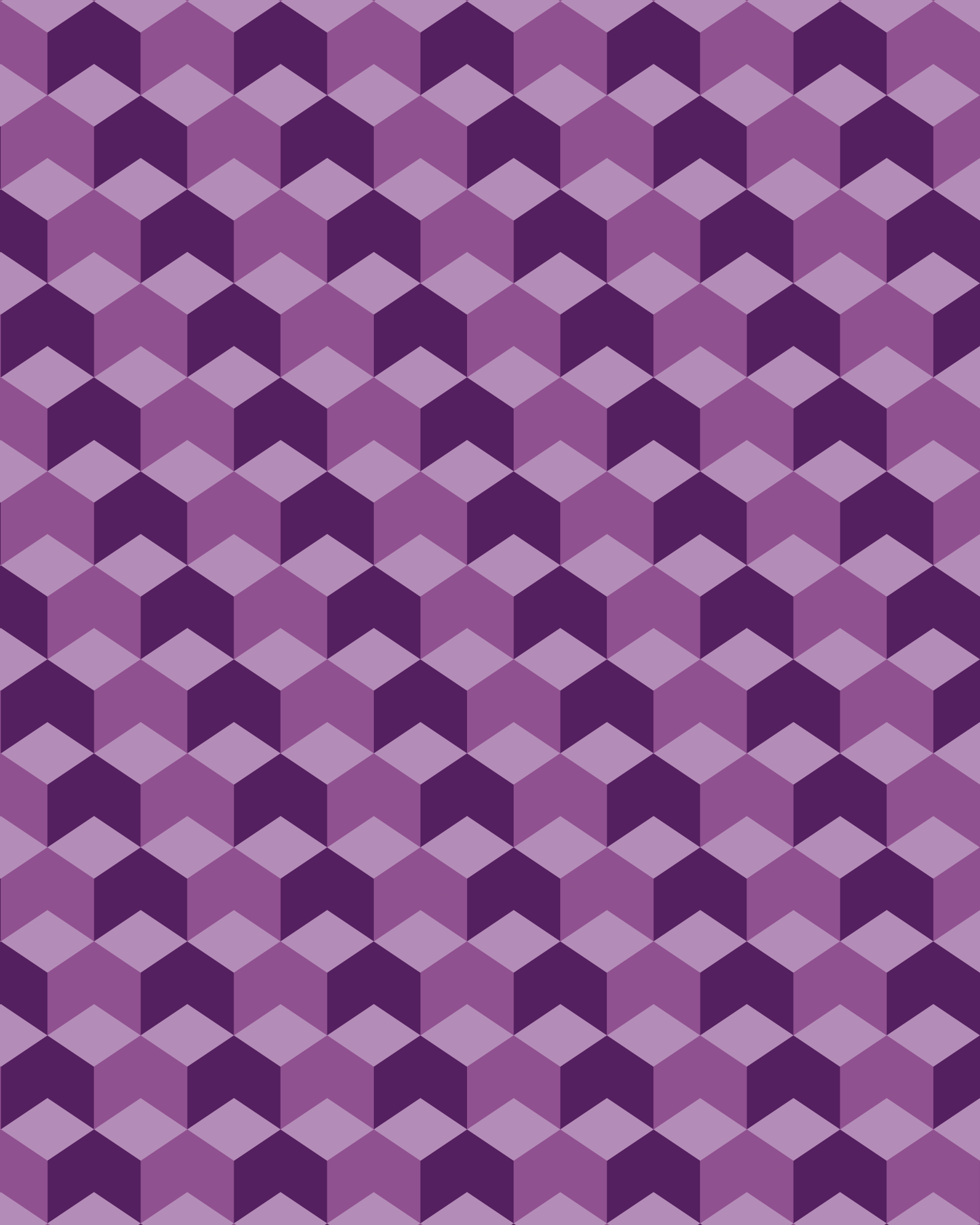
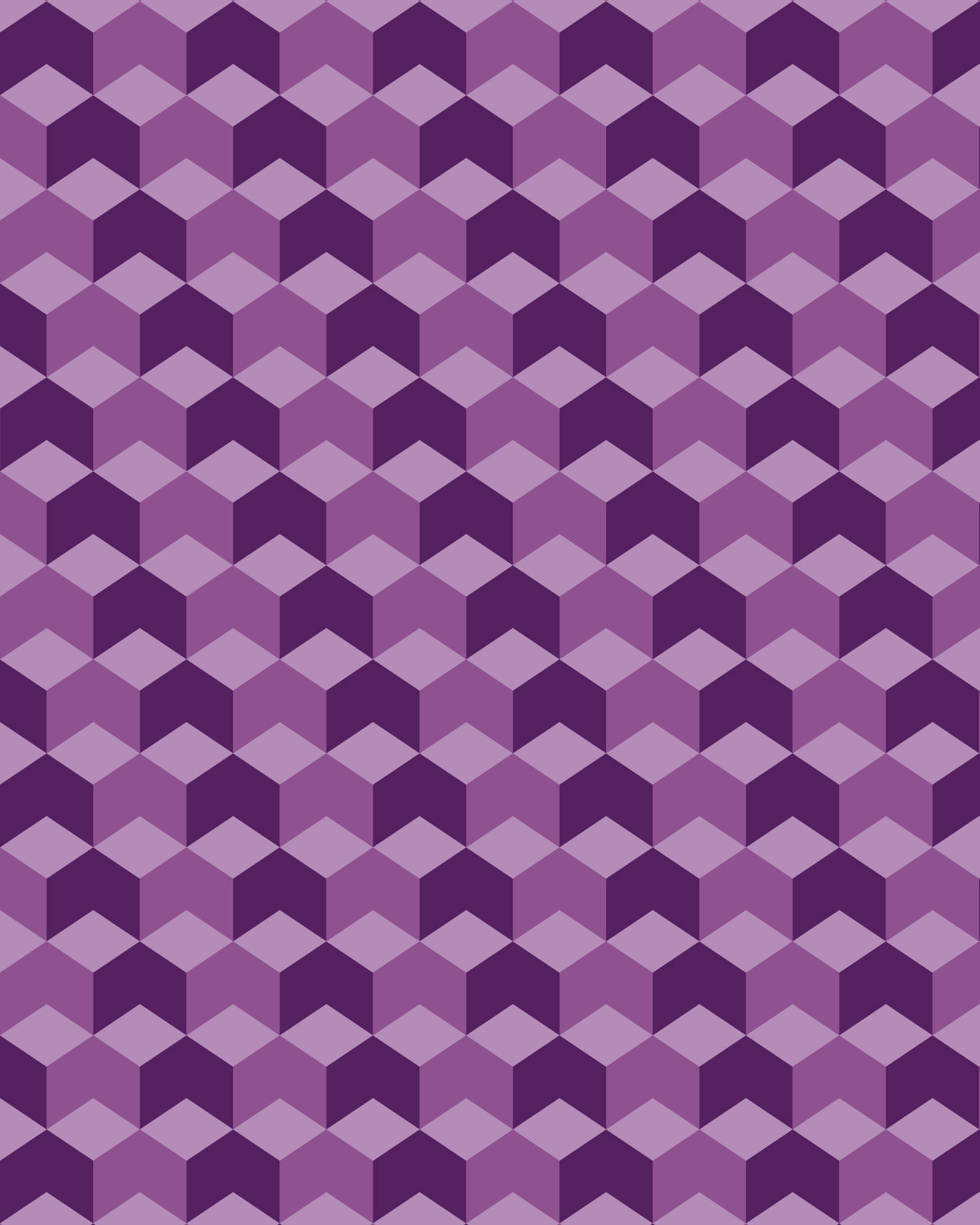


2 0 1 8

**G I A N T
JAMBOREE**

Hynes Convention Center
October 24 - 28
Boston







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is
the
most
powerful
technology
on
the planet

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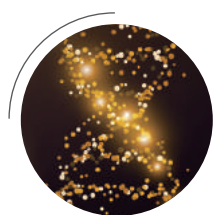
About GenScript

Established in 2002, GenScript (Stock ticker: 01548.HK) is a world leader in biotechnology reagent service industry, serving 200,000+ customers in 100+ countries for 16 years. GenScript offers a comprehensive portfolio of reagent services, biologics services and products.

- **The Most Frequently**-Cited Biotech Company in the world being cited in 26,900+ peer-reviewed publications
- **A Proven Synthetic Biology Expert** with full scope Molecular Biology services and cutting-edge tools including CRISPR, GenSmart™ Design and etc.
- **A One-Stop Solution** for your plasmid, peptide, protein, antibody reagents.

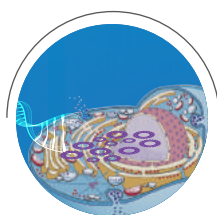
Calling for 2019 Proposals

GenScript has been proudly sponsoring the iGEM Giant Jamboree competition since 2009. In 2018, we gladly sponsored five teams out of over 100 participating teams, with GenScript voucher and cash awards. We are now calling for proposals for 2019 GenScript Proposal Competition!



GenParts® DNA Fragments

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ABOUT

The International Genetically Engineered Machine (iGEM) Foundation is an independent, non-profit organization dedicated to the advancement of synthetic biology, education and competition, and the development of an open community and collaboration. This is done by fostering a cooperative community and friendly competition.

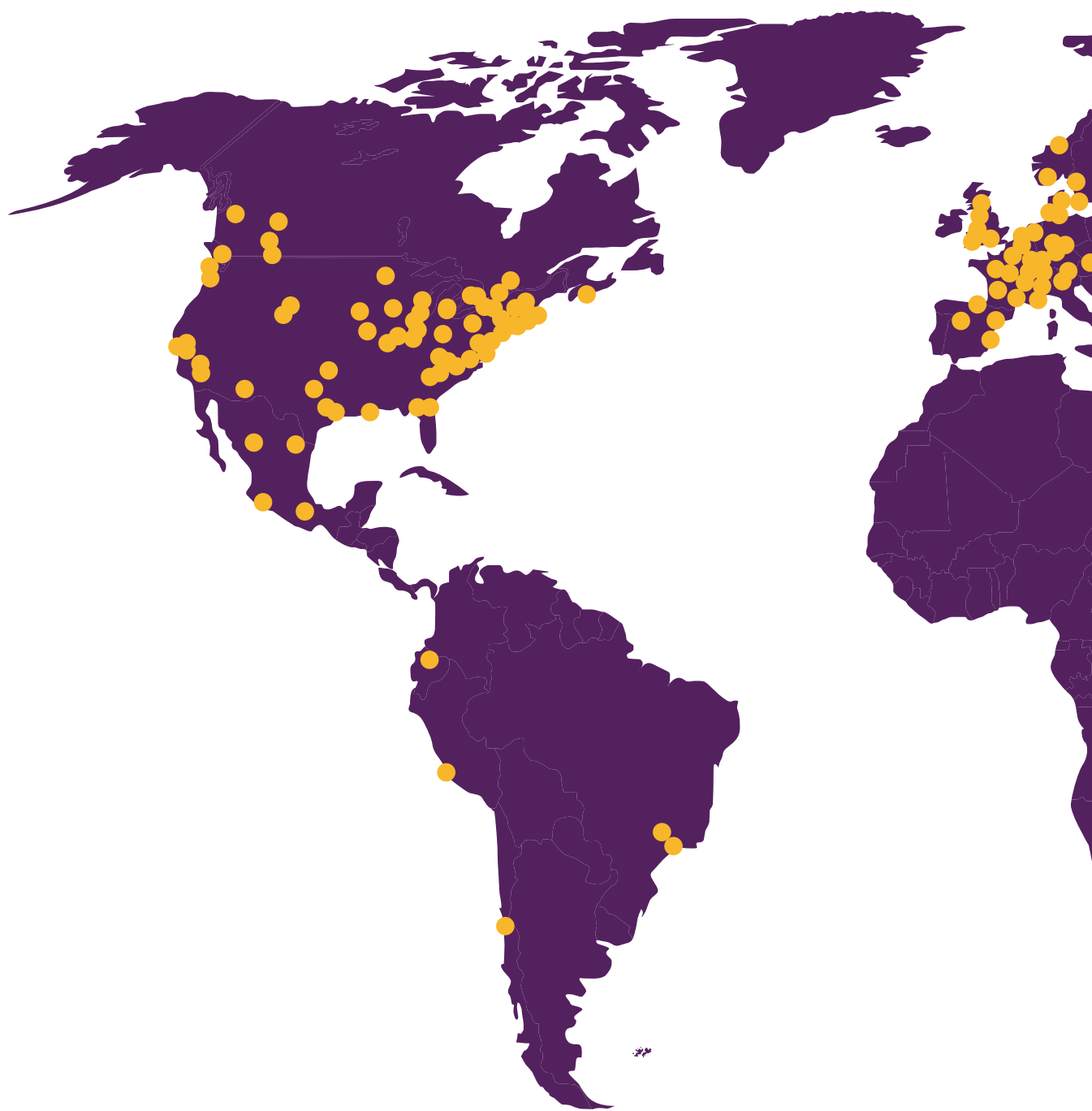
The iGEM Foundation's main programs include: the **iGEM Competition** - an international competition for students interested in the field of synthetic biology; the **Labs Program** - a program for academic labs to use the same resources as the competition teams; the **Registry of Standard Biological Parts** - a growing collection of genetic parts for building biological devices and systems; and **After iGEM** - a community and international network of academics and industry professionals beyond the competition.

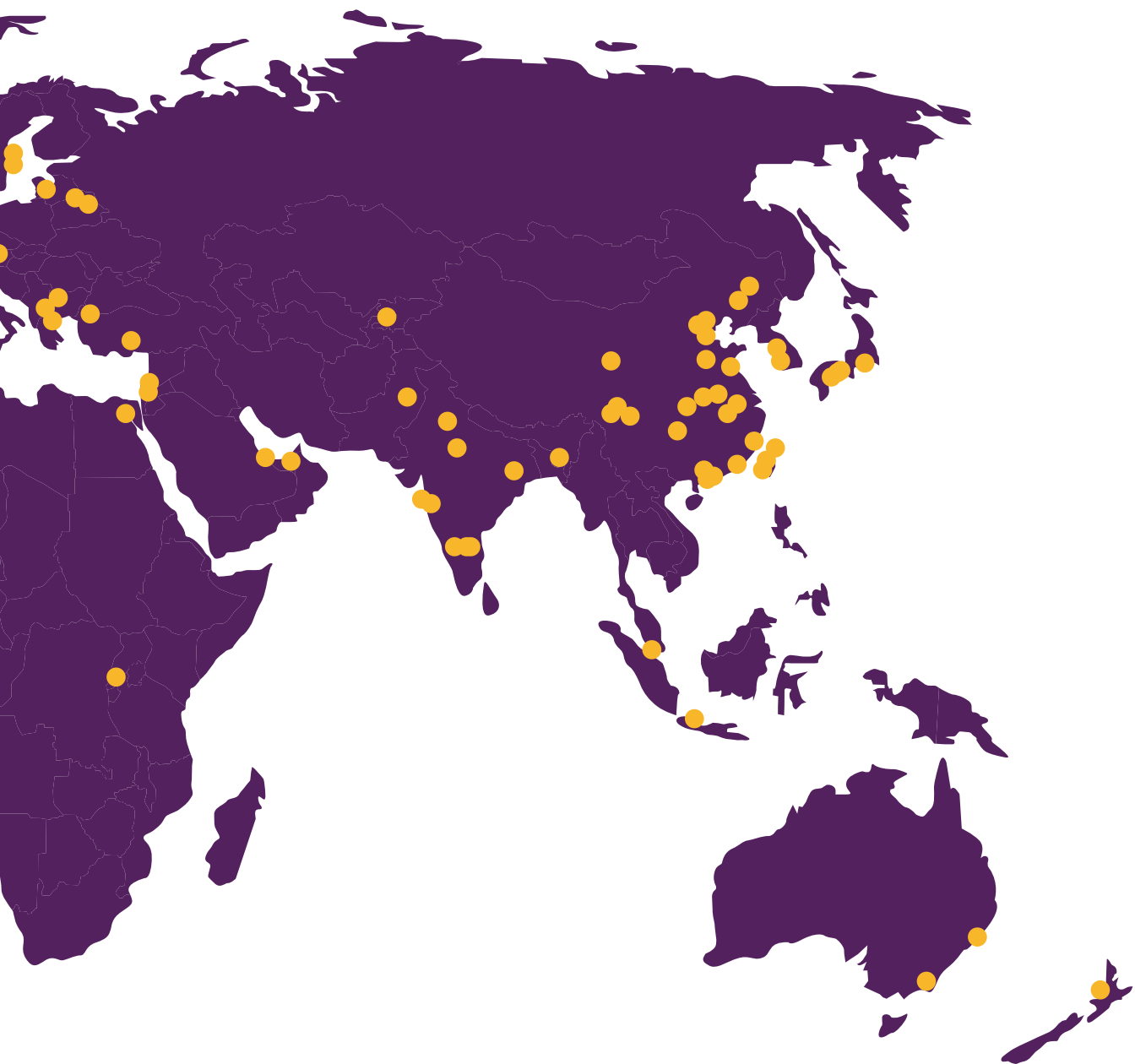
iGEM began in January 2003 as an independent study course at the Massachusetts Institute of Technology (MIT) where students developed biological devices to make cells blink. This course became a summer competition in 2004 with 5 teams. In 2018, the iGEM Competition has expanded to 340 teams from more than 40 countries.

The iGEM Competition gives students the opportunity to push the boundaries of synthetic biology by tackling everyday issues facing the world. Made up of undergraduate, graduate, and high school students, multidisciplinary teams work together to design, build, test, and measure a system of their own design using interchangeable biological parts and standard molecular biology techniques. iGEM teams work to create sophisticated projects that strive to make a positive contribution to their local communities and the world.

iGEM hosts the Giant Jamboree where all of the iGEM teams come together for four days of information sharing, competition, and celebration of team achievements. During this annual event, iGEM teams present their synthetic biology projects and compete for various awards and prizes. This year, iGEM is proud to host over 315 teams in Boston as they share, celebrate, and showcase their amazing work!

TEAM MAP





CONTRIBUTORS

iGEM Board of Directors

King Chow

Richard Johnson

Thomas Knight

Randy Rettberg

Pamela Silver

iGEM Foundation

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Vice President

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Suzie McLellan Soloviev
iGEM HQ Liaison

Sponsors

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Affiliates



EXHIBITORS

Halls A and B

Arbor Bioscience

FBI

Feles

GenScript

Ginkgo Bioworks

Human Practices Committee

IDT

MathWorks

NEB

OpenTrons

Promega

Rice University

Singer Instruments

Twist Bioscience

University of Edinburgh

USDA

Zymergen

Career Fair Exhibitors

Saturday - Room 202 - 3:45 PM - 6:45 PM

FBI

GenScript

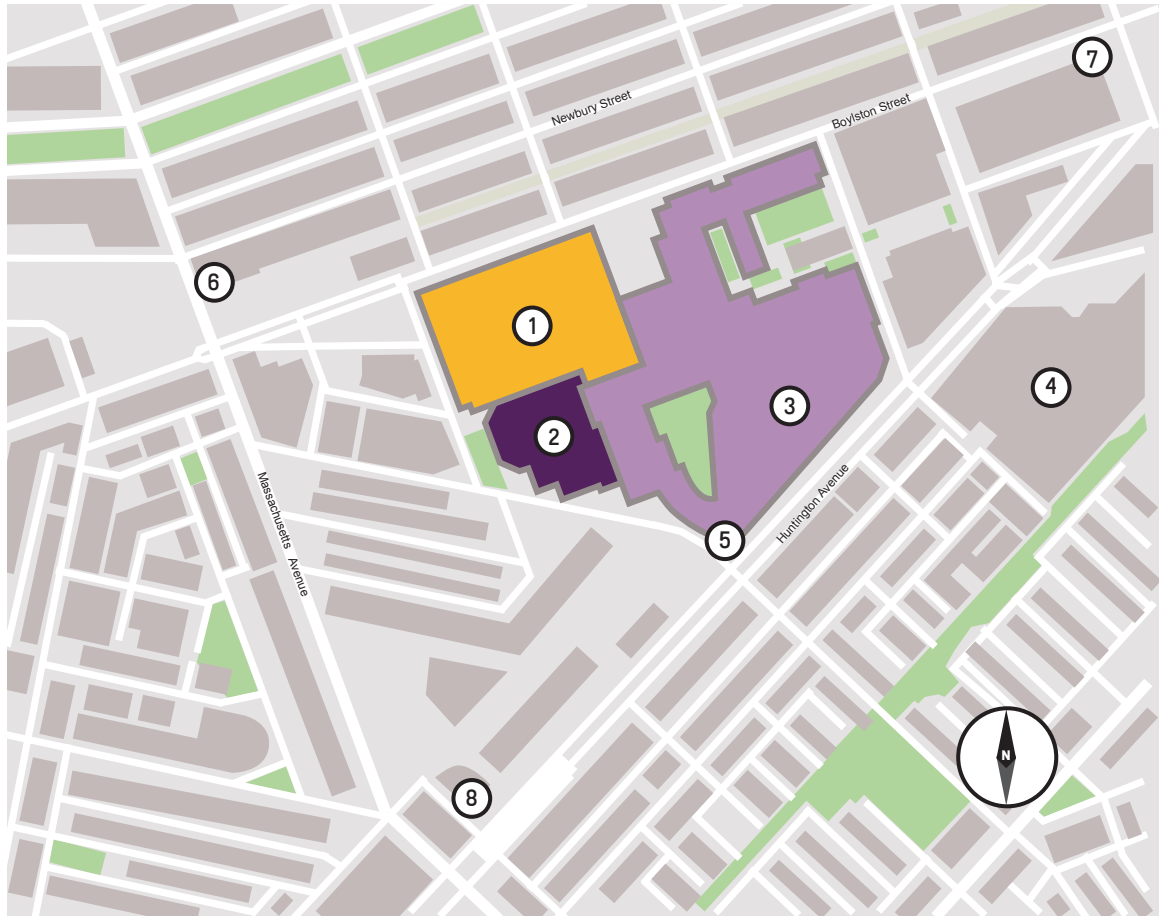
Ginkgo Bioworks

Promega

University of Edinburgh

MAPS

Exterior Hynes Convention Center



1 Hynes Convention Center

2 Sheraton Hotel

3 Prudential Center Mall

4 Copley Plaza Mall

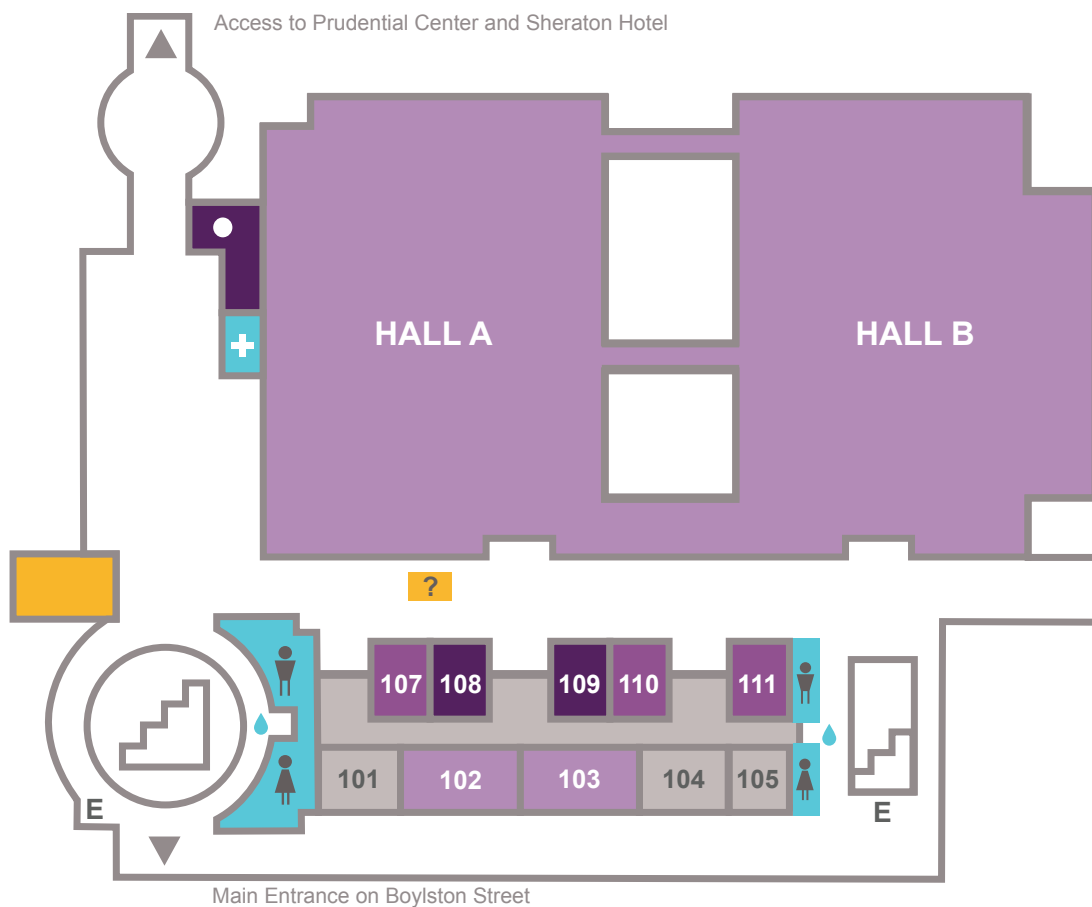
5 Prudential Subway Station

6 Hynes Convention Center Subway Station

7 Copley Subway Station

8 Symphony Subway Station

Plaza Level (First Floor)



Halls A and B (Hubs)
Posters, Food, Exhibitors

Rooms 107, 110 and 111
Extra Seating

Rooms 102 and 103
Workshops

Rooms 108 and 109
IDT Suite

? iGEM HQ Table

Public Safety Office

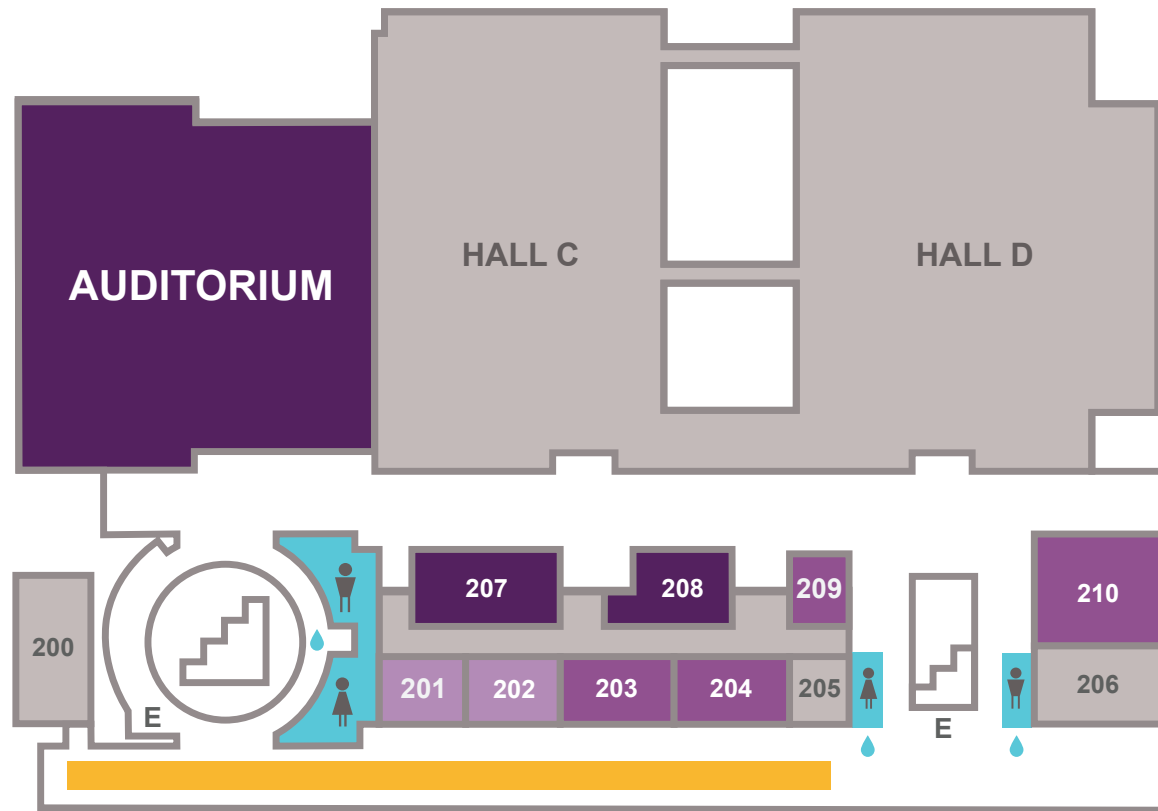
+ First Aid

● Business Center

Water

E Elevator

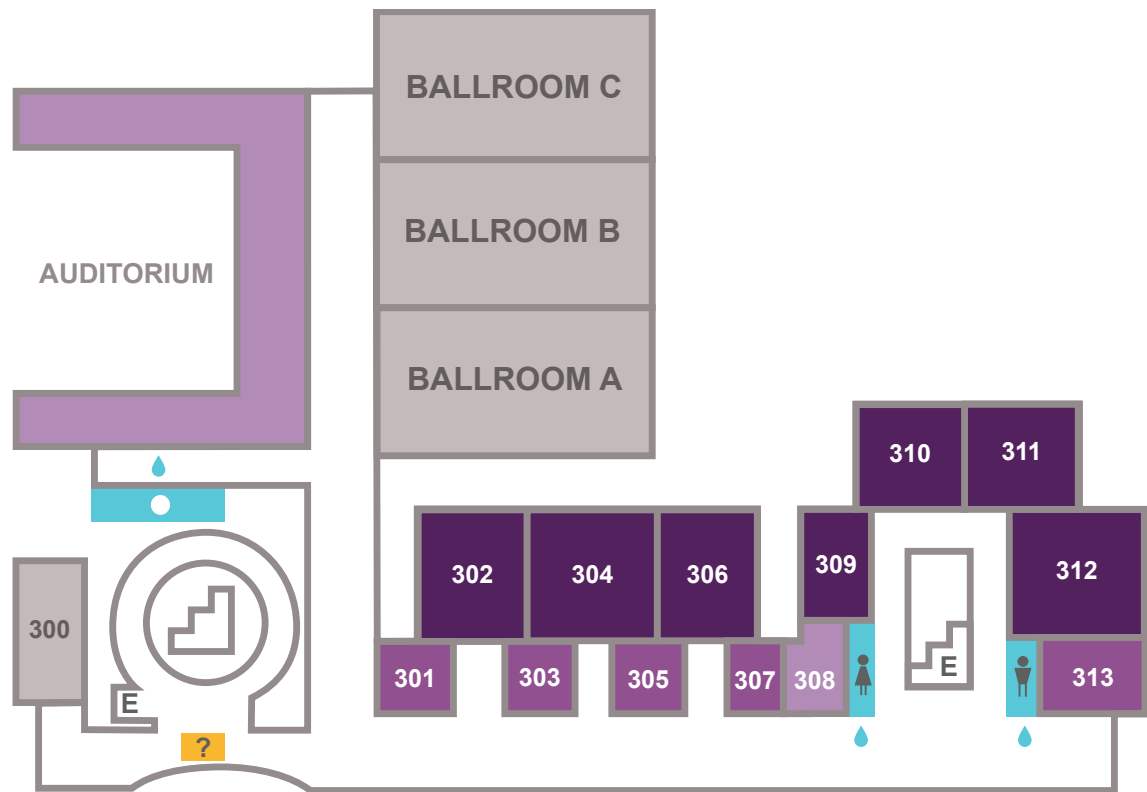
Second Floor



- Rooms 207 and 208**
Presentation Rooms
- Room 201**
Lactation Room
- Room 202**
Career Fair
- Room 209**
Extra Seating
- Rooms 203, 204 and 210**
Workshops
- Registration**

- Water**
- E** **Elevator**

Third Floor



Rooms 302, 304, 306, 309, 310, 311, 312
Presentation Rooms


Room 301, 303, 305, 307
Extra Seating

Room 308
Quiet Room / Prayer Room

Room 313
Workshops

?
Information Desk

Auditorium
Second level Extra Seating

 **Gender Neutral Bathrooms**

 **Water**

 **E** **Elevator**

SCHEDULE

Wednesday October 24			Thursday October 25	Friday October 26	Saturday October 27	Sunday October 28
8:00			Opening Ceremony			
8:30			Travel time			
9:00			Presentations Session A	Presentations Session E	Presentations Session I	Closing Ceremony Remarks Finalists Presentations iGEM from Above
9:30						
10:00			Break	Break	Break	
10:30			Presentations Session B	Presentations Session F	Presentations Session J	
11:00						
11:30			Break	Break	Break	Lunch
12:00						
12:30			Posters Sessions A & B	Posters Sessions E & F	Posters Sessions I & J	Keynote Speakers and Special Sessions
1:00						
1:30			Presentations Session C	Presentations Session G	Presentations Session K	
2:00						
2:30			Break	Break	Break	Break
3:00			Presentations Session D	Presentations Session H	Presentations Session L	Award Ceremony
3:30						
4:00	Registration	Audio / Visual Checks	Workshops	Workshops	Workshops	Award Pickup Travel time
4:30						
5:00			Posters Sessions C & D	Posters Sessions G & H	Posters Sessions K & L	Celebration Social
5:30						
6:00						
6:30						
7:00						
7:30						
8:00						
8:30			Instructor Social			
9:00						
9:30						
10:00 12:00						

Schedule












Thursday





















Room 207

Room 208

Room 302

















Room 304





















8:00 - 8:30	Opening Ceremony Auditorium			
8:30 - 9:00	Travel to rooms			
Session A	 New Application	 Diagnostics	 Environment	 Foundational Advance
9:00	NCHU Taichung	UiOslo Norway	HebrewU	Cornell
-	SDU-CHINA	BioIQS-Barcelona	NU Kazakhstan	Peking
10:30	Macquarie Australia	Tufts	IIT Kanpur	Washington
10:30 - 11:00	Break			
Session B	 Foundational Advance	 Manufacturing	 Therapeutics	 Environment
11:00	UMass Dartmouth	Linkoping Sweden	Ecuador	CO Mines
-	Tec-Monterrey	NUS Singapore-A	CSU CHINA	Hong Kong HKUST
12:30	SUSTech Shenzhen	UCL	Oxford	Stockholm
12:30 - 12:45	Break			
12:45 - 2:15	Posters Sessions A & B			
Session C	 Environment	 Foundational Advance	 High School	 Manufacturing
2:15	HBUT-China	ShanghaiTech	SHSID China	Jiangnan
-	Utrecht	Jilin China	SHSU China	Groningen
3:45	Dalhousie Halifax NS	Sorbonne U Paris	Saint Joseph	Stuttgart
3:45 - 4:15	Break			
Session D	 Therapeutics	 New Application	 Diagnostics	 Software
4:15	IISER-Kolkata	TU Delft	Athens	USTC-Software
-	EPFL	Uppsala	St Andrews	Tongji-Software
5:45	NTNU Trondheim	Montpellier		SYSU-Software
5:45 - 6:45	Engineering Challenge 1 Room 102	Human Practices in the Real World Room 103		Networking Bingo Room 210
6:45 - 8:15	Posters Sessions C & D			

