN-SYNTHESIZING YEASTS CAN BE USED FOR THE ABSORBANCE OF RADIOLOGICAL ISOTOPES IN PLACES WITH RADIOACTIVE CONTAMINATION.

How the found words relate to the project?

- **Synergy:** A good team is what creates the environment for a successful project, and we have what it takes.
- **Persistence:** Nothing ever works out perfectly, but through persistence, we can achieve our ultimate potential.
- **Ambition:** Our project is ambitious because there are many ways in which it can be developed and implemented.
- **Collaboration:** Throughout the project, our team has taken part in many collaborations, which has strengthened our connection to the iGEM community and helped us improve our project.
- **Evolving:** We constantly learn as we try out new strategies in order to find the best one.
- **Familiy:** Our team is a family where there are advisors and junior instructors, and they create sort of a support system for students, while also letting the students harvest their own ideas.
- **Edge-cutting:** Space Yeast aims to apply novel approaches to making a model organism radiation-resistant.
- **Amazing:** Combining great ideas and a synergetic team leads to amazing results.
- **Incredible:** This word can be applied to both our project and our team.
- **Constructive:** Each step of our project is like a building block that logically contributes to the previous construct.

iGEM Patras

N	O	I	T	A	R	O	B	A	L	L	O	C	N
S	U	S	T	A	I	N	A	B	I	L	I	T	Y
C	O	M	M	U	N	I	C	A	T	I	O	N	U
I	N	T	E	G	R	A	T	I	O	N	C	T	A
R	Y	T	I	L	I	B	I	X	E	L	F	E	S
O	T	T	E	E	L	X	I	I	I	L	T	C	T
M	I	U	N	N	T	N	N	N	O	T	O	H	B
N	Y	T	I	V	I	T	A	E	R	C	X	N	N
A	A	L	C	L	M	O	T	F	T	E	E	O	I
T	C	N	T	N	B	E	A	O	C	S	B	L	T
E	X	P	E	R	I	E	N	C	E	U	L	O	H
E	C	Y	L	S	C	R	A	U	N	I	I	G	C
I	A	X	I	G	N	U	I	S	N	C	B	Y	L
I	R	E	C	E	P	T	I	V	E	N	E	S	S

TECHNOLOGY
FOCUS
SUSTAINABILITY
COLLABORATION
COMMUNICATION
INTEGRATION
RECEPTIVENESS
EXPERIENCE
FLEXIBILITY
CREATIVITY

Our project's P.AG.G.A.A.I.A (Precision AGriculture using Genomics, Artificial Intelligence and Aerotransportable equipment) goal is soil improvement and increasing of the quality of the agricultural yield. This will be achieved through a protocol that includes molecular, physicochemical, and agronomical characteristics and analyzes them through Artificial Intelligence and more specifically Machine Learning, in order to propose tailor-made interventions to farmers and specialists in the field of agriculture.

iGEM Patras

How the found words relate to the project?

- **Collaboration:** Collaboration between our subteams as well as with other iGEM teams promote our goals and gives us the opportunity to meet new people and exchange ideas
- **Creativity:** New ideas and possible conceptualizations can make the project more interesting and innovative.
- **Sustainability:** Environmental sustainability is one of the basic pillars of our project.
- **Integration:** The integration and application of our project in everyday life by farmers, agronomists, and food industries is one of our team's main goals.
- **Technology:** Technology and its application in our project through Artificial Intelligence is one of our project's innovations.
- **Communication:** Communication between our team members makes our work more efficient and ensures robust results.
- **Flexibility:** Flexibility helps our team overcome possible problems and changes, and integrate them quicker into the project's main goal.
- **Focus:** Focusing on our team's goals and plan, especially while participating in a competition with deadlines, is very important.
- **Receptiveness:** Receptiveness to new ideas, collaborations, and changes creates new perspectives on our project and helps us improve it day by day.
- **Experience:** As iGEM Patras we truly appreciate the fact that we have the opportunity to gain new experiences while experimenting with innovative ideas and methods and meeting new people from all over the world.

iGEM PuiChing_Macau

R	U	R	N	T	A	C	C	E	Y	F	P	O	D
Y	D	A	R	A	U	C	T	T	T	T	F	E	P
N	A	B	R	U	O	U	O	R	I	F	O	A	T
T	N	A	L	P	T	R	H	E	L	A	O	O	C
N	I	N	O	T	A	N	Y	R	I	E	D	H	S
P	I	Y	I	M	A	U	D	U	B	V	M	A	T
R	I	A	L	T	U	E	R	T	A	I	O	T	U
O	P	C	C	C	T	P	O	L	N	T	H	T	T
T	A	L	Y	R	O	O	P	U	I	C	O	N	Y
O	Y	I	A	U	N	O	O	C	A	U	P	Y	I
T	Y	M	A	I	O	T	N	I	T	D	L	E	I
Y	N	A	P	Y	M	I	I	R	S	O	L	P	N
P	O	T	I	T	Y	N	C	G	U	R	D	N	A
E	P	E	U	O	Y	O	S	A	S	P	D	D	L

PLANT
SUSTAINABILITY
FOOD
AUTONOMY
HYDROPONICS
AGRICULTURE
PROTOTYPE
URBAN
CLIMATE
PRODUCTIVE

Due to the increasing food shortage caused by the extreme weather and manual problems, our densely populated city Macau needs a sustainable food source to stabilize the supply. To enhance productivity, we have chosen the hydroponic system to accomplish further experiments. However, there are two problems with hydroponics. First, the nutrition solution must be discarded regularly to prevent toxin accumulation or pH reduction, which heavily affect nutrient availability. We use the Genetic pH Shooting (GPS) system to neutralize the solution. Then, hormone regulation is also vital for enhancing plant growth. Plant hormones like phytohormones and abscisic acid (ABA), however, slow down plant development. Thus, we use the hormone binding domain of receptor T2R4 to inhibit ABA. To strengthen the adaptability of the plant, we also use PYL8 for competitive inhibition. By using HBDs + GPS systems, we can successfully establish a sustainable method of agriculture for the future.

How the found words relate to the project?

