

# A GUIDE ON HOW TO START A COMMUNITY LAB

Prepared by U of T iGem Human Practice Team 2014: Jing Guo, Juliun Chan, Carrie Huang

September 28, 2014

---

## TOPICS

A GUIDE ON HOW TO START A	1
COMMUNITY LAB	1
HOW TO USE THIS BOOKLET	3
MISSION & VISION	4
LABORATORY ESSENTIALS	5
MONEY MATTERS	6
PROJECT DESIGN	9
PROJECT MANAGEMENT	10
BUILDING RELATIONSHIPS	11
BIO-SAFETY REQUIREMENT	12
LABORATORY SAFETY	13
APPENDIX A: IGEM COMPETITION	15
APPENDIX B: SAFETY TRAINING PACKAGE	19

---

## How to use this booklet

Starting a community laboratory is exciting and challenging. This booklet contains practical guidelines and tips to provide you with a starting point on your laboratory building journey. It includes note pages, spread charts, and check lists for you to jot down your thoughts along the way. Information and details of companies in the Greater Toronto Area that are helpful for building a community lab in Toronto are also incorporated in this booklet.

This booklet is prepared by University of Toronto's International Genetically Engineering Machine (iGEM) Human Practice team of 2014. Each year the U of T iGEM team works on a research project and participates in the iGEM International Competition representing the University of Toronto. The Human Practice team is a subdivision of the iGEM team that focuses on outreach to the general public.

Let the journey begin!



---

# Mission & Vision

A community lab is a place for everyone to have a chance to learn about biology and biological engineering. Members will learn first-hand laboratory skills required in scientific research.

## MISSION

How would you like to frame your mission statements that can best meet your community's needs?

## VISION

What do you imagine the future of your community laboratory to be?

---

# Laboratory Essentials

## **FACILITIES**

Your first step is to find a facility for your lab. Considering choose a location that is close to an university or technology park to explore opportunities of equipment sharing and research collaboration.

## **TORONTO LOCAL FACILITIES**

### **MaRs Discovery District**

Location: 101 College St, Toronto, ON, CA

- MaRS offers furnished offices, outfitted laboratories and meeting rooms.
- Access to incubation space
- Access to shared equipments such as fridge, freezer, MilliQ, ice machine, centrifuges, autoclave, environmental rooms, meeting space, shared kitchen, fax and photocopies and internet access
- Monthly rent estimated to be \$3000 as of September 2014

### **Sheridan Science and Technology Park**

Location: 16-1375 Southdown Road, Mississauga, ON, CA

### **McMaster Innovation Park**

Location: 175 Longwood Rd S, Hamilton, ON, CA

- Innovation Park Office & Laboratory Space offers offices and laboratories that meets the LEEDS requirements
  - Access to incubation space
  - Laboratory equipment leasing
  - To inquire on monthly rent, please contact: [mwalker@mcmasterinnovationpark.ca](mailto:mwalker@mcmasterinnovationpark.ca)
-

---

# Money Matters

When it comes to lab equipment, there are ways to save money!

- Contact PI individually, research institutes or local universities to buy second hand lab equipments
- Borrow or share equipments with other labs
- Find lab equipment at auctions

Heavy Equipment	Quantity	Unit Price	Cost	Sharing Cost
Refrigerators & freezer			\$ 0	
Incubator			\$ 0	
BSC, hood			\$ 0	
Shakers			\$ 0	
Centrifuge			\$ 0	
Autoclave			\$ 0	
			\$ 0	
			\$ 0	
			\$ 0	
Cell/Molecular Equipment	Quantity	Unit Price	Cost	Sharing Cost
PCR Machine			\$ 0	
Plate reader			\$ 0	
Micro-centrifuge			\$ 0	
Gel box			\$ 0	
Powerpack			\$ 0	
Heating apparatus			\$ 0	