Room 306	Room 309	Room 310	Room 311	Room 312
Opening Ceremony Auditorium				
Travel to rooms				
 Therapeutics Leiden TecMonterrey GDL Nottingham	 Manufacturing UCSC Lubbock TTU SSTi-SZGD	 Environment SKLMT-China WLC-Milwaukee NCTU Formosa	 Foundational Advance Fudan Thessaloniki NUDT CHINA	 Food and Nutrition WPI Worcester UofGuelph HSHL
Break				
 New Application BrockU ETH Zurich Hawaii	 Diagnostics JMU Wuerzburg UI Indonesia BIT	 Food and Nutrition WashU StLouis NEU China B UGA	 Energy UIUC Illinois UESTC-China HUST-China	 Environment ECUST IISER-Bhopal-India Auckland MOD
Break				
Posters Sessions A & B			High School Team Meet and Greet Room 203 1:00 PM - 2:00 PM	
 Foundational Advance NAU-CHINA Gifu Tianjin	 High School ASIJ Tokyo BioMarvel ColegioFDR Peru	 New Application Toronto ZJU-China McMaster	 Therapeutics AFCEM-Egypt Melbourne Aix-Marseille	 Open BostonU HW Rotterdam HR UCAS-China
Break				
 High School H14Z1 Hangzhou RMHS Maryland CCA-San Diego	 Environment Minnesota RHIT Exeter	 Foundational Advance McMasterA Kyoto USP-Brazil	 Environment GO Paris-Saclay TUST China BCU	 High School METU HS Ankara SFLS Shenzhen SHPH-Shanghai
GenSmart Plasmid Design Workshop Room 302		InterLab Study Room 304		Mentorship Workshop Room 306
SynBio Solutions Room 311				
Posters Sessions C & D				

Schedule

















Friday





















	Room 207	Room 208	Room 302	Room 304
Session E	 Food and Nutrition	 Foundational Advance	 Diagnostics	 High School
9:00	Tec-Chihuahua	Edinburgh UG	CMUQ	New York City
-	MichiganState	Michigan	ColumbiaNYC	Navarra BG
10:30	Botchan Lab Tokyo	Vilnius-Lithuania	Georgia State	HKJS S
10:30 - 11:00	Break			
Session F	 High School	 Environment	 Therapeutics	 Diagnostics
11:00	GZHS-United	Gaston Day School	Chalmers-Gothenburg	SJTU-BioX-Shanghai
-	HFLS ZhejiangUnited	WHU-China	Unesp Brazil	Bulgaria
12:30	Tacoma RAINmakers	ULaVerne Collab	XJTLU-CHINA	UC San Diego
12:30 - 12:45	Break			
12:45 - 2:15	Posters Sessions E & F			
Session G	 Open	 Therapeutics	 High School	 Foundational Advance
2:15	NTHU Taiwan	NEU China A	Austin LASA	FAU Erlangen
-	CUNY Kingsborough	USAFA	HK HCY LFC	Lethbridge
3:45	Madrid-OLM	HZAU-China	Lambert GA	Marburg
3:45 - 4:15	Break			
Session H	 Environment	 High School	 Foundational Advance	 New Application
4:15	Yale	Worldshaper-Wuhan	Tuebingen	TU-Eindhoven
-	BUCT-China	BNDS CHINA	FSU	Aalto-Helsinki
5:45	Bielefeld-CeBiTec	Rheda Bielefeld	BNU-China	Stanford
5:45 - 6:45	Engineering Challenge 2 Room 102	Synthetic biology and social justice Room 203	Biorisk Management I Room 204	
6:45 - 8:15	Posters Sessions G & H			

Room 306		Room 309		Room 310		Room 311		Room 312	
 Information Processing		 Therapeutics		 Foundational Advance		 Environment		 High School	
Pittsburgh William and Mary KAIT JAPAN		DLUT China BGU Israel UPF CRG Barcelona		BostonU McGill IIT-Madras		Hamburg Tartu TUIT Makerere University		BGIC-Global Hong Kong JSS East Chapel Hill	
Break									
 High School		 Environment		 New Application		 Foundational Advance		 Manufacturing	
OLS Canmore Canada Pittsburgh CSL SDSZ China		UChile Biotec UT-Knoxville Newcastle		NKU CHINA KUAS Korea XMU-China		Hong Kong HKU REC-CHENNAI OUC-China		USMA-West Point Duke British Columbia	
Break									
Posters Sessions E & F									
 Manufacturing		 Diagnostics		 High School		 New Application		 Environment	
SZU-China Edinburgh OG UConn		Bio Without Borders Purdue Hong Kong-CUHK		LACAS BioBots SUIS Shanghai Lethbridge HS		Pasteur Paris CCU Taiwan SCAU-China		SCUT-ChinaA NCKU Tainan ICT-Mumbai	
Break									
 Therapeutics		 High School		 Environment		 Manufacturing		 Food and Nutrition	
SYSU-CHINA Delgado-Ivy-Marin Paris Bettencourt		TAS Taipei SIAT-SCIE SHSBNU China		ZJUT-China NAWI Graz NWU-China		ULaval Munich USTC		UAlberta UFlorida Emory	
DNA Assembly and Synthesis at iGEM Room 302		Modeling Synthetic Biology Systems with MATLAB and SimBiology Room 304			What kinds of industry jobs could I get with my degree? Room 306		Peers and Public Room 312		
Posters Sessions G & H									

Schedule

Saturday

	Room 207	Room 208	Room 302	Room 304
Session I	 Manufacturing	 High School	 Therapeutics	 Information Processing
9:00	DTU-Denmark	SSHS-Shenzhen	SMMU-China	Tsinghua
-	Jiangnan China	SMS Shenzhen	NorthernBC-Canada	NEFU China
10:30	Virginia	iTesla-SoundBio	MIT	BOKU-Vienna
10:30 - 11:00	Break			
Session J	 Environment	 Foundational Advance	 High School	 New Application
11:00	Northwestern	SCU-China	US AFRL CarrolIHS	Valencia UPV
-	SCUT ChinaB	Rice	ASTWS-China	DLUT China B
12:30	USP-EEL-Brazil	Calgary	RDFZ-China	Waterloo
12:30 - 12:45	Break			
12:45 - 2:15	Posters Sessions I & J			
Session K	 Therapeutics	 Environment	 Energy	 High School
2:15	UCLouvain	Ruia-Mumbai	HUBU-Wuhan	SBS SH 112144
-	CU-Boulder	UNebraska-Lincoln	Nanjing-China	Baltimore BioCrew
3:45	CSU Fort Collins	AHUT China	Stony Brook	BJRS China
3:45 - 4:15	Break			
Session L	 High School	 Manufacturing	 Environment	 Diagnostics
4:15	DNHS SanDiego	Toulouse-INSa-UPS	FJNU-China	Tsinghua-A
-	TPHS San Diego	XJTU-China	UMaryland	Aachen
5:45	Mingdao	TU Darmstadt	Bordeaux	NYU Abu Dhabi
5:45 - 6:45	Let's build the next version of Human Practices at iGEM! Room 102	Software Tools for Synthetic Biology Workflows Room 103	Turning iGEM projects into real world products Room 110	Inclusion in Synthetic Biology Room 203
6:45 - 8:15	Posters Sessions K & L			
8:00 - 10:00	Instructor Social Third Floor			

Room 306		Room 309		Room 310		Room 311		Room 312	
 High School		 Environment		 New Application		 Foundational Advance		 Environment	
Nanjing NFLS HZNFHS China CDHSU-CHINA		VIT Vellore Cardiff Wales Bilkent-UNAMBG		UChicago TJU China Harvard		KCL UK Duesseldorf NPU-China		Warwick Goettingen Missouri Rolla	
Break									
 Manufacturing		 Diagnostics		 Therapeutics		 High School		 Foundational Advance	
Stanford-Brown-RISD UIOWA Lund		NTHU Formosa Grenoble-Alpes Queens Canada		Fudan-CHINA ACIBADEM ISTANBUL IISc-Bangalore		Worldshaper-XSHS NDC-HighRiverAB JNFLS		NUS Singapore-Sci Vilnius-Lithuania-OG Austin UTexas	
Break									
Posters Sessions I & J									
 Foundational Advance		 High School		 Environment		 Food and Nutrition		 New Application	
UNSW Australia Evry Paris-Saclay NTU-Singapore		BFSUICC-China GreatBay China GDSYZX		Claremont Westminster UK UC Davis		IISER-Mohali Manchester UST Beijing		Tokyo Tech NYMU-Taipei BIT-China	
Break									
 New Application		 Therapeutics		 Foundational Advance		 Software		 High School	
UCopenhagen CPU CHINA		LZU-CHINA TecCEM Tongji China		NJU-China Imperial College IIT Delhi		UESTC-Software SJTU-software		HAFS CIEI-BJ	
Biorisk Management II Room 204		Engineering biology Room 210			Ambassador Program Workshop Room 312		Safeguarding Science and the Future Ballroom B		
Posters Sessions K & L									
Instructor Social Third Floor									

WORKSHOPS

Thursday - Saturday

Title	Room	Time
Build a Landmark iGEM Measurement Committee	HQ Table*	9:00 AM - 8:15 PM
IDT Suite IDT	108, 109	9:00 AM - 8:15 PM

*The HQ Table is located outside Hall A on the Plaza Floor

Thursday

Title	Room	Time
High School Team Meet and Greet	203	1:00 PM - 2:00 PM
Engineering Challenge 1: Synthetic Biology Engineering Challenge	102	5:45 PM - 6:45 PM
Human Practices in the Real World: Careers Outside of the Laboratory iGEM Human Practices Committee	103	5:45 PM - 6:45 PM
Networking Bingo After iGEM	210	5:45 PM - 6:45 PM
GenSmart Plasmid Design Workshop GenScript and MolecularCloud	302	5:45 PM - 6:45 PM
InterLab Study iGEM Measurement Committee	304	5:45 PM - 6:45 PM
Mentorship Workshop After iGEM	306	5:45 PM - 6:45 PM
SynBio Solutions Agilent	311	5:45 PM - 6:45 PM

Friday

Title	Room	Time
Engineering Challenge 2: Synthetic Biology Engineering Challenge iGEM Measurement Committee	102	5:45 PM - 6:45 PM

Workshops

Synthetic biology and social justice: how we avoid a 'techbro' catastrophe iGEM Diversity Committee	203	5:45 PM - 6:45 PM
Biorisk Management I: Risk and Planning iGEM Safety and Security Committee	204	5:45 PM - 6:45 PM
DNA Assembly and Synthesis at iGEM	302	5:45 PM - 6:45 PM
Modeling Synthetic Biology Systems with MATLAB and SimBiology MathWorks	304	5:45 PM - 6:45 PM
What kinds of industry jobs could I get with my degree? Promega	306	5:45 PM - 6:45 PM
Peers and Public: Science Communication within and beyond the iGEM Competition After iGEM	312	5:45 PM - 6:45 PM

Saturday

Title	Room	Time
Career Fair	202	3:45 PM - 6:45 PM
Let's build the next version of Human Practices at iGEM! iGEM Human Practices Committee	102	5:45 PM - 6:45 PM
Software Tools for Synthetic Biology Workflows iGEM Measurement Committee	103	5:45 PM - 6:45 PM
Turning iGEM projects into real world products iGEM Safety and Security Committee	110	5:45 PM - 6:45 PM
Inclusion in Synthetic Biology iGEM Diversity Committee	203	5:45 PM - 6:45 PM
Biorisk Management II: Plan Implementation iGEM Safety and Security Committee	204	5:45 PM - 6:45 PM
Engineering biology: identifying principles and establishing guidelines for iGEM and beyond iGEM Engineering Committee	210	5:45 PM - 6:45 PM
Ambassador Program Workshop: A tiny-huge world After iGEM	304	5:45 PM - 6:45 PM
Safeguarding Science and the Future FBI	Ballroom B	5:45 PM - 6:45 PM

Thursday - Saturday

Build a Landmark

Thursday, Friday, and Saturday

HQ Table

9:00 AM - 8:15 PM

Hosted by iGEM

Looking for a hands-on activity to destress during the Jamboree? Stop by the iGEM HQ desk outside of Hall A and build a famous landmark from your country using marshmallows and toothpicks!

We'll keep the tasty landmarks on display until the end of each day near the HQ Desk.

IDT Suite

Thursday, Friday, and Saturday

Rooms 108 and 109

9:00 AM - 8:15 PM

Hosted by IDT

Need a break to relax and recharge from the Giant Jamboree activities? Join us at the IDT suite! We are excited to again support iGEM teams as you reshape the future of science.

Stop by the lounge to enjoy:

- Comfortable furniture
- Charging stations
- Refreshments and snacks served during breaks (while supplies last!)

Thursday

High School Team Meet and Greet

Thursday

Room 203

1:00 PM - 2:00 PM

Hosted by iGEM

High school team members and advisors, bring your lunches to this facilitated discussion. Join students from around the world to network and relax. Let's develop ideas to enrich the iGEM experience for the unique needs of high school teams. Bring your best ideas to share and any lab hacks that you've developed.

Meet your new best iGEM friends from around the world and make contacts for your next year's collaboration. High school iGEM let's be anabolic and build a better world.

Engineering Challenge 1: Synthetic Biology Engineering Challenge

Thursday

Room 102

5:45 PM - 6:45 PM

Hosted by iGEM

Can you be the hero the world needs? Design and build a synthetic biology solution to an unusual problem.

Come work with other iGEMers to use your creativity and syn bio engineering skills to solve a science fiction dilemma.

Best solution wins a prize!

Human Practices in the Real World: Careers Outside of the Laboratory

Thursday

Room 103

5:45 PM - 6:45 PM

Hosted by the iGEM Human Practices Committee

This workshop will bring together a panel of experts and practitioners of human practices to discuss how human practices is conducted in the real world. It will feature a range of professionals (policy makers, NGOs, academics, etc.) to show the breadth of opportunities that science careers can take outside of the laboratory. All which utilize the human practices components that teams were asked to consider during their projects.

Networking Bingo

Thursday

Room 210

5:45 PM - 6:45 PM

Hosted by After iGEM

Networking Bingo will return during the Friday evening workshop session! If you are looking for an opportunity to meet many fellow iGEMers, team advisors and industry affiliates, you should plan to attend this session.

Participants will be given Bingo sheets with questions about iGEM and it will be your mission to get answers for all of them from someone else in the room. You will need to find someone from another team that meets each requirement and get them to sign your sheet.

Prizes will be awarded!

GenSmart Plasmid Design Workshop

Thursday

Room 302

5:45 PM - 6:45 PM

Hosted by GenScript and MolecularCloud

Discover how easy plasmid design can be with the FREE GenSmart Design tool, now available from GenScript & MolecularCloud.org. Our team will take you through our simple drag & drop platform and demonstrate how simple it is to build a construct using GenSmart Design. Coupled with the Molecular Cloud plasmid repository platform, you can design, manage, and share your plasmids using one easy platform. Join us and learn how!

InterLab Study

Thursday

Room 304

5:45 PM - 6:45 PM

Hosted by the iGEM Measurement Committee

The iGEM interlab study is the largest scientific replication project in all of synthetic biology. It is intended to be both a significant collective scientific project and a fun educational experience. In this workshop, we will discuss the goals and implementation of this year's interlab study, with the aim of figuring out how to make it even better next year. We will also present the results from this year's interlab and compare them to the previous studies. This workshop invites all teams who participated in the interlab study, are interested in participating in the future, or who are interested in issues around scientific replication to come and share your thoughts!

Mentorship Workshop

Thursday

Room 306

5:45 PM - 6:45 PM

Hosted by After iGEM

Come learn about the iGEM Mentorship Program!

This year, we paired 15 mentors with 21 teams. They shared exciting accomplishments and meaningful experiences throughout the season. During the workshop, they will discuss their vision about the program. We will use their comments and your insights to expand and improve upon our program for iGEM 2019.

What teams would benefit more from applying to the program?

Who should mentor other teams?

What are the key points that a mentor should cover?

How can we improve the mentorship program overall?

We will start the session off with a short summary of what the program has accomplished, hear from those who participated this year and then host an open discussion of iGEM mentorship in general.

If you are looking to start or continue a new team, share iGEM mentorship ideas, and give back to the iGEM community, then we highly encourage you to attend!

SynBio Solutions

Thursday

Room 311

5:45 PM - 6:45 PM

Hosted by Agilent

Solve real world Synthetic Biology research challenges while exploring Agilent solutions for CRISPR, Genome Engineering, Protein Engineering, NextGen cloning, and more. Prizes for creative solutions, enthusiasm, and teamwork? Of course!

Friday

Engineering Challenge 2: Synthetic Biology Engineering Challenge

Friday

Room 102

5:45 PM - 6:45 PM

Hosted by the iGEM Measurement Committee

Can you be the hero the world needs?
Design and build a synthetic biology solution
to an unusual problem.

Come work with other iGEMers to use your
creativity and syn bio engineering skills to
solve a science fiction dilemma.

Best solution wins a prize!

Synthetic biology and social justice: how we avoid a 'techbro' catastrophe

Friday

Room 203

5:45 PM - 6:45 PM

Hosted by the iGEM Diversity Committee

It is arguable that the field of synthetic biology is
going all-in on a silicon valley model of operation
at just the time when society is concluding that
this model can result in dangerous attitudes
to public risk and workforce culture. To what
extent is this true? Come and debate at this
workshop.

Biorisk Management I: Risk and Planning

Friday

Room 204

5:45 PM - 6:45 PM

Hosted by the iGEM Safety and Security Committee

This workshop will introduce the standard
international approach to the identification
of hazards, the calculation of risk, and the
development of a risk management plan,
referencing the International Standards
Organisation's future Biorisk Management
Standard (ISO35001). It will further look at some
of the problems of doing such risk planning in
conditions of uncertainty, which is often the
case in basic research, and explain in some
detail what exactly 'Dual-Use Research of
Concern' means.

DNA Assembly and Synthesis at iGEM

Friday

Room 302

5:45 PM - 6:45 PM

Hosted by iGEM

Being able to easily and reliably assemble DNA
Parts into Devices is crucial in synthetic biology
and particularly for iGEM teams. Over the years,
teams have utilized numerous methods to
construct their Devices, from BioBricks assembly
to Gibson. Come join us for a discussion on
DNA assembly in iGEM and learn about how
iGEM is thinking about assembly for 2019
and beyond.

Modeling Synthetic Biology Systems with MATLAB and SimBiology

Friday

Room 304

5:45 PM - 6:45 PM

Hosted by Mathworks

Mathematical modelling guides rational design of genetic modifications and enables synthetic biologists to better analyze and predict system behavior prior to fabrication. Modeling is an important part of synthetic biology and the iGEM competition. This workshop will provide iGEM teams with an introduction to modeling, simulation, and analysis with MATLAB and SimBiology using an example from synthetic biology literature. This session will provide an opportunity to ask questions as well.

Highlights include:

- Using graphical environment to build models of biological systems
- Simulating dynamics using ordinary differential equation (ODE) solvers
- Interactively exploring model sensitivity to parameters
- Streamlining model exploration via parameter sweeps and sensitivity analyses
- Extending modeling environment by running custom analyses

What kinds of industry jobs could I get with my degree?

Friday

Room 306

5:45 PM - 6:45 PM

Hosted by Promega

Congratulations on completing your iGEM project! Throughout the competition, you've gotten a taste for what you like and dislike, and what you might want to do in the future. Did you love performing experiments, but hate sharing the data? Were you nearly inept in the lab but a champion of discussing the results? Or were you the one who organized things and kept the rest of the team on task? Your strengths and preferences are a great starting point when you look ahead and consider whether you should stay in academia or move into an industry job.

The knowledge and skills you've developed could open a lot of opportunities in industry and lead to a career you love. In this session, let's chat about what it's like to work in industry, the various jobs you can find and the skills needed to get hired for those jobs. Join a panel of Promega employees who all share a scientific background but work in a variety of different areas. You'll learn about their unique career paths and get your questions answered about careers in industry.

Peers and Public: Science Communication within and beyond the iGEM Competition

Friday

Room 312

5:45 PM - 6:45 PM

Hosted by After iGEM

Science Communication is a core component of the iGEM Competition. Teams conduct a diverse range of engagement activities during the iGEM Competition in order to inform different population segments about Synthetic Biology and their project. From print to digital media, from workshops to lectures, scientists are utilizing different mediums to ensure that the research being conducted within the confines of the lab does not remain confined to the lab, and reaches the public.

How do we make the scientific information understandable?

How do we instill emotion within our content?

And how do we ensure that the our content cultivates an appreciation for Science, rather than a fear of it?

Saturday

Career Fair

Saturday

Room 202

3:45 PM - 6:45 PM

Hosted by iGEM

As part of the iGEM 2018 Giant Jamboree weekend, iGEM is hosting a career fair event on Saturday, October 27 to foster relationships within the synthetic biology community. This unique opportunity offers top employers a chance to meet with iGEM participants and discuss career opportunities. Be sure to bring plenty of copies of your resume or CV.

Exhibitors:

- FBI
- Ginkgo Bioworks
- GenScript
- Promega
- University of Edinburgh

Let's build the next version of Human Practices at iGEM!

Saturday

Room 102

5:45 PM - 6:45 PM

Hosted by the iGEM Human Practices Committee

Share your HP experiences and help make HP better at iGEM!

In this special session, the Human Practices committee invites you to share your adventures, successes, failures and ideas, and build these into recommendations for how to improve Human Practices within the iGEM competition. The session will also include a sneak peak of proposed changes for next year.

Check the Human Practices Hub for details (http://2018.igem.org/Human_Practices).

Software Tools for Synthetic Biology Workflows

Saturday

Room 103

5:45 PM - 6:45 PM

Hosted by the iGEM Measurement Committee

Learn about recent developments in software tools and how they can be used to address common challenges in synthetic biology! We will start with a short introduction to SynBioHub, SBOLDesigner, and other tools. We'll then give a fun engineering problem to work on using the tools and in teams with fellow iGEMers. Best solution wins a prize!

Participants are strongly encouraged to bring a laptop with network access.

Turning iGEM projects into real world products

Saturday

Room 110

5:45 PM - 6:45 PM

Hosted by the iGEM Safety and Security Committee

What does it take to make a marketable product? What aspects 'beyond the lab' are relevant? In this workshop you will play the 'Safe-by-Design Serious Game', which challenges you to develop a market-ready product that is safe by its design. You will experience what kind of issues you will face and need to address in order to establish a marketable product, thereby deepening and broadening the understanding of your innovation's context. After this game you are one step closer to marketing your iGEM product!

Inclusion in Synthetic Biology

Saturday

Room 203

5:45 PM - 6:45 PM

Hosted by the iGEM Diversity Committee

This workshop will tackle issues and solutions for inclusion within iGEM as well as the larger scientific community, with a focus on inclusion of women, LGBTQ+, and diverse ethnicities and religions. The session will kick off with lightning talks about inclusion within the iGEM community. We will then break into small groups to brainstorm for solutions to issues of inclusion, followed by a joint discussion of the ideas from each group.

Biorisk Management II: Plan Implementation

Saturday

Room 204

5:45 PM - 6:45 PM

Hosted by the iGEM Safety and Security Committee

Even when we have an ostensibly clear plan, people know the plan and everyone has received the requisite technical training on how to implement it, frequently the plan fails because of 'human error'. This course addresses why people do what they do, how systems all have competing priorities which result in trade-offs, and what both mean for how you go about implementing your biorisk management plan.

Engineering biology: identifying principles and establishing guidelines for iGEM and beyond

Saturday

Room 210

5:45 PM - 6:45 PM

Hosted by the iGEM Engineering Committee

Contribute your thoughts and experience about how biology can be engineered, and what the future of engineering biology could look like, within and beyond iGEM!

Engineering has always been at the heart of synthetic biology and iGEM, but what engineering biology means hasn't been clearly articulated to teams. We're looking to get a wide range of views about how biology can be engineered, identify commonalities to refine guidance for future teams and judges. What principles form the core power of an engineering mentality and how do we apply them to biology?

This will be a fully interactive workshop with a chance for everyone to contribute in smaller teams, and then feed back to the wider group. It will be a mix of everyone who is interested: students, supervisors, judges, guests - from newcomers to the field to those who have been shaping it from the start. All are welcome!

Ambassador Program Workshop : A tiny-huge world

Saturday

Room 312

5:45 PM - 6:45 PM

Hosted by After iGEM

From the mesmerizing Lake Saif ul Malook to the bustling streets of Ottawa in the blink of an eye. From majestic elephants roaming in the Mole National Park to magnificent mouflons bleating in Cyprus in a heartbeat. Smørrebrød for breakfast, Kung Pao Chicken for lunch and Tacos for dinner. All over the world, the iGEM Ambassadors are a team working together to support, expand and inspire the iGEM Community. Regional leaders connecting local dreamers (you!) to solve local problems.

Would you like to learn more about their exciting progress across the seven seas?

Are you interested in joining After iGEM and addressing your fellow iGEMers in your region as an iGEM Ambassador?

Join the conversation at this Ambassadors workshop, and share your astonishing ideas for improving After iGEM all over the world.

Safeguarding Science and the Future

Saturday

Ballroom B

5:45 PM - 6:45 PM

Hosted by the FBI

Meet with the FBI and participate in a discussion on the shared responsibility to protect the life sciences as a member of law enforcement or the synthetic biology community (whether you're an iGEM'er, scientist, biohacker, investor, business person, or all of the above). Find out what it means to be a guardian of science.

HANDBOOK

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Anti-harassment Policy

The iGEM Foundation strictly prohibits harassment of any kind, including but not limited to verbal, physical, and sexual harassment, and will take appropriate and immediate action in response to complaints or knowledge of violations of this policy. This action may include, but is not limited to, the offender's immediate ejection from the premises and disqualification of their team from the competition.

For purposes of this policy, harassment is any verbal or physical conduct intended to threaten, intimidate, or coerce another individual. Harassment can be verbal or nonverbal, and includes offensive comments, distribution, display, or discussion of offensive material.

To report an incident, please visit the iGEM Headquarters Table outside of Hall A on the plaza level or the Information Desk on the third floor. See the maps for the location.

Accessibility

The Hynes Convention Center is fully wheelchair accessible. A limited number of wheelchairs are available free-of-charge through the First Aid Office on the Plaza Level (see map), and there are elevators on both ends of the building near the escalators.

Please contact iGEM Headquarters for assistance with other accessibility requests, or locate a volunteer in a light blue sweatshirt for assistance.

Appreciation Station

Even though iGEM is a team activity, there are a lot of people around the team who may have contributed one way or another to your team's success. Perhaps it's a friend or loved one who supported you, a mentor or advisor going above and beyond to help, or your team instructors giving significant research time to ensure your success.

To help you show your appreciation, we will be providing "Thank You" postcards to send or take back home. Stop by the Appreciation Station at the HQ Table outside of Hall A.

Audio/Visual Check for Team Presentations

Teams will be given the opportunity for a five-minute Audio/Visual (AV) check to test the connections between their computer and the room projection system. AV checks will be scheduled on a first come-first served basis between 4:00 PM and 8:00 PM on Wednesday October 24, at the Hynes Convention Center. Each team will only be given five minutes to test AV.

AV checks will be scheduled in the following rooms: 207, 208, 302, 304, 306, 309, 310, 311, and 312.

Please come prepared with your laptop and cables/adaptors to ensure you make the most of your allotted time. There will be technical staff in the rooms to help with technical difficulties.

Remember, this is a quick check. Many other teams will be conducting AV checks as well, so be sure to leave your room on time, and also please leave your room in the condition that you found it!

Award Representatives

The number of Jamboree attendees increases every year. To ensure a smooth program, each team is asked to choose two student team members to serve as Award Representatives. Award Representatives are the only team members permitted on stage to accept award trophies during the Award Ceremony. They are also the only team members allowed to enter the pick up area after the Award Ceremony to collect any materials for their team (certificates, medals, trophy boxes, and banners).

Award Representatives will be identified by a yellow wristband that will be provided inside their Team Leader's registration packet. Award Representatives must wear their wristbands to the Sunday events and inside the pick up area for team materials. Entry to these areas is not allowed without the wristband.

There will be a designated seating area on the main floor of the Auditorium for Award Representatives during the events on Sunday. The remaining seats on the main floor and third floor balcony are open to all attendees as general seating.

Awards and Medals

Awards and medals will be announced at the Award Ceremony on Sunday October 28. Each team that wins an award will receive one corresponding trophy for the team as well as an award certificate for each team member on the roster. Award certificates are different from the participation certificates that are provided to all teams in the Team Leader packet. Awards and medals are awarded at the judges' discretion at the Giant Jamboree.

After the Award Ceremony, medals, award certificates, and trophy boxes (to safely transport crystal trophies) will be distributed from the registration area of the second floor Boylston Hallway. Only Award Representatives with a yellow wristband are permitted to collect materials on their team's behalf. Team banners can also be picked up in this area.

Award Representatives should note that there are two separate pick-up points on the second floor as follows (Look for directional signs):

- 1) For teams that have not received a trophy: go to the medal pickup area. (Your team banner will also be here)
- 2) For teams with trophies: go to the trophy pickup area. All team-related materials will be here.

All materials will be filed under the official team name as it appears in the program. If your team is not a medal or award recipient and did not submit a team banner, you do not need to report to a pick-up area.

Badges

You will receive your name badge as part of your registration materials. Please wear your badge at all times during the Jamboree and make sure it is clearly visible.

Badges will be necessary for entrance into presentation rooms, for access to refreshments, and for iGEM social events. If you do not have a badge, you must register in order to obtain one. Badges may not be shared or transferred.

Everyone needs to officially register to attend.

Business Center and Printing Services

Forget to print your poster? Need copies of your CV or resume for the Career Fair?

There are two FedEx stores located near the event - one is on the second floor of the Sheraton Boston Hotel and the other is in the Hynes Convention Center on the first floor. Call for details and pricing, or stop by one of the stores:

Sheraton Hotel Location

39 Dalton Street
Boston, MA 02199
+ 1 - 617 - 587 - 5444

Open Hours:

Wednesday - Friday: 7 AM - 7 PM
Saturday: 8 AM - 5 PM

Hynes Convention Center Location

900 Boylston Street
Boston, MA 02215
+1 - 617 - 954 - 2725

Open Hours:

Wednesday - Friday: 9 AM - 5 PM
Saturday: Closed

For 24/7 service, visit the FedEx store in Copley Square, approximately a 10 minute walk away.

187 Dartmouth Street
Boston, MA 02115
+ 1 - 617 - 262 - 6188

Childcare

Childcare will be provided at the Giant Jamboree by Care.com and is available by advanced registration only.

Childcare providers will all be fully trained in all aspects of childcare including CPR, and health and safety. Security of the children will be ensured, and parents/guardians can come and go with their children as often as they need during the event day. Toys and a full agenda of age-appropriate activities will be provided.

Concessions

A concession stand will be open in Hall B if you wish to purchase snacks or beverages during the Giant Jamboree. Each attendee will receive a \$5 coupon at Registration, and this can be used at the concession stand. The stand will be open on Thursday, Friday, and Saturday from 9:30 AM to 6:30 PM. Please see the "Meals" section for information regarding meals provided at the Jamboree.

Closing Ceremony, Keynote Session, and Award Ceremony

Sunday

Auditorium

9:00 AM - 6:00 PM

The Sunday events will celebrate the hard work of all iGEM teams. After the kickoff message, six finalists will be announced, and they will be invited to deliver their presentations. The first round of presentations will be followed by the traditional iGEM from Above photograph. After the second round of presentations, we will take a break for lunch in Halls A and B. Teams should remove their posters from the Halls by the end of lunch.

The afternoon program will begin with a keynote session and end with the Award Ceremony, during which awards and medal results will be announced.

Immediately following the Award Ceremony, the designated Award Representatives from each team are asked to report to the second floor of the Boylston Hallway if there are any team materials to be collected (see **Awards and Medals** section). Because of space constraints, only Award Representatives wearing yellow wristbands will be allowed in the pick-up area. All materials will be filed under the official team name as it appears in the program. Other team members are asked to stay out of the second floor Boylston Hallway to ease the distribution process and allow safe egress for departing teams.

Contact Information

If you need to get in touch with anyone at iGEM Headquarters (HQ) for an urgent matter, you may contact:

Meagan Lizarazo
+1 - 617 - 949 - 6421

Kitwa Ng
+1 - 646 - 250 - 1012

Emergency Information -

Hynes Convention Center

If there is an emergency (medical emergency, police, etc.) please contact the Hynes Convention Command Center by dialing:

+1 - 617 - 954 - 2111 [from a cell phone]
or
2111 [from a house phone]

This telephone number is a direct line to the Hynes Public Safety Department's Command Center, which is the emergency communications center for the Hynes Convention Center. All house phones located within all meeting rooms and entrances to the exhibit halls are labeled with this number.

When reporting an emergency, please give the following information:

- The location
- The nature of the emergency
- Number of persons involved
- Nature and extent of injuries, if any
- Any other pertinent information that may be helpful for responding emergency crews

PLEASE DO NOT contact Emergency Service providers by dialing 911 from cellular telephones. This action could significantly delay the response network within the Hynes and is a significant detriment to the safe and efficient response of emergency service providers.

Please ALWAYS call the Public Safety Command Center at: **+1 617 954 2111** to report all emergency situations while inside the Hynes.

When you may safely do so, please notify iGEM HQ of the emergency by visiting the iGEM Headquarters Table outside of Hall A.

Emergency Information -

Boston

If you are **outside** of the Hynes Convention Center, dial 911 for police, medical, or fire emergencies.

Electrical Power

Power outlets are available in multiple locations within the Hynes Convention Center to allow you to charge your devices. Every presentation room has a power strip with multiple sockets in the back of the presentation room, as well as outlets at various locations along the walls.

Please note: USA power outlets supply electricity between 110 and 120 volts. This is compatible with most modern devices, such as laptops and cellphones, but we recommend that you confirm the acceptable range for your device before plugging it in. If you need an adapter, these are available for purchase at the Walgreens convenience store at 841 Boylston Street, across the street from the Hynes Convention Center.

Event App

Be sure to download the Giant Jamboree event app! It includes all the information found in the program booklet, such as schedules, maps, and presentation descriptions, as well as any last minute additions. The app allows users to create a customized schedule and share photos. You can also link it to your Twitter account.

iOS and Android users:

- Download the **Guidebook app** from iTunes or the Play Store
- Type “Giant Jamboree” in the search box
- Click on “Get this Guide”
- The guide will download on your phone and can be used offline

Tablet and other devices:

- Go to **guidebook.com/browse/** on your browser
- Type “Giant Jamboree” in the search box
- Click on “Get this Guide”
- The guide will download on your device and can be used offline

Exhibition Space

Make sure to stop by the exhibition space in Zone 6 located in Hall B where teams will be showcasing their work! The exhibition space will be open throughout the Giant Jamboree.

First Aid

There is an EMT on staff for the entire event. At the First Aid Office on the 1st floor of the Hynes Convention Center. If needed, ask at the Customer Service desk or talk to a volunteer in a light blue sweatshirt.

Follow us on Social Media!

We'll be posting news, updates, and answering questions on Twitter, Facebook, and Instagram:

#iGEM2018
#GiantJamboree

Twitter: @iGEM
Facebook: @iGEMFoundation
Instagram: @igem_hq

General Release Form

The iGEM 2018 Giant Jamboree will be a multimedia event. We will be uploading photos and videos from the entire event so others can see what iGEM and the Jamboree are like. In order to comply with the law, all participants attending the Giant Jamboree must agree to the terms of the general release form on the registration website. If you choose not to sign the release form, you will be responsible for staying out of event photos and videos.

Note: If you did not agree to the terms of the general release form on your online registration and would now like to agree, blank copies will be available in the registration area on the second floor Boylston Hallway. If you have any questions or need further clarification, feel free to ask an iGEM staff member or volunteer in a light blue sweatshirt.

