Newsletter June

Dear reader,

June passed in the blink of an eye! In the meantime, we have been working very hard on our project. The preparations for the lab-phase of our project are progressing smoothly. We already have most of our supplies and very soon, we will enter the lab. For that reason, we will introduce our science team this month. We hope you enjoy this month's letter!

Content

Introductions

Experimental design manager - Bas van Woudenberg

My name is Bas van Woudenberg and I am the experimental design manager of the 2021 Leiden iGEM team. One of the main reasons for me to become involved with the iGEM Leiden team is the idea of solving world problems with synthetic biology and thereby contributing to a better world. I see the iGEM adventure as an opportunity to further develop myself as a scientist, but also as a team player. ***I think science is better when you do it together*** . As the experimental design manager, my main focus is to translate the project idea to actual scientific

experiments and research questions. I am really looking forward to the moment we can start in the lab and see our idea become a reality!

Lab and safety manager - Hoda Ekhlasi

Hi all! I am Hoda and I am a master student in Molecular Genetics and Biotechnology at Leiden university. I am so glad to have one of the exciting roles in iGEM competition 2021 team as the laboratory and safety manager. Having this role, I will spend a lot of time in the laboratory, but it would also give me the chance to cooperate in other parts of the team. Being part of iGEM competition, will not only give me the chance to work more on the exciting field of synthetic biology, but also allow me to be in such a diverse environment that will maximize my growth not only as a future scientist, but also as an individual. Hope to see all the iGEM teams in a corona-free environment soon!

Modeling manager - Giovi Duivenvoorden

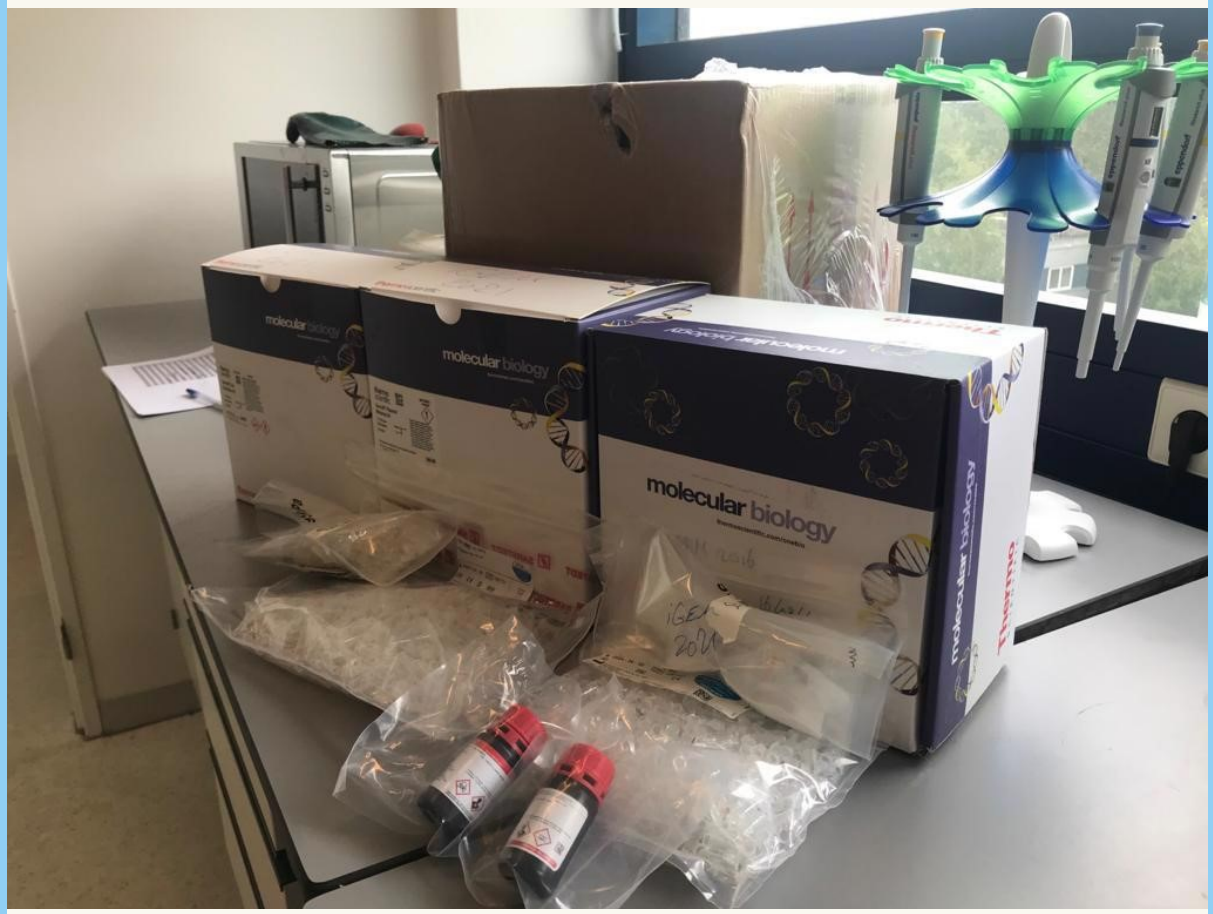
Hi all! I am Giovi, 20 years old and currently finishing up the bachelor Life Science and Technology at Leiden University and TU Delft. During my bachelor I encountered programming and to gain more experience and as a new challenge, I joined iGEM Leiden as modeling manager. I'm looking forward to the meetings we can have in person and the lab time during the summer, where we can develop our skills further. With the model I hope to support the experiments and prevent long-taking testing by basing the test on the results of the model.

