

# iGEM Experience

## How to make an iGEM team

**CINVESTAV-IPN-UNAM Team**

Human Practices

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Center for Research and Advanced Studies  
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## Sharing: The iGEM experience

iGEM is, maybe, the best way to get involve in synthetic biology. This new and dynamic discipline needs innovative education techniques, and iGEM provides this to the students with motivation to learn trough competitiveness.

Even though Mexico has a lot of creative and well-prepared researchers and excellent research faculties and universities, it is still a challenging to open and organize an iGEM team.

Mexico needs more iGEM teams; as it needs more passionate scientist with the initiative to start these kinds of projects. iGEM is an excellent chance for students to develop an original projects that could cause impact in science society and technology.

For this reason, we want to encourage other students to go further and dare to create new iGEM teams. We want share our experience with the world, and help future iGEMers take the lead on science. The objective of this document is making a little bit easier the iGEM process for future teams.

### 1 The Road to Colombia

To participate in an iGEM team it is a great experience. In my case (not unlike many other igemers), this competition has taught me more than my 4 years of formal college education. I've learned many things about the wonderful world of synbio as well as many new lab techniques. I've read more than 100 papers, and I've learned how hard research can truly be. Nobody said it was going to be easy, and as expected, it has been very hard; we have faced all kind of problems. Definitely iGEM has been the most challenging experience in my career so far.

Our road to Colombia started a year ago, when we decided to create a new iGEM team after the 2<sup>nd</sup> Summer Workshop in Synthetic Biology. We began with a brainstorming session to come up with the right idea. We thought in many crazy projects, but at the end, after almost 4 months of research we decided to explore and exploit the metabolically versatile bacteria *Rhodopseudomonas palustris*. When we had the right idea, we decided to recruit other members. Then, we started to look for funding and the design of our project.

The team formation was more difficult than we thought. Many of our former members couldn't continue with the team, so we had to invite more people to participate with us. The team is crucial for a successful team, and it is very important to have committed and passionate people in an iGEM team.

As soon as we finished with the experimental design, we started the wet lab and dry lab work. All of our team members had some experience working in the lab. Fortunately, we joined an excellent group of scientists, so it was easy to keep a very good rhythm. We sorted all kind of problems with creative solutions. I have to say that we could achieve our goals thanks to the Lab Staff. Special thanks to lab assistant Susana Ruiz, she's just a genius working at the lab.





We really worked hard, many times, we left the lab at 3 am, and we arrived the next morning at 9 am. This could sound weird, but we enjoyed every minute at the lab despite all the stress. We had a lot of fun working, learning and eating cookies and pizza; we would rather stay at lab instead of watching TV.

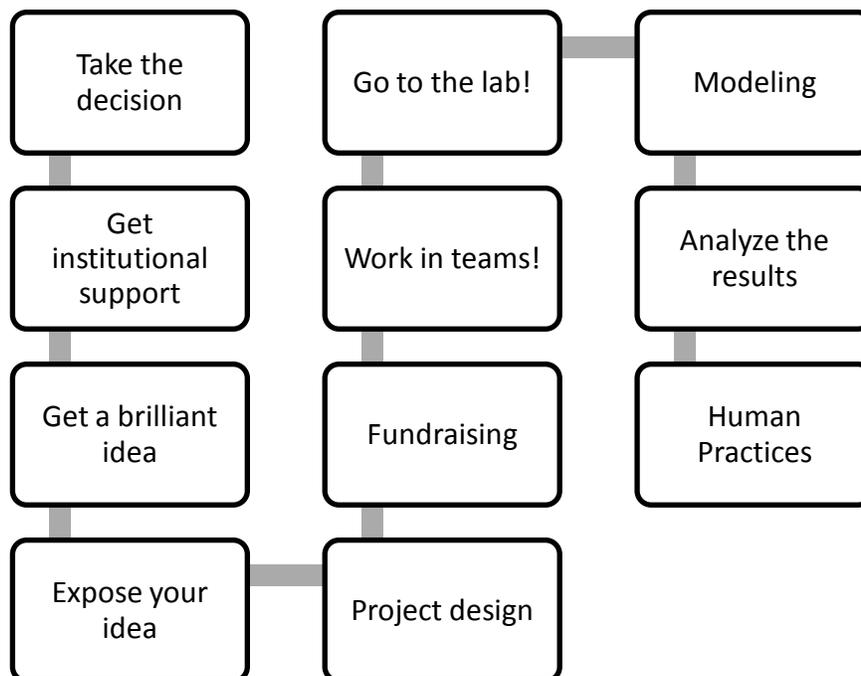
We once arrived at 9 am, planning to go to the movies in the afternoon, but some critical experiments went wrong, so we decided to stay at lab until we finished them and made sure everything was fine. We stayed all night in the lab, we didn't sleep that night but we made it. Another day we almost burn the lab! Luckily, that (almost) didn't happen.