Graffiti Kiosks

Teams can express their artistic sides through the iGEM graffiti kiosks! Boards are in Hall A and Hall B. Please return the markers to the holder at each kiosk so that other teams can use them after you. ***Remember to be respectful of all teams in your work.***

Hubs

Hall A and Hall B are the Hubs of the Giant Jamboree. Hubs are the main activity area in the Hynes Convention Center and will have the following:

- Team posters
- Exhibition space
- Food stations
- Exhibitor booths
- Seating
- iGEM timeline
- Graffiti kiosks

IDT Suite

Need a break to relax and recharge from the Giant Jamboree activities? Join us at the IDT suite! We are excited to again support iGEM teams as you reshape the future of science.

Stop by the lounge to enjoy:

- Comfortable furniture
- Charging stations
- Refreshments and snacks served during breaks (while supplies last!)

Stop by Thursday, Friday, and Saturday and check it out! The IDT Suite is in rooms 108 and 109 across from Hall A.

iGEM HQ Table & Information Desk

Want to know which room a presentation will be in? Have questions about the special events? If you have a question or need help at any point during the Jamboree, you can visit the iGEM Headquarters Table outside of Hall A on the plaza level or the Information Desk on the third floor. See the maps for detailed locations.

iGEMers' Prize

Vote for your favorite iGEM team! This year we are continuing the tradition of the iGEMers' Prize. One ballot will be provided to the Team Leader of each team at registration. Completed ballots can be dropped off at the iGEM HQ Table outside of Hall A. Be on the lookout for your prize ballot and be sure to vote by Saturday night at 8:15 PM, at the end of the Poster Session.

Questions?

Ask a volunteer in a light blue sweatshirt.

Internet

Wireless internet is provided by the Hynes Convention Center.

To join the Hynes Wireless Network:

- Go to "settings" on your mobile device
- Select the Wi-Fi option
- Select "Hynes Wireless Network" - no password is required

Meals and Snacks

A light lunch is provided on Thursday, Friday, Saturday, and Sunday in Halls A and B. Light refreshments including snacks and beverages are provided in the Hubs during the poster sessions on Thursday, Friday, and Saturday. Refreshments will also be provided at the social event at Jillian's Boston on Sunday evening.

Dietary Restrictions

If you indicated a dietary restriction (gluten-free, Kosher/Halal) on your registration, please do not take lunch from the general buffet selections. Your lunch will be available at the dietary restriction table in Hall B. Lunch tickets indicating your restriction are included with your badge and should be exchanged for your lunch. Vegetarian options will be available at all buffet stations.

To plan ahead, below are the daily options available on the buffet stations. Only one lunch per person, please.

Thursday October 25

• **Hot and Sour Soup** **vegetarian**

Mushrooms, bean threads, rice noodles and shaved green onions in spiced broth

• **Vegetable Spring Rolls** **vegetarian**

Soy dipping sauce

• **Udon Dragon Noodle Salad** **vegetarian**

Thai vinaigrette

• **Asian Pear Salad** **vegan**

Curly endive, shaved spinach and radicchio with rice wine vinaigrette topped with sliced pears

• **Chicken and Snow Peas**

Curly endive, shaved spinach and radicchio

- **Wok-seared Hoisin Beef and Asparagus**
Chili and Jasmine rice

- **Gingered Tropical Fruit Shortcake**
vegetarian

Mango, melon and kiwi in coconut syrup with angel food cake

Friday October 26

- **Macaroni and Cheese selection**
Buffalo Chicken with Jack and Blue Cheese
Classic Macaroni and Cheese **vegetarian**

- **Baby Arugula salad** **vegan**
Baby arugula with fennel and Meyer lemon vinaigrette

Saturday October 27

- **Ramen Noodle Bar (self-serve)**
Selection of broths (Mole, Shanghai Soy Pork, and Thai Vegan)

Selection of vegetables **vegetarian** (snap peas, sliced carrot, shaved celery, Thai basil, sliced jalapenos, shiitake mushrooms)

Selection of sauces (sweet soy sauce, Sriracha, sweet chili, chili garlic)

- **Ramen noodles** **vegetarian**

- **Ramen chicken**

- **Almond cookie** **vegetarian**

- **Vegetable Cobb salad** **vegan**
Grilled yellow squash, bell peppers, asparagus, eggplant, charred corn, white beans and red wine vinaigrette

Sunday October 28

- **Individual Lunches**

(each includes whole fruit, a bag of potato chips, and a cookie)

- **Chipotle Turkey and Avocado on Ciabatta** (guacamole, pepper-jack cheese, roasted tomatoes, arugula, chipotle mayo and turkey)

- **Corned Beef on Rye** (Swiss cheese and Louie dressing)

- **Fire-roasted Vegetable Wrap** **vegan**
(sun-dried tomato hummus, wilted spinach, and red wine vinaigrette in a spinach wrap)

- **Greek Salad** **vegetarian** (Romaine lettuce, vine-ripened tomatoes, feta cheese, pepperoncini, red onions, kalamata olives, and Greek dressing)

Lactation Room for Nursing Mothers

We are offering a private lactation room for nursing mothers in Room 201 at the following times:

Wednesday	4:00 PM - 8:00 PM
Thursday	7:30 AM - 8:00 PM
Friday and Saturday	9:00 AM - 8:00 PM
Sunday	8:30 AM - 6:00 PM

The room will have plenty of seating and electrical power (120 V, 60 Hz), as well as a refrigerator for use. A key for the room will be available at the Customer Service booth on the second floor Boylston Hallway during registration hours. After registration hours, please pick up a key from the iGEM HQ Table. When you are finished using the room, please lock the door and return the key.

Participation Certificates

Every approved team member listed on the official team roster will receive a participation certificate. These certificates will be provided to the Team Leader in the registration packet they receive at check in. It is the Team Leader's responsibility to distribute the certificates to team members.

Poster Sessions

Each team is required to present a poster at the Giant Jamboree to judges and Jamboree attendees. Poster locations have been randomly assigned between the poster areas. Please see the poster information pages in the program booklet for your team's specific poster location. Remember that the poster must not be larger than 1.219m x 1.219m (4ft x 4ft). Each team may only put up ONE poster. All teams should set up their posters on Thursday morning by 11:00 AM.

Each team is assigned to present their poster at ONE of the six poster sessions. Your team must be present during your assigned time. Teams presenting in the first and second presentation sessions (9:00 AM-10:30 AM, 11:00 AM-12:30 PM) will present their poster in the first poster session of that day (12:45 PM-2:15 PM). Teams presenting in the third and fourth presentation sessions (2:15 PM-3:45 PM, 4:15 PM-5:45 PM) will present their poster in the second poster session of that day (6:45 PM-8:15 PM).

See the schedule to the right.

All teams must remove their posters by Sunday afternoon at 1:30 PM. Any remaining posters will not be saved.

Note: Teams are not allowed to move any furniture, including tables and chairs, to their poster location. Power is not available for use at your poster location. Please only use designated areas to charge your devices. For safety reasons, no extension cords are allowed within the Hubs or presentation rooms, nor are power cords allowed to be positioned across walkways or in any manner which creates a safety hazard.

	Thursday October 25	Friday October 26	Saturday October 27
9:00	Presentations Session A	Presentations Session E	Presentations Session I
9:30			
10:00	Break	Break	Break
10:30			
11:00	Presentations Session B	Presentations Session F	Presentations Session J
11:30			
12:00	Break	Break	Break
12:30			
1:00	Posters Sessions A & B	Posters Sessions E & F	Posters Sessions I & J
1:30			
2:00	Presentations Session C	Presentations Session G	Presentations Session K
2:30			
3:00	Break	Break	Break
3:30			
4:00	Presentations Session D	Presentations Session H	Presentations Session L
4:30			
5:00	Workshops	Workshops	Workshops
5:30			
6:00	Posters Sessions C & D	Posters Sessions G & H	Posters Sessions K & L
6:30			
7:00			
7:30			
8:00			
8:30			

Prayer / Quiet Room

Room 308 will be set aside as a prayer / quiet room during the Giant Jamboree. Small tables and open floor space will be available in this room for our attendees to use for prayer. Please be respectful of others and keep conversation and other sounds to a minimum when you are in this room.

Presentations

At the Giant Jamboree, there will be nine presentation rooms throughout the Hynes Convention Center. Your team's scheduled presentation session, time slot, and room have all been randomly assigned. Please see the schedule for information on when and where your team will be presenting.

Presentations will take place on Thursday, Friday, and Saturday. The schedule for presentations is divided into sessions based on track. Each team has 20 minutes of presentation time, 5 minutes for questions and answers, and 5 minutes to switch with the next presenters. Judges will be monitoring time and will give warnings at the 2- and 1-minute remaining mark.

Note: Please be sure to bring the necessary equipment for your presentation, such as your laptop, cables/adaptors, and power supply, as iGEM will not provide these.

If you are attending a presentation, please be courteous—stay for the whole session, and only leave the room during the scheduled breaks.

Registration

Registration will be located on the second floor Boylston Hallway during the hours below. See map for details.

Wednesday	4:00 PM - 8:00 PM
Thursday	7:30 AM - 8:00 PM
Friday	8:30 AM - 6:00 PM
Saturday	8:30 AM - 6:00 PM
Sunday	8:30 AM - 6:00 PM

Pre-registered attendees must pick up their materials in the registration area. Registration check-in is on an individual basis and your materials will be filed by the last name (family name) on your registration record.

If you have a balance due on your registration, your materials will be held at the Customer Service/Unpaid booth.

Social Events

After a full weekend of presentations and workshops, there are social events on Saturday and Sunday evenings so attendees can relax!

Instructor Social

Saturday

Hynes Convention Center - Third Floor
8:00 PM - 10:00 PM

An instructor social event will take place on Saturday evening on the third floor of the Hynes Convention Center. Hors d'oeuvres will be served and each instructor will receive two free drink tickets.

Celebration Social Event

Sunday

Jillian's Boston (145 Ipswich St Boston, MA 02215)

7:00 PM - 12:00 AM

This event is open to all of our attendees!

Jillian's Boston is an entertainment venue in Boston that has a dance floor, arcade games, pool tables, bowling lanes, and lounge areas. With so many options to choose from, there is something for everyone. Beverage and snack refreshments will be provided. You will need your iGEM badge.

A cash bar will be available on the third floor for attendees (21+) who wish to order alcoholic beverages. Attendees under the age of 21 cannot order alcoholic drinks, and cannot have another person order for them. You will need to be 21+ in order to access the third floor, and alcoholic drinks cannot be transported from the third floor. The second floor will only serve soft drinks and water.

Please note: the legal drinking age in the United States is 21. Attendees interested in ordering alcoholic beverages will need to bring a passport (international or U.S.) or a driver's license (U.S. only) to be able to order an alcoholic drink.

Shuttle buses will run from the Boylston Street entrance of the Hynes Convention Center to Jillian's between 6:45 PM and 12:00 AM.

Jillian's is approximately a 15-minute walk (0.7 miles) from the Hynes Convention Center. From the entrance of the Hynes, turn left onto Boylston Street and turn right onto Ipswich Street. It is also a 15-minute trip by MBTA subway. From Hynes Station on the Green Line, take the B-Line, C-Line, or D-Line trolley outbound to Kenmore Station. Jillian's is approximately a 5-minute walk from Kenmore Station. For trip planning information, visit <http://www.mbt.com/>

T-Shirts

Remember to collect your free iGEM T-Shirt after you register! T-shirts can be picked up outside of Room 206 during registration hours (Wednesday through Sunday while supplies last!).

Team Banners

If your team submitted a banner for print and display, you can take it home after the event. Please have your Awards Representative pick up your banner at the Registration area (Second floor Boylston Hallway) after the Closing Ceremony.

Team Leader

Each team will have a designated Team Leader, who will be responsible for picking up the Team Leader Packet. This packet will include the team certificates of participation, the ballot for the iGEMer's prize, and two bracelets for the team member who will serve as Award Representatives during the Sunday events. The default Team Leader will be the Primary PI. If the Primary PI cannot attend, we will contact another team member to be the Team Leader prior to the Giant Jamboree. If you do not know who your designated Team Leader is, please check the list at the Customer Service/Unpaid Booth or New Badge Pickup Booth. Note that the team leader is not necessarily the same as your team's student leader.

Transportation

Transportation to the Sunday social event will be provided from the Hynes Convention Center. For details, please see the Social Events section of the handbook.

The city of Boston and the surrounding suburbs have a public transportation system that is comprised of buses and subways. It is a convenient and inexpensive way to travel around the city. There are one-way fare options and day passes are available. Boston is also rather small and is an easy city to walk around.

You can find more information about the MBTA at <http://www.mbtta.com/>.

The Giant Jamboree will be held at the Hynes Convention Center, located at the Hynes Convention Center subway station on the MBTA Green Line. It is accessible via the B, C, and D branches of the Green Line.

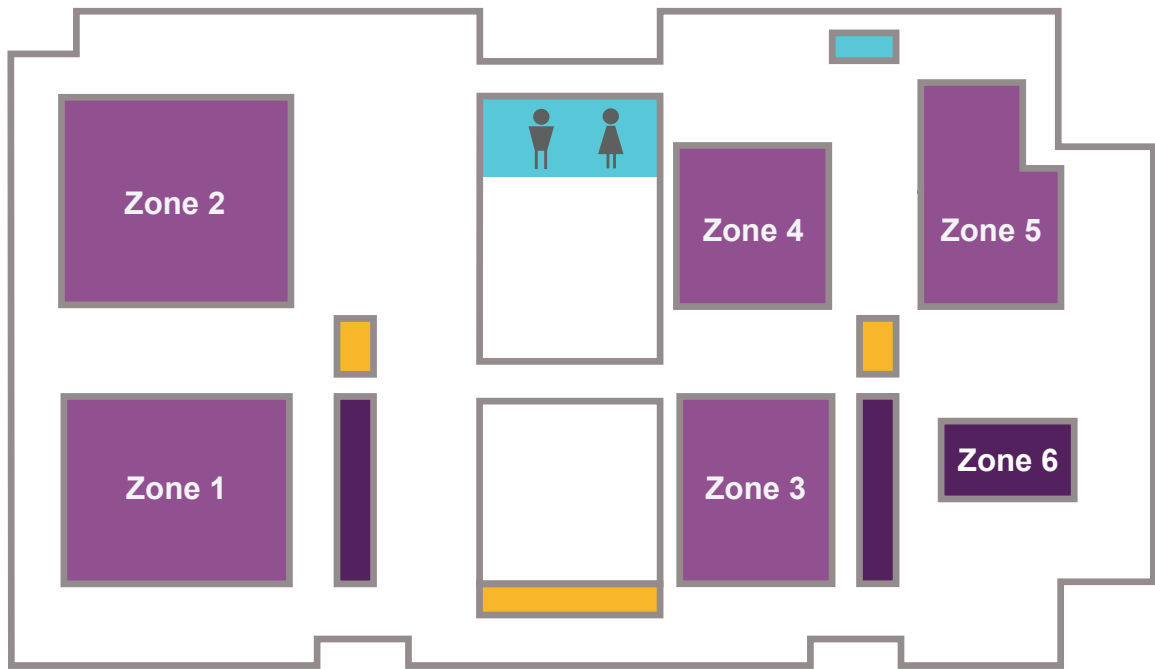
Volunteers











Have questions throughout the event? Look for help from an iGEM volunteer in the light blue sweatshirts.

Water Bottles and Stations

At registration, every attendee will be provided with a reusable iGEM water bottle. Be sure to remove the instruction slip and carabiner ring inside, and rinse the bottle before use. You can refill your water bottle at multiple water stations within the Hynes Convention Center. Each presentation room has a water station in the back of the room, and water stations can also be found outside of the bathrooms, which are near the escalators on both sides of the building. See the maps for details.

POSTERS



- | | | | |
|---|------------------------------------|---|--|
|  | Zone 1
Posters 1 - 88 |  | Lunches
Dietary Restrictions |
|  | Zone 2
Posters 89 - 168 |  | iGEM Timeline |
|  | Zone 3
Posters 169 - 212 |  | Graffiti Kiosk |
|  | Zone 4
Posters 213 - 260 | | |
|  | Zone 5
Posters 261 - 320 | | |
|  | Zone 6
Exhibition Space | | |
|  | Exhibitors | | |

Name	Zone	Number	Session	Day	Time
Aachen	5	302	K & L	Saturday	6:45 PM - 8:15 PM
Aalto-Helsinki	4	229	G & H	Friday	6:45 PM - 8:15 PM
ACIBADEM ISTANBUL	5	305	I & J	Saturday	12:45 PM - 2:15 PM
AFCM-Egypt	2	153	C & D	Thursday	6:45 PM - 8:15 PM
AHUT China	2	99	K & L	Saturday	6:45 PM - 8:15 PM
Aix-Marseille	2	128	C & D	Thursday	6:45 PM - 8:15 PM
ASIJ Tokyo	5	287	C & D	Thursday	6:45 PM - 8:15 PM
ASTWS-China	2	152	I & J	Saturday	12:45 PM - 2:15 PM
Athens	3	178	C & D	Thursday	6:45 PM - 8:15 PM
Auckland MOD	5	316	A & B	Thursday	12:45 PM - 2:15 PM
Austin LASA	5	317	G & H	Friday	6:45 PM - 8:15 PM
Austin UTexas	1	69	I & J	Saturday	12:45 PM - 2:15 PM
Baltimore BioCrew	4	237	K & L	Saturday	6:45 PM - 8:15 PM
BCU	2	141	C & D	Thursday	6:45 PM - 8:15 PM
BFSUICC-China	2	95	K & L	Saturday	6:45 PM - 8:15 PM
BGIC-Global	3	210	E & F	Friday	12:45 PM - 2:15 PM
BGU Israel	4	250	E & F	Friday	12:45 PM - 2:15 PM
Bielefeld-CeBiTec	2	164	G & H	Friday	6:45 PM - 8:15 PM
Bilkent-UNAMBG	3	173	I & J	Saturday	12:45 PM - 2:15 PM
Bio Without Borders	1	62	G & H	Friday	6:45 PM - 8:15 PM
BioIQS-Barcelona	2	106	A & B	Thursday	12:45 PM - 2:15 PM
BioMarvel	1	64	C & D	Thursday	6:45 PM - 8:15 PM
BIT	5	271	A & B	Thursday	12:45 PM - 2:15 PM
BIT-China	4	235	K & L	Saturday	6:45 PM - 8:15 PM
BJRS China	4	249	K & L	Saturday	6:45 PM - 8:15 PM
BNDS CHINA	2	147	G & H	Friday	6:45 PM - 8:15 PM
BNU-China	3	208	G & H	Friday	6:45 PM - 8:15 PM
BOKU-Vienna	4	260	I & J	Saturday	12:45 PM - 2:15 PM
Bordeaux	5	277	K & L	Saturday	6:45 PM - 8:15 PM
BostonU	2	160	E & F	Friday	12:45 PM - 2:15 PM

Name	Zone	Number	Session	Day	Time
BostonU HW	3	195	C & D	Thursday	6:45 PM - 8:15 PM
Botchan Lab Tokyo	1	27	E & F	Friday	12:45 PM - 2:15 PM
British Columbia	2	121	E & F	Friday	12:45 PM - 2:15 PM
BrockU	2	89	A & B	Thursday	12:45 PM - 2:15 PM
BUCT-China	4	253	G & H	Friday	6:45 PM - 8:15 PM
Bulgaria	5	286	E & F	Friday	12:45 PM - 2:15 PM
Calgary	1	14	I & J	Saturday	12:45 PM - 2:15 PM
Cardiff Wales	2	97	I & J	Saturday	12:45 PM - 2:15 PM
CCA-San Diego	2	131	C & D	Thursday	6:45 PM - 8:15 PM
CCU Taiwan	1	45	G & H	Friday	6:45 PM - 8:15 PM
CDHSU-CHINA	1	78	I & J	Saturday	12:45 PM - 2:15 PM
Chalmers-Gothenburg	1	49	E & F	Friday	12:45 PM - 2:15 PM
CIEI-BJ	1	42	K & L	Saturday	6:45 PM - 8:15 PM
Claremont	2	93	K & L	Saturday	6:45 PM - 8:15 PM
CMUQ	2	96	E & F	Friday	12:45 PM - 2:15 PM
CO Mines	2	108	A & B	Thursday	12:45 PM - 2:15 PM
ColegioFDR Peru	4	244	C & D	Thursday	6:45 PM - 8:15 PM
ColumbiaNYC	4	240	E & F	Friday	12:45 PM - 2:15 PM
Cornell	3	188	A & B	Thursday	12:45 PM - 2:15 PM
CPU CHINA	1	48	K & L	Saturday	6:45 PM - 8:15 PM
CSU CHINA	1	8	A & B	Thursday	12:45 PM - 2:15 PM
CSU Fort Collins	4	239	K & L	Saturday	6:45 PM - 8:15 PM
CU-Boulder	5	284	K & L	Saturday	6:45 PM - 8:15 PM
CUNY Kingsborough	2	137	G & H	Friday	6:45 PM - 8:15 PM
Dalhousie Halifax NS	3	179	C & D	Thursday	6:45 PM - 8:15 PM
Delgado-Ivy-Marin	5	299	G & H	Friday	6:45 PM - 8:15 PM
DLUT China	1	22	E & F	Friday	12:45 PM - 2:15 PM
DLUT China B	2	142	I & J	Saturday	12:45 PM - 2:15 PM
DNHS SanDiego	4	216	K & L	Saturday	6:45 PM - 8:15 PM
DTU-Denmark	1	52	I & J	Saturday	12:45 PM - 2:15 PM

Name	Zone	Number	Session	Day	Time
Duesseldorf	4	254	I & J	Saturday	12:45 PM - 2:15 PM
Duke	3	169	E & F	Friday	12:45 PM - 2:15 PM
East Chapel Hill	4	242	E & F	Friday	12:45 PM - 2:15 PM
Ecuador	1	58	A & B	Thursday	12:45 PM - 2:15 PM
ECUST	1	80	A & B	Thursday	12:45 PM - 2:15 PM
Edinburgh OG	2	122	G & H	Friday	6:45 PM - 8:15 PM
Edinburgh UG	2	166	E & F	Friday	12:45 PM - 2:15 PM
Emory	2	168	G & H	Friday	6:45 PM - 8:15 PM
EPFL	1	84	C & D	Thursday	6:45 PM - 8:15 PM
ETH Zurich	4	221	A & B	Thursday	12:45 PM - 2:15 PM
Evry Paris-Saclay	1	83	K & L	Saturday	6:45 PM - 8:15 PM
Exeter	1	7	C & D	Thursday	6:45 PM - 8:15 PM
FAU Erlangen	4	224	G & H	Friday	6:45 PM - 8:15 PM
FJNU-China	3	185	K & L	Saturday	6:45 PM - 8:15 PM
FSU	4	228	G & H	Friday	6:45 PM - 8:15 PM
Fudan	1	16	A & B	Thursday	12:45 PM - 2:15 PM
Fudan-CHINA	2	154	I & J	Saturday	12:45 PM - 2:15 PM
Gaston Day School	2	130	E & F	Friday	12:45 PM - 2:15 PM
GDSYZX	1	71	K & L	Saturday	6:45 PM - 8:15 PM
Georgia State	3	183	E & F	Friday	12:45 PM - 2:15 PM
Gifu	4	217	C & D	Thursday	6:45 PM - 8:15 PM
GO Paris-Saclay	3	205	C & D	Thursday	6:45 PM - 8:15 PM
Goettingen	3	198	I & J	Saturday	12:45 PM - 2:15 PM
GreatBay China	1	2	K & L	Saturday	6:45 PM - 8:15 PM
Grenoble-Alpes	1	70	I & J	Saturday	12:45 PM - 2:15 PM
Groningen	4	238	C & D	Thursday	6:45 PM - 8:15 PM
GZHS-United	2	145	E & F	Friday	12:45 PM - 2:15 PM
H14Z1 Hangzhou	2	162	C & D	Thursday	6:45 PM - 8:15 PM
HAFS	2	109	K & L	Saturday	6:45 PM - 8:15 PM
Hamburg	1	82	E & F	Friday	12:45 PM - 2:15 PM

Posters

Name	Zone	Number	Session	Day	Time
Harvard	3	212	I & J	Saturday	12:45 PM - 2:15 PM
Hawaii	2	113	A & B	Thursday	12:45 PM - 2:15 PM
HBUT-China	5	278	C & D	Thursday	6:45 PM - 8:15 PM
HebrewU	1	51	A & B	Thursday	12:45 PM - 2:15 PM
HFLS ZhejiangUnited	2	129	E & F	Friday	12:45 PM - 2:15 PM
HK HCY LFC	1	55	G & H	Friday	6:45 PM - 8:15 PM
HKJS S	1	46	E & F	Friday	12:45 PM - 2:15 PM
Hong Kong HKU	2	117	E & F	Friday	12:45 PM - 2:15 PM
Hong Kong HKUST	3	190	A & B	Thursday	12:45 PM - 2:15 PM
Hong Kong JSS	5	297	E & F	Friday	12:45 PM - 2:15 PM
Hong Kong-CUHK	2	157	G & H	Friday	6:45 PM - 8:15 PM
HSHL	3	170	A & B	Thursday	12:45 PM - 2:15 PM
HUBU-Wuhan	5	301	K & L	Saturday	6:45 PM - 8:15 PM
HUST-China	1	26	A & B	Thursday	12:45 PM - 2:15 PM
HZAU-China	4	248	G & H	Friday	6:45 PM - 8:15 PM
HZNFHS China	5	261	I & J	Saturday	12:45 PM - 2:15 PM
ICT-Mumbai	1	56	G & H	Friday	6:45 PM - 8:15 PM
IISc-Bangalore	1	79	I & J	Saturday	12:45 PM - 2:15 PM
IISER-Bhopal-India	5	267	A & B	Thursday	12:45 PM - 2:15 PM
IISER-Kolkata	2	159	C & D	Thursday	6:45 PM - 8:15 PM
IISER-Mohali	4	236	K & L	Saturday	6:45 PM - 8:15 PM
IIT Delhi	2	101	K & L	Saturday	6:45 PM - 8:15 PM
IIT Kanpur	4	243	A & B	Thursday	12:45 PM - 2:15 PM
IIT-Madras	2	120	E & F	Friday	12:45 PM - 2:15 PM
Imperial College	2	116	K & L	Saturday	6:45 PM - 8:15 PM
iTesla-SoundBio	1	77	I & J	Saturday	12:45 PM - 2:15 PM
Jiangnan	5	274	C & D	Thursday	6:45 PM - 8:15 PM
Jiangnan China	1	50	I & J	Saturday	12:45 PM - 2:15 PM
Jilin China	4	252	C & D	Thursday	6:45 PM - 8:15 PM
JMU Wuerzburg	1	28	A & B	Thursday	12:45 PM - 2:15 PM

Name	Zone	Number	Session	Day	Time
JNFLS	5	281	I & J	Saturday	12:45 PM - 2:15 PM
KAIT JAPAN	3	175	E & F	Friday	12:45 PM - 2:15 PM
KCL UK	1	37	I & J	Saturday	12:45 PM - 2:15 PM
KUAS Korea	2	139	E & F	Friday	12:45 PM - 2:15 PM
Kyoto	3	180	C & D	Thursday	6:45 PM - 8:15 PM
LACAS BioBots	1	21	G & H	Friday	6:45 PM - 8:15 PM
Lambert GA	2	156	G & H	Friday	6:45 PM - 8:15 PM
Leiden	3	193	A & B	Thursday	12:45 PM - 2:15 PM
Lethbridge	4	233	G & H	Friday	6:45 PM - 8:15 PM
Lethbridge HS	3	174	G & H	Friday	6:45 PM - 8:15 PM
Linkoping Sweden	5	262	A & B	Thursday	12:45 PM - 2:15 PM
Lubbock TTU	4	219	A & B	Thursday	12:45 PM - 2:15 PM
Lund	3	172	I & J	Saturday	12:45 PM - 2:15 PM
LZU-CHINA	4	246	K & L	Saturday	6:45 PM - 8:15 PM
Macquarie Australia	1	20	A & B	Thursday	12:45 PM - 2:15 PM
Madrid-OLM	2	112	G & H	Friday	6:45 PM - 8:15 PM
Makerere University	4	241	E & F	Friday	12:45 PM - 2:15 PM
Manchester	2	143	K & L	Saturday	6:45 PM - 8:15 PM
Marburg	1	74	G & H	Friday	6:45 PM - 8:15 PM
McGill	4	226	E & F	Friday	12:45 PM - 2:15 PM
McMaster	1	34	C & D	Thursday	6:45 PM - 8:15 PM
McMasterA	5	269	C & D	Thursday	6:45 PM - 8:15 PM
Melbourne	5	304	C & D	Thursday	6:45 PM - 8:15 PM
METU HS Ankara	2	132	C & D	Thursday	6:45 PM - 8:15 PM
Michigan	1	11	E & F	Friday	12:45 PM - 2:15 PM
MichiganState	1	60	E & F	Friday	12:45 PM - 2:15 PM
Mingdao	5	296	K & L	Saturday	6:45 PM - 8:15 PM
Minnesota	4	232	C & D	Thursday	6:45 PM - 8:15 PM
Missouri Rolla	5	270	I & J	Saturday	12:45 PM - 2:15 PM
MIT	5	319	I & J	Saturday	12:45 PM - 2:15 PM

Posters

Name	Zone	Number	Session	Day	Time
Montpellier	1	61	C & D	Thursday	6:45 PM - 8:15 PM
Munich	5	265	G & H	Friday	6:45 PM - 8:15 PM
Nanjing NFLS	1	9	I & J	Saturday	12:45 PM - 2:15 PM
Nanjing-China	2	126	K & L	Saturday	6:45 PM - 8:15 PM
NAU-CHINA	4	215	C & D	Thursday	6:45 PM - 8:15 PM
Navarra BG	1	72	E & F	Friday	12:45 PM - 2:15 PM
NAWI Graz	5	293	G & H	Friday	6:45 PM - 8:15 PM
NCHU Taichung	1	59	A & B	Thursday	12:45 PM - 2:15 PM
NCKU Tainan	1	85	G & H	Friday	6:45 PM - 8:15 PM
NCTU Formosa	1	18	A & B	Thursday	12:45 PM - 2:15 PM
NDC-HighRiverAB	2	103	I & J	Saturday	12:45 PM - 2:15 PM
NEFU China	1	15	I & J	Saturday	12:45 PM - 2:15 PM
NEU China A	1	53	G & H	Friday	6:45 PM - 8:15 PM
NEU China B	1	12	A & B	Thursday	12:45 PM - 2:15 PM
New York City	1	5	E & F	Friday	12:45 PM - 2:15 PM
Newcastle	2	135	E & F	Friday	12:45 PM - 2:15 PM
NJU-China	2	94	K & L	Saturday	6:45 PM - 8:15 PM
NKU CHINA	3	184	E & F	Friday	12:45 PM - 2:15 PM
NorthernBC-Canada	5	291	I & J	Saturday	12:45 PM - 2:15 PM
Northwestern	3	186	I & J	Saturday	12:45 PM - 2:15 PM
Nottingham	4	222	A & B	Thursday	12:45 PM - 2:15 PM
NPU-China	2	150	I & J	Saturday	12:45 PM - 2:15 PM
NTHU Formosa	1	32	I & J	Saturday	12:45 PM - 2:15 PM
NTHU Taiwan	1	13	G & H	Friday	6:45 PM - 8:15 PM
NTNU Trondheim	1	17	C & D	Thursday	6:45 PM - 8:15 PM
NTU-Singapore	1	6	K & L	Saturday	6:45 PM - 8:15 PM
NU Kazakhstan	2	140	A & B	Thursday	12:45 PM - 2:15 PM
NUDT CHINA	2	114	A & B	Thursday	12:45 PM - 2:15 PM
NUS Singapore-A	2	119	A & B	Thursday	12:45 PM - 2:15 PM
NUS Singapore-Sci	4	255	I & J	Saturday	12:45 PM - 2:15 PM

Name	Zone	Number	Session	Day	Time
NWU-China	2	100	G & H	Friday	6:45 PM - 8:15 PM
NYMU-Taipei	2	98	K & L	Saturday	6:45 PM - 8:15 PM
NYU Abu Dhabi	5	308	K & L	Saturday	6:45 PM - 8:15 PM
OLS Canmore Canada	4	218	E & F	Friday	12:45 PM - 2:15 PM
OUC-China	1	86	E & F	Friday	12:45 PM - 2:15 PM
Oxford	5	312	A & B	Thursday	12:45 PM - 2:15 PM
Paris Bettencourt	1	19	G & H	Friday	6:45 PM - 8:15 PM
Pasteur Paris	2	167	G & H	Friday	6:45 PM - 8:15 PM
Peking	2	144	A & B	Thursday	12:45 PM - 2:15 PM
Pittsburgh	4	227	E & F	Friday	12:45 PM - 2:15 PM
Pittsburgh CSL	1	76	E & F	Friday	12:45 PM - 2:15 PM
Purdue	5	318	G & H	Friday	6:45 PM - 8:15 PM
Queens Canada	5	282	I & J	Saturday	12:45 PM - 2:15 PM
RDFZ-China	3	201	I & J	Saturday	12:45 PM - 2:15 PM
REC-CHENNAI	5	295	E & F	Friday	12:45 PM - 2:15 PM
Rheda Bielefeld	3	196	G & H	Friday	6:45 PM - 8:15 PM
RHIT	4	231	C & D	Thursday	6:45 PM - 8:15 PM
Rice	1	30	I & J	Saturday	12:45 PM - 2:15 PM
RMHS Maryland	3	197	C & D	Thursday	6:45 PM - 8:15 PM
Rotterdam HR	1	33	C & D	Thursday	6:45 PM - 8:15 PM
Ruia-Mumbai	2	107	K & L	Saturday	6:45 PM - 8:15 PM
Saint Joseph	5	294	C & D	Thursday	6:45 PM - 8:15 PM
SBS SH 112144	3	203	K & L	Saturday	6:45 PM - 8:15 PM
SCAU-China	5	288	G & H	Friday	6:45 PM - 8:15 PM
SCU-China	4	256	I & J	Saturday	12:45 PM - 2:15 PM
SCUT ChinaB	5	290	I & J	Saturday	12:45 PM - 2:15 PM
SCUT-ChinaA	2	110	G & H	Friday	6:45 PM - 8:15 PM
SDSZ China	2	127	E & F	Friday	12:45 PM - 2:15 PM
SDU-CHINA	5	275	A & B	Thursday	12:45 PM - 2:15 PM
SFLS Shenzhen	5	298	C & D	Thursday	6:45 PM - 8:15 PM