- **Sustainability:** Sustainability is a very significant theme of our project since we want to optimize hydroponics into a more sustainable system.
- **Prototype:** Our project involves a prototype home kit that can be placed on Macau balconies and it is good for us to promote self-farming and our project.
- **Agriculture:** This is the general topic of our project.
- **Urban:** We are targeting farming, especially urban farming.
- **Hydroponics:** Hydroponics is the system we use to complete our experiments.
- **Autonomy:** Autonomy is one of our targets, and we increased the autonomy level through our pH shooting system.
- **Productive:** We hope our system could be more productive.
- **Plant:** Plant is important in reducing carbon dioxide.
- **Food:** Maintaining a stable food supply in urban conditions is our main target.
- **Climate:** Climate change is impacting everyone on Earth and is also the inspiration for our project.

iGEM Freiburg

A	I	R	E	C	O	M	P	O	U	N	D	L	P
E	R	S	I	N	I	D	O	D	N	T	G	O	R
P	C	N	U	I	R	A	M	B	E	R	D	C	O
T	O	N	N	N	Y	U	B	A	E	Y	L	A	D
T	M	O	N	D	I	O	R	A	O	A	I	L	U
O	P	A	P	I	E	U	U	R	L	W	T	I	C
G	A	O	T	R	L	N	M	M	I	H	R	S	T
I	R	R	R	U	D	N	B	O	N	T	I	I	I
D	T	D	O	B	R	A	A	N	A	A	D	N	O
N	M	T	O	I	R	T	O	I	R	P	T	G	N
I	E	T	D	N	E	U	T	M	C	N	E	P	E
L	N	D	T	O	A	R	L	I	I	M	E	O	S
N	T	D	I	E	C	A	P	L	C	S	H	R	Y
N	S	P	R	T	I	L	I	M	U	I	O	N	S

PATHWAY
LOCALISING
INDIRUBIN
COMPARTMENTS
UNNATURAL
AMBER
COMPOUND
YIELD
INDIGO
PRODUCTION

The production of valuable compounds such as pigments or drugs in bacteria is a more ecologically friendly and sustainable approach compared with chemical synthesis. Usually, the metabolic pathway required for the biosynthesis of the compound is transplanted from the natural producer into a model bacterium such as Escherichia coli. To improve product yield, it is common practice to increase the expression levels of the exogenous enzymes. An occurring common problem is the production of toxic intermediates, which hinder the growth of the host organism, eventually negatively impacting on the final product yield. We utilize bacterial microcompartments in E. coli to increase the yield of the indigo dye and indirubin. This is achieved by localising part of the pathway into the compartments for the biosynthesis of the compounds. To further improve our microcompartments, we want to incorporate unnatural amino acids into the shell protein using the amber stop codon suppression technology.

iGEM Freiburg

How the found words relate to the project?

- **Production:** "Production" is an important aspect for our project, because we compare the yield when using different bacterial microcompartments.
- **Compound:** With "Compound" we want to make our production more general, as we can increase the synthesis of many different compounds.
- **Yield:** "Yield" is important because this is the main focus of the project as we strive to increase the yield of biochemical pathways.
- **Microcompartments:** "microcompartments" are important because these are the "chambers" where we localise the pathways
- **Indigo:** "indigo" is one of our produced compounds as it is easily detectable due to the change of absorbance.
- **Indirubin**: "indirubin" is another of our compounds with is in high demand for studies as a drug against leukaemia.
- **Localising:** "localising" describes our project very well because we are bringing enzymes in spatial proximity.
- **Pathway:** "pathway" is important because we are increasing the yield of pathways.
- **Unnatural**: We decided on "unnatural" because we are expanding the functions of the proteins by incorporating unnatural amino acids.
- **Amber**: "amber" was chosen because the amber stop codon suppression is the technologie to introduce unnatural amino acids into proteins in vivo and it makes up part of our name "chAMBER".

iGEM Barcelona_UB

G	E	D	R	U	G	C	A	R	R	I	E	R	D
P	E	R	S	G	G	G	T	N	E	O	I	S	S
T	A	G	S	Y	S	T	E	M	R	M	R	T	G
A	X	N	G	O	L	D	E	N	G	A	T	E	E
S	E	A	S	C	Y	A	T	S	S	D	I	D	G
E	E	Y	L	H	M	I	E	V	C	Y	M	C	N
L	I	O	S	K	P	O	M	O	L	S	K	Y	I
C	T	R	O	R	H	E	V	G	S	D	T	E	T
I	E	X	O	S	O	M	E	S	E	T	R	T	E
S	I	E	P	I	M	N	A	N	R	I	S	R	G
E	Y	O	A	P	A	D	L	N	R	S	O	O	R
V	M	N	E	S	R	K	G	X	G	E	I	I	A
T	S	L	S	V	T	I	I	S	M	R	G	M	T
O	I	T	I	S	O	T	E	T	G	C	O	L	O

DRUGCARRIER
TAGSYSTEM
CMYC
LYMPHOMA
GOLDENGATE
KIT
EXOSOMES
TARGETING
SIRNA
VESICLES

Extracellular vesicles (EVs) are a heterogeneous group of small, lipid-based nanoparticles that play a key role as mediators of many physiological and pathophysiological processes. EVs are coated with surface proteins that provide specific tissue targeting. This interesting feature, alongside their biocompatibility, bioavailability, and ability to cross the blood-brain barrier, has boosted EVs as a potential RNA drug carrier. However, the capacity to create designer EVs is still lacking. Here we provide a solution for these two issues. We present a molecular biology kit to use in a biological system to produce designer vesicles. At the same time, we have included a tag system to improve and simplify the collection and purification techniques, making it more feasible for laboratory groups. Moreover, we take a step further. We propose to load EVs with the c-myc siRNA to use them as an innovative and side-effect-free therapy for Burkitt's lymphoma.

iGEM Barcelona_UB

How the found words relate to the project?