---

Pipetors			\$ 0	
Incubator			\$ 0	
Vortex			\$ 0	
Ultra pure water			\$ 0	
			\$ 0	
			\$ 0	
			\$ 0	
Reagents	Quantity	Unit Price	Cost	Sharing Cost
Buffers			\$ 0	
PCR kit			\$ 0	
Miniprep Kit			\$ 0	
Cybersafe/ EtBr			\$ 0	
			\$ 0	
			\$ 0	
			\$ 0	
Labware	Quantity	Unit Price	Cost	Sharing Cost
Bottles & Cans			\$ 0	
Glassware			\$ 0	
Plates			\$ 0	
Pipettes Tips			\$ 0	
			\$ 0	
			\$ 0	
			\$ 0	
<b>Total</b>			<b>\$ 0</b>	

---

## WHAT'S YOUR FUNDRAISING GOAL?

---

### SOME FUNDRAISING IDEAS

- Membership fee
- Donations: donations of money or equipments
- Posting your projects online to raise funds
- Applying for community funding/grants
  - City of Toronto: Community Partnership and Investment Program (CPIP) Grants
  - City of Toronto: Investment Funding Programs under community recreation
  - City of Toronto: TMMIS
- Sponsorship
- Find out if your City lets you present your community lab initiatives during the city council's meeting

### WHERE WOULD YOU LIKE TO START?

---

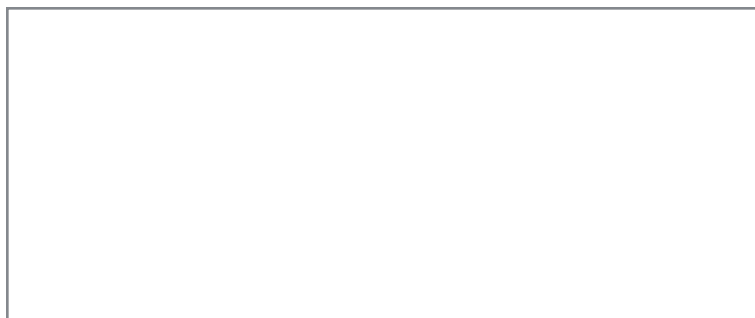


---

# Project Design

You might want to consider the following criteria when designing a project:

## WHAT'S THE SIGNIFICANCE OF YOUR PROJECT?



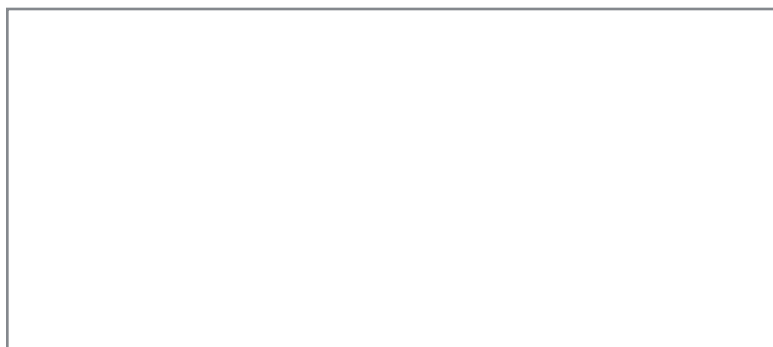
Are you taking this project to a competition?

(refer to Appendix for iGem Community Track Competition)

Does this study address an problem or propose a solution to a problem?

How does this project impact the existing concepts or methods?

## WHAT APPROACH ARE YOU TAKING?



What methodology are you employing?

Are there potential problems/ difficulties that you might encounter? Are there any alternative tactics?

## IS IT INNOVATIVE?



Does this project improve current existing concepts?

Is your project original? If not, who have done similar experiments before? (make sure you give credits!)

---

---

# Project Management

## EFFICIENCY

- Think about how long would this project take?
- Consider if there is a more efficient experiment methodology?
- Define each participant's responsibility clearly
- Appoint an experienced leader for each project.
- Project can be divided into small parts, which gives members the flexibility to choose the parts they would like to work on
- Host weekly/monthly meetings to discuss project process
- Keep lab book within the laboratory for your lab mates to reference

## Use iGem's wiki or Google Doc. to keep an online lab journal

Template:

Week 1

Monday:

Planned Tasks: list your planned tasks here and the person in charge

Log: record your process

Protocol: link the protocol that will be used today

Others: notes for other lab members

Tuesday

Wednesday

Thursday

Friday

---

# Building Relationships

Whether you are an expert in biological science or someone new to this field, your skills and dedications is valuable. This place is for everyone who is curious and fascinated about biology.