Name	Zone	Number	Session	Day	Time
ShanghaiTech	3	209	C & D	Thursday	6:45 PM - 8:15 PM
SHPH-Shanghai	2	146	C & D	Thursday	6:45 PM - 8:15 PM
SHSBNU China	1	57	G & H	Friday	6:45 PM - 8:15 PM
SHSID China	1	10	C & D	Thursday	6:45 PM - 8:15 PM
SHSU China	3	204	C & D	Thursday	6:45 PM - 8:15 PM
SIAT-SCIE	3	192	G & H	Friday	6:45 PM - 8:15 PM
SJTU-BioX-Shanghai	4	234	E & F	Friday	12:45 PM - 2:15 PM
SJTU-software	3	187	K & L	Saturday	6:45 PM - 8:15 PM
SKLMT-China	1	41	A & B	Thursday	12:45 PM - 2:15 PM
SMMU-China	2	118	I & J	Saturday	12:45 PM - 2:15 PM
SMS Shenzhen	1	47	I & J	Saturday	12:45 PM - 2:15 PM
Sorbonne U Paris	4	214	C & D	Thursday	6:45 PM - 8:15 PM
SSHS-Shenzhen	1	24	I & J	Saturday	12:45 PM - 2:15 PM
SSTi-SZGD	4	247	A & B	Thursday	12:45 PM - 2:15 PM
St Andrews	4	225	C & D	Thursday	6:45 PM - 8:15 PM
Stanford	2	149	G & H	Friday	6:45 PM - 8:15 PM
Stanford-Brown-RISD	1	38	I & J	Saturday	12:45 PM - 2:15 PM
Stockholm	5	273	A & B	Thursday	12:45 PM - 2:15 PM
Stony Brook	2	163	K & L	Saturday	6:45 PM - 8:15 PM
Stuttgart	5	303	C & D	Thursday	6:45 PM - 8:15 PM
SUIS Shanghai	5	320	G & H	Friday	6:45 PM - 8:15 PM
SUSTech Shenzhen	5	263	A & B	Thursday	12:45 PM - 2:15 PM
SYSU-CHINA	1	1	G & H	Friday	6:45 PM - 8:15 PM
SYSU-Software	1	29	C & D	Thursday	6:45 PM - 8:15 PM
SZU-China	1	54	G & H	Friday	6:45 PM - 8:15 PM
Tacoma RAINmakers	1	44	E & F	Friday	12:45 PM - 2:15 PM
Tartu TUIT	2	92	E & F	Friday	12:45 PM - 2:15 PM
TAS Taipei	1	36	G & H	Friday	6:45 PM - 8:15 PM
Tec-Chihuahua	2	102	E & F	Friday	12:45 PM - 2:15 PM
Tec-Monterrey	2	133	A & B	Thursday	12:45 PM - 2:15 PM

Name	Zone	Number	Session	Day	Time
TecCEM	5	315	K & L	Saturday	6:45 PM - 8:15 PM
TecMonterrey GDL	2	90	A & B	Thursday	12:45 PM - 2:15 PM
Thessaloniki	2	165	A & B	Thursday	12:45 PM - 2:15 PM
Tianjin	4	259	C & D	Thursday	6:45 PM - 8:15 PM
TJU China	1	3	I & J	Saturday	12:45 PM - 2:15 PM
Tokyo Tech	2	158	K & L	Saturday	6:45 PM - 8:15 PM
Tongji China	1	25	K & L	Saturday	6:45 PM - 8:15 PM
Tongji-Software	1	88	C & D	Thursday	6:45 PM - 8:15 PM
Toronto	3	191	C & D	Thursday	6:45 PM - 8:15 PM
Toulouse-INSA-UPS	2	155	K & L	Saturday	6:45 PM - 8:15 PM
TPHS San Diego	1	31	K & L	Saturday	6:45 PM - 8:15 PM
Tsinghua	1	87	I & J	Saturday	12:45 PM - 2:15 PM
Tsinghua-A	1	75	K & L	Saturday	6:45 PM - 8:15 PM
TU Darmstadt	5	292	K & L	Saturday	6:45 PM - 8:15 PM
TU-Eindhoven	2	138	G & H	Friday	6:45 PM - 8:15 PM
TU Delft	5	266	C & D	Thursday	6:45 PM - 8:15 PM
Tuebingen	1	4	G & H	Friday	6:45 PM - 8:15 PM
Tufts	2	123	A & B	Thursday	12:45 PM - 2:15 PM
TUST China	4	230	C & D	Thursday	6:45 PM - 8:15 PM
UAlberta	5	285	G & H	Friday	6:45 PM - 8:15 PM
UC Davis	3	171	K & L	Saturday	6:45 PM - 8:15 PM
UC San Diego	4	258	E & F	Friday	12:45 PM - 2:15 PM
UCAS-China	2	111	C & D	Thursday	6:45 PM - 8:15 PM
UChicago	2	91	I & J	Saturday	12:45 PM - 2:15 PM
UChile Biotech	2	104	E & F	Friday	12:45 PM - 2:15 PM
UCL	2	136	A & B	Thursday	12:45 PM - 2:15 PM
UCLouvain	3	211	K & L	Saturday	6:45 PM - 8:15 PM
UConn	2	125	G & H	Friday	6:45 PM - 8:15 PM
UCopenhagen	5	279	K & L	Saturday	6:45 PM - 8:15 PM
UCSC	5	313	A & B	Thursday	12:45 PM - 2:15 PM

Posters

Name	Zone	Number	Session	Day	Time
UESTC-China	5	309	A & B	Thursday	12:45 PM - 2:15 PM
UESTC-Software	3	176	K & L	Saturday	6:45 PM - 8:15 PM
UFlorida	4	257	G & H	Friday	6:45 PM - 8:15 PM
UGA	5	310	A & B	Thursday	12:45 PM - 2:15 PM
UI Indonesia	2	134	A & B	Thursday	12:45 PM - 2:15 PM
UiOslo Norway	1	43	A & B	Thursday	12:45 PM - 2:15 PM
UIOWA	1	35	I & J	Saturday	12:45 PM - 2:15 PM
UIUC Illinois	3	207	A & B	Thursday	12:45 PM - 2:15 PM
ULaval	5	268	G & H	Friday	6:45 PM - 8:15 PM
ULaVerne Collab	3	177	E & F	Friday	12:45 PM - 2:15 PM
UMaryland	1	40	K & L	Saturday	6:45 PM - 8:15 PM
UMass Dartmouth	1	63	A & B	Thursday	12:45 PM - 2:15 PM
UNebraska-Lincoln	3	200	K & L	Saturday	6:45 PM - 8:15 PM
Unesp Brazil	5	264	E & F	Friday	12:45 PM - 2:15 PM
UNSW Australia	1	73	K & L	Saturday	6:45 PM - 8:15 PM
UofGuelph	2	161	A & B	Thursday	12:45 PM - 2:15 PM
UPF CRG Barcelona	4	223	E & F	Friday	12:45 PM - 2:15 PM
Uppsala	2	148	C & D	Thursday	6:45 PM - 8:15 PM
US AFRL CarrollHS	3	199	I & J	Saturday	12:45 PM - 2:15 PM
USAFA	4	245	G & H	Friday	6:45 PM - 8:15 PM
USMA-West Point	3	206	E & F	Friday	12:45 PM - 2:15 PM
USP-Brazil	3	194	C & D	Thursday	6:45 PM - 8:15 PM
USP-EEL-Brazil	1	39	I & J	Saturday	12:45 PM - 2:15 PM
UST Beijing	5	276	K & L	Saturday	6:45 PM - 8:15 PM
USTC	3	181	G & H	Friday	6:45 PM - 8:15 PM
USTC-Software	2	115	C & D	Thursday	6:45 PM - 8:15 PM
UT-Knoxville	2	124	E & F	Friday	12:45 PM - 2:15 PM
Utrecht	4	251	C & D	Thursday	6:45 PM - 8:15 PM
Valencia UPV	5	306	I & J	Saturday	12:45 PM - 2:15 PM
Vilnius-Lithuania	1	65	E & F	Friday	12:45 PM - 2:15 PM

Name	Zone	Number	Session	Day	Time
Vilnius-Lithuania-OG	5	272	I & J	Saturday	12:45 PM - 2:15 PM
Virginia	4	220	I & J	Saturday	12:45 PM - 2:15 PM
VIT Vellore	5	289	I & J	Saturday	12:45 PM - 2:15 PM
Warwick	3	182	I & J	Saturday	12:45 PM - 2:15 PM
Washington	1	23	A & B	Thursday	12:45 PM - 2:15 PM
WashU StLouis	2	151	A & B	Thursday	12:45 PM - 2:15 PM
Waterloo	1	68	I & J	Saturday	12:45 PM - 2:15 PM
Westminster UK	1	66	K & L	Saturday	6:45 PM - 8:15 PM
WHU-China	5	314	E & F	Friday	12:45 PM - 2:15 PM
William and Mary	5	280	E & F	Friday	12:45 PM - 2:15 PM
WLC-Milwaukee	4	213	A & B	Thursday	12:45 PM - 2:15 PM
Worldshaper-Wuhan	5	283	G & H	Friday	6:45 PM - 8:15 PM
Worldshaper-XSHS	1	67	I & J	Saturday	12:45 PM - 2:15 PM
WPI Worcester	5	300	A & B	Thursday	12:45 PM - 2:15 PM
XJTLU-CHINA	3	189	E & F	Friday	12:45 PM - 2:15 PM
XJTU-China	3	202	K & L	Saturday	6:45 PM - 8:15 PM
XMU-China	2	105	E & F	Friday	12:45 PM - 2:15 PM
Yale	1	81	G & H	Friday	6:45 PM - 8:15 PM
ZJU-China	5	311	C & D	Thursday	6:45 PM - 8:15 PM
ZJUT-China	5	307	G & H	Friday	6:45 PM - 8:15 PM

ABSTRACTS

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Aachen

Melasense

Region
Europe - Germany

Track
Diagnostics

Poster
Zone 5 - #302
Saturday
Session K & L
6:45 PM - 8:15 PM

Presentation
Saturday
Room 304
4:45 PM - 5:15 PM

We plan on developing a melatonin biosensor. Our approach for the biosensor is to genetically modify *Saccharomyces cerevisiae* by integrating a highly specific human melatonin receptor into the cells. Melatonin has a high membrane permeability which permits us to use the nuclear retinoid z receptor (RZR) which is directly regulating gene expression. We express the RZR as a fusion-protein with the recognition sequence of the human estrogen receptor alpha (ER α). When melatonin is bound, the modified receptor binds to the estrogen receptor responsive element (ERE) and as a consequence regulate expression of firefly luciferase reporter genes. In our second approach, we will use the membrane-receptor MT1 for our biosensor. When melatonin binds to the G protein-coupled receptor, β -arrestins can be recruited. This mechanism allows us to use an enzyme fragment complementation assay based on two fusion-proteins.

Aalto-Helsinki

Silkolor - A sustainable approach to dyeing industry using fusion proteins

Region
Europe - Finland

Track
New Application

Poster
Zone 4 - #229
Friday
Session G & H
6:45 PM - 8:15 PM

Presentation
Friday
Room 304
4:45 PM - 5:15 PM

Textile dyeing is one of the biggest polluters of natural waters. Many of the synthetic dyes used are non-biodegradable, toxic and large amounts of them end up in waters during the dyeing process. Natural dyes, although less toxic than synthetic ones, require mordants in order to bind to the fabric. Mordants often contain aluminum or other metals, which are harmful to the environment. We are addressing the problem by using two types of colorful fusion proteins. Chromoproteins are fused with binding domains to create colorful proteins which can bind cellulose or keratin based materials, such as cotton or wool, respectively. Spider silk is added to some of the proteins in order to make colored silk proteins that can be made into fibers, which would erase the need for the dyeing step from the textile value chain completely. Our experiments were focused on binding tests and silk fiber production.

ACIBADEM ISTANBUL

LTNF 2.0: Circularized Venom Neutralizing Factor

Region

Asia - Turkey

Track

Therapeutics

Poster

Zone 5 - #305

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 310

11:30 AM - 12:00 PM

The Opossum (Didelphimorphia) is an animal with a very unique characteristic; it displays an outstanding resistance to toxins, snake venoms in particular. This anti-venom ability is gained through a single protein; the Lethal Toxin Neutralizing Factor (LTNF). We are attempting to produce an improved version of this anti-venom, LTNF 2.0 if you will, as a synthetic anti-venom for human use. LTNF 2.0 incorporates the post-translational modification process known as circularization, a process that comprises of adding cysteine amino acids to both ends of a polypeptide chain; triggering the formation of a disulphide bridge, ultimately leading to a circular structure, hence the name circularization. Circularized proteins are known for not only greater stability but also greater efficacy of the protein, thereby improving its shelf life and lowering the required dosage for treatment, ultimately providing a more efficient bioproduct.

AFCM-Egypt

Microbiota: Opening Doors to New Horizons in Colorectal Cancer Therapy

Region

Africa - Egypt

Track

Therapeutics

Poster

Zone 2 - #153

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 311

2:15 PM - 2:45 PM

Colorectal cancer (CRC) is considered one of the most common cancers and accounts for almost half a million deaths annually worldwide. Tremendous progress has been made in understanding the role of the immune system in driving the development of cancers, including CRC. As sensors of cell death and tissue remodeling, Toll like receptors (TLRs) may have a universal role in cancer. There are different TLRs that respond to a variety of Pathogen associated molecular pattern (PAMPs) such as bacterial lipopolysaccharide. The evidence of existence of relevance between bacterial microbiota and carcinogenesis is increasing. It's suggested that microRNAs act as ligands of TLRs playing a role in epigenetic immune modulation. In this study, We will assess the therapeutic efficacy of microbiome based approach as novel therapeutic strategy in restoring normal Toll like receptor signaling in CRC cell line.

AHUT China

Carbon dioxide purifier

Region

Asia - China

Track

Environment

Poster

Zone 2 - #99

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 208

3:15 PM - 3:45 PM

With greenhouse effect becoming a widespread concern in recent years, how to effectively capture CO₂ has become a worldwide problem. At present, CO₂ capture mostly includes absorption, adsorption and membrane methods, etc., which have problems with high cost, high energy consumption for regeneration and secondary pollution. CO₂ capture using carbonic anhydrase has attracted extensive attention due to its high catalytic efficiency and environmentally friendly properties. First, our project successfully expressed wide type carbonic anhydrase in *E. coli*, however, its industrial application was limited due to poor stability and easy inactivation. Therefore, based on this, molecular simulation technology was used to investigate effect of amino acid residues mutation on the conformation and activity of enzyme, and the mutant carbonic anhydrase with higher thermal stability was obtained. The experimental results showed that the purified mutant carbonic anhydrase exhibited higher stability and activity than wild type carbonic anhydrase, achieving efficient capture of CO₂.

Aix-Marseille

Breaking bugs

Region

Europe - France

Track

Therapeutics

Poster

Zone 2 - #128

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 311

3:15 PM - 3:45 PM

An alternative weaponry must be found to replace the harmful and expensive traditional insecticides, that are now nearly useless against bed bugs. In fact, they developed multiple resistance mechanisms (exoskeleton thickening and enhanced metabolic pathways). The breaking bugs project aims to provide a human-friendly, and efficient solution to eliminate bed bugs. The plan is to elaborate an attractive lethal trap. We will use biosynthesized pheromones as a chemical lure to attract the bugs into the trap and infect them with *Beauveria bassiana* (an entomopathogenic fungus), causing a fatal epidemic. We produced several types of pheromones in *E. coli* and are running tests to create the optimal pheromone cocktail. We have worked on producing several enzymes and adding adjuvants to improve the killing efficiency and speed of the fungus. We had nationwide advertising of our project and obtained an indisputable validation from the public for our engagement in fighting bed bugs.

ASIJ Tokyo

A1AT deLiVERy - Using Stem Cell and CRISPR Technology to Combat Alpha-1 Antitrypsin Deficiency

Region

Asia - Japan

Track

High School

Poster

Zone 5 - #287

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 309

2:15 PM - 2:45 PM

Alpha-1 Antitrypsin deficiency is a common genetic disorder -- the defective gene for which is carried by 1 in 25 people -- which arises from a single base pair mutation in the SERPINA1 gene, resulting in the production of a form of antitrypsin prone to polymerization. The mutated antitrypsin then builds up in liver cells and is unable to inhibit proteases in the lungs, leading to damage in both. Using CRISPR-Cas9 technology, we aimed to fix the error in SERPINA1 so that proper antitrypsin can be produced. We will show proof of concept in E. Coli cells using osmy secretion tags and GFP as a reporter. We hope to design a liver organ bud using IPS cell technology to deliver function A1AT through collaboration with Dr. Kagimoto of Healios Japan KK.

ASTWS-China

Environment-friendly Copper Ion Sense and Treatment System

Region

Asia - China

Track

High School

Poster

Zone 2 - #152

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 302

11:30 AM - 12:00 PM

With the continuous development of industrialization, the negative environmental effects caused by heavy metal pollution are becoming more and more significant. Owing to easy migration and difficult biodegradation, it poses more challenges to the treatment of heavy metals in the environment, especially in soil and water. In this study, we developed an engineered E. coli-based system to sensitively detect the copper concentration in industrial waste using synthetic biological methods. Meanwhile, we are trying to introduce a new gene to effectively capture copper ions in environment. If successful, this constructed biosystem could not only detect copper ions, but also enrich heavy metal pollutants (copper), form copper deposits and then purify the environment, which is portable, low-cost and environment-friendly.

Athens

GENOMERS: Toehold switch enabled viral detection via routine glucose monitoring technology

Region

Europe - Greece

Track

Diagnostics

Poster

Zone 3 - #178

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 302

4:15 PM - 4:45 PM

Middle-East Respiratory Syndrome Coronavirus (MERS-CoV) is a virus with ~35% mortality rate, considered to be one of the most likely to cause major epidemics. We aim to develop a rapid, low-cost test for MERS-CoV for potential use in field diagnosis. Our biosensor is based on the toehold switch mechanism. The designed switches regulate the expression of trehalase, an enzyme which hydrolyzes the disaccharide trehalose to glucose. Thus, overall, the presence of viral load in the sample triggers glucose production, which is measured by a repurposed glucometer, signaling the diagnosis. Finally, attempting to accelerate the diagnosis, we lower the complexity of the switches using an alternative reporter, an engineered split trehalase. The two split fragments assemble to a functional enzyme through coiled-coil interactions. Our proposed diagnostic workflow is easily customizable for the detection of other viruses threatening global health, aiming to contribute to travel medicine and diagnostics.

Auckland MOD

Improving the Farmer, Environment and Nitrogen Use Efficiency

Region

Asia - New Zealand

Track

Environment

Poster

Zone 5 - #316

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 312

12:00 PM - 12:30 PM

Environmental pollution is a pressed global issue, even in clean, green New Zealand. Maintaining clean waterways is our responsibility as kaitiaki of the land (guardians in Te Reo Māori), but agricultural practices such as excess fertiliser application and cow effluent are flooding our New Zealand soils and waterways with urea. Taking a fluxomics approach in *Arabidopsis thaliana*, we are overexpressing a high-affinity urea transporter (DUR3) to upregulate the uptake of urea, and glutamine synthetase (GS1) to convert the toxic metabolite ammonia into glutamine. As a result, urea is removed more readily from the soil before it's subject to groundwater leaching or surface run-off. We predict the increase in amino acid production will enhance plant growth. Applying our model to other plants like ryegrasses will allow farmers to grow pasture or forage crops that utilize urea on the paddock more efficiently, requiring less financial investment into urea fertilisers.

Austin LASA

Infection Detection: HIV1 Detection in Infants

Region

North America - United States

Track

High School

Poster

Zone 5 - #317

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 302

2:15 PM - 2:45 PM

HIV diagnosis of infants in the developing world continues to pose many problems as current diagnostic methods are inaccurate in infants and difficult to administer in the field. Recent research demonstrates CRISPR-associated enzyme Cas12a's ability to indiscriminately cleave ssDNA following recognition and cleavage of a dsDNA target strand, lending itself to nucleotide detection assays. Due to their high stability in cells, Cas enzymes such as Cas12a are prime candidates for lyophilized bacterial reagents ('cellular reagents') that can be stored at room temperature until resuspended for later use in the field. Our project aims to design an innovative HIV1 diagnostic system for infants that combines cellular reagents with a Cas12a assay. For the purposes of iGEM and biosafety, our team focused on demonstrating the following with purified enzymes and cellular reagents: isothermal amplification of viral DNA and detection of viral DNA by a Cas12a assay.

Austin UTexas

A Broad Host Range Plasmid Kit for Engineering Non-Model Bacteria

Region

North America - United States

Track

Foundational Advance

Poster

Zone 1 - #69

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 312

12:00 PM - 12:30 PM

Synthetic biologists often reach for a handful of well characterized organisms when designing experiments due to their ability to be reliably engineered with standard protocols. However, there are many non-model organisms that perform useful functions, survive extreme environments, or are optimized to produce certain materials which are largely ignored because the methods of engineering them are not well established. The broad host range kit aims to use genetic parts that function in a wide range of bacteria to make this process more efficient. The kit contains a combination of plasmid parts and assembled plasmids with origins of replication known to function in diverse bacteria. Each origin is linked to a fluorescent protein or chromoprotein so successful transformations can be easily identified when plated. Additionally, origins are associated with a specific barcode that can be sequenced to confirm the assembly. Several assemblies containing broad host range origins have been constructed.

Baltimore BioCrew

Coagulance Rx

Region

North America - United States

Track

High School

Poster

Zone 4 - #237

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 304

2:45 PM - 3:15 PM

In 2017, Baltimore suffered from 301 homicides due to gun violence. As students who live in Baltimore City, we knew that this issue needed to be addressed. We decided to create a cost-efficient alternative to current fibrinogen-laced bandages on the market. Our method to cause blood clots was by expressing Factor V activator RVV-V gamma in E.coli. We intend to embed this protease into a bandage to treat gunshot or stab victims. We have also worked to enhance the expression of tissue plasminogen activator (tPA), an enzyme that causes coagulated blood to degrade. We want to express an optimized sequence of tPA within E.coli. A purified form of this tPA would be used within an IV therapy for patients suffering from heart disease and other illnesses involving invasive blood clots. We hope to liberate communities within Baltimore by creating more balanced and equitable methods of treatment.

BCU

Nicotine Degradation

Region

Asia - China

Track

Environment

Poster

Zone 2 - #141

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 311

5:15 PM - 5:45 PM

Nicotine, a major alkaloid in tobacco plants, is a significant factor of evaluation for tobacco and cigarettes. Nicotine plays a critical role in smoking addiction and is well known to be harmful to human beings, because it easily crosses the blood-brain barrier and biological membranes. Meanwhile, with large quantities of tobacco products being produced and consumed, tobacco waste is entering the environment. So we want to find a key nicotine-degrading gene to degrade nicotine effectively in E.coli by synthetic biology. Nicotine oxidoreductase (nicA) from *Pseudomonas putida* S16 has been obtained by our team and a new expression vector has been constructed with promoter(J23119), ribosome binding site(RBS B0034), nicA ,terminator(B0015) in psb1c3. NICA expressed by E.coli top10 could catalyse and degrade Nicotine effectively from 35-50 °C and pH5 to pH8.

BFSUICC-China

Biological toolkit for Copper detection

Region

Asia - China

Track

High School

Poster

Zone 2 - #95

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 309

2:15 PM - 2:45 PM

The world's production (supply) and consumption (demand) of copper have increased dramatically in the past 25 years. Massive mining and extensive using of copper results in serious contamination to environment, and then copper contamination threaten the balance of the whole ecosystem. We design a circuit that can better detect the amount of copper ions than before. We improved a previous Part by placing self-cleaving RNA ribozyme RioJ between the promoter of copA and RBS, and replacing reporter of GFP by sf GFP. PcopA is regulated by Cue R protein. We design a new part that is made up of L-arabinose inducing PBAD, RBS and Cue R coding sequence. Furthermore we connect the improved part and the new part together, which is the circuit of our project. It is found that Cue R protein of different concentration affects the response of PcopA to Copper ions.

BGIC-Global

Formaldehyhunter

Region

Asia - China

Track

High School

Poster

Zone 3 - #210

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 312

9:00 AM - 9:30 AM

In large cities of China, the population growth is accelerating. As a result, an increasing number of buildings are constructed and renovated, and problems of indoor air quality in newly decorated houses become more and more serious. Formaldehyde existing in paint and furniture may cause asthma, or even potentially leukemia. It is commonly acknowledged that formaldehyde volatile is very hard to control as it has long volatilization period. Unfortunately, current methods to remove formaldehyde are mostly either inefficient or expensive. Therefore, our project aims to develop an engineered E.coli to detect and eliminate the indoor formaldehyde safely and efficiently, when the concentration of which exceeds the legal limitation. By emitting florescence, the E.coli indicates the presence of formaldehyde and its effectiveness. Besides, the design of replaceable freeze-dried E.coli ensures the durability of the product. In this way, we would like to provide people with a real 'formaldehyhunter'.

BGU Israel

OriginALS - Prolong ALS Patients Survival

Region

Europe - Israel

Track

Therapeutics

Poster

Zone 4 - #250

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 309

9:30 AM - 10:00 AM

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease that leads to a progressive muscle wasting and paralysis due to damage in motor neurons. However, no efficient treatment exists. The BGU-IGEM team aims to develop a system that will ultimately prolong survival of ALS patients by targeting microglia and reactive astrocytes, which are both non-neuronal cells that directly contribute to motor neuronal damage. Our approach is based on: (1) inhibition of toxic pro-inflammatory cytokines secretion in microglia cells and (2) on promoting intrinsic apoptotic signal in reactive astrocytes and preventing their toxic effect on motor neurons. Using modified genome editing technique, we build a system that specifically target toxic astrocytes and prevent the formation of new ones which hopefully will slow down the progression of the disease. As the reactivity of microglia and astrocytes is a common in neurodegenerative diseases, our novel approach could be expanded to other neurodegenerative diseases.

Bielefeld-CeBiTec

nanoFactory: Recycling metal resources - Every particle matters!

Region

Europe - Germany

Track

Environment

Poster

Zone 2 - #164

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 207

5:15 PM - 5:45 PM

Copper, silver and gold - metals are essential for our daily life but resources are dwindling. Industrial mining of metals and electronic waste cause pollution of the environment. Therefore, we established new approaches to recover valuable resources through synthetic biology. By enhancing bacterial abilities to scavenge metal ions from the environment we generated nanoparticles. We optimized *Escherichia coli* to accumulate metal ions as copper and iron by overexpression of dedicated importers and silencing of exporters while reducing the effects of oxidative stress. To gather nanoparticles from various metal ions we engineered the iron storage protein ferritin. Recycled into nanoparticles the metals could be used for various applications as demonstrated by printing electronics. Considering Dual Use aspects we decided to extract metal ions from pit water instead of dissolving electronics directly. Therefore, in close collaboration with leading experts we developed a customized cross-flow bioreactor for the mining industry.

Bilkent-UNAMBG

The Last Penicillin Binder

Region

Europe - Turkey

Track

Environment

Poster

Zone 3 - #173

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 309

10:00 AM - 10:30 AM

Water pollution originates from many contaminants and antibiotic waste is one of them. Antibiotics which remain in waste water after a treatment may cause bacteria to become multi resistant. In result of this, bacterial infections could spread rapidly and without having an efficient treatment. Current chemical methods of water purification require high cost and energy to be effective. To solve this problem with a cheaper method, our team modified bacteria to bind penicillin remains in waste water. The bacteria produce biofilms which on the surface has penicillin binding peptides attached to csgA proteins. We aim to target beta-lactam rings of the penicillin with these peptides. Our modified bacteria produces an iron-storage protein, bacterioferritin. Then using a magnetic field, we plan to pull away the penicillin-captured-bacteria to which we have added magnetic property with bacterioferritin proteins.

Bio Without Borders

Blueblood

Region

North America - United States

Track

Diagnostics

Poster

Zone 1 - #62

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 309

2:15 PM - 2:45 PM

Horseshoe crab (*Limulus polyphemus*) blood is the basis for the LAL clotting test for endotoxins in injectable formulations. Harvesting crabs for this purpose has endangered this 350 million-year-old species. The first step in the cascade that characterizes the LAL test is activation of the protease Factor C by contact with endotoxins. We have devised a replacement for the LAL test using cloned Factor C and an artificial substrate consisting of a reporter fused to cellulose binding domain with the Factor C protease site connecting them. The substrate is bound to paper by the cellulose binding domain. When exposed to Factor C mixed with the injectable liquid formulation to be tested, the presence of endotoxins will activate the protease and the substrate will be cleaved, releasing the reporter. Our aim is to develop the most cost-effective and simple device possible so that it can be used by everyone.

BiolQS-Barcelona

IN SITU PERSONALIZED DIAGNOSIS KIT FOR CELIAC DISEASE

Region

Europe - Spain

Track

Diagnostics

Poster

Zone 2 - #106

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 208

9:30 AM - 10:00 AM

In our iGEM Project we will design a personalized gluten sensor through a synthetic biology approach. To do so, we will build a model based on the HLA expression of the patient which will be coupled to a sensor, allowing the detection of reactive epitopes. Our sensor: a) Will be built according to the patient HLA, allowing the detection of specific reactive epitopes independently of the food source. b) Will be able to detect reactive epitopes even in fermented foods. c) The methodology implemented in our sensor could be used for the identification of new reactive epitopes and unknown allelic variants. d) Requires only a DNA sample of the patient. Therefore, the methodology and application of our sensor could be extended for the detection of other HLA related disorders as well as the generation of new research lines for the diagnosis, detection and basic knowledge of these type of disorders.

BioMarvel

Functional Fusion Protein-Based Biochip for Diagnosis and Monitoring of Heart Failure

Region

Asia - Korea

Track

High School

Poster

Zone 1 - #64

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 309

2:45 PM - 3:15 PM

The goal of this project is to construct a novel fusion protein of gold binding polypeptides (GBP)-protein G (ProG) to develop an electrochemical biosensor for rapid and simple diagnosis and monitoring heart failure. DH5-alpha E. coli strain was transformed by a genetically modified recombinant vector coding GBP and ProG. The GBP-ProG fusion protein was derived from the strain with IPTG-induced expression and purified using the TALON metal affinity resin. The resulting GBP-ProG was directly self-immobilized onto gold surfaces via the GBP portion, followed by the oriented binding of antibodies onto the ProG domain targeting the Fc region of antibodies. An electrochemical immuno chip was fabricated through the GBP-ProG and gold patterned interdigitated array electrode. Antibody immobilization onto the gold surface of the electrode by the GBP-ProG was rapidly and simply achieved with proper antibody orientation. This immuno chip shown in this study could be used for diagnosis and monitoring of heart failure.

BIT

JACOB 2.0:Reborn for Optimization

Region

Asia - China

Track

Diagnostics

Poster

Zone 5 - #271

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 309

12:00 PM - 12:30 PM

Last year, our JACOB 1.0 used the competitive reaction between target protein and aptamer-complementary chain complexes to achieve signal conversion for sample markers' early detection. This year, we adopted the idea of JACOB, detect CKMB protein to monitor myocardial infarction. Then, in order to adapt to different needs of detection. We designed two sets of independent fluorescent expression systems that each has advantages. One is to modify the molecule SAM on the complementary chain, and to control engineering bacteria to produce GFP by using SAM-riboswitch. Another method is to combine the Spinach Probe with the complementary strand to form a stem loop structure to capture the Fluorescein (DFHBI) then produce fluorescence. We designed microfluidic chip that can carry the whole biological reaction process. We integrated the peristaltic pump on it also, so the chip and detection equipment are completely separated, which greatly reducing the volume of the overall instrument.

BIT-China

Who can get an A?

Region

Asia - China

Track

New Application

Poster

Zone 4 - #235

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 312

3:15 PM - 3:45 PM

Reactive oxygen species (ROS) is considered as the main reason of human aging through damaging DNA, attacking membrane and inducing apoptosis. Now many antioxidants adding in food, cosmetic and some medical production claim they can clear oxidative damages. Although many methods of measuring antioxidants capability are precise in vitro, there is no standard method for living cell. Therefore our project is to construct a system which can determine the activity of antioxidants in vivo. We chose *Saccharomyces cerevisiae* as host and accumulated ROS by overexpressing genes. After reacting with antioxidants, the remaining ROS could reflect the antioxidant activity which could be detected by a redox sensor, roGFP2-Orp1. Additionally, a feedback gene circuit was set to avoid the overproduction of ROS which injured our yeast. Compared with the traditional methods, our system requires a milder environment, damage-free and with higher biologically relevant which make our system more reliable.

BJRS China

OxygenMAX

Region

Asia - China

Track

High School

Poster

Zone 4 - #249

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 304

3:15 PM - 3:45 PM

Previous work have shown that the expression of bacterial *Vitreoscilla* hemoglobin (VHb) can help bacteria utilize oxygen more efficiently. However, the bacterial cell membrane makes efficient hemoglobin-oxygen contact a challenge. Based on this, our team designed a VHb surface display system to express VHb on the outermost shell of the bacteria to raise the hemoglobin-oxygen contacting efficiency. Consequently, this could help bacteria tolerate the low oxygen environment better. We named this system OxygenMAX system. Basically, our OxygenMAX system can be applied to industrial fermentation to raise the high-cell-density growth of the engineering bacteria in bioreactors. Also, allowing for the better growth ability of the OxygenMAX system carried bacteria, our system can help avoid contamination with miscellaneous bacteria in industrial fermentation. Moreover, our OxygenMAX system can be applied to other low-oxygen engineering bacteria working condition like biosensor in intestinal tract, water or soil.

BNDS CHINA

A. hydrophila Killer

Region

Asia - China

Track

High School

Poster

Zone 2 - #147

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 208

4:45 PM - 5:15 PM

Aeromonas hydrophila is an ubiquitous gram-negative opportunistic pathogen in aquaculture. Every year, it causes a variety of diseases in fish. The symptoms include ulcers, fin rot, and hemorrhagic septicaemia. When *A. hydrophila* enters fish body, it often colonise in the gastrointestinal tract first. The pathogen's virulence factors secretion systems are controlled by N-acylhomoserine lactone (AHL)-dependent quorum-sensing system based on the *ahyRI* locus. Since the pathogen has developed resistance to most common antibiotics, our project targets to develop an *A. hydrophila* killer by engineering the fish probiotics, *Escherichia coli* MG1655. The killer expresses lactonase to degrade quorum sensing signals from the pathogen in aim of reducing the production of virulence factors. Also, it expresses antimicrobial peptides (AMPs) to inhibit the growth of *A. hydrophila* directly. We plan to regulate lactonase and AMPs expression by using *PrhI* promoter, which is induced by the pathogen's dominant quorum sensing molecule, C4-HSL.

BNU-China

Screening Advantageous Mutants - a Self-enrichment System

Region

Asia - China

Track

Foundational Advance

Poster

Zone 3 - #208

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 302

5:15 PM - 5:45 PM

Bioengineering uses stable, highly productive mutants, target strains, which contain foreign genes. However, screening these mutants costs vast time and workforce, and it is difficult to avoid using antibiotics. We apply synthetic biology methods, constructing a novel pathway to screen mutants by giving target strains growth advantages. Here, utilizing AND gate, the gene of interest expresses to a certain level, making the downstream pchAB gene express and catalyze the generation of salicylic acid (SA). SA can activate the expression of glucose dehydrogenase, which gives the target strains an additional growth advantage. Besides, we integrate the most important control module of the system into the genome using Chemically Inducible Chromosomal Evolution (CIChE). In summary, the target strain will finally obtain the greatest growth advantage in bacterial suspensions and achieve screening internally. This new screening method is simple to operate and provides a new idea for antibiotic-free screening.

BOKU-Vienna

ROBOCROP –Turning Genes ON and OFF, in Yeast and Arabidopsis through a dCas9 Toggle Switch

Region

Europe - Austria

Track

Information Processing

Poster

Zone 4 - #260

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 304

10:00 AM - 10:30 AM

Our goal, communication with eukaryotes, is achieved through the heart piece of our model, the dCas9 Toggle Switch. This will allow switching between two stable states of gene expression. It consists of 2 gene classes which we simply call the ON and OFF genes. One gene in each class, which is considered the primary gene, codes for a gRNA which represses the antagonistic set of genes by binding to dCas9 and further blocking transcription through CRISPR Interference. The switch can be activated either by signal molecules binding to a receptor or directly by liposome bound gRNA that is taken up by the cell. As a proof of concept, the ON gene contains a GFP coding sequence as a reporter gene. Our design is very universal and has many possible applications in the lab and in agriculture, such as controlling flowering time of plants to protect them from late frost.