- **Exosomes:** They are the basis of our project, and the main goal.
- **Designer vesicles:** Synthetic genetics allows us to design vesicles according to our needs, and to optimize them to obtain our objectives.
- **tissue-targeting:** The major advantage of exosomes is their specificity and, therefore, the absence of side effects.
- **Molecular biology kit:** Simplicity, efficiency and affordability united in a single concept.
- **Drug-carrier:** Our idea is to develop or improve a new drug delivery strategy.
- **Tag system**: We improve the way of purifying exosomes, which until now was a handicap in the practice.
- **siRNA:** Our proof of concept is the insertion of an si-RNA, although the possibilities of the kit are endless.
- **Burkitt's lymphoma:** Our disease of choice was Burkitt's lymphoma, as therapies for lymphomas are limited and they are the most common blood cancer disease among adults.
- **c-myc:** It is the oncogene responsible for the development of Burkitt's lymphoma, located on chromosome 8.
- **Golden Gate Cloning:** A novel technique of synthetic genetics that has allowed us to design and assemble our constructs and create the Lentiviral Transfer Plasmid.

iGEM Unicamp_Brazil

L	K	Y	A	R	L	Y	T	G	E	M	B	S	R
E	Y	O	M	C	T	O	A	W	G	E	C	M	L
O	I	A	M	I	I	A	L	U	O	M	T	A	A
R	G	L	R	A	O	L	K	I	L	Y	H	I	C
I	A	U	I	E	G	C	O	M	U	C	N	I	I
C	P	E	A	D	E	A	T	B	U	L	I	I	G
B	U	R	N	S	U	F	T	B	A	S	I	I	O
R	I	E	C	B	M	C	M	A	A	T	G	A	L
A	M	U	T	T	K	O	A	T	E	I	E	F	O
E	S	A	R	S	K	N	A	L	O	I	I	M	C
K	F	E	R	M	E	N	T	A	T	I	O	N	E
H	B	R	C	C	C	E	L	L	U	L	O	S	E
O	R	A	N	G	E	W	A	S	T	E	B	R	I
O	I	A	W	L	A	C	I	D	E	M	O	I	B

METABOLIC
FERMENTATION
KOMBUCHA
CELLULOSE
KOMAGATAEI
BIOMEDICAL
PURITY
ORANGEWASTE
BURNS
ECOLOGICAL

Bacterial cellulose is an organic polymer that can be adopted as an efficient alternative to the use of plant cellulose, which is widely used in the industry, especially in Brazil, which is one of the biggest producers of plant cellulose. The problem in itself is the impact to the environment and the ecological damage that causes the tree splint, in addition to not being a very pure material. With the Cellulopolis project, we aim to optimize the production of cellulose by Komagataeibacter, through the use of adjustable promoters, modulating the energy flow of the bacterium. The central strategy is to attenuate the metabolic competition between bacterial growth and cellulose production. In addition, in order to reduce costs and adopt a more sustainable approach to the production of bacterial cellulose, Unicamp_Brazil still proposes the use of alternative culture media like orange waste, for the growth of the strains.

iGEM Unicamp_Brazil

How the found words relate to the project?

- **Cellulose:** Material widely used for industralization extracted from plants or produced by bacterias.
- **Ecological:** The damage caused by the overexploitation of plant cellulose.
- **Fermentation:** metabolic process that produces chemical changes in organic substrates through the action of enzymes.
- **Kombucha:** Fermented, slightly fizzy, sweetened tea commonly consumed for its purported health benefits.
- **Komagataeibacter:** One of the bacterias used in kombucha and also the bacteria which best produce celullose.
- **Orange waste:** For growing Komagataeibacter strains we are planning to use a ecological ecologically sustainable and cheaper growth culture.
- **Metabolic:** Modification strategy that Team Unicamp will use for making Komagataeibacter more competent for producing cellulose.
- **Purity:** Bacterial cellulose is material of interest for industrialization regarding its highly purity.
- **Biomedical Applications:** Aplication of interest for bacterial cellulose in the industry.
- **Burns:** Bacterial cellulose Biomedical application .

iGEM BOKU-Vienna

C	A	M	I	R	O	K	C	I	R	B	U	Y	Y
R	M	I	A	C	T	L	I	H	N	B	U	C	C
I	A	N	R	Y	O	E	Y	M	O	G	E	L	Y
B	N	E	C	H	L	E	N	E	L	I	I	A	A
I	U	R	H	E	A	R	R	O	A	R	E	B	N
O	F	A	I	S	U	I	C	T	I	A	R	A	O
P	A	L	T	R	E	C	Y	C	L	I	N	G	B
O	C	I	E	C	R	A	L	L	I	T	N	G	A
L	T	S	C	T	C	H	M	I	Y	E	M	R	C
Y	U	A	T	A	R	I	A	U	M	I	L	C	T
M	R	T	U	I	I	U	E	E	E	A	R	A	E
E	I	I	R	R	E	P	A	R	N	T	T	Y	R
R	N	O	E	A	I	E	T	N	A	I	S	E	I
S	G	N	E	M	I	N	E	R	A	L	S	T	A

CLIMATE
RECYCLING
YEAST
BIOPOLYMERS
ARCHITECTURE
BRICK
CYANOBACTERIA
MINERALISATION
MINERALS
MANUFACTURING

Combatting the 11% of worldwide carbon emissions produced by the production of building materials! We use cyanobacteria and the yeast P.Pastoris to make a brick material without the high drying temperatures and extensive damage to the environment. Cyanobacteria take CO2 from the air and convert it to calcium carbonate, while the yeast produces various biopolymers to connect the mineral into a cement-like material. Additionally, we add underused waste products of various industries (building and construction, as well as paper and pulp industry) to look at their effect on brick properties. That way, we contribute to shifts towards a circular economy.

How the found words relate to the project?

- **Brick:** It is the central product of our project! While the method can be used to make materials with a variety of properties, we settled on making a proper brick first.
- **Manufacturing:** Our project is constructed as a proof of concept for further work to change existing manufacturing processes. Thus, collaboration with shareholders and existing industry leaders during our project is vital to our work.
- **Architecture:** The aim and outlook of such concepts (material production with synbio) is to, hopefully, see cities of the future to be built with materials that take carbon from the air, not add to the current damage we are causing the environment. We want to see buildings built with our bricks, someday :)
- **Biomineralisation:** The ability of cyanobacteria to take CO2 from air and make calcium carbonate is vital to our material, thus it deserves a spot here :)-
- **Climate:** The climate is important, and we are motivated in our project to fight climate change in an industry often forgotten by the general public. 11% of emissions is a lot, and it would be great to reduce that footprint.
- **Cyanobacteria:** One of our microorganisms and one of the stars of the project! Amazing green little organisms, very impressive.
- **Biopolymers:** The glue thats keeping it all together! The minerals produced by cyanobacteria need some structure, and biopolymers do the trick. In our project, we use PHB, spider silk and gelatin.
- **Minerals:** The product of the hard work of the cyanobacteria in our project! Small and solid, it gives our bricks the stability it needs.
- **Recycling:** We think recycling is important, and so, in our project, we use lignin, a waste product of the paper and pulp industry, and construction waste (provided by industry players) to add to our building material. This way, we find uses for otherwise unused/underutilized materials.
- **Yeast:** The second star of our project - the small microrganism producing our biopolymers!