Individuals who are working in a community lab need to complete BioSafety trainings. Such trainings can be done at local university/college institutes. In Toronto, University of Toronto offers Bio-safety training courses. See appendix for an innovative training package designed by iGEM team Toronto 2013.

---

# Bio-Safety Requirement

## **BIO-SAFETY LEVEL 1:**

Currently, there is no regulation or policy regarding BSL-1 lab. Further, there is no registration required for BSL-1 Lab. Chemical and biological material can be purchased through Bio Basic, a local company in Toronto. Other companies, such as Sigma-Aldrich, may require purchase permit or certificate to purchase. Ask a sales representative to how you can obtain a purchase permit.

## **BIO-SAFETY LEVEL 2 & ABOVE:**

For Canada

CL2 Compliance Letter Application should be completed and sent to Pathogen Regulation Directorate (PRD), Public Health Agency of Canada (PHAC). And then PHAC Letter of Compliance or a CFIA Letter of Compliance should be in place too. Please omit the remainder of this section and proceed to Section 2. CDR110 or CDR 110A.

<http://canadianbiosafetystandards.collaboration.gc.ca/cbsg-nldcb/index-eng.php>

---

---

# Laboratory Safety

Health and safety hazards in the laboratories are often overlooked. This summary will give you an overview of the common laboratory hazards, and some measures to minimize them. This is an summary of the Laboratory Safety guideline from Workplace Safety & Prevention Service. The original form can be downloaded on [www.wsps.ca](http://www.wsps.ca)

## HAZARDS AND CONTROLS

### Chemical and biological agents

**Hazards:** Toxic chemicals, acids and bases, cryogenic chemicals, organic solvents, compressed gases. Bacteria and virus.

**Controls include:**

- Isolation
- Proper identification
- Strict personal hygiene: make sure that washbasins, showers, separate lockers are provided
- Control of all ignition sources
- Proper transportation of chemical containers within the laboratory: provide material handling equipment, provide unbreakable portable containers
- Proper and adequate storage facilities
- Proper waste disposal facilities and procedures

### Physical Agents

**Hazards:** X-ray machines

**Controls include:**

- Ensure that equipment emitting ionizing radiation is regularly maintained

### Equipment and Apparatus

**Hazards:** Laboratory machines, electrical powered equipment (hot-plates), glassware

**Controls include:**

- Provide proper containers to confine liquids in the event of glass breakage
  - Ensure that machinery and equipment are properly shielded
  - Develop protocol or operating procedure before using dangerous machine
  - Institute an inspection cleaning and maintenance program
-

---

## Ergonomics

**Hazards:** Repetitive motions from pipetting/transferring fluids and lab samples

**Controls include:**

- Organize work to minimize repetitive motions

## SAFETY-INSPECTION CHECK-LIST:

Department <input checked="" type="checkbox"/> Acceptable <input checked="" type="checkbox"/> Unacceptable	Dates of Inspection							
Ventilation System								
Hazardous products labelled								
Handling procedures								
Work station layout/ ergonomic safe work practices								
Waste disposal procedures								
Compressed air procedures								
Cryogenic process/storage								
Cylinders containing gases								
Safety showers/eye baths								
Radioactive material storage/control								
Personal protective equipment								
Electric wiring/equipment								
Centrifuge process								
Burners/hot plates/ovens								
Glassware procedures/ disposal								
General housekeeping								
Conditions of floors								
Storage areas/cupboard/shelves								
First aid supplies								
Alarm systems								
Emergency procedures								
Fire exits								
Sign-off: (Initials of person making inspection)								
Notes:								

