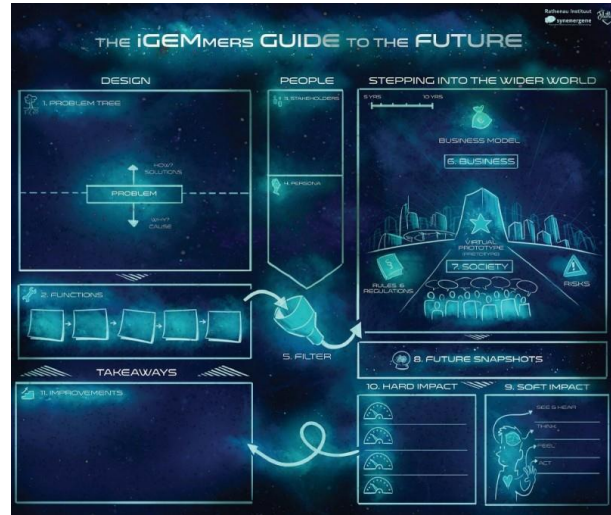


The iGEMer's Guide to the Future

By Zoë Robaeyⁱ

The last weekend of October 2016, I was at the Giant Jamboree in Boston, USA, to meet as many members of the iGEM community as possible and present them with a tool we developed for them in order to support the community for a responsible research and innovation process. It is an easy-to-use visual tool that will allow iGEM teams to do Integrated Human Practices in their own way and independent from our supervision. We called it 'the iGEMer's Guide to the Future'.



Amongst other activities within SYNENERGENE, we have been involved in supervising for iGEM teams' human practices projects since 2014. While the core of the students work is to develop a synthetic biology application, iGEM also requires of them to innovate in terms of safety, and in terms of what they call 'integrated human practices': The teams have to take up investigations in ethics, sustainability, social justice, safety, etc., in their design.

Over the past 3-4 years, we have developed guidelines for helping students with their human practices projects in order to make it an integrated human practices project. In 2016 we sponsored 8 teams out of 29 applications from all over the world for the [grant](#) supporting projects on issues dealing with conservation and mosquito borne diseases. Throughout this grant sponsorship, we continued on assessing the needs of students for their integrated human practices by working with them using guidelines we developed and learning from their experiences.

Stepping into the wider world

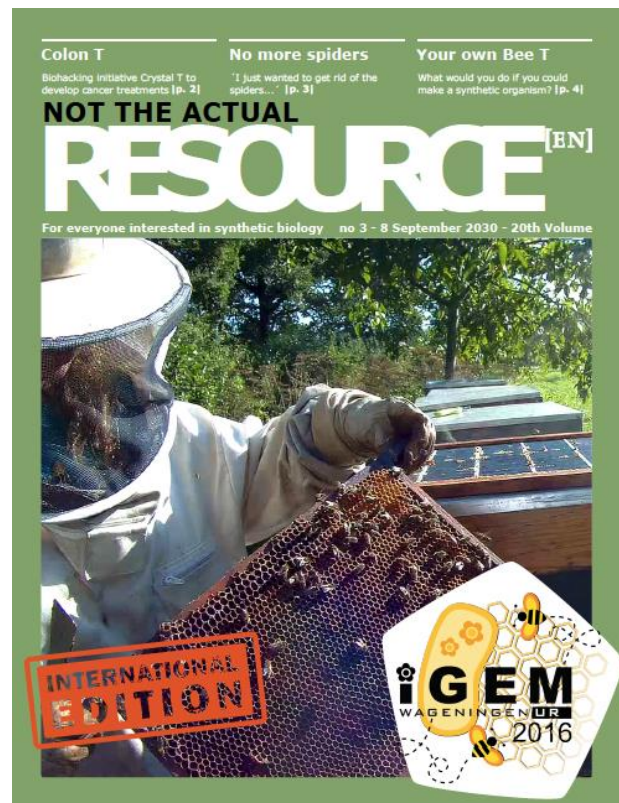
As part of the guidelines, we asked the iGEM teams to produce an application scenario and a techno-moral scenario (see [SYNERGENE Newsletter 01](#)). The application scenario is meant to look at the feasibility of their project in the current context, whereas the techno-moral scenario looks at the desirability of an innovation by imagining a moment in the future when their innovation has been widely adapted. These exercises in anticipation allow reflecting on their project and identifying issues that can be addressed in the design of their project. This process of stepping into the wider world is formative for teams and the definition of their projects. Here are just some examples of the extensive work teams did as part of our collaboration.

