Agenda

1. Introduction to iGEM
   a. Synthetic Biology
   b. What does every team need to do?
   c. Previous Projects
2. Subteams of iGEM
3. iGEM as a class
4. Preparing for the Competition
5. Funding
6. Q&A
Videos Explaining SynBio
International student team competition in Synthetic Biology

Mission: We aim to solve **real-world challenges** by building genetically engineered biological systems

316 teams
41 countries
What do we do?

**Spring**
- Training
- Getting to know each other + being certified

**Summer**
- Bulk of development, research, and lab

**Autumn**
- Finishing touches (this is not a calm process)
- Fly to Boston to present findings!
¡GEM is Interdisciplinary!

Biochemistry

Electrical Engineering

Bioengineering

ACMS

Biology

Informatics

Education

Math

Physics

Computer Science

(Intended and Declared!)
Team (Professors)

Prof. Liangcai Gu  
(Biochem, IPD, Genome)

Chemically Induced Dimerization

Prof. Herbert Sauro  
(BioE, EE)

Systems Biology  
Software + Biological Control Systems
iGEM Requirements

All teams have...
• Project
• Website
• Poster
• Presentation
• Biobricks

Good teams have...
• Relevance to the real world
• Engagement with stakeholders
• Modeling
• Business and policy considerations
• Much more...
Website!

- Showcases the project in a complete and comprehensive way

- #Aesthetic

Poster + Presentation!
BioBricks!
DNA parts in a standard format
Open source → available to all scientists!
Student responsibilities + expectations

• Have an attitude to learn and willingness to participate!

• Ability to work in a team in a fast-paced environment

• Be available during Summer (if you have to juggle an internship and lab...talk to us)

• Dedicate 5-10 hr/wk in winter/spring, 10 - 20 hr/wk in summer/fall*

• Stay up to date on communications & contribute your own thoughts!
Previous Projects

Boundless Possibilities!
Diesel Production

- E. coli produce alkanes by introducing a pair of genes that convert fatty acid synthesis intermediates into alkanes.

Gluten Destruction

- Reengineered a gluten-degrading protease enzyme to have increased gluten-degrading activity, allowing for the breakdown of gluten in the digestive track for patients with gluten intolerance.
Washington 2018 Project

Stronger Together

An Efficient, Generalizable Approach to Designing Biosensors
Background

Chemically Induced Dimerization

Simple mechanism with promising applications
Background

Chemically Induced Dimerization

Simple mechanism with promising applications:
- CAR T-cell Therapy
- Point of Care Diagnostics
- Metabolic Engineering
Background

Few CID systems are available:
- Hard to find
- Currently unfeasible to engineer

Solution: antibodies
- Screen large library of antibodies to find binders
- Method: Phage Display
Washington 2018 Project- Application

**Biosensor:** Adapted Yeast 3 Hybrid system
- Create novel biosensors for small molecules
  - Vitamin D3
  - Artemisinin
Washington 2018 Project– Future Work

The Need for Optimization

- Poor binding inadequate for applications
- Insufficient specificity leads to false positives
Washington 2018 Project– Future Work

- Simulations goals:
  - Determine antibody structure
  - How do they bind to target molecules
- Ultimate goal: engineer stronger binders
Simulations goals:
- Determine antibody structure
- How do they bind to target molecules

Ultimate goal: engineer stronger binders
Wetlab
Our Project

• Identifying nanobody binders for specific small molecules
  • Working in close collaboration with the Gu Lab in the department of Biochemistry
• Goal for this year: To identify all nanobodies necessary and create a biological detection system
Interlab

- Have previously analyzed reproducibility
- Largest interlaboratory study
- A chance to get published! And...
- A chance to lead a project!

Reproducibility of Fluorescent Expression from Engineered Biological Constructs in *E. coli*
What do we want from you?

• Your address, credit card number, SSN, soul, and all your waking hours from now until eternity

• Initiative, Good nature, Endurance, Motivation

• -10 hours a week, often more (in summer)
What do you get out of all this?