Bordeaux

Far Waste in the Landes Forest

Region

Europe - France

Track

Environment

Poster

Zone 5 - #277

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 302

5:15 PM - 5:45 PM

This year iGEM Bordeaux Team would like to find an alternative to an entire segment of the traditional petrobased chemistry by a new green biobased chemistry. Indeed, we would like to focus on the biocatalysis of the hydroxymethylfurfural (HMF) in 2,5-furandicarboxylic acid (FDCA). Don't worry, it is not as complicated as it appears. HMF is a by-product of the lignocellulosic biomass treatment. Its toxicity toward microorganisms leads to big issue for many companies which want to use these microorganisms to produce molecules of interest from lignocellulosic biomass. Our project consists in HMF detoxification by using it as a substrate to produce FDCA through bacteria. FDCA was identify as one of most promising biobased molecules which can replace many polymers such as PET (and other petrobased molecules). We suggest a sustainable alternative, eco-friendly and independent from fossil resource.

BostonU

Characterizing Inducible Tools for Dynamic Control of Transcription in Budding Yeast

Region

North America - United States

Track

Foundational Advance

Poster

Zone 2 - #160

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 310

9:00 AM - 9:30 AM

BostonU is characterizing and optimizing two light-inducible promoters, LOV2 and PhiReX, in *S. cerevisiae* to improve eukaryotic transcriptional control with applications in industrial fermentation. Light-inducible promoters lend greater spatiotemporal control over transcription than small molecule-inducible promoters. Further, LOV2 is activated by blue light and PhiReX by red light, allowing for multiplexed control. We characterize these systems using the eVOLVER, a novel automated cell culturing platform developed by Brandon Wong at Boston University's Khalil Lab. The eVOLVER's specificity and high throughput allows for unprecedented characterization across light pulse programs, temperature, and OD thresholds. We then apply LOV2 and PhiReX to the violacein pathway, demonstrating the induction of four distinctly-colored phenotypes in a single strain, providing a proof-of-concept for the multiplexed control and finely-tuned expression of genes required for effective control of metabolic flux via transcriptional regulation.

BostonU HW

TERRA: An application agnostic device that selectively dispenses the outputs of microfluidic chips

Region

North America - United States

Track

Open

Poster

Zone 3 - #195

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 312

2:15 PM - 2:45 PM

While microfluidics is not new to synthetic biology, they're not widely used by or accessible to many biologists. The current 'lab on a chip' microfluidic chips are highly specialized to each experiment and expensive to manufacture. In order to analyze the results of the experiments on microfluidic chips, many designs incorporate embedded sensors directly on chip. However, labs already have dedicated equipment to analyze experiments, such as plate readers and flow cytometers. Traditional analytical equipment could be used to analyze the outputs of microfluidic chips if the outputs were dispensed selectively into standard vessels, such as a 96-well plate. This would increase the design space for microfluidic experiments, enabling biologists to incorporate microfluidic chips into their workflows without having to fabricate highly specialized chips. To accomplish this we have created TERRA, an application-agnostic system that selectively dispenses the outputs from a microfluidic chip into standard vessels for downstream analysis.

Botchan Lab Tokyo

Bacterial Supplement ~Amino Acid Synthesis Model from Nitrogen in Intestinal Bacteria~

Region

Asia - Japan

Track

Food & Nutrition

Poster

Zone 1 - #27

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 207

10:00 AM - 10:30 AM

Among some kind of nutrients, proteins are very important elements for body formation. However, it is difficult for people in poor areas to continuously obtain protein rich foods. Therefore, in addition to these ingredients, we propose 'Bacterial Supplement' anyone can easily take it into the body. We got this idea from Papuans living in Papua New Guinea. Despite their low-protein diets, they have muscular bodies. It is thought that nitrogen fixing bacteria in their intestines are influencing on protein nutrition. We thought to construct a pathway to synthesize amino acids from nitrogen in *E. coli*, introducing it in the future. To synthesize amino acids, we first express nitrogenase to convert nitrogen to ammonia. We then express amino acid dehydrogenase to synthesize glutamate and phenylalanine from accumulated ammonia. We hope that our project will contribute to the solution of protein-energy malnutrition by fixing this *E. coli* in our intestinal flora.

British Columbia

Co-Optimize: Distributed Metabolic Pathway of Naringenin and Kaempferol

Region

North America - Canada

Track

Manufacturing

Poster

Zone 2 - #121

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 312

12:00 PM - 12:30 PM

Distributing metabolic pathways between microbial community members has shown significant potential for the large-scale production of complex, biologically-derived chemical products. Our goal is to address the challenge of regulating population dynamics in a synthetic microbial consortium, by improving the rate of production of naringenin and its pharmaceutically significant derivative, kaempferol, which has anti-cancer properties. This is done by distributing the synthesis of kaempferol between two *E. coli* strains and optimizing their relative proportions in co-culture. To optimize population dynamics for the production of kaempferol, we regulated the ratio of the two strains using GP2, a transcriptional inhibitor, under the control of a biosensor responsive to the pathway intermediate naringenin. This couples cell growth with the concentration of naringenin, allowing the co-culture to self-optimize based on pathway intermediate abundance. Using our system, we have demonstrated a novel way to optimize microbial polycultures for the synthesis of metabolically complex compounds.

BrockU

Lights, Camera, Flip!: Engineering a Light-Activatable Flip Recombinase for in vivo Genetic Manipulation

Region

North America - Canada

Track

New Application

Poster

Zone 2 - #89

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 306

11:00 AM - 11:30 AM

Flip recombinase is a versatile and important recombinase enzyme with broad applications in molecular genetic applications. Flip recombinase has been used to induce genetic mutations in vivo in numerous model organisms including bacteria, *Drosophila*, Zebrafish, and mouse and human cells. However, Flip recombinase activity is binary and thus cannot be precisely activated in time and space. Utilizing light sensitive protein interaction domains termed 'magnets', we have developed a light-sensitive optogenetic variant of Flip recombinase that can be controlled in *Escherichia coli* with exquisite spatio-temporal precision. We believe this Opto-Flip recombinase has the potential to be utilized in multiple model organisms, and will provide a novel tool allowing for precise molecular-genetic control for numerous future research and industrial applications.

BUCT-China

Research and Construction of Fatty Acids and Glyoxylic Acid Operons

Region

Asia - China

Track

Environment

Poster

Zone 4 - #253

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 207

4:45 PM - 5:15 PM

The regulation of expression in the process of life is the essence of life. The construction of gene expression regulation network has become the key to explain the mystery of life. However, due to its complexity and diversity, it is necessary to study its subunit λ -operator first. . In this experiment, experiments were carried out by experimental ideas such as controlled experiments and deductive methods. Through the design process, operon prediction, operon verification, quantitative analysis, model establishment and other experimental processes, the research and construction of multi-class fatty acids and glyoxylate operons were carried out. Through many experiments, this experiment successfully constructed fatty acid, glyoxylate operon, and found a suitable substrate for fatty acid operons: hydroxy fatty acids. At the same time, quantitative experiments have also made some progress. Based on the qualitative and quantitative experiments, we also established the mode

Bulgaria

The 65 CRISPRoses Story

Region

Europe - Bulgaria

Track

Diagnostics

Poster

Zone 5 - #286

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 304

11:30 AM - 12:00 PM

We aim to create a CRISPR-based DNA diagnostics system that could be used for the detection of the most frequent mutations leading to cystic fibrosis. This genetic condition is considered to be the most common rare disease in Bulgaria. In most cases, the patient is initially misdiagnosed when sweat chloride level is used as an indicator. Our system relies on CRISPR's ability to recognize specific sequences. We plan on using different read-outs, our first idea being site-specific DNA cleavage if a cystic fibrosis associated mutation is present. Another approach would be a pair of dCas9 proteins, linked to split halves of a reporter molecule that restores its activity if the target sequence is identified. Not only could our system be applied in big healthcare facilities, but also in many small town hospitals, since it does not require expensive and sophisticated equipment, for instance DNA sequencing devices.

Calgary

Snip, Equip, Flip: Towards a Safer Gene Therapy

Region

North America - Canada

Track

Foundational Advance

Poster

Zone 1 - #14

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 208

12:00 PM - 12:30 PM

The ideal medicine is not a perfect treatment - it's a cure. Gene therapy, by correcting the genetic basis of disease, may represent humanity's best chance to develop such ultimate health solutions. Despite its unbounded potential, gene therapy is constrained by safety concerns surrounding existing gene transfer technologies. Highlighting a path forward, the 2018 Calgary team has developed a targeted gene integration strategy that leverages CRISPR knock-in, FLP recombinase vector integration and beta-resolvase backbone excision. Extending the integration strategy, the team tested chromatin-modifying elements to reduce variability in therapeutic gene regulation, built a droplet microfluidic device for a scalable gene transfer system, and developed a search tool to help iGEMers find past teams' software. As an extensible platform, the strategy promises greater reproducibility for transgenic research and industrial applications. As a vision for the future, the approach represents a shift away from legacy technologies and towards a safer gene therapy.

Cardiff Wales

RNAphid - an effective RNAi pesticide against *Myzus persicae*, expressed in *Nicotiana benthamiana*

Region

Europe - United Kingdom

Track

Environment

Poster

Zone 2 - #97

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 309

9:30 AM - 10:00 AM

Aphids are crop pests globally. They feed on a massive diversity of crops and can cause tremendous economic loss for farmers by reducing crop yields and grain sizes. They damage crops directly by feeding on plant vasculature, draining essential compounds, or indirectly, as hosts of a variety of plant viruses. Current agricultural practice is to use chemical pesticides, which are unfavourable due to off-target effects, harmfulness to humans, and developing resistance of aphids. Consequently, our team has attempted to produce an effective RNAi pesticide against *Myzus persicae*, the most economically detrimental aphid pest worldwide. In the vasculature of *Nicotiana benthamiana*, we express siRNAs that affect aphid bacteriocytes, cells that enable the survival of their essential symbiont, *Buchnera aphidicola*. We target genes BCR3 and SP3 to do this. Finally, we expand the limited PhytoBrick registry, with several plant promoters and reporter genes.

CCA-San Diego

HORIZON: Regulated Systems for Crude Oil Degradation, Coupled with Biohydrogen Production

Region

North America - United States

Track

High School

Poster

Zone 2 - #131

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 306

5:15 PM - 5:45 PM

Oil fuels our modern world, but unrefined oil contains carcinogenic compounds known as polycyclic aromatic hydrocarbons (PAHs). PAHs and Petrogenic PAHs can inflict lasting damage to entire ecosystems. Horizon harnesses the natural ability of microorganisms to degrade PAHs to catabolize them into nontoxic substances. Horizon then reuses the catabolic end products which can be metabolized by bacteria to produce clean energy by coupling the degradation pathways with sequences that upregulate hydrogen synthesis within E.Coli. Horizon also uses synthetic pathways to metabolize long n-chained hydrocarbons to fuel such hydrogen synthesis. These engineered E.Coli systems are then implemented in a bioreactor system optimized for bioremediation and capable of modulating between conditions for degradation and synthesis. To regulate the oil degradation and hydrogen synthesis pathways inexpensively, Horizon characterizes riboswitches and novel synthetic CRISPRi operators under riboswitch regulation. Ultimately, Horizon provides a comprehensive system for oil degradation and clean energy fuel production.

CCU Taiwan

Liggreen

Region

Asia - Taiwan

Track

New Application

Poster

Zone 1 - #45

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 311

2:45 PM - 3:15 PM

With the policy of restriction on plastic usage in Taiwan, we aim to produce a lignin-like polymer which can be applied as a lining for paper cups in place of plastic. We were inspired by the water resistant nature of lignin, but natural lignin has many weaknesses. By taking advantage of an oxidizing enzyme produced by engineered *Pichia pastoris*, we can bind monolignols together into a simpler polymer. This polymer, which we named Liggreen, is water resistant like plastic but decomposable and also heat resistant. Liggreen in paper cups is just one of many applications, so the future of Liggreen is prosperous.

CDHSU-CHINA

Use genetically modified lactic acid bacteria to compound miraculin

Region

Asia - China

Track

High School

Poster

Zone 1 - #78

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 306

10:00 AM - 10:30 AM

Nowadays, it is nearly impossible for the patients with diabetes mellitus to enjoy the sweet foods, and our project is designed to solve that problem. So far, there is one thing that could help us reach our purpose-- Synsepalum dulcificum. The key is that the Miraculin in the Synsepalum dulcificum Could turn the taste of sour foods to sweet briefly, allowing patients with diabetes mellitus to enjoy the sweet taste. However, the current technology couldn't make the collection of Miraculin from the Synsepalum dulcificum easy and efficiently. Our goal is to compound the Synsepalum dulcificum protein by using genetically modified technology, and we believe that the new compound method could increase the quantity of the Miraculin and decrease the cost of production, with the intention to help diabetes mellitus patients.

Chalmers-Gothenburg

DiYEASTive: Probiotic yeast for diagnosis and treatment of colorectal cancer

Region

Europe - Sweden

Track

Therapeutics

Poster

Zone 1 - #49

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 302

11:00 AM - 11:30 AM

Our project uses Synthetic Biology to treat colorectal cancer. Our envisioned product is a pill containing genetically engineered probiotic yeast. The pill is ingested by the patient and passes through the digestive tract. If the ingested yeast cells encounter cancer cells in the colon, they will selectively attach to them. As more yeast cells accumulate, the secretion of anti-cancer molecules will be triggered. The yeast cells continuously produce gas vesicles which will refract ultrasound waves. This allows detection and monitoring using simple ultrasound imaging technology in an otherwise invisible and inaccessible part of the body. Meanwhile, the anti-cancer molecules specifically target and kill the cancerous cells, treating the patient with highly limited collateral damage.

CIEI-BJ

A yeast system for detection and degradation of aflatoxin B1

Region

Asia - China

Track

High School

Poster

Zone 1 - #42

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 312

4:45 PM - 5:15 PM

Our project is inspired by the possible contamination of the carcinogenic aflatoxins (AFTs), in Pu'er, a Chinese traditional fermented tea. We aim to design a genetically engineered yeast system to detect and degrade its widely occurred species AFT-B1. Our system contains three modules-induction, detection and degradation. The induction module was designed based on an iGEM project in 2017 using two fragments of an antibody against AFT-B1. The detection module utilizes enhanced yellow fluorescent protein to indicate the presence of ATF-B1. In the degradation module, four candidate enzymes were incorporated individually and their activities were assessed. Both detection and degradation modules are triggered when AFT-B1 bridges the two antibody fragments. Our design not only provides a parallel detection and degradation in yeast with potential practical value for Pu'er Tea and other agricultural products, but also establishes a convenient screening system for identifying novel AFT-B1-degrading enzymes.

Claremont

No title

Region

North America - United States

No abstract

Track

Environment

Poster

Zone 2 - #93

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 310

2:15 PM - 2:45 PM

CMUQ

Cas12a - Recognizing Carriers of recessive traits to save generations

Region

Asia - Qatar

Track

Diagnostics

Poster

Zone 2 - #96

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 302

9:00 AM - 9:30 AM

Our approach overcomes the limitations of sequencing, it being a cost-ineffective, labour-intensive, and location-specific method. Utilizing CRISPR for purposes other than gene editing has allowed us to create a novel, field-ready, diagnostic technique for carriers of recessive traits. Cas12a proteins are DNA targeting enzymes that recognize DNA based on a guide RNA sequence designed to match a target. The binding initiates non-specific single-stranded DNA (ssDNA) cleavage activity in Cas12a sufficient to degrade linear and circular ssDNA within minutes. Through this, ssDNA attached to fluorescent dye and quencher, serving as reporters, will undergo degradation. Upon cleavage, the quencher is released and fluorescence is emitted. We designed, built and programmed a hand-held device that can detect the fluorescence with high sensitivity. Simply, DNA obtained from cheek swabs, inserted into the device, diagnoses carriers of Sickle Cell Anemia.

CO Mines

Molecular Mining of Cadmium: Detecting and Binding Cadmium for Bioremediation

Region

North America - United States

Track

Environment

Poster

Zone 2 - #108

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 304

11:00 AM - 11:30 AM

Heavy metal contamination at current and former mining sites is a significant environmental and human health problem. Cadmium (Cd) is one of the more commonly found metal contaminants and due to the highly toxic nature, even minute amounts can cause loss of function of the kidney and liver and loss of bone. We developed a rapid and efficient cadmium sensing and binding system that is capable of detecting cadmium down to 10 μ M concentrations. When exposed to a minimum concentration of Cd, the cell expresses the green fluorescent protein (GFP). After Cd is detected, a metallothionein protein binds it and sequesters it in the periplasmic space in the E. coli cell. We will present data characterizing the performance of this system. The engineered system can be used for remediation efforts to remove Cd from the environment and process it safely.

ColegioFDR Peru

Fishing for Mercury: Detecting and Removing Hg from Fish Meal.

Region

Latin America - Peru

Track

High School

Poster

Zone 4 - #244

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 309

3:15 PM - 3:45 PM

Contamination of heavy metals is intoxicating the food chain at an alarming rate. We are working with T.A.S.A., exporter of anchovy fish meal to detect, accumulate, and isolate mercury (Hg) from their fish meal product. Our first construct contains a Hg accumulator and Green Fluorescence protein (GFP) to detect and accumulate the Hg. The second construct, with delayed expression of a Killer Red (KR) protein, will kill the bacteria in response to light. We aim to characterize the delayed expression of the KR protein under three different RBSs using unique constructs. The construct enabling delayed expression of the KR protein will be coupled with GFP/accumulator construct. We are building the GFP/accumulator construct using overlapping PCR. Finally, we are designing and creating a container optimizing the efficiency of detection and removal of Hg from fish meal.

ColumbiaNYC

Self-Contained Detection of Pathogenic Bacteria Using E. coli Based TX-TL Cell-Free Expression System

Region

North America - United States

Track

Diagnostics

Poster

Zone 4 - #240

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 302

9:30 AM - 10:00 AM

Improved characterization of the cas13a protein provides the opportunity to build a cheap, rapid non-technical diagnostic tool that has point-of-care applications in resource-poor settings through the use of an Escherichia coli γ -based transcription-translation (TX-TL) cell-free expression system. This self-contained platform encodes all components for diagnosis from detection to a readout in a cell-free solution. By combining the collateral cleavage of CRISPR-cas13a and small molecule sensing via metal sensitive operons, this system becomes modular, allowing for multiple diagnostic targets. To demonstrate, gene fragments of Chlamydia trachomatis and Neisseria gonorrhoeae were detected through the creation of specific targeting guide RNAs. CRISPR-cas13a's collateral cleavage and its preferential cleaving towards certain motifs allowed for the development of a ratiometric read-out due to the preferential degradation of chromoprotein expressing mRNA. The diagnostic system provides a simple in vitro platform that can be used for the versatile detection of pathogenic bacteria in clinical or field settings.

Cornell

Oscillate

Region

North America - United States

Track

Foundational Advance

Poster

Zone 3 - #188

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 304

9:00 AM - 9:30 AM

As the field of synthetic biology grows, it becomes increasingly necessary to have a reliable cell signaling platform that is more resilient to noise than traditional promoter-controlled systems. This year, we developed a robust new paradigm for cellular signaling based on frequency, rather than amplitude-based signals. Our system is analogous to a band-pass filter in electronics; the bacteria respond only to signals of an intermediate frequency, but not those of low or high frequency. By adding tunable degradation tags to proteins in the system, it is possible to frequency at which the reporter was expressed. Versatile deterministic and stochastic models were developed by our team and used to simulate and predict properties of the system. Creating a more robust paradigm for cellular signaling has several implications for the future of synthetic biology, including advancements in biological data storage and computing, chemical production, and biosensing.

CPU CHINA

A gene therapy strategy to target hepatocellular carcinoma based on conditional RNA interference

Region

Asia - China

Track

New Application

Poster

Zone 1 - #48

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 306

4:45 PM - 5:15 PM

Hepatocellular carcinoma (HCC), also called malignant hepatoma, is one of the deadliest cancers. Through the introduction of a double-stranded RNA to the targeted messenger RNA (mRNA), RNA interference (RNAi) leads to the specific cleavage of the mRNA and efficient silencing of gene expression. Since RNAi could be used to silence genes involved in the development and progression of carcinomas, it has promising therapeutic potential for their treatment. The gene therapy strategy we propose here: (1) utilize two cancer-specific promoters (one HCC-specific) to open an AND-gated system to target HCC, the selectivity supposed to be extremely high; (2) is dependent on and hence controllable by a low molecular weight compound; (3) has the flexibility to be adapted to target any mRNA and, if there are disease-specific promoters, other diseases.

CSU CHINA

Hepasheild: Gene Circuits for Liver Cancer Gene Therapy

Region

Asia - China

Track

Therapeutics

Poster

Zone 1 - #8

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 302

11:30 AM - 12:00 PM

The goal of our team is to develop a sensitive system to specifically kill liver cancer cells via genetic circuits, by using the combination of liver cancer-specific promoters and miRNAs. The expression of Gal4-VP16 fusion protein was under the control of liver cancer cells-specific AFP, hTERT or ZEB1-AS1 promoters. The Gal4-VP16 in turn drives the HSV-thymidine kinase (HSV-TK) expression by binding to nine tandem UAS elements in the promoter. Furthermore, the expression of Gal80, a Gal4 inhibitor, is controlled under a CMV promoter as well as a cluster of miRNA93/miRNA-362-5p/miRNA-221 binding sites at the 3'-end. As miRNA93/miRNA-362-5p/miRNA-221 are liver cancer cells-specific miRNAs, the expression of Gal80 is significantly suppressed in the liver cancer cells compared with normal cells. As a result, the nontoxic ganciclovir is converted by HSV-TK to a cell-killing drug in the liver cancer cells, but not normal cells.

CSU Fort Collins

Staphylococcus aureus Quorum Sensing: A Look Into Ultra-Sensitivity Switches in Gram Positive Bacteria

Region

North America - United States

Track

Therapeutics

Poster

Zone 4 - #239

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 207

3:15 PM - 3:45 PM

One of the most pressing matters facing the medical community is the growing dilemma of bacterial resistance to antibiotics. Due to their overuse, we have created bacteria that are resistant to antibiotics, and there are cases of bacteria that are resistant to multiple antibiotics, so called 'superbugs', such as Methicillin Resistant Staphylococcus aureus(MRSA). They pose an enormous risk to human health in the coming decades. We focused on utilizing the quorum sensing system of S. aureus to build a sensitivity switch, dependent on the concentration of the autoinducing peptide (AIP) that it uses to detect it's population density, and become virulent and break away from the biofilm. Our system will hijack the system and trigger production of a phage that will specifically target S. aureus and deliver a kill mechanism. This system will be able to safely treat S. aureus and avoid perpetuating the problem of creating new resistant species.

CU-Boulder

Antibody Switch

Region

North America - United States

Track

Therapeutics

Poster

Zone 5 - #284

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 207

2:45 PM - 3:15 PM

Biologic based therapies have become a promising field in cancer medicine due to their ability to harness the immune system to attack cancer cells. However, a potential side-effect of these therapies is an overactive immune system which can lead to severe reactions and possibly death. A solution to this overactive autoimmune attack would be to engineer and implement a safety switch into the system. This would allow for more aggressive monoclonal antibody therapies to be used while limiting the hazards of potential severe side-effects of current therapies.

CUNY Kingsborough

Low Cost Quantification of DNA Using ImageJ™ and Application

Region

North America - United States

Track

Open

Poster

Zone 2 - #137

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 207

2:45 PM - 3:15 PM

Quantification of nucleic acids is essential for ligation reactions and other reactions that require nucleic acids. Without accurate quantification of nucleic acids, it is difficult to complete a molecular biology experiment. Spectrophotometers are commonly used but are not accessible to all lab groups, making experiments prohibitively difficult for some. The Ethidium Bromide Spot Test protocol is a quick and dirty approach that relies on visualizing dye-DNA complex fluorescence under UV light. However, its reliability is questionable because the protocol is not well characterized. This year, the CUNY Kingsborough iGEM team hopes to better characterize this protocol and standardize the fluorescent measurements using ImageJ™. Ideally, our characterization will allow future iGEM teams to reduce lab costs but still produce trustworthy results. As proof of application, we will use the Ethidium Bromide Spot Test to construct and characterize quorum sensing BioBricks. Additional modelling will be performed to tune the BioBricks' pattern-forming behaviour.

Dalhousie Halifax NS

A Microbial Approach to Detecting Toxic Aluminum

Region

North America - Canada

Track

Environment

Poster

Zone 3 - #179

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 207

3:15 PM - 3:45 PM

As a result of acid rain, levels of toxic aluminum are rising in Nova Scotia rivers. These aluminum levels correlate with dramatic declines in Atlantic Salmon populations. Measuring aluminum levels is expensive, making it difficult for community groups that protect rivers in Nova Scotia to track aluminum levels. To decrease this cost, we designed a sensitive and inexpensive biosensor to detect levels of toxic aluminum. Our team is making use of the natural product pyoverdine, a fluorescent compound that certain pseudomonads produce to scavenge iron. While the enzymes responsible for pyoverdine synthesis are known, it is not known what steps in the pyoverdine synthesis pathway may be rate-limiting. We are overexpressing pyoverdine enzymes to determine the rate-limiting step. We are developing a fluorescent aluminum biosensor, which could be used as a 'point-of-care' diagnostic for at-risk rivers. This will enable targeting of mitigation strategies and better profiling of aluminum levels.

Delgado-Ivy-Marin

SynJazz NOLA

Region

North America - United States

No abstract

Track

Therapeutics

Poster

Zone 5 - #299

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 306

4:45 PM - 5:15 PM

DLUT China

A microbial agent for treating hyperuricemia

Region

Asia - China

Track

Therapeutics

Poster

Zone 1 - #22

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 309

9:00 AM - 9:30 AM

Hyperuricemia refers to the symptom that the level of uric acid is unusually high in blood. It commonly affects joints and leads to the gouty arthritis which are shown as joint deformity. At present, the drugs for treatment of hyperuricemia show a strong side effect. Urate oxidase is an enzyme in organism that catalyzes the oxidation of uric acid in purine metabolism. It oxidizes uric acid to allantoin. Allantoin can be easily metabolized by the kidneys. To solve the above problems, introduced the gene encoding humanized urate oxidase into *E. coli* Nissle. After the patient consumes these bacteria, the recombinant strain will remain in the patient's intestine. When the uric acid concentration reaches the threshold, the strain can secrete urate oxidase which can reach the blood of the patient. In addition, we have set up a microbial population control and in vitro lethal system to make our strains safer.

DLUT China B

Homehold portable urine analyzer for early diagnosis and monitoring of chronic kidney diseases

Region

Asia - China

Track

New Application

Poster

Zone 2 - #142

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 304

11:30 AM - 12:00 PM

In order to provide regular screening and early prevention for potential patient populations, it provides home portable visual detection. This project is aimed at chronic kidney disease caused by hypertensive and diabetes. In the early stages of the disease, it can provide medical advice by testing the content of early indicator beta2 microglobulin in the urine. We can get the concentration of the beta2 microglobulin by color change of the liquid crystal film which substance is the orientation change of the liquid crystal molecules caused by the antigen-antibody reaction on the liquid crystal substrate. The aldehyde group at the carbon terminal of the nano-antibody is modified by a screening and co-expression system, and then C18 is attached to enhance its ability to induce liquid crystal molecules, so that the nano-antibody fully satisfies the needs of liquid crystal detection. This project provides prophylactic measures for patients, early recognition and timely treatment.

DNHS SanDiego

Survival and Quorum Sensing Activity of *Pseudomonas aeruginosa* Under Influence of QS Inhibitors vs Antibiotics

Region

North America - United States

Track

High School

Poster

Zone 4 - #216

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 207

4:15 PM - 4:45 PM

Pseudomonas aeruginosa, an opportunistic bacterial species, often infects major burns and cystic fibrosis. Historically, antibiotics can treat these infections; however, *P. aeruginosa* quickly grow resistance, increasing colonization in human flora and decreasing treatment efficiency. Alternatively to antibiotics, inhibition of quorum sensing (QS), chemical communication among bacterial colonies, is under speculation. This experiment compares the effects of common antibiotics (gentamicin and tobramycin) to QS inhibitors (salicylic acid and zeaxanthin) on *Pseudomonas* survival and QS activity. Bacteria transformed with a plasmid that detected LasR, a *P. aeruginosa* QS indicator, levels and correspondingly produced green fluorescence protein (GFP) would be transformed to *P. aeruginosa* and grown in the presence of each antibiotic and QS inhibitor over 3 days. Absorbance and fluorescence would then be measured through serial dilution. This experiment explores a promising possibility for the future of antibacterial care efficiency and success in saving the lives of cystic fibrosis and burn patients.

DTU-Denmark

Hyphae Hackers: Fungal building materials for extreme environments

Region

Europe - Denmark

Track

Manufacturing

Poster

Zone 1 - #52

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 207

9:00 AM - 9:30 AM

Colonization of uninhabitable areas, like Mars, will require building materials to be transported to the site of deployment. Transport limitations such as space and weight make this process very expensive. Based on these challenges, we propose to make building materials from fungal mycelium to be grown on site. Therefore, our project is focused on how to optimize the material properties of the fungi through engineering of basic fungal characteristics. Our initial studies identified *Aspergillus oryzae* as the best candidate chassis for material properties and ease of genetic engineering. Based on this, we transformed the *melA* gene from *Rhizobium etli* into *A. oryzae* in an effort to improve the UV radiation tolerance by establishing melanin production. Furthermore, we have designed a final geometric structure that can withstand external conditions and reduce the amount of work needed to assemble it.

Duesseldorf

Trinity - towards an engineered co-culture toolbox

Region

Europe - Germany

Track

Foundational Advance

Poster

Zone 4 - #254

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 311

9:30 AM - 10:00 AM

Co-cultures are found in all conceivable entities, such as the human gut, cheese or plants, but good tools to study those communities are currently not given. Indeed we created a modularly built toolbox using not only three different dependencies but also three different organisms: With *Escherichia coli*, *Saccharomyces cerevisiae* and *Synechococcus elongatus* our team engineered a system based on nutrient exchange. Here phosphate is provided through oxidation of phosphite, nitrogen source produced by melamine breakdown, whilst carbon source is provided by *Synechococcus elongatus*. Two additional independent approaches are designed, too. The first includes regulation via cross-feeding by amino acid auxotrophies and production: lysine by *Escherichia coli* and leucine by *Saccharomyces cerevisiae*. The other utilizes regulated self-lysis via quorum sensing molecules, to control cell density by a phage lysis gene. This engineered toolbox opens a wide range of possibilities to create microbial communities for different purposes, such as synthetic probiotics.

Duke

Optimized Taxol Biosynthesis in E. Coli

Region

North America - United States

Track

Manufacturing

Poster

Zone 3 - #169

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 312

11:30 AM - 12:00 PM

Taxol is a natural molecule found in the bark of the Pacific Yew tree that has been used to treat a variety of cancers. Current manufacturing methods are unable to achieve high yields; the aim of our project is to greatly improve manufacturing outputs and reduce costs through biosynthesis of taxol from an intermediate in the synthesis pathway in *E. coli*. We used a modular approach to link the five necessary genes together before recombineering the construct into the *E. coli* genome; our design thus can be easily adapted to produce next generation taxanes. Five T7 bacteriophage promoters of varying strengths were selected from a promoter library and fitted in random combinations to the pathway genes. The resulting variants were screened to determine which combination of promoters maximized taxol synthesis. Finally, we analyzed the activity of produced taxol and evaluated this biosynthesis design's feasibility in industrially relevant conditions.

East Chapel Hill

Improving the Efficacy of Riboswitch Based Sensor for Visual Detection of Fluoride in Water

Region

North America - United States

Track

High School

Poster

Zone 4 - #242

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 312

10:00 AM - 10:30 AM

Fluoride, in appropriate quantities, has been recognized as beneficial for protecting tooth enamel from decay. However, a significant problem arises when excess amounts of fluoride infiltrate drinking water. High fluoride concentrations can result in dental fluorosis, which is characterized in children by hypomineralization of the enamel. To address this challenge by efficiently detecting fluoride in water, we aim to develop a fluoride biosensor using previously characterized fluoride riboswitches. Last year, we have developed an operon that, when fluoride binds, activates the riboswitch resulting in transcription of the chloramphenicol acetyltransferase gene. Thus, when fluoride is present, bacterial growth can be observed in the presence of chloramphenicol. However, this system was only able to detect high fluoride concentrations. To improve the efficacy and reduce the detection threshold, we used restriction enzymes to test various promoters and riboswitch sequences. We found that two of the new sequences promoted higher bacterial growth.

Ecuador

Recombinant production of fusion proteins and their coupling to bacterial cellulose for obtaining a biomaterial.

Region

Latin America - Ecuador

Track

Therapeutics

Poster

Zone 1 - #58

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 302

11:00 AM - 11:30 AM

Development of a biomaterial based on the cross-linking of bacterial cellulose and fusion proteins, for use in biomedical applications. Bacterial cellulose is used as a bandage matrix. The fusion proteins have the following parts: CBD, ELP and BMP2. CBDs function is to bind to cellulose, the ELP protein gives greater flexibility to the bandage, while the BMP2 protein, an inducer of cell differentiation in osteoblasts, is responsible for reducing the recovery time of the bones. To achieve the objective, the expression of the cellulose and the fusion proteins is carried out separately. For bacterial cellulose, is used an Escherichia coli expression system, in two plasmids: psb1C3 responsible for cellulose synthesis and psb1A3 responsible for the synthesis of the export system and overproduction. For the fusion protein, is used plasmid psb1C3, which contain the genes for the proteins CBD, ELP and BMP2.

ECUST

Engineering microbial method to solve the problem of blockage corrosion caused by bacteria

Region

Asia - China

Track

Environment

Poster

Zone 1 - #80

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 312

11:00 AM - 11:30 AM

The global cost of blocking and corrosion in cooling towers is estimated to be several billion dollars each year, which mainly results from the colonization of microbes. The microbes cause the formation of corroded objections and biofilm, directly leading to severe blocking. In this year, ECUST iGEM is trying to solve the problem by synthetic biology, presenting a totally new idea. By constructing engineered *Escherichia coli*, we design an integrated gene circuit which assembles sensing, cleaning rust, eliminating biofilm and killing iron bacteria. The microbes in pipelines will firstly be sensed through quorum sensing, then two key substances will be secreted to clear rust and biofilm respectively. When this method achieves the certain effect, the expression of antimicrobial peptides and autolysins will be triggered to kill the bacteria without adhesion ability, basically preventing the pipelines from being blocked again.

Edinburgh OG

Escherichia Coli with heterologous polyhydroxyalkanoate (PHA) pathway produces bio-based and biodegradable thermoplastics from industrial co-products

Region

Europe - United Kingdom

Track

Manufacturing

Poster

Zone 2 - #122

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 306

2:45 PM - 3:15 PM

Among the pressing issues towards bio-based alternatives to plastic, cost-efficiency and truly sustainable models remain a challenge. As our proposed solution, we are investigating the production of polyhydroxybutyrate-co-valerate (PHBV) by looking not only at using industrial co-products as substrate but also improving downstream processing. PHBV and other polyhydroxyalkanoates (PHA) are thermoplastics that can be designed with bespoke physical properties based on their relative compositions. By introducing heterologous genes (*phaCAB*) from *Cupriavidus necator*, we engineered recombinant *Escherichia coli* to produce PHBV using co-products from local whisky distilleries. Furthermore, we have designed a secretion system to reduce costs associated with current extraction methods. To complement this, we are developing not only in silico metabolic models for optimized polymer synthesis but also macro-scale models to assess the environmental and economic impact of these products in their life cycles.