---

---

# Appendix A: iGEM COMPETITION

The following information is taken from the iGEM Foundation website, please visit [http://2014.igem.org/Tracks/Community\\_Labs](http://2014.igem.org/Tracks/Community_Labs)

## INTRODUCTION TO iGEM COMMUNITY LABS TRACK

iGEM is an engine for innovation. In this manner it is aligned with both traditional scientific research institutions and the free market. But participants in iGEM will tell you that beyond the accolades of scientific publishing and economic reward, the real motivating force that energizes innovation is a simple desire to push technology as far as possible - and to HAVE FUN. Innovating for the sake of innovation itself is an intrinsic and separate motivation, just as a valid and important as a wish to advance science or make millions.

The worldwide community of amateur biologists, biohackers, citizen scientists, or otherwise non-institutional scientists is motivated by this incredibly powerful force. They want to push the envelope of biological technology. They want to, in general, increase the power of an individual to understand biological systems - "to understand things" - and to prototype biological designs - \*to build things\*. They ask why the tools we use as biological engineers - protocols and equipment and organisms and genes - are the way they are, and imagine how they could be made simpler, less expensive, or just easier to work with.

In 2014 for the first time, the iGEM competition will expand to include the DIYbio community by adding the Community Lab Track. iGEM requires a large investment in time and money to participate, but its format as annual competition actually facilitates fundraising, recruitment, and general motivation to do something BIG. It provides a compelling vehicle to organize a team, a lab, and get a project done on time. It is our hope that the new DIY track could stimulate the formation of many new community labs, with great benefit to the DIYbio community.

The Community Lab Track will have the same focus on bench research as the traditional iGEM track, however we are also looking for projects that increase the accessibility of synthetic biology. These might include kits such as Genomikon, or equipment hacks such as the Open PCR. We especially want to encourage teams that may not be able to conduct genetic engineering experiments within their labs due to local regulations, but who might innovate in the areas of equipment, software, etc. It's also permissible to collaborate with an institution for the parts of the project that require licensed facilities, as long as it is clear that the regulated activities are being performed solely within the designated institutional space and supervised by appropriate personnel. As in the past, all iGEM teams must submit a safety page. The Community Labs will have to describe their facilities in detail, and work with organisms and procedures appropriate to the [biosafety level](#) of their facility, and follow [recombinant DNA guidelines](#).

---

---

## COMMUNITY LAB TRACK DETAILS

Community labs will be able to compete alongside traditional iGEM teams for the same prizes. Teams will be eligible for the Grand Prize, as well as other prizes such as the Best Human Practices, Best Software and Best Part awards.

If you participate in iGEM this season, we will ship you a copy of the 2014 distribution as well as fulfill any part requests for the duration of the competition. You get space on this 2014 wiki to display your project, a presentation slot and poster board at the Giant Jamboree.

## COMMUNITY LAB TRACK REQUIREMENTS

In addition to the [general requirements for all iGEM teams](#), Community Lab teams are required to complete the following:

- ♣ Team composition. While there is no minimum number of team members, iGEM is a team competition and single individual entries will not be accepted. CL teams must have two advisors, one of which must be in the field of their chosen subject area.
- ♣ Community Lab teams must demonstrate they have access to a BL 1 lab in order to receive a copy of the distribution.
- ♣ Teams participating in the hardware aspect of the CL track are encouraged to bring their equipment to the Giant Jamboree. Teams may not bring live or inactive organisms as part of their equipment. This topic will be covered in more detail when evaluation criteria and awards are published.

As Community Lab teams are not operating within the framework offered by academic institutions, they must meet the following additional requirements:

1. CL teams must be an incorporated entity (for profit or not-for-profit).
2. CL teams must have a legal entity that has the ability to sign contracts.