iGEM Bonn-Rheinbach

E	L	E	N	E	C	C	I	A	U	A	Y	G	G
U	F	D	E	O	E	A	E	A	T	T	U	Y	T
E	O	E	B	F	F	R	E	R	R	F	A	L	E
L	U	I	E	O	B	B	O	Y	F	F	S	D	F
B	E	I	T	O	I	O	C	R	I	T	O	N	F
A	N	E	E	T	O	N	F	R	N	B	F	E	I
D	E	E	C	P	F	N	G	R	E	E	N	I	C
R	R	R	B	R	U	E	S	B	T	E	S	R	I
O	G	C	O	I	E	U	S	F	E	L	B	F	E
F	Y	Y	L	N	L	T	A	C	U	F	O	O	N
F	B	A	I	T	E	R	N	E	F	I	R	C	T
A	Y	N	A	Y	A	A	R	P	I	A	I	E	C
T	R	B	C	E	F	L	T	E	T	N	I	A	R
E	S	U	S	T	A	I	N	A	B	L	E	E	E

CARBONNEUTRAL
ENERGY
GREEN
AFFORDABLE
SUSTAINABLE
EFFICIENT
BIOFUEL
ECOFRIENDLY
FOOTPRINT
CYAN

The main idea of the project is to design the perfect cyanobacteria basis for production of alkane. That means a decent quantity of alkane is expected from the over expression of certain genes. With the overexpression of the AAR- ADO system and increase in NADPH levels, ideally would generate the same or higher alkane yield than experiments made in modified E. Coli (2.5 g/L) . This is because cyanobacteria have a higher resistance to alkanes. The concept of Cyan Energy could be used as a starting point for further research, in an attempt to optimize ADO. By optimizing this pathway, the first step of the HEFA pathway (most common biofuel production pathway) could be bypassed. This in theory, would not only save time but money.

How the found words relate to the project?

- **Sustainable:** We aim to produce a more sustainable aviation fuel.
- **Eco-friendly:** Being eco-friendly is a conscious effort to contribute to the climate strike.
- **Green-Energy:** We aim to optimize the production of a green energy.
- **Cyan:** We chose to name our biofuel cyan energy.
- **Cyan-Energy:** Our project name.
- **Biofuel:** Our main idea of the project.
- **Carbon-footprint:** We aim to decrease the carbon footprint of biofuels.
- **Carbon-neutral:** We aim to make our biofuel carbon neutral.
- **Efficient:** Skipping a step in the HEFA pathway could save time and money.
- **Affordable:** Skipping a step in the HEFA pathway could save time and money.

iGEM MiamiU

G	N	A	L	P	O	I	C	I	T	T	C	C	O
A	O	P	G	S	L	T	E	O	I	I	A	G	R
E	I	C	R	I	S	P	R	C	A	S	T	I	C
S	T	O	A	A	S	A	Y	I	C	A	G	S	L
O	I	A	E	U	R	O	E	T	I	T	P	A	I
R	N	T	H	E	R	A	P	E	U	T	I	C	S
D	G	P	T	P	L	I	G	A	T	I	O	N	T
C	O	I	S	I	E	I	U	O	T	I	L	C	I
C	C	Y	T	I	V	I	T	C	E	L	E	S	S
V	E	N	P	H	A	G	E	S	L	I	A	T	S
A	R	P	A	A	I	A	S	U	B	A	T	I	A
Y	I	D	S	C	I	T	O	I	B	I	T	N	A
Y	T	I	R	A	L	U	D	O	M	I	N	I	I
I	S	O	R	T	A	S	E	A	M	L	A	P	P

LIGATION
CRISPR-CAS
TAIL
SORTASE
THERAPEUTICS
RECOGNITION
SELECTIVITY
ANTIBIOTICS
MODULARITY
PHAGES

Our project works to provide a modular system for treating antibiotic resistance infections. We provide two layers of selectivity in our design to support the health and safety of human consumers while only targeting pathogens. The first layer comes from attachment of an antibody (in our proof-of-concept case a camel-originated nanobody) while the second layer comes from the CRISPR-Cas13 components our phage will deliver into bacteria. The antibody attachment comes from the sortase enzyme that will cleave and ligate peptides using specific recognition sequences while the CRISPR-Cas system will be designed to target antibiotic resistance or virulence factor genes.

How the found words relate to the project?

- **Antibiotics:** We are working to combat antibiotic resistance.
- **Phages:** We are using phages as delivery systems.
- **Therapeutics:** Future implications of our work lie solely in developing treatments used directly in humans.
- **CRISPR-Cas:** CRISPR-Cas13 helped us target solely antibiotic resistance or virulence factor genes.
- **Sortase:** Sortase was use to modify phage tail fibers at specific cleavage sites for attachment of different antibodies and this flexibility in recognition for different types of bacteria.
- **Modularity:** A modular approach was created because both the phage tail attachment and CRISPR-Cas gRNA can be changed for different targets.
- **Selectivity:** Selectivity to target strictly antibiotic resistance genes was crucial for our project.
- **Tail:** The tail fiber was the component of the T7 phage we chose to modify to expand its host range.
- **Ligation:** Ligation to attach a desired antibody is catalyzed by the sortase after cleavage at a recognition site.
- **Recognition:** Recognition of both the bacterial cell wall by the phage tail fiber and the sortase of a specific tag sequence during its cleavage and ligation reactions were important focuses of our project.