Edinburgh UG

Maxed OOT

Region

Europe - United Kingdom

Track

Foundational Advance

Poster

Zone 2 - #166

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 208

9:00 AM - 9:30 AM

Release of the living prokaryotic chassis used in synthetic biology outside of laboratory conditions can cause unforeseeable damage to the environment and the ecosystems present there. However, the inability to release synthetic biology inhibits its usefulness, and limits its potential in solving global and localised problems. At team Maxed OOT we believe we have the solution... Maxicells! Maxicells are achromosomal E. coli cells that cannot replicate. Maxicells remain metabolically active following the loss of their chromosome and express genes given to them on an 'instructor plasmid'. In our project we analyse the most efficient methods for maxicell production, quantify their active metabolic timeframe, and characterise them as a biosensor. Additionally, we present our triple lock system for preventing horizontal gene transfer. The resulting novel chassis could re-contextualise many previous Synthetic Biology projects and open doors for the field as a whole.

Emory

Recombinant bacteria protect fruit flies from malathion

Region

North America - United States

Track

Food & Nutrition

Poster

Zone 2 - #168

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 312

5:15 PM - 5:45 PM

Organophosphate (OP) insecticides, including parathion and malathion, inhibit the enzyme acetylcholinesterase, thereby causing over-accumulation of the neurotransmitter acetylcholine. OPs account for 30% of pesticide sales worldwide. Over 200,000 people, mostly farm workers, die each year from over-exposure. The OP malathion is the most common insecticide contaminant of livestock feed in the U.S. Here we show that *Escherichia coli* that express artificially evolved enzymes protect a model animal, *Drosophila melanogaster*, from otherwise toxic doses of malathion. This result is significant because the strategy could be extended to protect pollinating insects, livestock and farm workers from malathion. More generally, these results suggest that enzymes that bioremediate toxins can be applied without purification as long as they are expressed in environmentally benign hosts.

EPFL

Title: CAPOEIRA (CAncer PersOnalised Encapsulin Immunotherapy & Relapse surveillance)**Region**

Europe - Switzerland

Track

Therapeutics

Poster

Zone 1 - #84

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 207

4:45 PM - 5:15 PM

While Melanoma remains the deadliest form of skin cancer, immunotherapy approaches can harness our immune system to defeat it! Yet, current immuno-treatments suffer from high costs, limited accessibility, and poor specificity. Our project 'CAPOEIRA', named after the Brazilian self-defense martial-art, exploits the potential of synthetic biology to develop a personalized, cost-effective, and rapid production scheme for cancer vaccine and point-of-care relapse surveillance. First, a bioinformatic pipeline integrating state-of-the-art tools identifies our targets: melanoma neoantigens, the fingerprints of cancer cells. Next, cell-free protein expression rapidly synthesizes a library of encapsulin protein nanocompartments presenting the various neoantigen epitopes. This encapsulin vaccine activates dendritic cells which trigger T-cells' attack on the neoantigen-bearing cancer cells. Nevertheless, we don't underestimate a defeated villain! To detect potential relapse, we combine techniques including dumbbell probes, rolling circle amplification, isothermal amplification, and CRISPR-Cas12a to detect circulating tumor miRNA and DNA.

ETH Zurich

AROMA - Autonomous Robot for Odorant Measurement in Air**Region**

Europe - Switzerland

Track

New Application

Poster

Zone 4 - #221

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 306

11:30 AM - 12:00 PM

Cell-based biosensors allow to simply and selectively sense diverse chemical signals; yet their applications are limited by the minutes-to-hours timescale of gene transcription and translation. To generate a real-time output, we exploit the much faster changes in protein interaction and bacterial movement. Based on the *E. coli* Tar chemotaxis receptor, we developed two sensing systems: detecting DNA binding of a transcription factor via split luciferase complementation, and imaging the movement of bacteria at the single-cell level. The sensory domain of Tar can be modified to recognize different molecules, extending the applicability of the sensor. To show the advances brought by our system we built AROMA, an autonomous robot that is directly driven by the onboard biosensor. The robot detects the concentration of volatile compounds in air by imaging the bacterial response with a microscope built in-house. This enables our device to locate the source of pollutants or chemical hazards.

Evry Paris-Saclay

PepTalk - Repurposing Bacteriophage Peptide Signals For Expanded Bacterial Communication Vocabulary

Region

Europe - France

Track

Foundational Advance

Poster

Zone 1 - #83

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 306

2:45 PM - 3:15 PM

Communication is Key' is a universal principle that applies to all levels of organization: from microbial colonies to human social networks. Communication helps single-celled organisms to determine their collective fate by quorum sensing, and individual footballers to coordinate the winning goal for their team (Allez les bleus!). However, if the language used to communicate has limited vocabulary, it's hard to have any meaningful conversation. Synthetic bacterial consortia are currently engineered using a very small set of signalling molecules for cell-to-cell communication, thus limiting the potential of this powerful technology. In our project, PepTalk, we repurpose the small peptide based signalling system of SPbeta group bacteriophages for application in the more widely used laboratory workhorse *Escherichia coli* by engineering hybrid *E. coli* promoters in order to demonstrate orthogonal communication channels between cells. The PepTalk system will expand the repertoire of unique bacterial communication signals, enabling more complex conversations in bacterial consortia.

Exeter

Project Perchlorate: Turning a problem on Earth into a solution on Mars

Region

Europe - United Kingdom

Track

Environment

Poster

Zone 1 - #7

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 309

5:15 PM - 5:45 PM

Mars is a location of scientific interest and the next step in space exploration. NASA's 2008 Phoenix Rover found that Martian regolith contained up to 1% perchlorate salts, which would leach into crops grown in Martian soil and cause health issues like hypothyroidism. Additionally, transporting the necessary oxygen to a Martian base would be expensive and inefficient. Oxygen production would ideally take place in situ. Our project aims to utilise a GM bacterium that bioremediates perchlorate, reducing it to oxygen. Naturally occurring perchlorate reducing bacteria utilise two enzyme complexes; PcrABCD for perchlorate reductase and Cld for chlorite dismutase. We will insert these genes on two plasmids into *E. coli*. We've worked with stakeholders to design a perchlorate reducing bioreactor that could be integrated into existing life support systems, providing breathable oxygen. Existing methods of perchlorate disposal are explosive, something especially dangerous in space, making this a uniquely synbio project.

FAU Erlangen

Paving the Way for Biocatalytically Active Protein Membranes

Region

Europe - Germany

Track

Foundational Advance

Poster

Zone 4 - #224

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 304

2:15 PM - 2:45 PM

The idea of this project is the improvement of biocatalytic properties of enzyme cascades using surface-layer (S-layer) proteins. S-layers are prokaryotic protein membranes which assemble into two-dimensional lattices with different symmetries. As components of a model system, the S-layer proteins SbsB (p1, *Geobacillus stearothermophilus*), PS2 (p2, *Corynebacterium glutamicum*) and RsaA (p3, *Caulobacter crescentus*) were isolated. In solution these S-layer proteins arrange into three-dimensional nanostructures. Cluster formation of S-layer proteins was examined by mixing different symmetries (p1, p2 and p3). Structure formation was predicted with Monte-Carlo Markov chain simulations. To explore novel potential applications, S-layer proteins were conjugated with Streptavidin. Thus, various biotinylated fluorescence markers can be applied for FRET analysis. This can serve as model system for S-layer conjugates with biocatalysts.

FJNU-China

2-PLEAsant

Region

Asia - China

Track

Environment

Poster

Zone 3 - #185

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 302

4:15 PM - 4:45 PM

According to statistics, the microbes we touched each day are about 3 times more than the human cells. The infection with some specific microbes can cause infectious diseases and give unpleasant smell. Bacteria can infect any area of the body and cause different diseases: pneumonia, meningitis, food poisoning, etc. Our project focuses on inhibition of the infectious microbes in a more efficient, environmentally friendly way. Based on the principles of metabolic engineering, we engineered an *E. coli* strain producing phenyllactic acid that has broad-spectrum antibacterial effects, and the rose-like aroma compound 2-phenylethanol. We incorporated the common components of temperature and salt control in the synthesis system, which applied phenyllactic acid and 2-phenylethanol to the natural environments. In addition, we designed the toxic protein mazF as a suicide switch to ensure biosafety. In the future research, we plan to promote the system into various types of fields and solve more environmental problems.

FSU

Audiogenetics: Activating Bacteria with Sound

Region

North America - United States

Track

Foundational Advance

Poster

Zone 4 - #228

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 302

4:45 PM - 5:15 PM

QUESTION: Can sound be used to induce gene expression in *E. coli*? **IMPACT:** It is routine to use a small molecule to induce gene expression in cells. Can sound become a routine means to induce gene expression? The Human Practices Team revealed that success in using sound to induce gene expression in cells has the potential to impact the brewing industry and molecular biology research. A potential negative impact could be the activation of pathogenic cells with sound guns. **RESULTS:** We characterized promoters submitted by the 2008 UC Berkeley team that potentially could be activated by sound. In parallel, we selected additional promoters that also have the potential to be induced by sound. We tested the promoters in new genetic devices to evaluate if different sound frequencies and amplitudes correlated with increased gene expression. The results of the tests are available on the wiki and will be presented.

Fudan

ENABLE across-membrane binary computing in mammalian cells

Region

Asia - China

Track

Foundational Advance

Poster

Zone 1 - #16

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 311

9:00 AM - 9:30 AM

Contact-dependent signaling is critical for multicellular biological events, yet customizing contact-dependent signal transduction between cells remains challenging. Here we have developed the ENABLE toolbox, a complete set of transmembrane binary logic gates. Each gate consists of 3 layers: Receptor, Amplifier, and Combiner. We first optimized synthetic Notch receptors to enable cells to respond to different signals across the membrane reliably. These signals, individually amplified intracellularly by transcription, are further combined for computing. Our engineered zinc finger-based transcription factors perform binary computation and output designed products. In summary, we have combined spatially different signals in mammalian cells, and revealed new potentials for biological oscillators, tissue engineering, cancer treatments, bio-computing, etc. ENABLE is a toolbox for constructing contact-dependent signaling networks in mammals. The 3-layer design principle underlying ENABLE empowers any future development of transmembrane logic circuits, thus contributes a foundational advance to Synthetic Biology.

Fudan-CHINA

Synthetic Transducer Engineering Platform (STEP)

Region

Asia - China

Track

Therapeutics

Poster

Zone 2 - #154

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 310

11:00 AM - 11:30 AM

Cell therapy has shown great potential in cancer treatment these years, while the existing CAR-T cell therapy can only target on cell surface antigens. However, there are also many tumour markers free in the blood, also being important targets marking the location of tumour. Here we manage to construct a brand new transducer system, named STEP, to recognise small, soluble tumour markers (e.g. VEGF, AFP, TSGF). For that purpose, we adapt and optimise a newly developed system to transduce the input (free ligands) into release of a transcription factor and expression of desired drugs. To increase the recognition ability, we use Rosetta to redesign the interface between ligand and receptor in order to enhance the binding affinity. Our STEP system can be applied for detecting tumour markers in blood and secrete drug in real time to appropriate tissues, providing a new yet practical approach for cell therapy and cancer treatment.

Gaston Day School

Improving *E. coli*'s resistance to isobutanol for large scale production

Region

North America - United States

Track

Environment

Poster

Zone 2 - #130

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 208

11:00 AM - 11:30 AM

We use fuel to power everything from our cars to our furnaces; however, our fuel supply is running low. As a result, we are turning to biofuels for renewable energy. We are trying ethanol, but it is inefficient, requires arable land, and pulls corn from the food supply. For this reason, our team is engineering *E. coli* K-12 to produce isobutanol, a biofuel with an energy density similar to gasoline. We started by improving *E. coli*'s resistance to isobutanol. Though *E. coli* can produce isobutanol naturally, its toxicity will hinder production at high concentrations. Higher resistance will allow for greater production later. We cloned the genes *GlmY*, *EutG*, and *AdhP*, combined them with a range of promoters, and observed bacterial growth in media containing isobutanol from 0.0217 to 0.650mM. In the future, we plan on cloning *AdhE*, *AceE*, *AceF*, *YiaY*, and *GlmZ*: genes associated with alcoholic resistance.

GDSYZX

Rocking Yeast

Region

Asia - China

Track

High School

Poster

Zone 1 - #71

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 309

3:15 PM - 3:45 PM

Our goal this year is to create a kind of yeast for controlling heavy metal contamination in water. Heavy metal pollution has the characteristics of being enriched by the biological chain. Traditional treatment methods such as chemical reagent sedimentation mostly bring about great environment pollution and potential safety hazard. We aim at treating this pollution with yeast in an environmentally friendly, economical and effective manner. We found that gene PCS1 extracted from Arabidopsis thaliana can synthesize phytochelatin to chelate heavy metal ion. we use the genetic engineering techniques to take the pcs1 gene from Arabidopsis thaliana and then transfer it into the pPIC9K plasmid. The final step of the process is to transfer this plasmid into the yeast's cell and activate the gene expression of pcs1.

Georgia State

Is Your Detector Expecting? See with HCG!

Region

North America - United States

Track

Diagnostics

Poster

Zone 3 - #183

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 302

10:00 AM - 10:30 AM

Detection is essential in providing an illustration of the chemical world around us. Currently, fluorescent protein are used as reporters but they require additional analysis with expensive and immobile equipment. We propose to create an alternative detection system kit using recombinant Human Chorionic Gonadotropin (HCG) as a reporter. The goal of our project is to create an easy, cost-effective, and sensitive detection device for use in synthetic biology, it can even be used by other iGEM teams to get an all-or-nothing response indicating the presence of targeted protein using pregnancy test strips. We plan to create a pGEX plasmid containing recombinant HCG preceded by new restriction sites which is where the promoter is inserted, only to be activated in the presence of the protein in question. Then when a pregnancy test strip is inserted in the sample, it will trigger the response based on the activation of the introduced promoter.

Gifu

MPPP (Mass-production of protein in PURE system)

Region

Asia - Japan

Track

Foundational Advance

Poster

Zone 4 - #217

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 306

2:45 PM - 3:15 PM

In vivo circular RNA expression can be a cutting edge method to perform mass-production of protein. During the translation of coding information of DNA into amino acids, function of ribosomes is naturally influential. The translation is initiated by binding ribosomes to mRNA and termination of translation is induced by a stop codon. When a start codon is recognized by ribosomes, the protein producing organelles release the protein. To produce large amount of protein and long-chain protein we can utilize circular RNA without the stop codon. iGEM Gifu 2015 performed the method of the Permuted Intron-Exon Method (PIE method). Currently 2.5% of transcribed RNA can be formed as circular RNA. With PIE method, mass-production of protein was confirmed in E.coli, however the protein had no function because of aggregation. This year our team will try to produce functional protein from the circular RNA in PURE system, a kind of cell-free system.

GO Paris-Saclay

MethotrExit: a HeteroGenious Cleaning Factory

Region

Europe - France

Track

Environment

Poster

Zone 3 - #205

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 311

4:15 PM - 4:45 PM

Cytotoxic anticancer drugs are among the harmful chemicals found in hospital wastewater at high concentrations. Degradation through physical and chemical methods exist but are often inefficient, unsustainable or expensive. We propose MethotrExit, a bioreactor-based approach to tackle this problem. We focused on the biotransformation of methotrexate (MTX), a widely used anticancer drug. We designed synthetic cassettes encoding a new biotransformation pathway using a heterologous carboxypeptidase in Escherichia coli. In only five hours, MethotrExit drastically removes MTX from the media. However, anticancer drug degradation products and/or the biotransformation pathway itself might be toxic for E. coli. To overcome this issue, biobricks generating heterogeneity in enzyme expression were built to ensure survival of a subpopulation. Modeling of this system highlights the interest of a division of labor between 'cleaning' and 'stem' bacterial cells.

Goettingen

Glyphosate on my plate?! Detection and inactivation of Glyphosate using the soil bacterium *Bacillus subtilis*

Region

Europe - Germany

Track

Environment

Poster

Zone 3 - #198

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 312

9:30 AM - 10:00 AM

Feeding the steadily growing world population is a major agricultural task that heavily relies on the utilization of herbicides. Glyphosate is the prominent example for a total-herbicide, as its usage rate is ever increasing since its introduction in 1974, making it the most-used herbicide in the USA today. Glyphosate has a bad reputation as it is thought to be harmful to human health. We want to improve the knowledge of the influence of glyphosate on the physiology of a model organism. For this purpose, we aim to engineer the Gram-positive model bacterium *Bacillus subtilis* for the detection and degradation of glyphosate. So far, we have isolated *B. subtilis* variants tolerating high amounts of glyphosate. Currently, these strains are used to develop and characterize a glyphosate detection system, which is based on fluorescently labeled bacteria. We also plan to engineer the bacteria for glyphosate inactivation using the glyphosate N-acetyl-transferase.

GreatBay China

mCATNIP: microbial Compartmentalization AssisTed Nepetalactol Ingredient Production

Region

Asia - China

Track

High School

Poster

Zone 1 - #2

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 309

2:45 PM - 3:15 PM

Nepetalactone is the active ingredient in catnip, a feline attractant, and a potential green pesticide. It has a common precursor, nepetalactol, with other plant-derived compounds of great therapeutic value, such as vincristine (an anti-cancer drug). We aim to synthesize nepetalactol through the co-culture of *E. coli* and yeast where *E. coli* generates the intermediate geraniol, and yeast continue to convert geraniol to nepetalactol. Endogenous genes in yeast are deleted to reduce shunt products. Besides, we design, characterize, and use a library of transcription activator-like effectors (TALE) stabilized promoter to regulate the heterologous gene expression in *E. coli*. Our applied design conceives the future application of nepetalactone on stray cat control, which we consider as an opportunity for public engagement and education.

Grenoble-Alpes

'Phagzyer' : a fully automated detection device in the superbugs era.

Region

Europe - France

Track

Diagnostics

Poster

Zone 1 - #70

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 309

11:30 AM - 12:00 PM

Bacteriophages are viruses that kill specifically, and with a relative efficiency, strains from a bacterial species. They are thus a viable alternative to antibiotics that our fully automated device aims to promote. Our project is designed to: identify a pathogenic bacterium; detect if this bacterium presents an antibiotic resistance marker; select the most effective phages for a therapy. As a proof of concept, we targeted *Pseudomonas Aeruginosa*, a bacterium causing opportunistic lung infections in immunosuppressed patient. We created DNA probes targeting a housekeeping gene and an antibiotic marker of PAO1. In parallel we automated the different processes required for detection with DNA probes: from the DNA extraction after lysis to a fluorescence measurement via a bacterial transformation. Hence, untrained healthcare professionals will eventually be able to take a sample from a patient, run it through our system, wait for a few hours and get information to decide of a therapy.

Groningen

StyGreen: Bioplastic from cellulosic waste through consolidated bioprocessing

Region

Europe - Netherlands

Track

Manufacturing

Poster

Zone 4 - #238

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 304

2:45 PM - 3:15 PM

Current production of styrene, an important plastic monomer, is oil based. As an alternative to oil based styrene we aim to produce styrene from a presently underused wastestream: cellulosic waste. Our system consists of both breaking down cellulose to glucose and subsequent styrene production in *Saccharomyces cerevisiae*. First the cellulose is degraded by an established cellulosome complex containing different cellulases and a cellulose binding domain. By complexing the cellulases and anchoring the complex to the cell wall the efficiency of the cellulosome is enhanced synergistically. The freed glucose is taken up and used for growth and production of phenylalanine. Conversion of phenylalanine to styrene occurs in two steps, first the phenylalanine ammonia lyase enzyme (PAL2) is introduced, which enables the yeast to convert phenylalanine into trans-cinnamate. The final step of our cascade is catalyzed by a native enzyme, producing styrene from trans-cinnamate.

GZHS-United

And then there were none (mosquitoes)

Region

Asia - China

Track

High School

Poster

Zone 2 - #145

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 207

11:00 AM - 11:30 AM

Our project is to make a new biological mosquito killer to kill mosquitoes in an environmentally friendly way. Mosquito-borne diseases such as dengue and Zika are prevailing around the world and causing death of a great number of people every year. Therefore, controlling mosquitoes is of great importance. There are two active components in our product: protein Cry11Aa and recombinant Aedes aegypti densovirus. Protein Cry11Aa is solubilized in mosquito mid-gut and can lead to cell lysis when binding the receptor on cell membrane. The recombinant Aedes aegypti densovirus can express insect-specific toxin, which kill mosquito by to affect insect neuronal sodium conductance. We mix them together to make effective and environmental mosquito killer. The new mosquito killer shows a high specificity for mosquitoes as a host. It is relatively stable in the environment and have the potential to spread and persist in mosquito populations.

H14Z1 Hangzhou

Production of several liver-saving factors in Lactobacillus

Region

Asia - China

Track

High School

Poster

Zone 2 - #162

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 306

4:15 PM - 4:45 PM

After literature survey, several key liver-saving factors were screened out and further synthetic pathways were constructed in Lactobacillus. This in-vivo strategy will be super to the traditional production of these factors in industry.

HAFS

Minicell-based oral delivery of Insulin

Region

Asia - Korea

Track

High School

Poster

Zone 2 - #109

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 312

4:15 PM - 4:45 PM

Type 1 and 2 Diabetes mellitus (T1DM, T2DM) are caused by inappropriate insulin production. The former results from the lack of β cell, while the later results from insulin resistance. In order to treat T1DM as well as severe cases of T2DM, patients should be injected with insulin analog multiple times a day. Because these analogues are readily degraded upon oral intake, the only method of injecting insulin analog is via invasive methods. We aimed to develop minicell-based insulin delivery system that can be orally administered. Minicells are achromosomal cells that do not reproduce. Overexpression of FtsZ gene in *Escherichia coli* induces abnormal cell division that produces minicells. Through gibson assembly, we have engineered the minicell that produce single chain insulin associated with cell penetrating peptide that facilitates cellular intake. The cells lyses in response to bile salt, which leads to targeted secretion of insulin in intestine.

Hamburg

Reagents of S.H.I.E.L.D.

Region

Europe - Germany

Track

Environment

Poster

Zone 1 - #82

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 311

9:00 AM - 9:30 AM

Malaria is one of the deadliest diseases worldwide. Extraordinary efforts are made to reduce malaria infections with limited success. All currently available applications, which look to prevent transmission by mosquitoes, are limited by the vast infrastructural differences in affected regions. With the Sustainable Human-Imitating Elimination and Lure Device (S.H.I.E.L.D.) we developed a mosquito trap tailored especially to the requirements of infrastructurally and economically disadvantaged regions. S.H.I.E.L.D. employs a self-sustaining co-culture of cyanobacteria and engineered *E. coli* which produce a complex mosquito attractant mixture as well as a targeted bioinsecticide. Careful implementation of novel regulatory circuits limiting cell growth, responding to nutrient availability, and monitoring metabolic load allows sustained in-trap production of attractants and insecticide over extended periods of time. The durable trap case with nano filter, co-culture separation and hydrogel reservoir ensures biosafety and brings together our no-maintenance sustainable solution to one of world's biggest problems.

Harvard

Degratin: a story of keratin degradation

Region

North America - United States

Track

New Application

Poster

Zone 3 - #212

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 310

10:00 AM - 10:30 AM

Keratosis pilaris and Seborrheic keratosis are characterized by a buildup of keratin which are accompanied by redness and rashes. In severe cases, these skin conditions may be precancerous. Keratin is difficult to degrade due to the nature of its protein structures. However, complete degradation can be induced by the synergistic capacity of endo-acting, exo-acting, and oligopeptide-acting keratinases. We have engineered strains of E.coli to produce these keratinases and secrete them through the curli secretion pathway. We then encapsulated these modified bacteria in a hydrogel only permeable to the enzymes and essential nutrients for growth. Thus, we've created a prototype for a keratin-degrading patch to place on the afflicted area to mitigate the lesion, eliminating the need for conventional invasive treatments. The development of easily produced keratinases lends to future uses, such as management of agricultural waste and facilitated research in precancerous growths linked to excess of keratin.

Hawaii

Delivering Transgenes to Corn Centromeres

Region

North America - United States

Track

New Application

Poster

Zone 2 - #113

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 306

12:00 PM - 12:30 PM

Nature has provided a remarkable system to insert genes into functional centromeres of grass genomes. Specifically, centromeric retrotransposons (CR) have the unique ability to insert themselves into the centromere by targeting a yet unidentified docking agent. We plan to adapt this system to insert genes of interest into centromeres. Centromeres are advantageous transgene targets because they lack recombination, allowing the stacking of multiple traits. Retrotransposons, or 'jumping genes,' self-replicate and package their genome into self-assembling virus-like particles (VLPs), then reinsert (or 'jump') themselves into a new chromosomal location. To measure the stability of VLPs for packaging molecular cargo, we cloned the full-length gene encoding the CR gag protein and successfully generated VLPs in vitro. We also tested the efficiency of different gene constructs in forming VLPs in vitro. Electron microscopy can confirm VLP assembly, however, we plan to develop a convenient fluorescent assay to assess VLP assembly.

HBUT-China

Nickel Hunter2.0

Region

Asia - China

Track

Environment

Poster

Zone 5 - #278

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 207

2:15 PM - 2:45 PM

This year's iGEM team decided to continue the work started by last year's team with the Nickel Hunter project; a biological device to detect nickel ions in the environment. Two shortcomings of the previous design were a small measurement range, and low precision. This year we added the nickel ions channel protein NikABCDE gene to the original gene element allowing the ions to enter the cell more smoothly, which has improved both of these issues. We also replaced the RFP gene with the luciferase LuxCDABE gene. The reporter gene emits fluorescence in response to nickel ions which further enhances our measurement precision. It also provided the opportunity to develop a biosensing instrument for real-time nickel ions detection. Our changes improved sensitivity and range, as well as provided an opportunity for a new method of nickel ions detection.

HebrewU

The Catalysis of Dioxin Degradation

Region

Asia - Israel

Track

Environment

Poster

Zone 1 - #51

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 302

9:00 AM - 9:30 AM

Dioxins, a family of chemical compounds, pose a serious threat to humans, animals, and the environment. Classified as persistent environmental pollutants, these compounds move up the food chain via bioaccumulation; consequently, they are found in very harmful concentrations by the time they reach humans. Our team has set out to engineer a metabolic pathway for the complete degradation of dioxins, and detoxification of chlorinated compounds. The pathway would involve the uptake of these pollutants and their subsequent breakdown into molecules that would enter organisms' native metabolism. We are testing the pathway in *S. cerevisiae*, and have prepared expression vectors and means to engineer a multitude of plants. By deploying such pathways directly into endemic plants, our solution can be tailored to specific regions. Furthermore, because we can efficiently control plant reproduction, we can responsibly implement synthetic biology to solve this issue in a non-invasive and ecological manner.

HFLS ZhejiangUnited

Formaldehyde Eliminator: Engineered Microbes for Detecting and Biodegrading of Formaldehyde

Region

Asia - China

Track

High School

Poster

Zone 2 - #129

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 207

11:30 AM - 12:00 PM

Formaldehyde brings different degrees of harmful symptoms to us humans, such as eye, throat and skin irritation, and even carcinogenicity, which is widespread used in construction and decoration industries. In previous iGEM projects related to formaldehyde, several problems still need to be improved, such as 1) the present sensing threshold of formaldehyde concentration (~ 10 ppm) is far upper beyond the environment-protecting standard (~ 0.1 ppm); 2) the degrading system seems to work unstably, although some survival or duration after formaldehyde addition was observed. Our project is aiming to construct a more sensitive and effective *E. coli*-based system for detecting and further degrading formaldehyde in environments, basing on current systems (already registered as BioBrick parts).

HK HCY LFC

A Self-Assembled DNA Tweezer Nanomachine - New Approach for the Diagnosis of Spinocerebellar Ataxia(SCA3)

Region

Asia - Hong Kong

Track

High School

Poster

Zone 1 - #55

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 302

2:45 PM - 3:15 PM

The situation of SCA was described by Professor Edwin Chan during interviews. The difficulties encountered by patients from different stages of SCA were shared in a workshop with Hong Kong Spinocerebellar Ataxia Association. The SCA3 relates to either up or down regulation of four miRNAs biomarkers. A new approach for the diagnosis of SCA3 will be developed under this study. Under the mentorship of the University of Hong Kong, a DNA tweezer nanomachine is employed to detect target SCA3 biomarkers. When the desired miRNA hybridized to the recognition site on the tweezers, the nanomachine is turned from an open state to a closed state, which allows the assembly of the split strand G-quadruplex. The G-quadruplex acts as an aptamer and binds to hemin. The hemin-mediated peroxidase activity produces a color change as a signal. This alternative diagnostic method would have further implication on monitoring the onset and progress of SCA3.

HKJS S

Carbon dioxide Reduction to Methane using Modified Nitrogenase with PET decomposition as Primary Carbon Source

Region

Asia - Hong Kong

Track

High School

Poster

Zone 1 - #46

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 304

10:00 AM - 10:30 AM

Poly(ethyleneterephthalate) (PET) is a prevalent material which can be used in various applications, while bringing adverse effects to the environment. An enzyme, PETase, can degrade the highly-crystallized PET to mono-(2-hydroxyethyl) terephthalic acid (MHET), terephthalate and Bis(2-Hydroxyethyl) terephthalate. MHET is also further decomposed by MHETase to terephthalic acid and ethylene glycol (EG). EG can be further broken down in *E. coli* K-12 to produce carbon dioxide. Carbon dioxide, however, is a notable greenhouse gas. Using the mutagenesis of the amino acid residues of nifD in nitrogenase, the substrate binding site can be modified so that carbon dioxide can undergo the multi-electron reduction to methane. We propose an efficient carbon dioxide reduction system with the decomposition of PET as the primary carbon source. PETase, MHETase, and amino acid substituted nitrogen fixation genes in MoFe nitrogenase will be expressed in a fast-growing bacterium, *E. coli*.

Hong Kong HKU

In vivo synthesis of therapeutic DNA nanostructures

Region

Asia - Hong Kong

Track

Foundational Advance

Poster

Zone 2 - #117

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 311

11:00 AM - 11:30 AM

DNA nanotechnology has been evolving fast in the past few decades and has found various new applications in biomedicine. Currently, most functional DNA nanostructures are assembled in vitro, using chemically synthesized custom oligonucleotides. Our project aims to harness the synthetic ability of bacteria to accelerate the production of functional DNA nanostructures. Multiple DNA nanostructures with aptamers and strand-displacement toeholds were designed for breast cancer therapy. We characterized their actions in vitro and evaluated their therapeutic effects on human breast cancer cell line. To synthesize these DNA nanostructures, a reverse transcription system consisting of three plasmids was designed to operate inside *E. coli*. By demonstrating a simple and scalable biological production method of functional DNA nanostructures, we made a foundational advance in synthetic biology.

Hong Kong HKUST

From plastics to the power line

Region

Asia - Hong Kong

Track

Environment

Poster

Zone 3 - #190

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 304

11:30 AM - 12:00 PM

Polyethylene is the most widely used plastic and arguably one of the most versatile materials to ever be synthesized. Its practicality and convenience however, have come at a great environmental cost. Polyethylene takes millennia to decompose, leeching harmful microplastics into the environment. We approached this pressing issue from a synthetic biology perspective, making use of *E. coli* engineered with genes encoding for laccase to degrade polyethylene into smaller alkane chains. Our team recognizes the opportunity to further advance this project by addressing another key issue – energy. Using *Shewanella oneidensis* MR-1 strain's inbuilt extracellular electron transport mechanism in tandem with genes responsible for alkane metabolism derived from *Desulfatibacillum alkenivorans*, we will generate electricity from the metabolism of degraded polyethylene, hoping that it will one day help in solving the world's growing energy needs. Thus, our project serves as an integrated effort to simultaneously solve two crucial problems.

Hong Kong JSS

A Synthetic Approach to Absorbing Copper Ions in Aquaponics

Region

Asia - Hong Kong

Track

High School

Poster

Zone 5 - #297

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 312

9:30 AM - 10:00 AM

Heavy metal pollution has been a hot issue among the society, copper is one of the most universal types of pollutant. In aquaponics, accumulation of copper ions is toxic to organisms. In sight of this, we aimed to create a cost-effective device for metal ions removal from water. In this project, metallothioneins, a type of protein capable of binding metal ions, was expressed in *E. coli*. Copper absorption capacity of the transformed bacteria is tested. From our results, *E. coli* can absorb copper ions at 10 mg/L and 2 mg/L. There is no significant difference between untransformed and transformed bacteria at 10 mg/L. At 2 mg/L, the transformed bacteria expressing *Elsholtzia haichowensis* Metallothionein 1 (EhMT1) slightly enhances the copper absorption ability. At last, we tried circulating *E. coli* inside dialysis tubings, receiving positive results, it is confirmed the idea using bacteria to remove copper ions in water is feasible.

Hong Kong-CUHK

RAPID(RNA Aptamer Probe for Influenza Detector)

Region

Asia - Hong Kong

Track

Diagnostics

Poster

Zone 2 - #157

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 309

3:15 PM - 3:45 PM

Transmissible diseases such as influenza have threatened the lives of people in Hong Kong and worldwide. However, while cold-flu differentiation remains difficult for non-experts, subtyping for epidemic control and treatment scheming is inaccessible for small clinics. In our project, we have constructed a sequence-specific RNA probe that increases its fluorescence by 10-fold upon target recognition. It is proven in a cell-free context and has the potential to expand to cellular applications. We also developed a mobile phone-based fluorometer coupled with its external software, collectively called Tracer. (The combination of hardware calibration and machine learning analysis may provide signal measurement with orthogonality and accuracy.) The tools can be combined into a user-friendly kit, allowing quick determination of their infection status using their nasal fluid, while the data obtained from a population of software users can be gathered for epidemic monitoring. This project provides a novel, rapid RNA-based influenza diagnostic system.

HSHL

Enabeling Tobacco plants to hyperaccumulate heavy metals

Region

Europe - Germany

Track

Food & Nutrition

Poster

Zone 3 - #170

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 312

10:00 AM - 10:30 AM

Our challenge is to solve the problem of heavy metal polluted soil, especially in areas of high industrial use, such as mining. We enable a tobacco plant to hyperaccumulate cadmium and lead by transferring genes of *arabidopsis halleri* and adding other special abilities that support accumulation of heavy metals.

HUBU-Wuhan

Building up biological parts in non-model bacterium *Zymomonas mobilis* for converting waste cartons into biofuels

Region

Asia - China

Track

Energy

Poster

Zone 5 - #301

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 302

2:15 PM - 2:45 PM

Although many genetic parts have been characterized, they are mostly from and for model species with limited studies on their compatibility. Additionally, significant amount of omics data has also been accumulated but not widely utilized yet. *Zymomonas mobilis* is a non-model Gram-negative ethanologenic bacterium with many desirable characteristics to favor the production of lignocellulosic biofuels. In this project, a reporter-gene system for *Z. mobilis* was established to effectively characterize genetic parts such as promoters and RBS. Moreover, promoter strength was systematically predicted based on omics datasets. These genetic parts including their compatibility were then characterized and further utilized for building an isobutanol-production module to convert campus waste paper cartons into renewable biofuels of ethanol and isobutanol. The success of our project will not only build up a reporter-gene system, basic and composite parts for the non-model species, but also provide renewable biofuels while protecting the campus environment.

