

iGEM K.U.Leuven, in collaboration with iGEM ULB, presents:

Synthetic biology: changing the quality of our life?

A debate about the future of engineered organisms
Thursday, the 1st of September at 7 PM

INFORMATION KIT

Psychologisch Instituut
Auditorium Michotte (91.93)
Tiensestraat 102
3000 Leuven, Belgium

Dear Panel members and participants,

iGEM K.U.Leuven and ULB are honored to welcome you as a panel member or participant at our debate about synthetic biology.

This info kit provides practical information about the debate, a brief explanation of the subject and why we wanted to organize this debate. We hope that this info kit can serve as a tool to answer some of your questions in advance. However, if you have more preliminary questions, please do not hesitate to contact us.

We are looking forward to see you!

Hosting organization

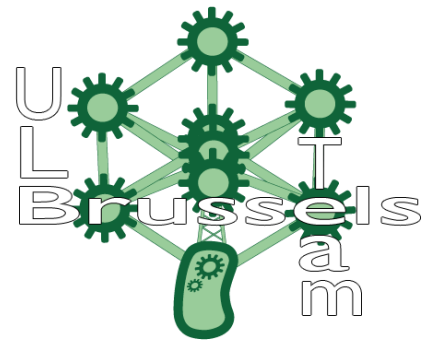
The international Genetically Engineered Machine (iGEM) competition is a contest where the participating universities create a synthetic organism with socially relevant features.



In the hope of bringing home a gold medal for the third time, our K.U.Leuven team is now eagerly working on a new model for the **iGEM** competition of 2011. We will present our project "**E.D. Frosti**" at the iGEM European Jamboree in Amsterdam in October. Hopefully we will also join the iGEM World Championship Jamboree at MIT Boston in November 2011, which is the largest annually international gathering of synthetic biology scientists.

In collaboration with

ULB is the only other university in Belgium participating to the iGEM competition. Over the past years they have won a silver medal, a bronze medal and a price for the best new BioBrick. With their new model "**Pindel**", ULB is hoping to do the same thing this year.



Subject of the debate

Synthetic biology is *'the design and construction of new biological parts, devices and systems that do not exist in the natural world and also the redesign of existing biological systems to perform specific tasks'* (the ETC group, an Action Group on Erosion, Technology and Concentration). The difference between Genetically Modified Organisms (GMOs) and synthetic biology is the following: with synthetic biology we design completely new functions, which do not occur in nature and with GMOs we improve existing properties in organisms e.g. improvement of plant stress resistance.

Synthetic and genetic manipulated organisms fulfill functions that natural organisms cannot perform or have difficulties with. The goals scientists hope to achieve with synthetic biology would be profitable for the whole society. Think about new vaccines (e.g. insulin production in bacteria), energy produced by micro-organisms, degeneration of toxic products, etc. But the question remains, are people willing to live in a world full of genetic manipulated and synthetic organisms? There are several institutions that focus on informing people about these new developments in science, like the 'Rathenau Instituut' in The Netherlands and the 'European Academies Science Advisory Council' (EASAC). In Belgium however, similar organizations do not exist yet, and we can only hope to stimulate the creation of one with this debate.

Aim of our debate

The aim of our debate is to inform students who never get in touch with synthetic biology and debate with them about their opinions or anxieties concerning synthetic biology in general and our projects. By presenting our projects, people can discuss the pros and cons of possible applications. For us, it is important to gain more insight into the opinions of other students, and not just those of politicians or scientists. We also want to bring up the subject of GMOs and synthetic organisms and ask people whether they have different opinions about these two kinds of organisms.

The European law is quite flexible on GMOs; each country can decide if GMOs are allowed or banned. Belgium has decided to forbid products which contain GMOs. However, for synthetically created organisms, there isn't a specific law yet. It would be very interesting to discuss whether there should be different laws for synthetic organisms and what kind of laws.