iGEM William_and_Mary

O	I	N	G	E	N	O	M	E	S	C	A	L	E
M	R	K	D	A	T	A	D	R	I	V	E	N	I
G	E	T	I	N	C	L	U	S	I	V	I	T	Y
R	G	T	I	I	M	N	E	T	W	O	R	K	S
O	R	I	A	I	A	N	I	C	I	A	I	N	O
W	E	D	I	G	N	E	F	I	M	R	I	S	I
T	S	R	T	W	E	C	L	F	W	L	T	T	R
H	S	N	A	H	S	N	H	E	A	G	N	C	I
R	I	E	M	U	W	A	O	A	T	O	G	E	W
A	O	D	B	L	E	D	V	M	S	U	O	O	E
T	N	Y	W	D	D	N	C	E	I	S	M	V	E
E	Y	I	S	N	G	U	T	I	O	C	I	A	G
F	I	E	L	D	A	B	I	L	I	T	Y	S	I
H	T	V	R	B	D	A	A	N	S	L	M	N	C

ABUNDANCE
GENOMESCALE
FIELDABILITY
NETWORKS
CHASSIS
REGRESSION
DATADRIVEN
METAGENOMIC
INCLUSIVITY
GROWTHRATE

One of the major barriers to fieldability, this is, applying synthetic biology systems outside of the laboratory, is selecting an appropriate chassis. Many factors impact the ability of a chassis to survive and thrive in a deployment site, making it challenging to determine if a given chassis is compatible with a certain environment. Choosing an optimal chassis for an area of deployment remains a fundamental problem in the field of synthetic biology. To address this problem, the 2022 William and Mary iGEM team is developing a novel software package to determine the ideal bacterial chassis for a soil, air, water, or human gut environment. We take an integrated, multipronged approach, incorporating AI neural networks, multivariate regression, genome-scale metabolic models, and metagenomic analysis to determine both bacterial abundance and growth rate in specific environments.

iGEM William_and_Mary

How the found words relate to the project?

- **Chassis Selection:** This year, our team developed a chassis selection software for fieldable synthetic biology applications.
- **Fieldability:** Our software allows for the identification of optimal chassis for a range of given environments, and for the identification of optimal environments for a given chassis.
- **Data-driven:** Our software is based on published 16S rRNA sequencing data from experiments conducted on various environmental samples taken from soil, water, air, and the human gut.
- **Bacterial Abundance:** Our software incorporates AI neural networks, multivariate regression, genome-scale metabolic models, and metagenomic analysis to determine bacterial abundance in specific environments.
- **Growth Rate:** Our software incorporates AI neural networks, multivariate regression, genome-scale metabolic models, and metagenomic analysis to determine bacterial growth rate in specific environments as well.
- **Genome-Scale Metabolic Models:** Our software incorporates genome-scale metabolic models, which take into account the metabolic state of a chassis in a specific environment.
- **Multivariate regression:** Multivariate regression is one of the methods that our model uses to make predictions about the optimal chassis for a given environment.
- **Metagenomic analysis:** Our software uses published 16S rRNA sequencing data from experiments conducted on various environmental samples to provide the end user with detailed growth rate and abundance predictions.
- **AI Neural Networks:** AI neural networks are another method that our model uses to make predictions about the optimal chassis for a given environment.
- **Inclusivity:** By varying the range of input parameters, researchers can determine the optimal chassis to use across a range of conditions, such as different gut microbiome environments, leading to more inclusive therapeutic design.

iGEM Uni-Hamburg

R	D	A	S	D	I	A	G	N	O	S	I	S	A
E	C	N	A	T	S	I	S	E	R	A	R	S	T
D	E	A	R	F	A	S	T	I	M	C	C	I	A
I	E	R	R	T	S	A	T	C	N	I	S	O	I
H	E	E	G	A	R	S	M	A	T	C	T	O	S
T	O	T	C	A	C	I	R	O	A	S	P	C	P
A	S	D	N	H	C	A	I	A	R	I	P	C	R
I	P	R	G	A	C	B	I	C	B	C	E	R	A
T	I	I	B	T	I	R	S	R	O	T	C	O	D
G	D	N	A	T	E	O	E	T	O	I	M	R	S
A	T	A	N	T	I	L	P	S	T	T	O	I	S
Z	T	A	C	A	R	I	B	O	Z	Y	M	E	I
R	S	A	D	D	E	G	A	H	P	T	C	I	S
C	B	N	R	S	E	O	B	C	G	N	S	M	I

ANTIBIOTICS
RIBOZYME
DOCTORS
SPLIT
BACTERIA
DIAGNOSIS
RNA
PHAGE
FAST
RESISTANCE

Antibiotic resistant pathogens pose an emerging risk in modern medicine. Antibiograms are used to detect those pathogens and depend on bacterial growth, stalling the diagnosis. We developed SPEAR - Sensing Pathogens and Emerging Antibiotic Resistances, a point-of-care diagnostic method detecting antibiotic resistances, allowing more accurate treatment. Resistance genes are detected using a split ribozyme fused to guide RNAs (gRNA). gRNA binding to a target resistance gene mRNA activates the ribozyme. It fuses a ribosome binding site and coding sequence of a reporter gene by self-excision, inducing translation of the reporter for visible readout. SPEAR robustly detects several genes of interest. Modular architecture enables fast adaptation to novel resistance genes through exchange of gRNAs. SPEAR may be delivered by phages, simplifying storage and extending shelf-life.

iGEM Uni-Hamburg

How the found words relate to the project?

- **Ribozyme:** We are wokring with a ribozyme to detect RNA.
- **Antibiotics:** We want to speed up diagnosis, so that antibiotics can be used more accurately for treating patients.
- **Doctors:** Our goal is to help doctors get the right diagnosis more easily and quicker.
- **Diagnosis:** We hope to speed up diagnosis of bacterial pathogens.
- **Phage:** Phages are a good way to get our Ribozyme-System into the bacteria, especially because of the easier storage.
- **Bacteria:** We detect bacterial RNA in our project, and our goal is to detect bacterial pathogens.
- **RNA:** We detect bacterial RNA, and are faster than growth dependent assays.
- **Fast:** Our system is going to be a fast and easy diagnosis tool. The current duration of diagnosis on probable bacterial pathogens is much too slow.
- **Resistance:** Antibiotic resistance of bacterial pathogens is a big challenge in modern medicine and the reason why we want to speed up diagnosis for more accurate treatment.
- **Split:** The way that our detection system works, the ribozyme is split into two parts which can only bind each other and get active if the target RNA is present.