Since this was our first time, we asked for help to former igemers and experts that have guided us through the road to the regional jamboree. Nevertheless, that help was not enough; we made a lot of mistakes due to our lack of experience. It was June and we had almost nothing, just a list of how not to do many things. However, with a lot of effort and persistence we accomplished almost all of our initial goals.

After all these experiences, I can say that a good igemer needs to be creative, passionate, committed, responsible, professional, ingenious and most of all, an igemer needs to be good at teamwork, but above all an igemer must have the iGEM attitude!

## 2. How to create an iGEM team?

It is a fact that every team is different, and every team has its own way to work; especially with the great cultural diversity of iGEM teams. We can summarize our team formation process in the next diagram. We would be happy to listen to other experiences.





### First Step: Take the decision

You could think this is an obvious step, however, taking the initiative to create a team from scratch it is even harder than it sounds. If you're reading this and you are thinking about creating a new team, you have to think that maybe the easiest way to participate in iGEM is to join a solid team. This year Mexico has 7 teams, but they're located in just 3 cities. We have 3 teams in Monterrey, 3 teams in Mexico City, and one team in Cuernavaca (near from Mexico City).

If you don't have an iGEM team near I encourage you to create a new one. As I said before, it is very difficult, but believe me, it's worth it. You just have to find the right partners to begin the initiative. If you don't have the right partners you can invite other students to join for a science club, and then start thinking about forming a team.

### Second Step: Get Institutional Support

It is very important to get support from an academic or research faculty. Dare to ask teachers and researchers and convince them to get involved in iGEM. Remember that you need a place to work and this is the only way to get it.

### Third step: Get a Brilliant idea

It is the core of an iGEM project, an original idea that can revolutionize synthetic biology. We asked to other iGEM teams and former igemers: **How to get the right idea?**

Evry Team (France) experience says that the best way to create new projects and ideas is the following:

1. - Read articles
2. - Write down every idea you get no matter of their pertinence
3. - Listen to people. Learn about their problems and needs. Then try to solve them.
4. - Brainstorming... a lot.
5. - Expose your ideas to critics

***We have to keep in mind that the imagination is more important than knowledge, there're no bad ideas and more the crazier the idea, better it is (Evry Team).***

TU Eindhoven (Netherlands) had a little bit different experience:

*We started out by going through all the projects from previous years and selecting the few we found interesting and promising to continue. We also did a general brainstorm round, but would suggest more elaborate brainstorm sessions (there are many methods available and suggested on Google). Not only will this help enthuse team members, but it can also be an informal get-together, which we highly recommend if team members do not know each other very well.*

In our case, we started reading many papers and getting together for brainstorming sessions, we tried to think in a way to solve some local problems. We received help from many people to focus our ideas.





A personal advice: it is very exciting to explore unknown field, but always be realistic. If no one in your country works with DNAzymes, it could be difficult to get the right equipment.

### **Fourth step: Expose your idea**

Once you have an awesome idea you have to make sure you have the right approach. Make a lot of research. Read as much papers as you can, and discuss those papers in-group. Maybe the best way to tune up your idea is to expose it to someone with much more expertise. Tell the idea to your professors and friends, and send e-mails to experts in the topic. Don't be afraid, people won't steal your idea, and of course, you have to be very careful, but still dare to contact people that can help you with their experience. It doesn't matter if he or she is a Nobel Prize.

### **Fifth Step: Project Design**

This is a critical step, you need to be very creative for this, **how are you going to make your project?** Which techniques are you going to use? You have to define your objectives and a critical route to achieve all your goals. It is very important that you know exactly what you want to do.

Not every iGEM team have an enormous budget, you have to adjust to your lab's equipment and save as much money as you can.

*To plan and design a project, the first thing to do is to cut the project in small pieces to obtain several secondary objectives. For each of these objectives, we have to attribute a dead line and the previous objectives needed to perform this objective. In each objective, there are several tasks and each task should be attributed to a person.*

(Evry Team)

*Planning and designing the project is indeed tricky when participating for the first time. If possible, start before the summer. Make sure you have team members with experience in the lab or arrange a general training for lab skills. We lost quite some time due to errors made on the lab thanks to our inexperience. For planning, formulate detailed and manageable goals (with the help of your supervisors) and set deadlines for these goals.*

(TU Eindhoven)

### **Sixth Step: Fundraising**

Asking for money is not as difficult as people think. Nevertheless it is not easy either. If you're going to ask for sponsoring you need to be prepared, my recommendation is that you make a quick power point presentation that explains:

What is iGEM?