Data analysis manager - Siheng Li

Hello everyone! My name is Siheng Li and I am the data analysis manager of iGEM team Leiden 2021. I am an international student from China and currently in the

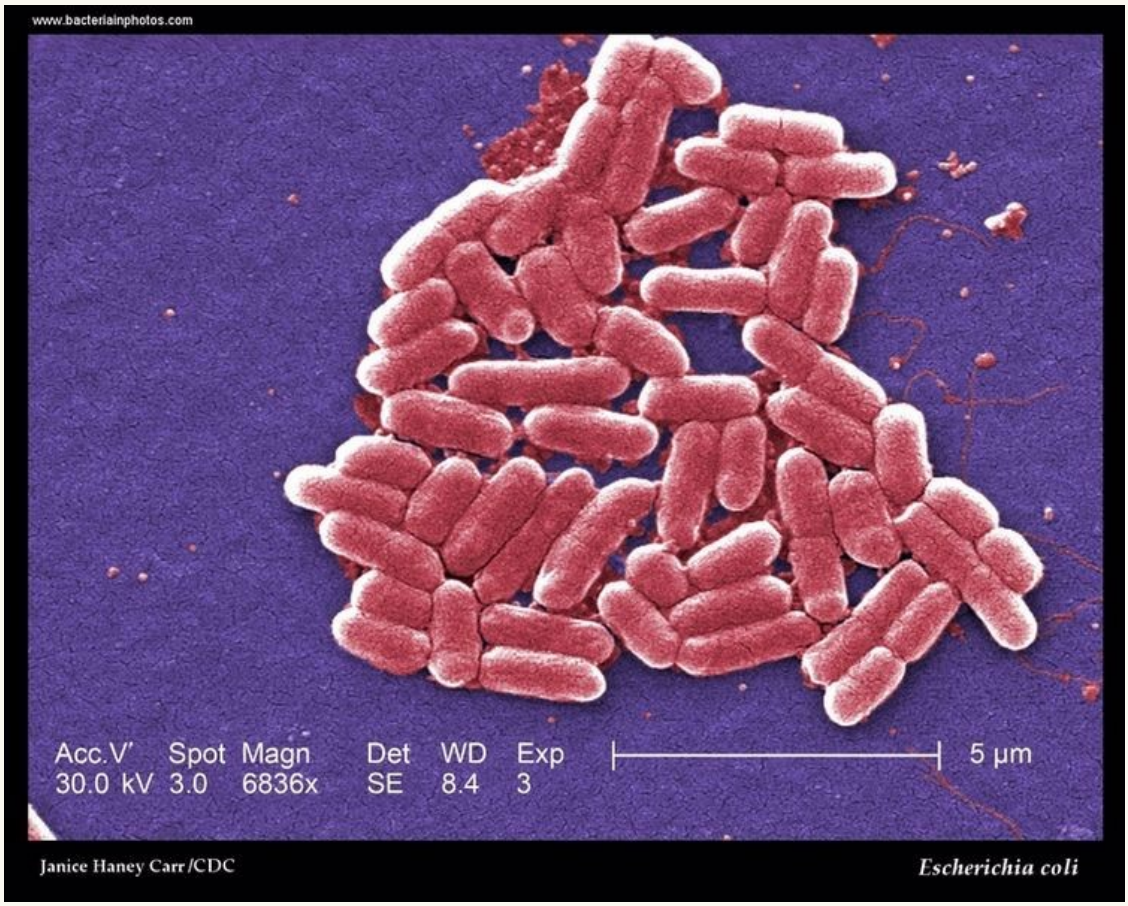
first year of my master. I learned a lot about synthetic biology in my bachelor internship but unable to do real experiment in the lab unfortunately during pademic. IGEM give me another uppotunity to have fun with synthetic biology. This month science team have been doing heavy work. We learn the all the theory and skills to decide how to realize our goal. I enjoyed all the producive discussion we had online or in person. Now we are getting well-prepared for the lab in the summer time!