## MEDAL CRITERIA

The Community Lab Track is unique in that the track is defined not by the scope of the project, but by the type of lab the team comes out of. Therefore, the medal will be awarded based on the highest level of requirements (bronze, silver or gold) satisfied in ANY of the following four categories:

1. Parts: CL teams can choose to compete based on the [standard medal criteria for all iGEM teams](#).
  2. Software: CL teams can choose to compete based on the [medal requirements for the software track teams](#).
-



- 
3. Hardware: Community Lab Teams can choose to build and submit hardware as part of their CL track iGEM participation
  4. Systems for Community Engagement and Promotion of Citizen Access to Synthetic Biology: CL teams can choose to work on meeting the criteria for Community Engagement

While Community Labs have the option of picking any of the four sets of criteria, once chose, they **MUST** adhere to that set of criteria.

## IGEM 2014 COMMUNITY LABS HARDWARE MEDAL CRITERIA

**Bronze.** The following 4 goals must be achieved:

1. Register the team, have a great summer, and have fun attending the Jamboree.
2. Create and share a description of the team's project via the iGEM wiki.
3. Present a Poster and Talk at the iGEM Jamboree.
4. Develop a working prototype of an open source hardware tool that supports synthetic biology based on BioBrick standard biological parts (not just another gel box!)

**Silver:** To earn a Silver Medal, in addition to the Bronze Medal requirements, a team must:

1. Develop and make available via a communal wiki page, schematics the information sufficient to reproduce the device.
2. Provide a demonstration of their hardware using a video tutorial made available on their wiki. This tutorial should explain all the features of the hardware operation. The team must send the video to iGEM HQ and the Community Lab Committee.

**Gold:** In addition to the Bronze and Silver Medal requirements, the following mandatory medal criteria and one optional criteria must be achieved:

1. Have another team utilize the hardware developed by your team. You must clearly show how your hardware was used and the results that were obtained. Results should take the form of a written report from the team testing the hardware and be posted on both team's wikis.

AND EITHER

2. Outline and detail how your hardware affects Policy and Practices in Synthetic Biology. Such topics include: safety, security, ethics, or ownership, sharing, and innovation.

OR

3. Create a user-friendly software interface that allows protocols for the hardware to be easily created and shared within the community
-

---

## IGEM 2014 COMMUNITY LABS COMMUNITY ENGAGEMENT MEDAL CRITERIA

**Bronze.** The following 4 goals must be achieved:

1. Register the team, have a great summer, and have fun attending the Jamboree.
2. Create and share a description of the team's project via the iGEM wiki.
3. Present a Poster and Talk at the iGEM Jamboree. You should be able to clearly articulate the specific question(s) your team chose to address, and detail the methods used.
4. Create a 2-page Executive Summary and a 3-minute video of your project, accessible to an interested lay audience.

**Silver:** In addition to the Bronze Medal requirements, the following four criteria must be achieved:

1. Evaluate your proposed approach, by showing the extent to which it allowed you to answer your question(s) in part or in whole.
2. Describe the advantages and limitations of your method(s) in relation to the project questions.
3. Outline how your team managed limitations or challenges of your method.
4. Create step-by-step documentation for your method, sufficient that it could be replicated by another community lab.

**Gold:** In addition to the Bronze and Silver Medal requirements, the following mandatory medal criteria and one optional criteria must be achieved:

1. Help a current iGEM team or community lab engage the public using your method.
  2. Document this using video and send this video to iGEM HQ and the Community Lab track Committee.
  3. Provide a method of evaluation/feedback and discuss how the feedback you received did or will inform future step(s) in your team's project.
  4. iGEM projects involve important questions beyond the bench, for example relating to (but not limited to) ethics, sustainability, social justice, safety, security, or intellectual property rights. **Describe** an approach that your team used to address at least one of these questions. **Evaluate** your approach, including whether it allowed you to answer your question(s), how it influenced the team's scientific project, and how it might be adapted for others to use (within and beyond iGEM). We encourage thoughtful and creative approaches, and those that draw on past Policy & Practice (formerly Human Practices) activities.
-

---

# Appendix B: Safety Training Package

The iGEM Toronto team 2013 came up with a novel approach to lab safety that takes the form of situational exercises giving users real accident simulations. This package can be downloaded on our website.