HUST-China

Optopia

Region

Asia - China

Track

Energy

Poster

Zone 1 - #26

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 311

12:00 PM - 12:30 PM

To convert optical energy into electric energy in a clean and sustainable way, Optopia is designed as a photovoltaic system consisting of photosynthetic microorganism (*Rhodospseudomonas palustris*) and electrogenic microorganism (*Shewanella oneidensis*). Synthetic biology strategies are applied to the system to trigger production and export of lactate in *Rhodospseudomonas palustris*, as well as to improve efficiency of lactate utilization and extracellular electron generation in *Shewanella oneidensis*. Compared to Cyanobacteria, also a kind of photosynthetic microorganism but generating oxygen in photosynthesis, *Rhodospseudomonas palustris* serves as a better carbon resource provider for *Shewanella oneidensis*, not only because of its anaerobic photosynthesis maintaining an anaerobic environment required for extracellular electron generation in *Shewanella oneidensis*, but also due to its capacity of reusing the waste from *Shewanella oneidensis*. Hence, functioning as a compatible and mutually beneficial optical MFC (Microbial Fuel Cell), Optopia creates a novel and optimized approach to utilize clean resources through optical-electric conversion.

HZAU-China

Pyroptosis: a new approach for cancer therapy

Region

Asia - China

Track

Therapeutics

Poster

Zone 4 - #248

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 208

3:15 PM - 3:45 PM

Pyroptosis is an inflammatory form of programmed cell death. The morphology of pyroptosis is characterized by cell swelling which causes the release of cytoplasmic contents. Recent studies have demonstrated that the N-terminal domain of GasderminD protein accounts for pyroptosis of the host cell, which may be exploited for tumor suppression. In our project, we redesign Salmonella to act as a delivery vehicle that can target tumor cells and replicate in their cytoplasm. By inducing the bacterial expression of the N-terminal domain of GasderminD, bacteria are led to lysis and release this protein into the cytoplasm of tumor cell and then induce pyroptosis to the tumor cell by making membrane pores. The lysate of cell rupture during pyroptosis destroys the tumor microenvironment and attracts immune cells into tumor bed to kill tumor cells. Our project which aims to induce pyroptosis to tumor cells provides a new approach for cancer therapy.

HZNFHS China

Genetic Engineered Germ For Improving the Soil Environment of Tea Trees and More

Region

Asia - China

Track

High School

Poster

Zone 5 - #261

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 306

9:30 AM - 10:00 AM

Our Project is finding effective gene in some particular gems and applying them to another germ to create an engineered germ for improving the soil environment.

ICT-Mumbai

SmartSoil: Rooting for Sustainable Agriculture

Region

Asia - India

Track

Environment

Poster

Zone 1 - #56

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 312

3:15 PM - 3:45 PM

Plants secrete many chemicals in the soil around their roots. These exudates can act as molecular signals for microorganisms in the rhizosphere, which can in turn modulate gene expression. We wish to exploit this natural phenomenon to engineer microorganisms to sense and respond to plants. A synthetic symbiotic association that helps plants grow better and resist diseases will reduce dependence on artificial fertilizers and pesticides. Toward this end, we are studying changes in gene expression in the common soil bacterium, *Bacillus subtilis*, in response to root exudates of rice, wheat, tomato and soybean plants. As a case study, we are constructing a genetic amplifier using an exudate-inducible promoter to produce phosphatase, which will help solubilize organic phosphate present in the soil. This represents an advance toward smart soil management practices and sustainable agriculture.

IISc-Bangalore

PhageShift: Improving treatment of bacterial infections through novel modifications to conventional phage therapeutics

Region

Asia - India

Track

Therapeutics

Poster

Zone 1 - #79

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 310

12:00 PM - 12:30 PM

Bacteriophages have long been proclaimed as the answer to antibiotic resistant bacterial infections. However, simultaneous resistance to phages and antibiotics is a concerning possibility. Anticipating this problem, we have developed an in-silico protein modification algorithm that hard-codes mutual exclusion of antibiotic and phage resistance. An engineered phage with high affinity for phosphoethanolamine, the molecule that confers colistin resistance, has been developed as a proof-of-concept. This system has potential applications in drug delivery, ligand extraction and study of bacterial membrane proteins. We are also building a phage mediated immune recruitment system that ensures removal of the pathogen without significant toxin release - a fatal condition in immuno-compromised individuals. This is accomplished by a monocyte chemokine encoded into a lysis deficient phage genome that recruits phagocytic immune cells to the site of infection. PhageShift thus takes a leap forward in addressing potential problems with phage therapeutics before they arise.

IISER-Bhopal-India

MethNote: A prototype of methane biosensor constructed by genetically modifying *Pichia pastoris*

Region

Asia - India

Track

Environment

Poster

Zone 5 - #267

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 312

11:30 AM - 12:00 PM

Methane is a Greenhouse gas associated with Global Warming, and green methods are desired for its real-time monitoring. Thus, we have developed the prototype of a robust field-applicable methane biosensor, MethNote. We found an enzyme-complex methane monooxygenase(MMO) from *Methylococcus capsulatus*, a methanotrophic bacterium, that converts methane to methanol. We expressed soluble-MMO in the methylotrophic yeast, *Pichia pastoris*, which harbors a plasmid expressing the reporter gene under a methanol inducible promoter AOX. Thus, linking methane uptake to a reporter gene expression generates the proposed methane biosensor. The inclusion of sMMO pathway was also checked by metabolic modeling. The constructed part will be a useful contribution to the iGEM repository. A commercial design of MethNote will find widespread applications in environmental monitoring of methane. In future studies, we also anticipate an additional application of Mut- strain of *P. pastoris* expressing sMMO in biofuel production through methanol sequestration.

IISER-Kolkata

BACMAN

Region

Asia - India

Track

Therapeutics

Poster

Zone 2 - #159

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 207

4:15 PM - 4:45 PM

Arsenic contamination of ground water is a serious issue in West Bengal (India). Each year a large population falls victim to severe Arsenic poisoning due to ingestion of heavy doses of Arsenic through water and food over years. Small amounts of water can be purified before drinking using several available techniques such as chemical filtration kits etc. but no decontamination techniques exist to remove Arsenic uptaken by food crops (rice) or fishes through polluted water used to raise them in paddies or ponds. We, Team IISER-Kolkata plan to design a probiotic bacteria that can efficiently intake and sequester Arsenic at the physico-chemical conditions existing in the human gut. We aim to design an affordable and effective pill to administer the probiotic microbes into the gut. The microbes will then colonize in the gut and outcompete GI epithelia at Arsenic absorption thus shielding humans from accumulating the ingested heavy-metal.

IISER-Mohali

FearOmone: Cat pheromone based Bio-synthetic deterrent to minimize post harvest losses caused by rat manifestation.

Region

Asia - India

Track

Food & Nutrition

Poster

Zone 4 - #236

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 311

2:15 PM - 2:45 PM

FearOmone seeks to exploit the innate fear of murines for the cats. Our challenge is to create genetically engineered yeast producing cat pheromone-based biosynthetic deterrent and prepare a device capable of diffusing this cat pheromone to areas surrounding grain storage facilities, thereby keeping murines away. Our first aim is to transform our host system, *S. cerevisiae*, with necessary synthetic gene circuits which will result in a recombineered yeast that mimics the cat nephron pathway for producing felinine. Next, we will conduct controlled experiments in the form of murine behavior assays to test the effectiveness of our synthetically derived felinine as a rat/ mouse deterrent. Finally, we intend to design user-friendly and field-effective hardware to integrate with our yeast cells and run simulations on field data to understand murine behavior in realistic conditions and over a reasonable time-frame, with the intention of designing software for optimal dispersal of our FerOmone.

IIT Delhi

Back & Forth with Recombinases

Region

Asia - India

Track

Foundational Advance

Poster

Zone 2 - #101

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 310

5:15 PM - 5:45 PM

With the growth of synthetic biology, there has been an increase in the development of digital synthetic circuits, which requires biological logic gates that can accept a binary input and generate a suitable binary output. Often biological systems are unable to provide sharp and accurate input to output response due to reasons like noise, growth factors etc. Hence there exists a need of robust and reliable modules that can transform the analog and stochastic behaviour of biology into a digital response. We aim to develop recombinase based elementary constructs that would allow development of complex circuits with specialized functions with greater ease. Recombinases are enzymes that trigger site-specific recombination to perform excision/ incision or inversion of genetic circuits, to produce the desired gene expression. Our project involves use of serine based recombinases to develop a novel recombinase based toolkit of elementary circuits such as feedforward loop, feedback loop etc.

IIT Kanpur

SWASH: Hacking E.Coli to clean the cleansing agent

Region

Asia - India

Track

Environment

Poster

Zone 4 - #243

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 302

10:00 AM - 10:30 AM

There are about 2 billion people worldwide who don't even have access to clean drinking water. This has resulted in a growing need for solutions to tackle the problem of water pollution. One of the major chemical wastes discharged in sewage and as industrial effluents are detergents. This year we plan to provide a reliable and robust solution to this problem by focusing on sodium dodecyl sulfate (SDS) which is an anionic biodegradable surfactant and is the major component of detergents used around the world. Our project is concerned with developing a synthetic pathway in *E. coli* for extracellular expression of enzyme alkyl-sulfatase originally found in bacteria *Pseudomonas aeruginosa* to degrade SDS into commercially viable 1-dodecanol. As part of our project, we will also develop a bio-sensor to precisely quantify and characterize the by-products obtained as a result of SDS degradation.

IIT-Madras

ADaPtat1on : Expanding Toolkit for *Acinetobacter baylyi*

Region

Asia - India

Track

Foundational Advance

Poster

Zone 2 - #120

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 310

10:00 AM - 10:30 AM

Acinetobacter baylyi is a gram-negative, soil-dwelling, non-pathogenic, naturally competent and nutritionally versatile organism especially known for its ability to degrade aromatic compounds. However, only a few tools are available for its gene manipulation. This year, we plan to expand the toolkit for *A. baylyi* ADP1 by making a synthetic promoter library along with codon optimized fluorescent reporter proteins to achieve better control over its expression rates. The codon table is not available for this organism. So we obtained sequence data of well-characterised proteins of this organism by filtering manually putative and hypothetical sequences and used this data to generate the codon table using CUTE - a tool of ChassiDex. The codon optimisation is done manually by replacing the less frequent codons with high-frequency codons based on the generated table. This can potentially open up various new exciting synthetic biology opportunities with this unexplored organism.

Imperial College

PixCell: Electronic Control of Biological Patterning

Region

Europe - United Kingdom

Track

Foundational Advance

Poster

Zone 2 - #116

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 310

4:45 PM - 5:15 PM

Engineering complex biological systems requires precise control of gene expression. Current biological control systems fail to provide the reversible and programmable spatiotemporal control of electrical systems used in industry. Electrogenetics is an emerging field of synthetic biology investigating electronic detection and control of gene expression. Presented here is the development of the first aerobic electrogenetic control system in *E. coli*. It functions through altering transcriptional activation of the SoxR/PsoxS redox-signalling system by controlling the oxidation of redox-mediators using an electrode. The potential of this system for precise spatial control is demonstrated using an affordable, custom electrode array to induce pattern formation in a lawn of cells. Patterning was a necessary condition for the evolution of complex multicellular life, and as such the programmable patterning demonstrated serves as an essential tool for the development of multicellular synthetic biology.

iTesla-SoundBio

Factor C The Difference: A Synthetic Biology Alternative to the LAL Endotoxin Detection Assay

Region

North America - United States

Track

High School

Poster

Zone 1 - #77

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 208

10:00 AM - 10:30 AM

Many gram-negative bacteria naturally create compounds called endotoxins, which induce pathological symptoms including septic shock in humans. Limulus Amebocyte Lysate (LAL) testing, the gold-standard endotoxin detection test, is used in virtually every area of biomedical product development. The test is derived from horseshoe crab blood, including coagulation Factor C, the primary effector protein. Many horseshoe crabs die each year due to the bleeding process, straining populations and ecosystems along the US Atlantic Coast and in Asia, where it is less sustainable. Moreover, LAL testing is expensive, creating a barrier to biomedical innovation in low-resource settings. For these reasons, our team sought to synthesize a codon-optimized sequence of Factor C and integrate it into *Bacillus subtilis* (a gram-positive bacterium) using a pAX01 backbone with a xylose inducible promoter. In the future, we hope to design a detection mechanism to signal for the cleavage of Factor C and the presence of endotoxin.

Jiangnan

SuperVIP-Suspended universal plasma-enabled rapid vaccine production

Region

Asia - China

Track

Manufacturing

Poster

Zone 5 - #274

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 304

2:15 PM - 2:45 PM

Vaccine is one of the most cost-effective public health solution, with cell-based approach being a promising production strategy. We are devoted to establish a cell line with self-owned intellectual property and feasible for rapid production of a broad spectrum of viruses, with the aim of reducing the cost of cell based virus production in the health care sector. By constructing two biobricks and enabling three features to our chassis cells, we considerably reduced virus production cost by increasing virus titer per cell and virus-producing cells per fermentor, and broadening cells' virus sensitivity spectrum. We used computational modeling to explore genes for biobrick construction and cold atmospheric plasma ejecting device to further increase virus titer. We proved the significance of our project through systematically examining the needs of vaccine production companies including our close collaborator DaBeiNong, and disseminated knowledge related to vaccine and synthetic biology to the public.

Jiangnan China

Anti-Man

Region

Asia - China

Track

Manufacturing

Poster

Zone 1 - #50

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 207

9:30 AM - 10:00 AM

Lactic acid bacteria are the most promising microorganisms to act as live vaccines and microbial cell factory which can produce various chemicals. During fermentation processing, they suffer from various stress conditions, especially acid and cold stress. Therefore, we aim to develop an ideal food-safe grade microorganism with enhanced acid and cold tolerance. Genome mutagenesis combined with high-throughput technologies was performed on *Lactococcus lactis* NZ9000 to screen acid tolerance strain. Next, comparative transcriptomics analysis was performed on mutant and parent strain to investigate the response mechanisms of microbial cells during acid stress. Based on the proposed acid tolerance mechanisms, one new anti-acid component-msmK was discovered. Also, an anti-cold gene cspD2 was selected. The constructed recombinant strain *L.lactis* NZ3900/pNZ 8149-MsmK-CspD2 shows a significant survival advantage compared with *L.NZ3900/pNZ 8149*, which means our product exhibited enhanced acid and cold tolerance. This study provides valuable insight into the development of robust industrial strains.

Jilin China

The collection of synthetic RNA-based thermosensors with different sensing temperatures

Region

Asia - China

Track

Foundational Advance

Poster

Zone 4 - #252

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 208

2:45 PM - 3:15 PM

Many strategies could be used by bacteria to coordinate temperature-dependent gene expression. A well-known class of biological temperature sensitive element is RNA-based thermosensor, which is thermoregulatory RNA sequence in the 5'-untranslated region of mRNAs. RNA thermosensors could induce equilibrium shift between closed and open conformations of the translation initiation region under temperature variation condition, and lead to mRNA degradation or ribosome accessibility, thereby controlling the efficiency of translation initiation. However, natural RNA-based thermosensors are difficult to be engineered with the narrow sensing temperature range. Therefore, this year based on free-energy method, we designed a series of synthetic RNA-based thermosensors, which can be engineered easily with broader sensing range. Then, we predicted their theoretical sensing temperature, detected the practical threshold by experimenting setting temperature gradient, and built the standard parts collection.

JMU Wuerzburg

Test Tonic – a rapid diagnostic device for malaria

Region

Europe - Germany

Track

Diagnostics

Poster

Zone 1 - #28

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 309

11:00 AM - 11:30 AM

Malaria affects 200 million people every year as reported by the WHO. This disease is caused by different Plasmodium species, leading to different types of malaria. Therefore a successful therapy for malaria requires rapid identification of the species affecting the patient. We engineered Test Tonic, a qPCR-based diagnostic device, capable for detecting Plasmodium DNA. Test Tonic can not only detect Plasmodium in general but also uses our specifically engineered and optimized primer/probe pairs for the identification of individual Plasmodium species. As a low resource alternative to qPCR we investigate Recombinase Polymerase Amplification (RPA) for our Malaria diagnosis system. Providing isothermal DNA amplification, RPA avoids the need of an expensive thermocycler. These benefits of a quick, economically priced, easy to use and portable malaria test make Test Tonic suitable for the application in traveling situations and in areas without proper infrastructure and energy supply.

JNFLS**HCV, Aparecium!****Region**

Asia - China

Track

High School

Poster

Zone 5 - #281

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 311

12:00 PM - 12:30 PM

We aim to develop a biosensor for detecting HCV by the nucleic acid aptamer, and the specific detection of trace HCV could be realized by rolling circle amplification, which has great significance to shorten the window period of HCV in clinic transfusion. HCV C gene was expressed, and collected secreted HCV C protein was used to bind specifically with the nucleic acid aptamer. Using the competing reaction of the target antigen, a highly sensitive fluorescent aptamer sensor was developed based on the rolling circle replication. When there is no target antigen, the aptamer complementary sequence binds with aptamer instead of the padlock probe; whereas when the aptamer probe binds with the target antigen, the complementary sequence hybridizes with padlock probe, which triggers rolling circle amplification reaction. Under the action of DNA ligase, the padlock probe is further cyclized and a rolling circle amplification occurs under the action of DNA polymerase.

KAIT JAPAN**Challenge to suspended animation of cells****Region**

Asia - Japan

Track

Information Processing

Poster

Zone 3 - #175

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 306

10:00 AM - 10:30 AM

Conservation of cells, which is indispensable for regenerative medicine, now depends on freezing method. However, the freezing method has a low cell survival rate. Our idea is to preserve cells for a long time using suspended animation. Our definition of the state of cells suspended animation is state of hypometabolism followed by ATP depression, and then returned to the original state. H_2S is believed to be involved in this suspended animation process at the individual level. The objective of our project is to let the E.coli respond to the signal of the cell, and secrete the necessary amount of H_2S synthase (CTH) for the state of suspended animation to lower the metabolism. The secretion of CTH is regulated by RhlR. When the cells to be preserved become the state of suspended animation, the secretion of CTH from E.coli will stop, and most of the E.coli will also be suicided.

KCL UK

Developing a novel tool to overcome antibiotic resistance by regulating gene expression in bacteria

Region

Europe - United Kingdom

Track

Foundational Advance

Poster

Zone 1 - #37

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 311

9:00 AM - 9:30 AM

Antibiotic resistance is a major concern worldwide, estimated to cause 1 death every 4 minutes. Antibiotics for fatal infections such as tuberculosis and pneumonia have become less effective due to bacterial resistance to drug-based treatments. This phenomenon has led pharmaceutical companies to develop new antibiotics to try overcome this problem. However, this is costly and contributes to the emergence of multi-resistant bacterial strains. Throughout the years bacteria have developed mechanisms to resist antibiotics such as DNA mutagenesis, cell wall modification and other; most involve various bacterial proteins that have been modified or repurposed to protect bacteria. It has been shown that down-regulating these proteins' expression helps maximise the effects of antibiotics. Therefore, our team aim to engineer a library of sRNAs, providing a platform for new tools to regulate gene expression. Our approach therefore synergises with current antibiotic treatment regimes, creating an innovative therapeutic tool.

KUAS Korea

Bacterial Evolutionary Game Simulation (BEGS) for Snowdrift, Harmony, Stag Hunt and Prisoner's Dilemma Games

Region

Asia - Korea

Track

New Application

Poster

Zone 2 - #139

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 310

11:30 AM - 12:00 PM

How does microbial community perpetuate or perish? Like human society, in nature, microorganisms not only compete but also cooperate with each other for a successful establishment of a microbial community. The major goal of our project is to construct an accessible evolutionary game model using a synthetic microbial population controlled by genetic circuits. Here, we use *E. coli* to form a microbial population composed of the "cooperator" and the "cheater". "Cooperator" which displays β -glucosidase on the cell surface breaks down cellobiose into glucose. This enzymatic activity allows both "cooperator" and "cheater" to share glucose as an energy source (public goods). "Cheater" which expresses GFP is now able to proliferate within microbe population by glucose from cooperator. Based on the combination of mathematical modeling and experiments, we are going to find critical parameters for evolutionary games such as harmony, snow-drift and prisoner's dilemma for controlling population dynamics of the microbial community.

Kyoto

Swallomyces cerevisiae ~Building a biological desalination system~

Region

Asia - Japan

Track

Foundational Advance

Poster

Zone 3 - #180

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 310

4:45 PM - 5:15 PM

The conformation, kinetics, and binding of macromolecules are highly sensitive to the ion environment so we must control it to succeed biological research. Thus, there is demand of ionic control tool which supports bio-sensing and bio-remediation for research usage. So we addressed to develop such a biological deionization tool. This year we focused on Na⁺ which is basic ion in biology, and desalination system can be realized by salvaging Na⁺ in solution as paste of *Saccharomyces cerevisiae* by applying two attributes. One is highly Na⁺ uptake of their plasma membrane and vacuolar by transfer of transporters. The other is surface interaction aggregation system using SdrG-Fgβ protein connection through surface display. In addition, we calculate initial amount of our yeast to adjust to desired concentration by reconstructive membrane transport mathematical model. Furthermore, this tool can be applied to bioremediation and expanded to other ions.

LACAS BioBots

No title

Region

Asia - Pakistan

No abstract

Track

High School

Poster

Zone 1 - #21

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 310

2:15 PM - 2:45 PM

Lambert GA

Captivate: Capture the Data & Activate the Response

Region

North America - United States

Track

High School

Poster

Zone 2 - #156

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 302

3:15 PM - 3:45 PM

Vibrio cholerae, a pathogenic waterborne bacteria, impacts millions of people annually. Cases are most prevalent in developing countries with a lack of practical diagnostic methods and clean water. Lambert iGEM created a proactive, inexpensive diagnostic kit for *V. cholerae* detection utilizing frugal hardware devices and toehold switches. These riboregulators activate gene expression in response to predetermined RNA sequences. Engineering *E. coli* to detect *V. cholerae*, we targeted ctxB, a non-toxic subunit of a gene specific to all pathogenic *V. cholerae*. Our Chrome-Q system quantifies aquatic *V. cholerae* presence utilizing HSV values while the Color-Q app inputs data into our machine learning model, CALM. Utilizing rainfall, conflict, and cholera case/death data, CALM is able to accurately model the Yemeni *V. cholerae* outbreak, forecasting outbreaks weeks in advance. With this diagnostic kit, Lambert iGEM addresses *V. cholerae* epidemics by predicting outbreaks, thus providing low-cost sustainable diagnostic tools while enhancing quality prediction.

Leiden

Fifty Shades of Stress: A colourful screening platform for detecting bacterial cell stress

Region

Europe - Netherlands

Track

Therapeutics

Poster

Zone 3 - #193

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 306

9:00 AM - 9:30 AM

The number of drug-resistant pathogenic bacteria is rising at an alarming rate, while no new classes of antibiotics have been discovered in the past three decades. We tackle this twofold problem using an innovative open-source screening platform and an extensive societal outreach program aimed at spreading awareness of antimicrobial resistance. Current drug discovery efforts suffer from tunnel vision: screening is limited to lethal compounds. Our project aims to enable rapid discovery of compounds that stress bacterial cells, which can be used to establish novel synergistic combination therapies. Such combination therapies have proven to reduce resistance development in HIV and cancer treatments. In our project, we created an *E. coli* reporter strain that produces fluorescent proteins in response to distinct classes of cellular stress, by utilising promoters which become activated under specific stressful conditions. This specificity allows for determination of the mechanism of action and for establishment of synergistic combination therapies.

Lethbridge

VINCEnT: A modular Viral-Inspired Novel Cargo Encapsulation Toolkit for targeted delivery of molecules to cells

Region

North America - Canada

Track

Foundational Advance

Poster

Zone 4 - #233

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 304

2:45 PM - 3:15 PM

The 2018 Lethbridge iGEM team is developing a Viral-Inspired Novel Cargo Encapsulation Toolkit ('VINCEnT') for simple design and assembly of protein nanocompartments (PNCs). This standardized toolkit can be used to produce custom PNCs for targeted delivery of various cargos including nucleic acids, proteins, and small molecules to desired cell types. PNC design will be facilitated by our software platform, enabling informed selection of cell-targeting surface modifications, encapsulation proteins, and cargo-loading approaches tailored to the intended application. PNCs have wide-ranging utility from targeted drug delivery and gene therapy to materials synthesis and distribution of biological control agents. With the simplified design, standardized protocols, and modular components, less experienced users will be able to design and produce PNCs in a basic laboratory environment. We have also critically examined the 'dual-use' implications of making custom PNC production more accessible and have developed a risk assessment rubric for VINCEnT to help mitigate potential threats.

Lethbridge HS

Cu Later: The Capture and Removal of Metal Ions from Solution Using Phage Capsid Display

Region

North America - Canada

Track

High School

Poster

Zone 3 - #174

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 310

3:15 PM - 3:45 PM

Tailings ponds enclose 176 square kilometers of oil extraction waste in Alberta. They pose a serious issue, as they contain toxic products such as heavy metals that negatively affect the environment. Due to the difficulty of its separation, the potentially useful metals present in these tailings ponds are rendered useless. However, our system of bacteria and bacteriophage demonstrates a possible solution. The target metal being copper, we will use a copper-binding protein on bacteriophage capsids to bind the copper. Then, elastin-like polymers attached between the copper binding proteins and the capsid proteins will be used for inducible precipitation, bringing the metals to the bottom of the solution and allowing them to be repurposed. Cu Later is an innovative project by turning the waste in oil sands into opportunity, in addition to cleaning up the environment.

Linköping Sweden

The Folding Factory

Region

Europe - Sweden

Track

Manufacturing

Poster

Zone 5 - #262

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 208

11:00 AM - 11:30 AM

The expression of proteins in bacteria is a way to enable production of biofuels, large scale production in the pharmaceutical industry, and research. However, mass production of certain proteins in bacteria is hindered by protein size or the complex folding structure of proteins. Protein folding has been shown to be assisted by chaperones, a protein aiding the expression of other proteins in bacteria. We illustrate this by co-expression of GroES and proteins that are problematic to express in E-coli. GroES is mostly known as a co-chaperone, but some studies indicate that it has a folding property on its own. We have aimed at investigating this further in order to create a system for expressing proteins in bacteria. We hope that our findings will give insight into sustainable ways for industrial protein production.

Lubbock TTU

Expanding the Synthetic Biology Toolkit for Polyamine Production

Region

North America - United States

Track

Manufacturing

Poster

Zone 4 - #219

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 309

9:30 AM - 10:00 AM

The metabolic engineering of E. coli has significant potential to provide an accessible cellular factory for the in vivo production of essential chemicals during space exploration. Recognizing the versatility of using E. coli for bio-manufacturing during space travel, we investigate applications in polyamine production. In particular, a diamine known as putrescine with medicinal and materials applications. To expand on earlier improvements of the product yield for putrescine in E. coli, we explore modifying the W3110 strain of K-12 E. coli. Additionally, we explore the use of TX-TL cell-free synthetic biology to design transcription factor-based biosensors for the detection of improved putrescine yield and to monitor other small molecules of interest. With these strategies we hope to improve the yield of putrescine in E. coli and to expand the synthetic biology toolkit for metabolic engineering.

Lund

Using synthetic biology to increase recombinant protein yield via co-expression of Vitreoscilla hemoglobin

Region

Europe - Sweden

Track

Manufacturing

Poster

Zone 3 - #172

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 306

12:00 PM - 12:30 PM

The use of Vitreoscilla hemoglobin (VHb) to increase recombinant protein yield via co-expression has been proven successful in various applications. However, recent studies have indicated that the success is largely dependent on the choice of associated expression system. While there are many ways of regulating VHb levels, there is to this end no simple nor standardized way of tuning the expression levels for a certain application. We present a set of inserts containing VHb expressed at various levels, created by utilizing the library of constitutive Anderson promoters. The effect on the cell growth was investigated by optical density measurements. The increase in recombinant protein yield was determined by co-expressing green fluorescent protein (GFP) and measuring fluorescence intensity by flow cytometry. Preliminary data suggest a positive correlation between VHb expression level and GFP fluorescence intensity. Further studies include expression under varying oxygen availability and expression of other target proteins.

LZU-CHINA

New therapy for gastric cancer based on TIL cells-exosomes mechanism

Region

Asia - China

Track

Therapeutics

Poster

Zone 4 - #246

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 309

4:15 PM - 4:45 PM

Gastric cancer is one of the most popular digestive malignant carcinomas in the world. Exosomes are cell-derived nanovesicles and act as vesicles for delivering micromolecular like miRNA. Here, we turn HEK 293 T cells and MGC803 cells into a manufacturing factory, massively producing exosomes with our target miRNA in it, whose function is related to reduce the viability of tumor cells. The three miRNA is obtained by bioinformation analysis. To be continued, considering the heterogeneity of tumor cells, we use inducible promoter to active three miRNAs separately. By changing the inducers' concentration, we want to grope optimum functional concentration range of miRNAs. Finally, we hope that this system can be used in tumor infiltrating T cells. TIL is an inactive T lymphocyte in tumor tissue whose function is inhibited because of tumor microenvironment. If the TIL were armed with our controllable miRNAs, a new therapy for gastric cancer treatment would appeared.

Macquarie Australia

Chlorophyll-induced Vesicles (ChiVes) for metabolic engineering and protein purification

Region

Asia - Australia

Track

New Application

Poster

Zone 1 - #20

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 207

10:00 AM - 10:30 AM

Recombinant proteins have diverse and important therapeutic and industrial utility, at present their purification is costly, time and labour intensive. Our research simplifies this purification process by sequestering desired proteins into synthetic vesicles, allowing for bulk purification via an operationally simple centrifugation step. These synthetic vesicles have been engineered into the expression host E.Coli. As previously shown in plants and algae, vesicle formation occurs spontaneously in the presence of chlorophyll and the enzymes needed for its biosynthesis. Cells grown in the dark recruit phospholipids to form crystalline aggregates known as prolamellar bodies. Subsequent exposure of the cells to light results in the conversion of these aggregates to vesicles. By mimicking this natural process, our cells can be selectively induced to capture valuable recombinant products in easily isolable vesicles. Additionally, through computational modelling and our human practices 'customer discovery' toolkit, we have validated the viability and potential impact of this research.

Madrid-OLM

Internet of BioThings

Region

Europe - Spain

Track

Open

Poster

Zone 2 - #112

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 207

3:15 PM - 3:45 PM

Society demands a better understanding of its environment. We require information about our surroundings, from the traffic density to the temperature distribution in the city we live. Generating and interconnecting this big amount of data is what we call the Internet of Things (IoT). There is no standard way of taking biological measurements within the frame of traditional IoT (i.e. the concentration in the air of viruses, toxins, allergens, etc). It is due to the instability of the reactives, the complexity of automating the laboratory protocols and the need of highly sensitive devices. Additionally, the economic cost of biological devices is remarkably high in comparison to traditional IoT gadgets. And this feature is key, as it is mandatory to extract data from a huge number of nodes. Our project deals with this issue, bringing together microfluidics, aptamer-based sensors, an affordable electrochemical metrological system and a big amount of love.

Makerere University

Plastic biodegradation

Region

Africa - Uganda

Track

Environment

Poster

Zone 4 - #241

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 311

10:00 AM - 10:30 AM

Plastics are waste products that pollutes the environment we live in more especially clogging the sewage system in urban centers and toxins from decomposed plastics are introduced into ecological systems that humans often manipulate for food. A biological approach to resolving this problem is favorable because of its practicality and efficiency. *Ideonella sakaiensis* is a bacteria that naturally decomposes polyethylene terephthalate, we have decided to genetically modify *E. coli* cells to model the plastic degradation process by adding the Lipase and Chlorogenate Esterase genes from *Ideonella sakaiensis* into *E. coli* bacterial cells.

Manchester

Man-Cheester: Development of *Listeria monocytogenes* biosensor for use in cheese starter cultures.

Region

Europe - United Kingdom

Track

Food & Nutrition

Poster

Zone 2 - #143

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 311

2:45 PM - 3:15 PM

Listeria monocytogenes is a Gram-positive, rod-shaped, food-borne bacterium, capable of causing the rare, but potentially fatal, disease listeriosis. *L. monocytogenes* can replicate at temperatures as low as 0°C, allowing it to survive in industrial and domestic refrigerators. *L. monocytogenes* is often found in soft cheeses, making many varieties of cheese unavailable to those who are immunosuppressed. Man-Cheester aims to introduce the agr quorum sensing system from *L. monocytogenes* into bacteria used in the cheese making process. On detection of AIP, a key quorum sensing molecule of *L. monocytogenes*, a colour change will occur, causing the cheese to turn purple and alerting the consumer to its contamination. Our concept could be further developed to include other sources of *L. monocytogenes* contamination, such as meats, vegetables or kitchen surfaces, to prevent as many cases of listeriosis as possible.

Marburg

Vibrigens - Accelerating Synbio: Establishing *Vibrio natriegens* as the new chassis organism for synthetic biology

Region

Europe - Germany

Track

Foundational Advance

Poster

Zone 1 - #74

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 304

3:15 PM - 3:45 PM

Waiting for cells to grow is an enormous time sink for synthetic biologists. Cloning cycles with the current standard, *Escherichia coli*, typically take up to three days. In our project Vibrigens - Accelerating Synbio, we established the tools to turn *Vibrio natriegens* into the next generation chassis for synthetic biology, ready to be used reliably. By taking advantage of its unbeaten doubling time of 7 minutes, we substantially reduced waiting time and made one-day-cloning a reality. We built and characterized a flexible golden-gate-based part collection, consisting of more than 100 parts, which enables the creation of complex pathways in a short amount of time. Our engineered *V. natriegens* strains VibriClone and VibriExpress are designed for cloning and protein expression applications, respectively. Moreover, we established the first synthetic metabolic pathway in this organism by producing the platform chemical 3-Hydroxypropionate and along the way developed an accelerated workflow for metabolic engineering.

McGill

Synnotch and Tandem ScFv in Novel System Granting Multi-Specificity to Phagocytic Immune Cells in Cancer

Region

North America - Canada

Track

Foundational Advance

Poster

Zone 4 - #226

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 310

9:30 AM - 10:00 AM

The Notch family of proteins are kinetically activated cell surface receptors found in eukaryotes which can be modified to form synthetic notch (SynNotch) receptors. Our team has designed a gene construct activated by SynNotch to produce a downstream product of choice. Through the transfection of immune cells with our SynNotch system and tandem ScFV's antibodies specific for both SynNotch and a target of interest, one can target many different cancers with the same population of transfected cells. The system provides specificity to one population of cells through use of a single tandem ScFV, and multi-specificity through the use of multiple ScFV's. The downstream product is modular and can be switched to activate cytokine signaling, cytotoxic granule release, and other important cellular events. This system shows great promise as a flexible, cost-effective immunotherapy with the potential to treat a wide variety of cancers.

McMaster**Investigating Mechanisms of Amyloid-beta Aggregation in Alzheimer's Disease****Region**

North America - Canada

Track

New Application

Poster

Zone 1 - #34

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 310

3:15 PM - 3:45 PM

Our proposed project seeks to investigate amyloid-beta aggregopathy in Alzheimer's disease (AD) through an E.coli model system. We will generate a mutant library of the Amyloid Beta 1-42 (A β 1-42) gene, to be recombinantly expressed in E.coli as part of a drop-out screen. Given that A β 1-42 spontaneously aggregates into toxic plaques, we expect the dropout cultures to become enriched over time for A β 1-42 gene variants correlated with a reduced capacity for aggregation. We will use next generation sequencing data from our initial and resulting mutant sequences to develop a model to identify key regions of the A β 1-42 sequence crucial to plaque formation. This can contribute to future research by revealing plaque-forming A β mutations.