- Molecular Biology Lab Techniques
  - DNA – PCR, Gel Electrophoresis, Miniprep, Transformation, etc.
  - Protein – Isolation, Purification and characterization
- Research Skills
- Communication and Leadership
Outreach/Human Practices

Talking to non-scientists/children
Education & Public Engagement

- 120-paged multilingual curriculum
  - Used across the world!
- Sit Down with Synbio
Integrated Human Practices

- Establish communication with our project’s stakeholders and use insight to shape our project’s future directions
- Shape the narrative of our project and communicate why our work is important
- How can our project be implemented practically?
- How does it benefit the community?
Collaborations
Collaborations

- Working with other teams around the world!
- Pacific Northwest iGEM Meetup
- Outreach Booklet Language Translations
  - Spanish, French, Hindi, Vietnamese
Design & Animations

...
“If a picture paints a thousand words, the motivation behind the design team is to paint our project as clearly as possible.”
What we’ve accomplished so far

- Logos
- Pamphlets
- Booklets
- Educational Materials
Projects to undertake

Design posters, flyers, and a website
  • Team and Project logos
  • Outreach informational flyers
  • Competition material
    • Project Poster
    • Presentation Slides
    • Wiki figures and animation

Develop a project storyline and introductory animation video

Think up of and tackle fun projects
  • Creative introductory pictures
Social Media

- Help us increase our reach through Facebook, Twitter, and Instagram
- Write content highlighting our team members & project for social media
- Work with design team to market our team and ideas!
  - Videos
  - Animations
  - Art
Business, Policy, & Social Media

Help us sell our ideas!
Companies now focus on high-value products

- Microbes
  - Ginkgo Bioworks
  - Cargill

- Industrial chemicals
  - Genomatica
  - BASF

- Enzymes
  - Codexis
  - Tate & Lyle

- Fashion
  - Bolt Threads
  - Patagonia

- Beauty

And are getting traction with larger companies
Business & Entrepreneurship

Filling a need (market demand) should inform design decisions in our project

- Engage with biotech industry professionals
- Perform market/industry research and SWOT analysis
- Practice technical writing and business skills
- Fulfill requirements for iGEM entrepreneurship awards
Public Policy & Ethics

Regulation and government policy plays a significant role in our research.

- Learn about policies related to synthetic biology, GMOs, and biotech research
- Research project-related ethical issues
- Interact with local experts and government officials regarding our project
- Write policy briefs related to our project
- Help us make a positive impact in our community!
Simulations
What is Simulations?

- We construct **computational models** in order to **simulate real systems**, allowing us to **gain insight** and **collect data** on otherwise expensive wetlab experiments.

- Simulations are never perfect, only approximations.
Web Development Team - Intro

● About me
  ○ William Kwok - Informatics 2020
  ○ Been with iGEM since freshman year
  ○ Enjoy building stuff, programming stuff, and playing PC games
  ○ TA, Research with Code and Cognition Lab, INFO Tutor
  ○ Interning at Qualtrics as a SDE Summer 2019

Web Development Team - Duties

- Build a performant, mobile friendly website using HTML, CSS, JavaScript ES6, and React
- Ideally, you should know HTML, CSS, JavaScript, and DOM manipulation fundamentals, will teach React if you don’t know it
- No need to know any biology
- You will gain experience with:
  - Common React patterns
  - Creating a content management system using Firebase
  - React execution order
  - iGEM MediaWiki quirks
  - working on a mission critical front end aspect of a project with time constraints
- Time commitment: Flexible, on a github issue basis
Web Development Team - Recruitment Process

- Fill out the general recruitment form
- Resume
- Technical project/interview yet to be determined
- Short interview
- 3-5 members.
- More details coming in the email later.
Individual Cost Break Down

3 Main Categories make up the itinerary:

- Airplane Tickets – $300 (July)
- Hotel or Airbnb Stay – $150 (Aug)
- Individual Registration Fee – $700 (Aug)

Est. total: $1,150
URP Grant + HUB Grant

URP Conference Grant:
“We encourage all students who have a paper, **poster**, or scholarly creative work that has been accepted for presentation at a professional conference to apply for an award.” – URP

Every member is eligible to apply! **SO APPLY**

Last year, every person who applied received the award.

HUB Travel Grant:
$1500 that the iGEM RSO applies for
– Pending availability

Together: potentially about $250–300 of travel grant per person.
Open Leadership Positions

- Fundraising Lead
- Operations Manager
- Director of Internal Affairs
- Treasurer
- Collaborations Lead
- Public Engagement Lead
Question Time!

- General questions now
- Specific/personal questions to relevant people after we break up

We believe that the engineering of biology will fundamentally change the world

And we are part of this revolution