What is synthetic biology?

What do you want to do?

Why do you want to do it?





Why should they give you money?

The way you look when you're asking for money is very important. Make sure you have the right outfit and try to look very professional. Don't be afraid, if you have a well-based project, you will have success.

*Before asking money, a sponsoring file has to be established. A sponsoring file contains: an explication of what it is the iGEM competition, a description of your project or your ideas of project, the composition of your team, your provisional budget and the advantages for the company/organism to give you money. Several ways are available to obtain sponsors. You can participate to contest, ask to your relations, and negotiate reductions with suppliers.*

(Evry)

*To approach possible sponsors, we suggest teams create a document, which describes the project overview, the team members and what you can offer in return for the sponsorship. This can be almost anything from advertisement on your wiki, a logo on a gadget you can hand out at the jamboree or selling your resumes to companies.*

(TU Eindhoven)

You're not always going to get money, but you can always ask for support different to financial one; i.e. discounts on products and services, uniforms, reactives, disposable material, etc. In addition it could be a good idea to ask other labs if they have some material that could be useful.

**Seventh Step: Work in teams!**

As mentioned before, defining responsibilities and dividing the project in parts are crucial aspects to achieve your goals. Teamwork is essential, sometimes is hard but you have to keep everything well organized to avoid problems. If everybody knows what he or she has to do, it will be easier.

*A good project organization is primordial to work in team. For that, the weekly meetings are the key point. They play a major role in solving problems and in readjustment of objectives. Meetings are essential for a good communication through the team. To follow this organization, there must have a leader in the group to animate and execute the plan of actions.*

(Evry)

*Usually, there are always people who are natural leaders, have a creative mind or are simply hard workers but remain in the background. If, before starting the project, everyone considers his or her role and assesses which task he/she should fulfill, this can contribute to working in a team. Knowing your strengths and weaknesses as an individual, but also as a team, is therefore important.*

(TU Eindhoven)

**Eight step: Go to the lab**





This is the most challenging step, yet ironically, it is also the easiest step for a scientist. A good iGEM team should be multi-disciplinary in order to have different approaches and opinions. Experience is basic, not just experience in iGEM, you need at least three guys with experience in lab work; otherwise it would be really hard although not impossible.

Make sure you have everything you need. If you don't, try to get it. Write every single move in your notebook, this is **indispensable!** Finally: if you're going to order primers, gene synthesis or everything that takes time to arrive... make sure you'll receive everything at the beginning of the summer. This is a very common problem; some teams receive their gene synthesis in August.

### **Ninth step: Modeling**

Make sure you have mathematicians in your team to get your model done. A mathematical model can be very useful. Maybe this doesn't apply to you, but it's worth it to check out other mathematical models.

*To support any of your experimental findings, mathematical modeling is a useful tool. If a studied process can be modeled, it will provide more insight into this process. If strange results occur during experiment, a mathematical model may help explain these findings.*

(TU Eindhoven)

*The mathematical modeling plays a role in the understanding of experiments which don't work. The factors which could be important for the success of experiment can be determined thanks to this modeling.*

(Evry)

### **Tenth step: Analyze your results**

I don't have to tell you this, it is evident that you have to analyze and discuss your results, my recommendation would be, again, ask for opinions and receive critics and comments.

### **Eleventh step: Human Practices**

The last part is Human Practices: solving legal, ethical, economic and social issues. I've always thought it is hard for scientist to make social activities; nonetheless, it is a significant part of synthetic biology. As a new discipline, synthetic biologists have to deal with many problems

*The role of the Human practices is to imagine the impact of our work on the world. The iGEM project has to be considered out of the lab and here is the place of Human practices.*

(Evry)

*Although ignorance is bliss, it would be beneficial to explain the benefits of synthetic biology to the world. Wrong interpretations cause fear amongst those who do not know or understand synthetic*





*biology. By reaching out to the uneducated, we can remove some of the fear and let people realize the beneficial aspects of synthetic biology.*

(TU Eindhoven)

As you can see, it is hard, and it requires a lot of time and effort, but in the end you'll have a big satisfaction. There are more things to take into consideration for iGEM projects, we'll keep working to provide a wide vision of iGEM. Now, it's time to go to Colombia and proudly represent our country.

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**Daniel Dominguez-Gomez**

Human Practices