iGEM Montpellier

F	V	H	L	L	Y	M	S	R	E	N	E	N	R
F	E	D	R	C	R	M	I	V	M	A	C	A	C
N	C	O	C	R	U	I	A	E	N	M	O	A	O
B	N	O	O	Y	S	T	E	R	R	U	N	C	M
A	A	V	R	T	O	L	R	M	A	H	O	M	M
C	R	F	M	R	O	H	O	A	O	U	M	M	U
T	E	O	A	C	O	B	N	C	A	N	Y	U	N
E	V	S	M	N	M	R	E	A	A	C	R	T	I
R	R	A	N	M	N	O	E	A	L	L	Y	U	C
I	E	V	A	F	U	V	V	E	N	F	Y	A	A
A	S	N	C	V	I	M	L	R	F	A	T	L	T
M	R	O	A	F	C	M	O	R	A	N	C	A	I
Y	E	V	N	U	M	R	I	E	M	E	D	I	O
F	P	P	F	A	R	M	I	N	G	C	N	D	N

OYSTER
BACTERIA
FARMING
COMMUNICATION
HUMAN
FIVE
MUTUAL AID
LOCAL
ECONOMY
PERSERVERANCE

Fast and reliable oyster-pathogen detection is critical to find new strategies to reduce shellfish losses throughout the farming process. In the Thau lagoon, representing 10% of the oyster French production, farmers face up to 80% of adult oyster deaths, mainly due to the bacterium V. aesturianus. Current PCR-based pathogen detections are lengthy and not directly accessible to farmers. Instead, we present SHELL'LOCK, a CRISPR-Cas detection system that is user-friendly and paper-based. We showed that we can detect pathogenic sequences using a fluorescent based assay. Moreover, we showed that we can use a user-friendly paper-based version of the test on the same sequences under physiological conditions.

How the found words relate to the project?

- **Oyster:** Oyster are the word we said the most during our project. They are at the center of the project.
- **Farming:** Farming because our project aims at contributing to better way of farming and to sustain farming.
- **Communication:** Communication because we realized that communication with oyster farmers is important to introduce a dialogue.
- **Local:** Local because from the beginning we wanted to tackle a local problem.
- **Human:** Human because we attached a great importance to the human in our project. We exchanges a lot with oyster farmers to integrate them in the project and to respect the human they are and their work.
- **Economy:** Economy because our project aims at sustain local economy driven by oyster farming.
- **Bacteria:** Bacteria because they are what we want to detect by our test.
- **Five:** Five is the number we are in the team.
- **Perseverance:** Perseverance is what we developed all along the project to be able to do the best.
- **Mutual aid:** Mutual aid was the key of our work because we are a small team.

iGEM Warwick

S	U	S	T	A	I	N	A	B	I	L	I	T	Y
N	E	P	D	T	G	I	E	O	A	E	D	E	P
A	G	R	I	C	U	L	T	U	R	E	L	O	E
S	E	D	E	G	R	A	D	A	T	I	O	N	S
A	U	E	E	A	E	D	N	A	B	G	E	I	T
L	N	A	S	R	I	O	D	A	A	M	G	E	I
I	R	D	D	D	S	P	N	T	L	T	G	E	C
E	C	B	I	O	N	E	R	U	A	G	A	I	I
D	E	T	E	C	T	I	O	N	N	T	E	T	D
T	R	E	M	A	T	P	A	T	C	A	E	E	E
L	O	E	T	H	T	C	H	E	E	L	N	L	S
I	L	C	S	N	O	I	T	U	L	L	O	P	N
A	M	I	A	L	A	L	T	N	T	F	E	B	A
T	F	G	U	M	O	D	E	L	L	I	N	G	I

BALANCE
DEGRADATION
DETECTION
APTAMER
SUSTAINABILITY
FISH
POLLUTION
MODELLING
PESTICIDES
AGRICULTURE

Warwick's 2022 Team, PyRe, tackled the build-up of pesticides in the environment using a 3-pronged approach: a cell-free detection system based on aptamers, a whole cell-biocatalyst based on E. coli, and a toxin-antitoxin kill switch. The project was targeted towards Lambda-cyhalothrin, a pyrethroid that is highly toxic to fish, bees and aquatic invertebrates. As they designed and validated their own gene (Pyre1), generated bioinformatics data (MATLAB), engaged with different manufacturers and experts, and spread awareness through multiple initiatives, they were able to preserve food security while maintaining environmental sustainability.

iGEM Warwick

How the found words relate to the project?

- **Sustainability:** Our project aims to promote sustainable food production.
- **Pesticides:** Our project involves degradation of pesticides.
- **Degradation:** Degrading pyrethroids.
- **Detection:** The second part of our project involves detecting pyrethroids.
- **Fish:** Pyrethroids are highly toxic to fish.
- **Aptamer:** An Aptamer is used in the detection of pyrethroids.
- **Modelling:** Modelling is a big part of our project, from ODEs to molecular modelling.
- **Agriculture:** Our project aims to be applied in the agricultural field.
- **Pollution:** Our main target pesticides are a form of chemical pollution.
- **Balance:** Our project aims to balance sustainability with food security.

iGEM Crete

Y	C	R	N	E	C	N	E	I	R	E	P	X	E
V	O	P	P	O	R	T	U	N	I	T	I	E	S
S	V	M	O	N	I	R	Y	S	T	Y	N	U	O
C	N	L	O	E	U	W	O	M	V	R	M	O	O
K	R	O	W	M	A	E	T	A	O	N	M	C	O
R	O	O	N	B	M	M	I	N	T	N	N	N	P
A	M	A	L	N	U	T	R	I	T	I	O	N	N
T	E	X	P	A	N	S	I	O	N	U	V	C	R
T	X	I	E	E	T	I	R	T	P	A	I	O	E
S	T	E	C	O	M	M	U	N	I	T	Y	N	O
A	I	N	R	A	I	S	X	T	X	U	L	T	O
M	O	I	N	N	O	V	A	T	I	O	N	T	I
G	N	I	M	R	O	T	S	N	I	A	R	B	I
C	M	S	S	E	N	E	R	A	W	A	N	R	E

ECONOMY
INNOVATION
MALNUTRITION
EXPERIENCE
COMMUNITY
BRAINSTORMING
AWARENESS
TEAMWORK
EXPANSION
OPPORTUNITIES

Our Project this year has a diagnostic role. It exploits protein structures, different from antibodies, which show high diversity and strong affinity to multiple antigens. In this regard, our group aims to exploit LRRs (Leucine Rich Repeats) for not only the rapid diagnosis of diseases, but also the rapid production or processing of antigen tests that potentially target any epitope. More specifically, our project concerns the use of LRR domain-containing proteins for agricultural diagnostics. To complete our program we will proceed to build a diagnostic tool of similar technology to the self-test, which can be easily applied by farmers to diagnose the possibly infected plants. We are aiming to introduce the global scientific community to a new generation of diagnostics of controls which is based on LLRs and not antibodies.