Preparation Lab



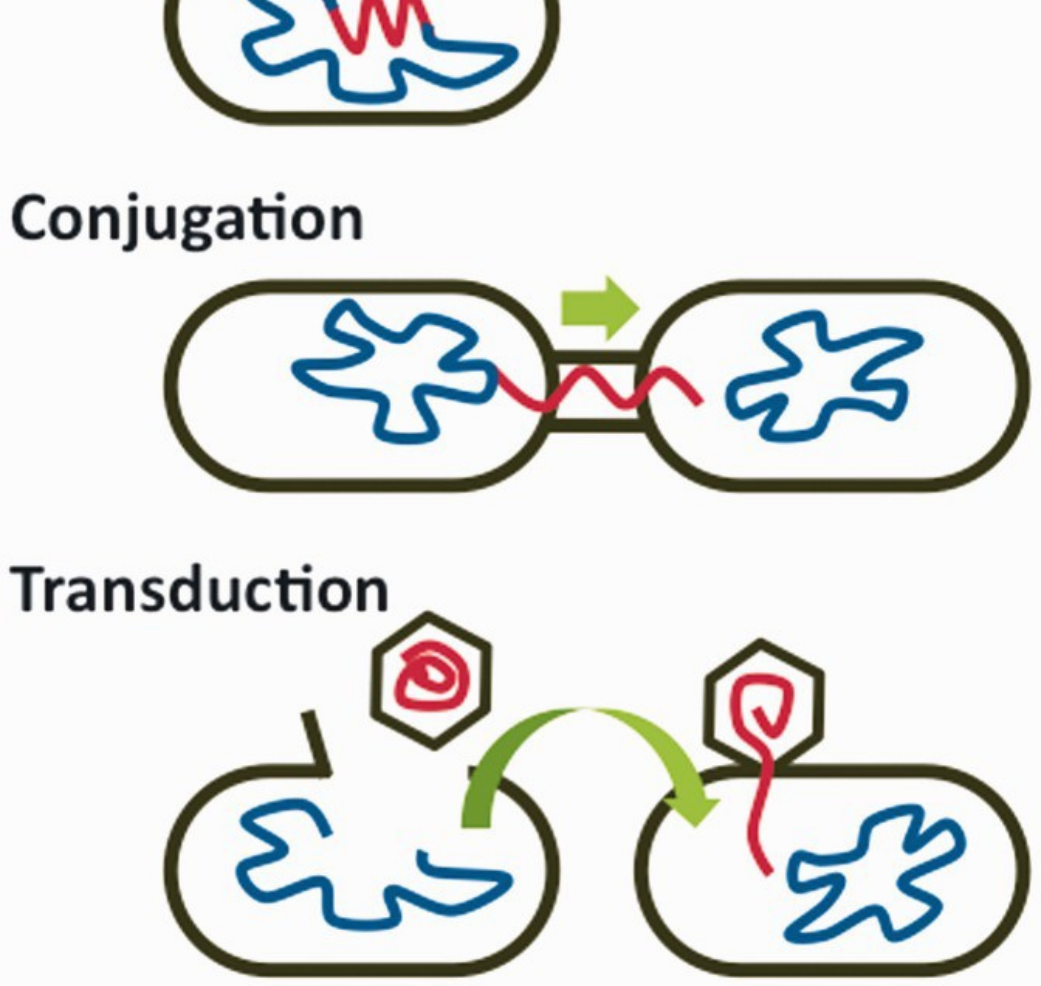
Over the past few weeks, we have been very busy with planning our experiments, collecting our supplies and making sure we have everything we need to jump right into the lab! The more supplies arrive, the more real it seems!We just can't wait to start!

Microbe of the Month: June



For the first microbe of the month, we will look at *Escherichia coli*, better known as *E. coli*. *E. coli* is arguably the most important bacterium out there to know about: it has played a huge role in the history of biotechnology as a model organism. Its name is derived from mr. Escherich who discovered it, and due to the fact that it is very commonly found in the colon of most warm-blooded animals. As they are found in the gut, they mostly thrive in hypoxic conditions. Some strains are actually quite harmful and can cause food poisoning like *E. coli* O157:H7, but most *E. coli* are quite harmless under most circumstances. *E. coli* has been about as important for biotechnology as the cow has been for agriculture. Countless discoveries have been made by studying the cellular physiology of this bacterium, with probably many more to come. *E. coli* cells are Gram-negative, this means that they have an extra layer around the cell to protect them from antibiotics and other noxious chemicals. The cells are around 1 micrometer in diameter: this is about 50 times less than the width of a human hair. Under the right conditions, these bacteria can multiply in 20 minutes. This means that when you put 1 bacterium in a vial of growth medium and wait 24 hours, when you come back, in theory there will be 4.7*10^21 bacteria, provided none die off! This makes it extremely useful for biological experiments, where time can be a limiting factor in research.