In terms of application scenarios: [Team Hamburg](#) team travelled to Malawi and established a partnership with a clinic for *trachoma* to test their prototype that does rapid diagnostics for *chlamydia trachoma* in order to help treating preventable blindness at a low cost in this area.



[Team Paris Pasteur](#) established a collaboration with French Interdepartmental Mosquito Control Board for their rapid diagnostic device for mosquito borne diseases. They built a prototype mosquito trap working together with entomologists and designers. [Team UCC Ireland](#) shipped equipment to the National University of Honduras after learning more about how this university deals with leishmaniasis, a neglected tropical disease. They tried to provide an alternative oral vaccination as part of their project. [Team Purdue](#) was actively involved in policy discussions with various governmental agencies concerning their bioremediation project to recover run off phosphate from water.

In terms of techno-moral scenarios: [Team Wageningen](#) produced a magazine from the future featuring various articles about how their application to fight the varroa mite affecting bees, thus reflecting on how it might evolve and change 15 years from now. [Team UC Davis](#) created a short story presenting how different people feel about the concept of naturalness and how difficult it is to relate this in policy terms. [Team Toronto](#) created diary entries of an artisanal minor describing how he experiences their gold bio-sensor and malaria diagnostic tool and how it might impact his life. [Team Marburg](#) produced an in-depth paper looking at land-grabbing and how their innovation would help tackling that issue. They produced a pamphlet from the future from the side of the industry and from the side of an activist.



Cover of team Wageningen's future magazine

All the teams sponsored by SYNENERGENE stepped into the wider world, learned from stakeholders, put themselves in their shoes, engaged in anticipation work and improved their synthetic biology innovation, as well the material and institutional design around it. Their experiences are an excellent example of how scientists can fulfil the four dimensions of responsible research and innovation: anticipation, reflexivity, inclusion and responsiveness.

From text to visuals

As part of this collaboration, we learned a lot from what iGEM teams need in terms of support for their Integrated Human Practices and we devised guidelines meant to help them in their projects. These guidelines, however, are not necessarily easy to understand without the help of an advisor, which was our role the past years. In order to give a useful support tool to the entire iGEM community, we needed to come up with something that would be self-explanatory. This is why we decided to work together with interaction designers of the



[Jongens van de Tekeningen](#) (Flatland in English) to visualize the guidelines, and we produced the iGEMer's Guide to the Future. This is an interactive PDF that provides simple workshops for different aspects of doing integrated human practices. At the Giant Jamboree, we presented the tool during two workshops and at our SYNENERGENE booth in the exhibition hall. We have been gathering valuable feedback on what we can improve and continue developing for this tool to support the iGEM community. An intermediary version of this Guide will be available shortly on the SYNENERGENE website.

Why does an iGEMer need a Guide to the Future?

This takes me to my last question: Why do iGEMers need a Guide to the Future? Well, partly because integrating Human Practices is a requirement in the competition, but also partly because every year, new iGEM teams from different places of the world might not have the resources or the contacts to carry out Integrated Human Practices. So we want all the iGEM teams to have an easy-to-use tool to do this in their own way.

Newly formed teams came to talk to us and shared their enthusiasm for the tool. I met students who set up the first iGEM teams in their countries, such as [Team Peshawar](#) in Pakistan, in their universities, such as [Team USP-EEL-Brazil](#), or in their high schools, such as [Team UrbanTundra Edmonton](#). I also met well-established teams who came to us and said that they carried out a lot of human practices work but did not know how to integrate it back into their project. Sometimes stepping into the wider world can be overwhelming.

We hope to make it easier for teams to integrate their human practices into their work, and get a flavour of what Responsibly Innovation means. Our next steps for the iGEMer's Guide to the Future is to continue developing it in order to address the diversity of iGEM. We will also make it widely available from early next year on for the next generation of iGEM teams to use.

ⁱ Zoë Robaey joined the Rathenau Institute (NL) in June 2016. Her work focuses on issues of responsible research and innovation in modern biotechnology. One of the main projects she is involved with is SYNENERGENE.