How the found words relate to the project?

- **Opportunities:** We are hoping to create new opportunities for the massive production of food supplies.
- **Economy:** Our goal is for our project to have an impact in the global agricultural economy using new cheap and fast diagnostic tools.
- **Malnutrition:** With our project we are hoping to put the humanity in a better place against malnutrition, by making the cultivation of food easier.
- **Awareness:** We are hoping to raise awareness regarding the unequal distribution of food in this planet.
- **Innovation:** We are aiming to introduce the flobal scientific community to a different type of diagnostics that use LRRs instead of antibodies.
- **Expansion:** To us, the expansion of our spirit, during this competition is very important.
- **Experience:** The experience that we all gain by being a part of this unique competition is unforgettable.
- **Community:** It is very important that the non scientific community gets familiar with the use of new types of diagnostics and understands the benefits that they provide.
- **Teamwork:** The Igem competition is the best lesson for teamwork and this is why we are putting a lot of effort to have meetings everyday.
- **Brainstorming:** Literally the ideas that every human brain can conceive are infinite. This is why brainstorming is a very special part of our work.

iGEM Patras_Uni_Hellas

E	L	P	O	E	P	R	S	I	C	R	H	L	N
K	E	U	O	B	L	N	W	E	O	R	A	C	S
L	R	I	I	E	A	O	T	L	L	I	I	M	T
H	N	O	R	O	M	M	O	M	L	O	U	E	K
B	H	T	W	T	R	E	T	T	A	H	O	S	H
H	I	T	R	M	S	C	N	E	B	I	M	T	B
I	E	T	L	R	A	E	O	C	O	Y	U	N	M
H	W	R	R	L	I	E	O	H	R	R	K	E	A
T	B	C	I	C	I	B	T	N	A	O	H	M	R
S	H	O	N	T	E	B	M	O	T	T	C	U	B
M	E	A	R	E	A	T	C	L	I	S	E	N	L
O	O	N	B	H	T	G	S	O	O	I	R	O	E
U	E	S	E	U	I	E	E	G	N	H	M	M	S
E	B	O	I	E	Y	R	I	Y	Y	S	O	I	B

PEOPLE
ANCIENT
BIO
COLLABORATION
TEAMWORK
MARBLES
MONUMENTS
HERITAGE
TECHNOLOGY
HISTORY

Historical monuments are an integral part of the cultural heritage of every civilization, whose protection is of paramount importance. Biotic and abiotic factors alter the quality and aesthetics of marble structures and statues with biocorrosion being the most widespread and resistant type of corrosion. The exposure of marbles to the environment and, as a result, to multiple environmental factors enhances their infestation by the above-mentioned micro-organisms.

Their growth on the surface, but also inside, leads to the aesthetic deterioration of these historical monuments (black crusts and patinas), but also to material losses, resulting in the deterioration of the quality of the monument due to the last resort of addition of low-quality maintenance materials, to cover the gap. The solution proposed by the UPHELLAS research team, is to create a biological biocide, which will be easy to use for conservationists, friendly to humans, the environment and marble. The use of antimicrobial proteins prevents the development of resistance of microorganisms, thus eliminating the need to create more and more modern biocides, thus providing a useful tool in the fight against biocorrosion and the preservation of cultural heritage

How the found words relate to the project?

- **Heritage:** Heritage is what we are trying to protect and the bigger meaning behind our project
- **Ancient:** Ancient monuments are our main area of focus and our most important "patient"
- **Monuments:** The monuments are what inspired us and where we hope to see our work in effect
- **Marbles:** Marbles are the main material used for the monuments we are trying to save so it has all our focus
- **History:** The history behind the statues and stractures we are trying to preserve gives the team the drive to strive for results
- **Technology:** Technology plays a huge part in our project and is what is going to help us achieve our goals
- **Teamwork:** Teamwork is really important to this team because we are a team of different universities and backgrounds and we have to work together efficiently
- **Collaboration:** During this contest the collaboration between teams from all around the world is what gave this project character
- **Bio:** As we aim to make a biological biocide the word "Bio" fits right in
- **People:** People is really what this project is all about, from preserving their heritage to making sure they are not hurt by toxic conservation material

iGEM WLC-Milwaukee

N	N	R	R	M	R	A	F	R	P	T	C	E	P
I	E	L	F	H	E	T	A	H	P	S	O	H	P
L	L	O	O	I	E	T	C	P	P	P	T	N	R
T	T	N	A	P	L	A	N	T	N	A	R	E	O
C	E	P	P	O	M	M	I	L	O	C	E	R	E
N	I	T	R	A	T	E	I	R	A	R	T	I	O
P	P	F	O	T	R	A	O	O	L	O	O	O	T
I	R	O	O	F	R	L	C	O	L	E	O	O	T
I	C	P	R	L	A	C	L	C	C	T	I	L	S
E	C	O	I	H	C	E	L	P	O	I	A	A	R
L	C	O	L	R	E	N	P	M	P	R	E	R	A
O	S	R	L	O	L	T	R	P	P	T	O	R	T
O	T	A	O	O	R	A	O	L	E	I	R	T	E
N	O	C	L	P	C	P	T	I	R	N	N	T	N

FARM
PLANT
COLOR
NITRITE
CROP
ECOLI
COPPER
PHOSPHATE
NITRATE
SOIL

We made an E. Coli engineered as a nutrient sensor to determine how much of each type of mineral is present in soil. When coming into contact with different nutrients in soil samples, the sensor will color change. This will allow for farmers to analyze their soil in a more efficient manner.

How the found words relate to the project?