Our projects

The **K.U.Leuven** is eagerly working on *E.D. Frosti*. This is a modified *E.coli* bacterium that we will engineer to stimulate and prevent ice formation, depending on the given stimulus. The ice nucleation protein (INP) is responsible for the making of more stable ice. When *E.D.Frosti* forms this protein, the bacteria cells will turn into a red color. A different stimulus is responsible for the production of the Antifreeze Protein (AFP). To be sure that the right protein is expressed, these cells will turn into a different color. We can use bacteria cells which produce AFP to make roads ice- and snow free during winter. A very important feature of the bacteria is its cell death mechanism, which makes sure that the cells will not overgrow the environment. When *E.D. Frosti* is exposed to cold temperatures, the bacteria will self-destruct. It is essential that both proteins are not produced at the same time. To avoid this, we engineered *E.D. Frosti* in a way that the production of one of the two proteins makes the formation of the other protein impossible.

One of the most basic actions of all engineers is adding or removing pieces of DNA (BioBricks). Unfortunately, in *E. coli*, it's still difficult to do that in one step because of the lack of genetic tools. Bearing in mind that one of the purposes of the iGEM competition is to make the link between synthetic biology and engineering sciences, **ULB** would like to simplify these steps. By designing a unique donor plasmid (circular DNA) and an *E. coli* that easily takes up the plasmid, the ULB students hope to achieve their goal.

It is very important to consider the safety and ethics before engineering an organism. Both the K.U.Leuven team and the ULB team have already reflected on the safety issues of our creations. On

our websites (<http://2011.igem.org/Team:KULeuven> & <http://2011.igem.org/Team:ULB-Brussels/Safety>) you can find a safety analysis with all the possible risks we could think of.

Panel

- Prof. PhD. Johan Robben is professor at the K.U.Leuven and head of the research group Protein Interactions. His current research focuses on DNA polymerases and their potential of incorporating synthetically modified nucleotides. Directed evolution techniques are used for evolving natural polymerases towards new substrate specificities.
- Prof. PhD. Jacques van Helden is professor at the Université Libre de Bruxelles, and director of the Laboratory of Genome and Network Bioinformatics (<http://www.bigre.ulb.ac.be/>). Initially trained as agronomic engineer, his PhD thesis focused on the genetic regulation of nervous system development in *Drosophila*. Since 1997, his research activities have been dedicated to the development of bioinformatics approaches to analyze genomes and networks of molecular interactions (regulation, metabolism, protein interactions).
- Prof. PhD. Johan De Tavernier is a professor at the K.U.Leuven. He has a degree in Moral Theology and since 1996, he has been the director of the Centre for Agricultural Bio- and Environmental Ethics (now the Centre for Science, Technology and Ethics). In one of his books 'science, ethics and society' (published in 2004) he discusses whether biotechnology is necessary to solve world hunger. Prof. De Tavernier is a member of 'Metaforum Leuven', an interdisciplinary think tank of the K.U.Leuven.
- Prof. PhD. Bruno André is professor at the Université Libre de Bruxelles, and director of the laboratory of Molecular Cell Physiology (IBMM, ULB). The research of his laboratory mainly focuses on the yeast *S. cerevisiae* which is a paradigm model system for dissecting the molecular mechanisms of basic cellular functions in eukaryotes.

Moderator

- Prof. PhD. Filip Rolland is professor at the K.U.Leuven in molecular physiology of plants and microorganisms. His research topic is plant metabolic signaling, mainly on 'sugar signaling'. The department of molecular physiology of plants and microorganisms, functional biology is further investigating the SnRK1 (discovered in *Arabidopsis thaliana*) signaling pathway and its role in controlling plant metabolism, development and stress resistance. He is also a member of the 'Metaforum Leuven'.

Contact information

If you have any questions or need more information, do not hesitate to contact us at:

Alice Uwineza: alice.uwineza@student.kuleuven.be, 0487/ 420. 913

Katrien Vandermeeren: katrien.vandermeeren@student.kuleuven.be, 0479/ 634 895

Responsible of the ethics, safety and education

On behalf of the 2011 K.U.Leuven iGEM team, coordinated by BioSCENter coordinators: Prof. Dr. Joris Winderickx; Dr. Erwin Swinnen

Sponsors