Horizontal Gene Transfer



Source: Burmeister (2015), Evol Med Public Health. issue 1, Horizontal Gene Transfer

Horizontal gene transfer is the process describing the sharing of genetic material between cells or organisms, not from parent to offspring, but between individuals. How often and when this happens is a difficult task to figure out. What we do know now however, is that the 'tree of life', is probably at least somewhat more of a web, with interconnections between several branches of the tree.
The three most well-understood mechanisms of horizontal gene transfer are transformation, conjugation and transduction. Transformation occurs when a cell takes up DNA from its surroundings. This might be in the form of a plasmid, but if the DNA that enters the cell is in linear form, it has to integrate into the genome of the cell, or it will be destroyed by the cell's viral defence mechanisms. Transformations are often used in biotechnology to give cells plasmids.
Conjugation happens between two cells. This type of gene transfer requires specialised proteins that can recognise certain DNA sequences, proteins that can make a 'tunnel' between two cells and a way for the DNA to be transported across the tunnel. Most of the times, cells require a specialised plasmid to transfer DNA through conjugation. In some cases, this can happen between bacteria and plants, like in *Agrobacterium tumofaciens*. The bacterium injects plant cells with DNA which make the plants grow a small tumor that has optimal growth conditions for the *A. tumofaciens*.
Lastly, transduction is the mechanism by which viral DNA enters the chromosomes of other organisms. One very well known example of where this happens is HIV. The HIV virion leaves a cell with a full package of its own DNA. When it then infects a new cell, it has proteins that can open the chromosome of the host and 'paste' its own DNA in the gap. This ensures that the host is infected for the rest of its lifetime. This type of viral infection has happened a lot over the course of history: it is estimated that 8% of human DNA is viral DNA. 40% of human DNA is made up of long, repetitive sequences. This is also thought to have originated from viruses. This means that nearly half of your DNA comes from viruses!

Tree showing tumors made by Agrobacterium, probably A. tumofaciens.

Source: Scot Nelson, Flickr:
https://www.flickr.com/photos/scotnelson/

Quizzes

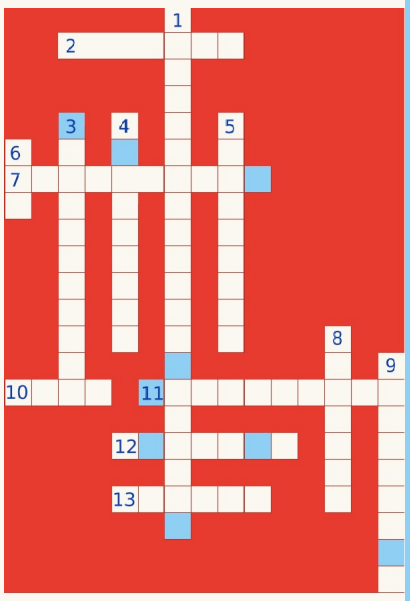
The letters in the blue boxes make 2 words. Can you guess what the answer is?

Horizontal:

2 Charles Darwin coined the idea that evolution and natural selection are a consequence of "survival of the …" **7** A community of creatures living inside another one **10** A stain used to distinguish bacteria based on their membranes **11** Used by Antoni van Leeuwenhoek to view "kleine dierkens" **12** Circular DNA used by bacteria for survival advantages, and exploited cleverly by scientists for molecule production **13** A sequence of nucleotides used to start the replication of DNA

Vertical:

1 A single molecule of a large chain, which is used to encode life **3** The genus of the famous coli bacteria which is renowned for its contribution to scientific advancements **4** The discipline addressing the safe handling and containment of infectious microorganisms and hazardous biological materials **5** Any type of a close and long-term biological interaction between two different organisms **6** Definition of a creature whose DNA has been altered to enhance its characteristics or introduce new ones **8** The study of living organisms **9** What we call bacteria when they are no longer susceptible to antibiotics



The answer of the puzzle is: iGEM Leiden

Collaborations

To any fellow iGEM teams: we are very much looking to cooperate with you! We hope to set up a few collaborations with any team that is also working in the area of biosafety or is looking to make their project made extra safe by adding your biobrick to our plasmid system. For inquiries surrounding collaborations, please contact igem@science.leidenuniv.nl

Sponsorship

We are looking for sponsors who are willing to sponsor our project for this year! Our project depends on the support of sponsors in order to realize our project. Currently, we are focusing on developing a biocontainment and biosafety system in bacteria. Although the release of these organisms is prohibited in most countries yet, it is expected that in the near future this might change. We are aware of the

dangers that come along with genetically modified organisms and therefore we do not encourage countries/companies in using them outside the lab. Our mission is that only when this happens in the future, we can provide a reliable biocontainment system to mitigate the risk. If you would like to contribute to our project in the form of a sponsorship you can send an email to igem@science.leidenuniv.nl.