- **Soil:** The main premise of our project is to test different soil samples to determine the nutrient content in soil.
- **Copper:** We are testing the soil to see how much copper is in the soil. The E. coli solution will turn red when copper is present.
- **Plant:** The kinds of nutrients which are in soil will impact how well plants will grow
- **Farm:** Our project is intensely important to farms as what is in their soil will have an intense impact on how crops will grow
- **Crop:** The nutrients in soil will have an impact on crop yields. If there are issues with the nutrient content of soil there could be drastic issues with crop yields.
- **Nitrate:** Nitrate is one of the nutrients we will be testing for with our kit.
- **Nitrite:** Nitrite is another nutrient we will test for in our kit.
- **Phosphate:** Phosphate is another nutrient we are going to test for in our kit. Phosphate is extremely important in plant growth.
- **Color:** Color change is a huge deal for our project as color change of samples are going to tell us what is in the soil.
- **E. coli:** We are using genetically engineered E. coli in order to perform this project. This E. coli will serve as a sensor for the project.

iGEM TU_Braunschweig

N	E	S	A	E	T	O	R	P	S	P	E	L	F
N	O	L	T	N	O	R	F	E	I	T	F	T	L
C	I	T	S	O	N	G	A	I	D	I	N	A	U
C	O	S	O	T	F	R	O	C	N	P	F	O	O
A	M	P	L	I	F	I	C	A	T	I	O	N	R
A	F	A	S	T	R	S	A	P	N	E	I	S	E
N	C	G	O	S	I	I	I	I	L	C	T	O	S
T	A	R	F	C	E	L	L	F	R	E	E	U	C
I	R	C	I	T	A	A	T	A	L	E	N	S	E
G	E	N	A	I	N	T	E	I	N	S	I	P	N
E	A	I	T	N	E	C	A	A	A	A	D	P	C
N	A	T	O	A	C	S	E	I	T	I	C	N	E
S	E	L	C	E	E	E	S	U	P	P	O	R	T
S	S	T	N	O	P	E	R	N	O	R	N	L	E

CANCER
FAST
DIAGNOSTIC
FLUORESCENCE
SUPPORT
AMPLIFICATION
PROTEASE
CELL FREE
INTEINS
ANTIGENS

We are working on a system that is amplifying itself. The goal is to be able to detect even very low concentrations of an antigen with it.

How the found words relate to the project?

- **Amplification:** It is a self amplifying System.
- **Fast:** The detection of the Antigen happens quickly.
- **Fluorescence:** The detection of the Antigen works with fluorescence.
- **Inteins:** One part of the System is based on Inteins.
- **Protease:** A very important part of the system is a protease. This is the main object of our project.
- **Esophageal Cancer:** The first idea was to detect esophageal cancer.
- **Antigens:** Our system detects Antigens in very low concentration.
- **Cell Free:** The System is cell free so everybody can use it.
- **Diagnostic:** The system can be used in diagnostics.
- **Support:** We always help each other with problems.

iGEM MIT_MAHE

E	E	O	H	A	I	H	I	A	S	A	A	N	I
I	A	O	L	P	A	T	H	O	G	E	N	S	I
R	H	O	P	T	A	I	E	I	R	S	T	O	C
M	T	O	R	A	C	W	T	G	G	E	I	E	U
A	C	T	O	A	P	A	I	A	V	A	M	C	H
I	A	A	T	I	B	T	U	C	W	F	I	I	S
R	T	A	E	I	I	E	I	L	I	O	C	T	I
E	W	E	I	T	O	R	O	L	E	O	R	L	F
T	I	D	N	A	D	I	E	I	A	D	O	N	I
C	U	V	I	B	R	I	O	S	I	S	B	S	S
A	A	R	G	O	E	E	U	A	C	R	I	C	A
B	P	E	D	I	T	P	E	P	O	E	A	N	C
A	S	T	R	F	R	F	I	A	G	I	L	G	R
I	E	R	U	T	L	U	C	I	C	S	I	P	P

VIBRIOSIS
WATER
PISCICULTURE
SEAFOOD
FISH
PEPTIDE
BACTERIA
PROTEIN
PATHOGENS
ANTIMICROBIAL

The aquaculture industry employs nearly 14.5 million people, contributing notably to the GDP of our country. Skyrocketing demand in this industry has been attributed to the emergence of various bacterial disease epidemics. V. parahaemolyticus of the Vibrio species has been reported to be one of the most prevalent pathogens in fish farms responsible for causing Vibriosis. It can cause mortality in fish up to 95% under certain stress factors. The pre-existing solutions include antibiotics and vaccines, which have led to challenges like antibiotic resistance. On further investigation, we discovered that it is a pressing concern not only along the Manipal coast but also all over India and the world since nearly 40% of the world population consumes fish, and is susceptible to the disease. These were the reasons that motivated us to engineer a solution for this escalating problem.

How the found words relate to the project?

- **Pisciculture:** Fish has continued to be a vital part of our diet since ancient times. The annual fish consumption has increased not only in India but around the globe as well. This has led to the development of a burgeoning pisciculture industry. Unfortunately, excessive industrialisation procedures, over-intensive exploitation, and poorly managed aquaculture farms have resulted in significant bacterial disease epidemics in aquaculture.
- **Fish:** Our novel antimicrobial peptide is a solution to Vibriosis in fish.
- **Pathogens:** We are targeting Vibrio parahaemolyticus, one of the most prevalent pathogenic bacteria involved in spreading the Vibriosis disease in fish.
- **Water:** The pisciculture industry is a subdivision of the extensive aquaculture industry spread across the world.
- **Seafood:** If we succeed, our solution can be applied to a wide range of aquatic animals which are consequently consumed as seafood.
- **Peptide:** Our solution is a novel antimicrobial peptide. It is a sustainable solution.
- **Protein:** We plan to target Multivalent Adhesion Molecule 7—an adhesion protein present on the surface of the bacteria.
- **Antimicrobial:** Our solution is a novel antimicrobial peptide. It is a sustainable solution.
- **Bacteria:** We are targeting Vibrio parahaemolyticus, one of the most prevalent pathogenic bacteria involved in spreading the Vibriosis disease in fish.
- **Vibriosis:** Vibriosis is a potentially serious illness caused by a group of bacteria called Vibrio. Through our project, we aim to design a solution to Vibriosis in fish.