McMasterA**No title****Region**

North America - Canada

No abstract

Track

Foundational Advance

Poster

Zone 5 - #269

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 310

4:15 PM - 4:45 PM

Melbourne

Glutamate Biosensor

Region

Asia - Australia

Track

Therapeutics

Poster

Zone 5 - #304

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 311

2:45 PM - 3:15 PM

Our proposed project is to create a glutamate biosensor. The proposed biosensor can be used to detect and give a fluorescent readout on the glutamate concentration level. The biosensor will be a circuit in *Escherichia coli* where fluorescent readout, via FRET, will correlate with the glutamate concentration. The signal will be detected using a calcium based fluorescent system. Our system uses a calcium channel that has a glutamate binding site which opens upon binding in our bacteria. Once the channel opens, the influx of calcium and the binding of calcium to our calmodulin-based fluorescent sensor. The calmodulin undergoes a conformational change into its active form, and will form a protein-protein interaction with M13 peptide, the calmodulin-binding domain of skeletal muscle myosin light chain kinase. On the ends of both protein will have an EGFP protein that will be in vicinity of each other to give a FRET signal.

METU HS Ankara

The Combination of FucO and GSH Stimulates Bioethanol Production from Lignocellulosic Biomass

Region

Europe - Turkey

Track

High School

Poster

Zone 2 - #132

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 312

4:15 PM - 4:45 PM

As energy resources get scarce, bioethanol production from lignocellulosic waste looks like a great alternative in terms of high energy yield and eco-friendliness. Due to their highly complex and rigid structure, lignocellulosic wastes need to be pretreated before they can be fermented. The process causes toxic byproducts such as furfural and 5-Hydroxymethylfurfural that inhibit the ethanol production and growth rate of bacteria, *E. coli* ethanologenic strain KO11. By integrating GSH and FucO genes into KO11 bacteria, we aim to enhance bioethanol production. Since furfural and HMF act as thiol-reactive electrophiles, cellular glutathione levels get depleted in their presence, leading to the accumulation of reactive oxygen species. Thus, overexpression of GSH increases cellular growth rates and lifespan. On the other hand, the expression of fucO results in the formation of NADH dependent furfural oxidoreductase which degrades furfural into furfuryl alcohol resulting in a higher rate of growth and ethanol fermentation.

Michigan

CRISPR Testing Model: Competitive Binding

Region

North America - United States

Track

Foundational Advance

Poster

Zone 1 - #11

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 208

9:30 AM - 10:00 AM

The Cas9 enzyme has seen a rapid expansion of applications in the field of gene therapy. However, CRISPR's high frequency of off site targets can lead to undesired mutations, making it imperative that accuracy and efficiency be improved to be successful. Since modifications to minimize off-site targets are under development, it is important that there is a standardized model available on which these modifications and their binding patterns can be tested and compared. We designed a testing platform for comparing engineered Cas9 variants to the natural form through direct competition. Our model relies on competition between two Cas9s from *Streptococcus pyogenes* and *Staphylococcus aureus* as a proof of concept in an assay termed 'Guardian/Assassin'. This system can be used to expedite the design process of Cas9 systems and expand the Cas9 toolbox by allowing faster identification of efficiency within iGEM and throughout the scientific community.

MichiganState

No title

Region

North America - United States

No abstract

Track

Food & Nutrition

Poster

Zone 1 - #60

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 207

9:30 AM - 10:00 AM

Mingdao

Blood Pathogen Test for a Mosquito Bite

Region

Asia - Taiwan

Track

High School

Poster

Zone 5 - #296

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 207

5:15 PM - 5:45 PM

Bloodborne and mosquito-borne diseases are common among humans. They are caused by pathogens in the blood such as *Escherichia coli*, *Staphylococcus aureus*, dengue viruses, HIV, etc. To detect these pathogens in the human bodies is difficult in areas with lacking resources such as healthcare workers and lab equipment. What's more, patients infected with diseases like HIV may not be willing to let others to know. Therefore, a simple and self diagnostic device would greatly appeal to them. Team Mingdao is working on engineered mosquitoes to become a biosensor and blood drawer. We successfully demonstrated the experiment in the mosquito cells with the synthetic Toll signaling through antimicrobial peptide (AMP) reporter system to response the pathogens. Finally, to make this project to be usable in real life, we designed a portable mosquito cage as the size of a matchbox for use at home even without any professional instruction.

Minnesota

Self-Sustaining Engineered Bacteria for Mercury Bioremediation with Auxotrophic Based Biocontainment System

Region

North America - United States

Track

Environment

Poster

Zone 4 - #232

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 309

4:15 PM - 4:45 PM

We have engineered mercury(II) ion auxotrophy, which is sensitive to the mercury(II) ion concentration. Cell proliferation will remain normal with the presence of mercury(II) and the auxotrophic attribute by mercury(II) concentration, at which become nonviable. This is achieved by inserting an plasmid vector into an existing auxotroph *E. coli* (strain JW3841-1), which has its *GlnA* gene (Glutamine synthetase) knocked out, leads to its inability to synthesize glutamine and constrains the *E. coli*'s proliferation. *MerR* is a mercury(II)-dependent transcriptional repressor-activator based on mercury(II) concentration. When mercury(II) is present, it activates the transcription of the mercury resistance protein complex and represses when absent. *GlnA*, *MerR* and *MerA* gene will be implanted into strain JW3841-1. *MerR* is activated by environmental mercury(II), glutamine synthetase will be produced for cell utilization. When the environmental mercury(II) is fully converted into mercury(0) by *MerA* (Reductase), the translation of glutamine synthetase will stop, which lead to bacterial death.

Missouri Rolla

BTree

Region

North America - United States

Track

Environment

Poster

Zone 5 - #270

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 312

10:00 AM - 10:30 AM

Since the year 2002, North American ash trees have been infected with and killed by an invasive beetle species known as Emerald Ash Borers (EAB). Current methods for prevention and treatment of EAB's are too expensive and time consuming for large scale eradication. Our proposed long term solution is to develop Ash trees that are genetically resistant to EAB's. From a known *Bacillus thuringiensis* Cry8Da protein, we hope to induce mutations in the protein's receptor binding regions to create a Bt toxin specific for EAB's. After screening modified proteins, we will utilize leaf-specific expression of the Cry Toxin in *Arabidopsis thaliana* as our model system for Ash trees. This method will target EAB's as they feed on ash leaves during adulthood. We hope to present this system for future development as a safe and effective alternative to current treatment methods used in affected areas.

MIT

Porting the ComCDE System of *Streptococcus mutans* into HEK Cells as a Potential Caries Treatment

Region

North America - United States

Track

Therapeutics

Poster

Zone 5 - #319

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 302

10:00 AM - 10:30 AM

Cariogenesis is facilitated by the growth of dense, adherent biofilm on the surface of teeth. This process is largely initiated by *Streptococcus mutans* through quorum sensing, a process by which *S. mutans* release Competence Stimulating Peptide (CSP) to activate a two-component signaling system (ComCDE) in neighboring cells, leading to critical bacterial mass formation on the tooth surface. Here, we engineer mammalian cells to sense CSP and biofilm formation by incorporating the ComCDE system into Human Embryonic Kidney (HEK) cells. In turn, our engineered HEK cells process the signal and actuate a response by secretion of kappa casein, a protein with known anti-biofilm activity. We envision these cells being administered through either an oral device worn overnight or as a cell therapy injected into patients' gums by dental professionals. Ultimately, our system will allow cells in the oral cavity to automatically detect and combat cariogenesis, preventing the onset of dental caries.

Montpellier

Vagineering : A New Non Hormonal Contraception

Region

Europe - France

Track

New Application

Poster

Zone 1 - #61

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 208

5:15 PM - 5:45 PM

Modern hormonal contraceptive methods have been revolutionary for women in developed countries; however, they still exhibit a variety of challenges. Developing countries lack consistent access, hormonal contraceptives can produce harmful environmental effects, and some women are unable to use them due to health problems. The Vagineering project looks to solve these issues with a novel, non-hormonal method. Our team aims to engineer *Lactobacillus jensenii*, a bacterium from the vaginal flora, to produce two proteins to prevent unintentional pregnancy: antisperm antibodies that inhibit sperm motility and anti-microbial peptides (AMPs) that produce spermicidal effects. The goal is to create a lasting contraceptive using only bacteria, which can later be reversed by engineering the strain with a kill-switch. Additionally, our studies of this strain have produced a toolbox that will help other teams to further engineer this less-characterized bacterium.

Munich

Phactory

Region

Europe - Germany

Track

Manufacturing

Poster

Zone 5 - #265

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 311

4:45 PM - 5:15 PM

Antimicrobial resistance is a major emerging threat as reported by the WHO. Worldwide implementation of bacteriophage therapy, a 100-year old treatment employing the natural enemies of bacteria, is impeded by the lack of common manufacturing procedures which meet international quality and safety standards. Based on synthetic biology we created Phactory, a cell-free molecular assembly line for bacteriophages. We demonstrate expression of several phages including T7, MS2 and 3S at clinically relevant concentrations. Exploiting the open nature of cell-free systems, Phactory enables modular composition of bacteriophages with engineered proteins while remaining GMO-free. We developed a quality control structure utilizing state-of-the-art bioinformatics, as well as purification and encapsulation protocols. To expand our production variety while reducing cost, we optimized and engineered home-made *E. coli* cell-extract. Compared to traditional manufacturing procedures, Phactory requires 2.5% of the production volume and demands no special biosafety regulations to yield bacteriophages ready for therapy.

Nanjing NFLS

A telomerase and CRISPR-based gene therapy of cancer

Region

Asia - China

Track

High School

Poster

Zone 1 - #9

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 306

9:00 AM - 9:30 AM

Telomerase is silent in most normal somatic cells while active in over 90% of cancers. Therefore, various telomerase activity inhibitors have been developed to treat cancers but all failed. In our project, we acted oppositely to develop a cancer gene therapy by utilizing the telomerase activity in cancer cells. We constructed a telomerase-activating gene expression system to induce cancer cell death. In this system, a vector ended with a telomerase-recognizable end can be elongated by telomerase, which will provide a telomeric repeat sequence that can be bound by a telomeric DNA-targeting dCas9-VP64-sgRNA. This binding will activate expression of an effector gene Cas9. The produced Cas9 protein can then be targeted to the telomeres of cancer cell chromosomes by a telomere-targeting sgRNA, which will produce the DNA damage and lead to cancer cell death. However, due to no telomerase activity, this system will not affect normal cells.

Nanjing-China

Light-Driven Biohybrid Nitrogen Fixation Approach in E. coli Cells

Region

Asia - China

Track

Energy

Poster

Zone 2 - #126

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 302

2:45 PM - 3:15 PM

Our team, Nanjing-China 2018, intends to establish a sound and ideal whole-cell photocatalytic nitrogen fixation system. We use the engineered E. coli cells to express nitrogenase and in-situ synthesize of CdS semiconductors in the biohybrid system. Instead of ATP-hydrolysis, such system is able to photocatalytic N₂(nitrogen) to NH₃(ammonia). The biohybrid system based on engineered E. coli cells with biosynthesis inorganic materials will likely become an alternative approach for the convenient utilization of solar energy.

NAU-CHINA

MOSFET

Region

Asia - China

Track

Foundational Advance

Poster

Zone 4 - #215

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 306

2:15 PM - 2:45 PM

MOSFET (metal-oxide-semiconductor field-effect transistor) is an essential component in both analog and digital circuits such as analog switches and micro-processors. Inspired by this idea, we built genetic circuit 'MOSFETs' in animal T cells which is 'Monitoring and Operating System Founded on Engineered T cells'. The upstream of this genetic circuit uses synNotch to transduce extracellular signals into cells. The concentration of signals corresponds to different threshold values, and the system can respond accordingly under different concentrations. We achieved some level of logical effects by applying recombinase's reverse mechanism to ensure the uniqueness of downstream output. By using ODE and gillespie algorithms, we conducted validations on mathematical models. Using the concentration of cell surface antigen as gate signal, different recombinase and promoter to adjust threshold value, we conducted experiment validation to measure different promoters and recombinases' response to signals.

Navarra BG

BioGalaxy: a project to produce plant biofactories for an extra-terrestrial future

Region

Europe - Spain

Track

High School

Poster

Zone 1 - #72

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 304

9:30 AM - 10:00 AM

In this project we propose to develop a simple and cost-effective plant-based method for production and purification of recombinant proteins. The system is based on the production of plants transiently expressing a target protein (TP) fused to granule-bound starch synthase (GBSS). Tissues of GBSS:TP expressing plants will be milled in an aqueous buffer and the starch granules will be purified from plant tissue-derived impurities through a series of simple centrifugation and wash/elution steps allowing the starch granules to precipitate in a highly purified form. The GBSS:TP will be engineered to contain a unique cleavage site recognized by a specific protease, enabling the TP to be separated from the GBSS into the aqueous buffer, while the GBSS remains embedded the starch granule. Once treated with the protease, the starch granules will be removed by centrifugation while the highly purified cleaved TP can be further purified using conventional downstream processing.

NAWI Graz

E. coLipid - The good kind of fat!

Region

Europe - Austria

Track

Environment

Poster

Zone 5 - #293

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 310

4:45 PM - 5:15 PM

In the last decades, the palm oil industry increased on an extreme level and, because of great demand, it still does. The main products from the palm plant, palm oil and palm kernel oil, are not dispensable in today's society. Because of their characteristic properties, they are widely used in food-, material-, beauty- and fuel industry. Palm kernel oil mainly consists out of saturated fatty acids, with Lauric acid (C12) as main component. This unique lipid pattern mainly differs from the palm oil itself. The aim of our project: We are working on a way to produce palm kernel oil using microorganisms, especially E.coli. The production of fatty acids and their esterification to triglycerides as energy storage is a natural process in all organisms. We make use of this natural way of synthesis by modifying the expression of fatty acids with appropriate carbohydrate chain length on a molecular level.

NCHU Taichung

Engineered Endophyte-Assisted Phytoremediation

Region

Asia - Taiwan

Track

New Application

Poster

Zone 1 - #59

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 207

9:00 AM - 9:30 AM

Endophyte can live inside the plants and work together with them without causing harm to the host plant. With the large and deep root system of plants, the endophyte can have further impact in soil. A serious case of soil contamination is dioxin pollution after the Vietnam War. Dioxin is a group of toxic compounds that accumulate in the environment and are difficult to break down naturally. Tackle with large area soil dioxin contamination is hard, since the most efficient way to clean up is burning, which is eco-unfriendly and costly. Our project combines phytoremediation and engineered endophyte to clean dioxin-contaminated soil. We engineered an endophyte with membrane transporter, dehalogenase and laccase to intake and break down dioxin, and created biobricks compatible shuttle vector that can express in a well-researched endophyte, Burkholderia phytofirmans. This platform can potentially apply to projects that related to or benefit from plant-microbe interaction.

NCKU Tainan

One step closer towards a low carbon society

Region

Asia - Taiwan

Track

Environment

Poster

Zone 1 - #85

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 312

2:45 PM - 3:15 PM

Ever since the 90s when concern over the impact of carbon emission on our environment was first raised, global-wide efforts in reducing emission have been met with mixed results. Just 2017 alone the global emission level grew by 1.4%. This year, the 2018 iGEM NCKU Tainan team will design a device capable of piping CO₂ and convert it into biomass via integrating a non-native Calvin-Benson-Bassham cycle into *E. coli* using the RuBisCO and PRK genes from *Synechococcus* sp, which encode for major enzymes involved in carbon fixation. Industrial gases will enter a pipe (inlet) at the bottom of a bioreactor, flow through a ceramic nozzle and mix with *E. coli*-containing mixture which also consumes CO₂. 'Of CO₂urse' is an alternative to utilize excess CO₂. Our ultimate goal is to convert CO₂ into useful bioproducts. It would be one step closer towards a low carbon society.

NCTU Formosa

Plan(t) B

Region

Asia - Taiwan

Track

Environment

Poster

Zone 1 - #18

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 310

10:00 AM - 10:30 AM

Soil bacteria distribution is skewed by chemical fertilizers. These elements temporarily increase nutrients; however, they promote excessive growth of certain bacteria, such as phosphate solubilizing bacteria, damaging soil integrity. We developed a regulation system to manipulate soil microbiota, using bacteriocins as bio-stimulants to maintain nutrient levels while balancing bacterial ratios. First, we determine ideal levels of nitrogen, phosphorus and potassium for plant growth. After determining a volume of fertilizer, we use a nutrient-to-microbiota model that relates element levels to bacteria amounts to determine the distribution of bacteria after fertilization. We use our bacteriocin-effect-model to predict an ideal bacteriocin volume. A correlation model relates inhibition to changes in bacterial ratios. This system predicts the bacteriocin volume needed to prevent bacteria that thrive off chemical fertilizers from becoming too dominant. Our innovative system of regulating microbiotas using bio-stimulants is a long-term solution, balancing high productivity with environmental sustainability.

NDC-HighRiverAB

Escherichia coli transformed with EstA gene breaks ester bonds between fatty acids and 4-nitrophenol

Region

North America - Canada

Track

High School

Poster

Zone 2 - #103

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 311

11:30 AM - 12:00 PM

Through the use of an esterase gene, the engineered bacteria was constructed with the purpose of reducing the accumulation of solidified fat that holds non-biodegradable material together in sewer systems. With the use of DH5... Escherichia coli as the chassis, a plasmid was introduced containing a pLac promoter, and EstA gene. The EstA gene that is found in the Pseudomonas aeruginosa, was inserted in the plasmid with the intention of breaking apart ester bonds which connect the glycerol backbone to the fatty acid. To test the enzyme's effectiveness, 4-nitrophenol joined to a short chain fatty acid by an ester bond was introduced to the bacteria sample. Once this ester bond is severed, the 4-nitrophenol compound turns green. Preliminary results have shown that the bacteria expressing EstA is capable of breaking the ester bonds within 4-nitrophenol constructs. In the future, our team hopes to achieve the same result with triglycerides.

NEFU China

Secured Message Transmission by Yeast: A multiple-level encrypted biosystem for information storage

Region

Asia - China

Track

Information Processing

Poster

Zone 1 - #15

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 304

9:30 AM - 10:00 AM

In the modern world, most people recognize computers as device to store information, but deoxyribonucleic acid, or DNA can do better. However, living organisms can also provide a superior camouflage for secret messages. The aim of our project is to develop a yeast-based encrypted system to transmit information between two parties. We convert messages into DNA sequences using a designated program or code book and integrate them into yeast genome. To comprehend the message, the receiver needs to successfully pass through multiple levels of encryption, including cracking a promoter lock by a specific small RNA, reuniting dispersed DNA segments separated by introns, retrieving message nucleotides by a specific primer set and decoding DNA sequence into readable sentences by a unique program. Additionally, a build-in suicide system will prevent the engineered yeast from being extensively propagated.

NEU China A

Engineered bacteria alleviate the inflammatory bowel disease and prevent colorectal cancer

Region

Asia - China

Track

Therapeutics

Poster

Zone 1 - #53

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 208

2:15 PM - 2:45 PM

Nowadays, due to the popularity of fast food and unhealthy life style, the number of patients with inflammatory bowel disease (IBD) is rising in Asia. In addition, patients with IBD have an increased risk of developing colorectal cancer (CRC). Therefore, NEU_China_A aims to design a biological system against IBD and potential CRC this year. To relieve the intestinal inflammation, we empowered our bacteria with an anti-inflammatory device, which includes a sensor to detect the inflammatory signal, a highly efficient enhancer and an effector to secrete interleukin ten (IL-10). Furthermore, we engineered our bacteria with myrosinase to turn the glucosinolates, a natural component of cruciferous vegetables, to sulphoraphane. It's an organic molecule with well-known anti-cancer activity. Integrating cruciferous vegetable diet with synthetic biology, we envision that the engineered bacteria will greatly help us to overcome the severe situation in the IBD patient's gut.

NEU China B

Engineered E.coli L-Lactate Biosensor in food fermentation

Region

Asia - China

Track

Food & Nutrition

Poster

Zone 1 - #12

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 310

11:30 AM - 12:00 PM

The role of L-lactate is not always beneficial for the yogurt fermentation due to excessive L-lactate can provide an optimized growth condition for yeast and mold. Therefore, it is important to detect the concentration of L-lactate. Acid-base titration is a common method for it, but this method is complicated and time-consuming. In order to monitor L-lactate quickly and conveniently, we designed a biosensor for detecting L-lactate concentration by using the lldPRD L-lactate operon and QS system in E. coli. One of these parts is able to induce the lldPRD genes expression, LuxS protein, in the presence of L-lactate. LuxS protein catalyzes the SAM cycle and produces a small signaling molecule AI-2 that motivates our second part promoter of LsrA&K to promote GFP expression. The optic fiber is able to detect the GFP signal and convert it into current. Simultaneously, the entire device container will be made by 3D printing.

New York City

Testing the efficacy of mRNA displacement technique in huntingtin cell lines to treat Huntington's Disease

Region

North America - United States

Track

High School

Poster

Zone 1 - #5

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 304

9:00 AM - 9:30 AM

Huntington's Disease (HD) is an autosomal dominant disorder that leads to the progressive degeneration of neurons in the brain, which currently has no cure. HD is typically adult-onset and is characterized by a variety of symptoms including memory loss, involuntary movements, poor coordination, and impaired decision-making. Mutation in the huntingtin (HTT) gene causes HD, specifically a trinucleotide repeat of CAG that is abnormally repeated over 40 times. The goal of our project was to test the effectiveness of the plasmid that we generated last year, which targets and blocks endogenous faulty mRNA and releases a corrected RNA strand for proper protein synthesis of the HTT gene. The efficacy of this plasmid was tested on huntingtin cell lines, specifically the HeLa/polyQ-mCFP cell line. The effectiveness of this treatment was tested by evaluating whether the quantity of mutated HTT protein decreases after transfecting cells with the engineered plasmid.

Newcastle

Alternative Roots: Engineering Microbial Communities

Region

Europe - United Kingdom

Track

Environment

Poster

Zone 2 - #135

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 309

12:00 PM - 12:30 PM

The demand for food, fuel and materials is placing unprecedented pressure on agricultural production. To secure higher productivity, the sector relies upon synthetic fertilisers derived from energy intensive manufacturing methods. Here, we propose an alternative approach to support plant productivity. The Alternative Roots project investigated *Pseudomonas fluorescens* as a chassis organism. Development of a plant-colonising chassis provides novel mechanisms for soil microbiome manipulation without genetically modified crops. As proof of concept, we focus on improving nitrogen supply via naringenin biosynthesis - a potential chemoattractant of free-living, nitrogen-fixing bacteria. Legal and social considerations of the project drove the development of NH-1, a low-cost, small-scale and programmable hydroponic system. Tailored to overcome experimental limitations faced by many plant scientists, NH-1 provides improved reproducibility, coupled with high-throughput experimentation. This system enabled exploration of future deployment techniques within contained environments that may result in enhanced, sustainable crop productivity at a local and accessible level.

NJU-China

Surf in the neuron: A new strategy to target the dendrites

Region

Asia - China

Track

Foundational Advance

Poster

Zone 2 - #94

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 310

4:15 PM - 4:45 PM

With cell-type specific targeting exosomes expressing a special peptide on the exosomal membrane, we could deliver biological molecules to the neuronal cells. By this method, the localization of molecular cargos in the recipient cells is random and even. However, some molecules are localized at sub-cellular compartment naturally, like in neurons, several mRNAs are transported to the dendrites or axons. How to specifically deliver an exogenous mRNA to the neurites remains to be solved. We tested two cis-acting RNA elements (the 5'-UTRs of Tick-borne encephalitis virus (TBEV) and the 3'-UTR of mouse β -Actin gene) to guide the mRNA. It turns out the shorter one, 5'-UTR of TBEV works better, and the 5'-UTR could be successfully applied to the AAV vector, carrying the mRNA into the neurites. Through our element, we could improve the targeting method to the sub-cellular level and provide new insights into future treatment of certain neuronal diseases.

NKU CHINA

Population Quality Control system: a circuit for yield enhancement based on non-genetic variations

Region

Asia - China

Track

New Application

Poster

Zone 3 - #184

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 310

11:00 AM - 11:30 AM

Biosynthesis enables renewable and environment-friendly production of various compounds. However, present biosynthetic performances still await improvements to be cost competitive with petroleum-based chemical synthesis and suitable for large-scale industrial production. In order to achieve this goal, many approaches have been created, among which the Population Quality Control (PopQC) system is proved efficient. In our project, a PopQC system was developed as a plasmid based gene circuit in *Bacillus amyloliquefaciens* LL3 to continuously select high-performing cells in order to improve the yield of target metabolite, glutamate. In the presence of our PopQC system, high-producers stayed alive while low-producers were unable to survive. Consequently, the average intracellular concentration as well as the yield of glutamate among the population was enhanced, which finally led to the yield enhancement of poly- γ -glutamate, a high-value-added secondary metabolite.

NorthernBC-Canada**No title****Region**

North America - Canada

No abstract

Track

Therapeutics

Poster

Zone 5 - #291

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 302

9:30 AM - 10:00 AM

Northwestern**MetaSense: A heavy metal biosensor optimized for cell-free expression****Region**

North America - United States

Track

Environment

Poster

Zone 3 - #186

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 207

11:00 AM - 11:30 AM

Water pollution has become a rising problem in Lake Michigan as more contaminants are accidentally or illegally dumped. However, very little is being done to raise citizen awareness or to combat the negative effects on the ecosystem. Thus, the goal of this project is to create a paper-based cell-free assay that detects whether chromium or lead is present in a given water supply. Cell free systems are ideal for heavy metal detection because they are field-deplorable, eliminate issues of biocontamination, and facilitate increased reaction control via the open reaction environment. For each metal, there are two plasmids; one that produces a repressor protein while the other constitutively produces GFP. With this combination, the repressor interferes with the production of GFP until the specified heavy metal is present, resulting in a fluorescent output. The benefit of creating an easy-to-use sensor is that it empowers everyday citizens to test their water quality.

Nottingham

Clostridium dTox

Region

Europe - United Kingdom

Track

Therapeutics

Poster

Zone 4 - #222

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 306

10:00 AM - 10:30 AM

Clostridium difficile infections are the primary cause of healthcare associated diarrhea, with hypervirulent outbreaks becoming increasingly common across the globe. It is predicted that \$6.3 billion is spent annually on treating *C. difficile* in the U.S alone. Patients who have undergone treatment with broad spectrum antibiotics are at a high risk of being infected by this opportunistic pathogen, because their native gut flora is more likely to exist in a dysbiotic state. Our project aims to engineer a lysogenic bacteriophage with genetic constructs that will suppress the toxin production in *C. difficile*. We will use two different strategies to achieve this: an antisense RNA system capable of inhibiting translation of toxin transcripts, and a dead Cas9 mechanism to impede transcription of the toxin genes. Ultimately, we intend to produce a novel phage therapy capable of reducing toxigenicity of resident *C. difficile* without affecting native gastrointestinal microbiota.

NPU-China

Design and Synthesis of the Minimal *Saccharomyces cerevisiae* Mitochondrial Genome

Region

Asia - China

Track

Foundational Advance

Poster

Zone 2 - #150

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 311

10:00 AM - 10:30 AM

Mitochondria harbor relatively independent genome, the uniqueness of which enables *S.cerevisiae* to be widely used in the study of mitochondrial loss and relevant diseases. The mitochondrial genome size varies prodigiously between different yeasts, positively correlated with the size of intergenic regions and introns. This year, we boldly try to design and synthesize a minimal *S. cerevisiae* mitochondrial genome from scratch (39k). We employed bioinformatics algorithms to analyze the function and conservation of various parts of the original mitochondrial genome, providing a criterion for determining the non-essential sequences that could be deleted. The complexity of the mitochondrial genome sequence, low GC content and the existence of local GC clusters make it difficult to synthesize the genome, which was solved by specialised separation, parameter optimization, etc. This genome will be transferred into *S. cerevisiae* cells that have lost mitochondria genome, verify their function, feed back the result and optimize our original design.

NTHU Formosa

BioWatcher_Autonomous cell reporter system for non-invasive real-time blood diagnosis

Region

Asia - Taiwan

Track

Diagnostics

Poster

Zone 1 - #32

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 309

11:00 AM - 11:30 AM

Countless biomarkers exist in our blood flow, which could be applied to diagnose health condition or even potential diseases. Ensuring the accuracy, common ways for soluble biomarkers detection are mostly invasive and not real-time. Hence, we proposed Biowatcher, engineered reporter cells that enable detection and autonomous report of soluble biomarkers in the bloodstream. The sensing parts of the reporter cells are powered by nanobodies, the single-domain antibody that can be engineered to detect different biomarkers. Binding of biomarkers on nanobodies triggers cleavages and releases of transcriptional activators. Activating the expression of lux gene, in turn, induces bioluminescent emission as a readout for devices to detect. This kind of autonomous reporting system can have great varieties of applications by installation on wearable devices, watch for example. With the required software, the wearable devices could noninvasively track the level of biomarkers for real-time diagnosis.

NTHU Taiwan

Equivibrium

Region

Asia - Taiwan

Track

Open

Poster

Zone 1 - #13

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 207

2:15 PM - 2:45 PM

The Vibrio-related infection of the aquatic animal leads to inestimable financial damage for aquaculture in Taiwan. Our goal is to design a regulatory system to replace the usage of antibiotics. Our engineered E. coli will detect AHL secreted by Vibrio and will trigger E. coli to produce a peptide which can kill Vibrio. The killing genes are regulated by the STAR system, and we would like to let the system satisfy the succession model. Moreover, to verify our experiment, we design a bioreactor which is low-cost and is a real-time O.D. measuring device. It can track two engineered germs at the same time. Last but not least, because the current Vibrio detection methods are time-consuming, we aim to create a high-specificity Vibrio detecting device which collects the water sample automatically and periodically. And it would warn fisherman timely if the concentration beyond the standard value.

NTNU Trondheim

Quorum Sensing as a target mechanism for reducing biofilm formation

Region

Europe - Norway

Track

Therapeutics

Poster

Zone 1 - #17

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 207

5:15 PM - 5:45 PM

Bacterial biofilm formation is a profound challenge in treating wounds, inserting prostheses in patients or on equipment in different production industries. Communication between bacteria and coordination of biofilm formation is mediated by the quorum sensing mechanism. Here we utilize a CRISPR interference (CRISPRi) system to inhibit *Escherichia coli*'s quorum sensing mechanism by knocking down the *luxS* gene. The *luxS* gene encodes the synthase "S-ribosylhomocysteine lyase", which is responsible for synthesis of the Autoinducer-2 (AI-2) quorum sensing molecule. We implemented the CRISPRi system in *E. coli* DH5 α and TG1 and measured the biofilm production by Crystal Violet assays. We were able to significantly reduce TG1's biofilm formation, while DH5 α showed results with high variability. Experimental approaches for reducing biofilm formation have the potential to illuminate unknown underlying processes in biofilm formation and possibly reveal treatments for the challenges that biofilms account for.

NTU-Singapore

ModVision - A programmable nucleic acid modification and detection toolkit based on CRISPR/Cas systems

Region

Asia - Singapore

Track

Foundational Advance

Poster

Zone 1 - #6

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 306

3:15 PM - 3:45 PM

Recently, different CRISPR/Cas systems have been engineered to perform base editing on both DNA and RNA. However, some critical shortcomings are hampering their applications. For example, these base editors are often too large to fit into common delivery vehicles. Additionally, no approach is available to enable fast screening of specific RNA modifications. To tackle the size issue, we developed novel compact Cas9 protein scaffolds that, when fused to deaminase domains, will be both small enough to fit into delivery vehicles and only exhibit sufficient editing activity for downstream therapeutic applications. With our human practice, similar efforts were made on analogous RNA modifications using the Cas13 protein family. To tackle the second issue, we aimed to directly detect nucleotide modifications in the transcriptome using nanopore sequencing. We synthesised and sequenced unmodified and modified RNAs with the nanopore sequencer to develop different machine learning models that reliably identify positions of base modifications.

NU Kazakhstan

From a Dangerous Waste to Functional Nanomaterials: Bioremediation of Sour Crude Oil Waste using Cyanobacteria

Region

Asia - Kazakhstan

Track

Environment

Poster

Zone 2 - #140

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 302

9:30 AM - 10:00 AM

Accumulation of a hydrogen sulfide as a consequence of sulfur-containing 'sour' oil refinement can be dangerous. H₂S damages the drilling equipment and causes corrosion of transporting pipelines. We use Cyanobacteria as a chassis since the organism is autotrophic. We designed a *Synechococcus elongatus* PCC 7942 that expresses Sulfide Quinone Reductase (SQR) that catalyzes sulfide-dependent plastoquinone reduction in anaerobic conditions, while photosystem II stays inhibited due to sulfide being present. SQR converts Sulfide to elemental Sulfur which is stored in the bacteria and accumulates in the Biomass. The electron flow in this modified Photosynthetic Electron Transport Chain goes to a transgenic Hydrogenase making use of the existing anoxygenic conditions due to sulfide presence. The Biomass is finally converted to functional materials used for Proton Exchange Membrane (PEM) fuel cells in accordance with a newly developed method in our laboratory.

NUDT CHINA

PR PREDATOR-An improved protein degradation method based on ectopic expression of TRIM21 and recombinant antibody

Region

Asia - China

Track

Foundational Advance

Poster

Zone 2 - #114

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 311

10:00 AM - 10:30 AM

TRIM-AWAY, through introducing antibody and Trim21 protein into cells by microinjection or electroporation, represents a novel strategy which could rapidly remove unmodified native proteins in diverse cell types. However, the high complexity and low efficiency limited its application. Through combining TRIM-AWAY and ectopic expression of recombinant antibodies, we developed PR PREDATOR, a robust tool for degrading endogenous proteins in mammalian cells. Basically, parts for expression of Trim21 and recombinant antibodies were constructed and inserted in one single vector to realize the P2A-mediated bicistronic expression. GFP and ErbB-3, a member of the receptor tyrosine-protein kinases highly involved in the proliferation and metastasis of cancer cells, were chosen as targets of PR PREDATOR for the proof of concept and further demonstration of our design respectively. Our PR PREDATOR method shall provide not only novel tools for protein function study but also brand-new options for treating disease caused by aberrant protein aggregations.

NUS Singapore-A

Eco-friendly Bio-manufacturing of Flavonoid Dyes in *Escherichia coli* via Computer-mediated Optogenetic Regulation

Region

Asia - Singapore

Track

Manufacturing

Poster

Zone 2 - #119

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 208

11:30 AM - 12:00 PM

Natural dyes are increasingly considered as an eco-friendly solution to the serious water pollution generated by the textile and dye industries. Traditional production of natural dyes from plants heavily exhausts land and labour. While bio-manufacturing is an attractive alternative, it remains costly and chemically-intensive. We aim to develop a new bio-manufacturing method of producing flavonoids in *E. coli* for use as natural dyes. To eliminate the use of expensive chemical inducers to switch from growth to production phase and allow dynamic gene regulation, we designed an optogenetic circuit using a blue light repressible promoter for flavonoid biosynthesis. As it is critical to monitor cellular metabolic burden for efficient production, we introduced a stress-sensing fluorescence reporter. To optimize operations, a computer-aided system was developed to regulate gene expression using light according to the feedback from the stress sensor. To demonstrate this approach, we produced Luteolin, a natural yellow dye.

NUS Singapore-Sci

RESCUE - RNA Editing System for C-to-U Editing

Region

Asia - Singapore

Track

Foundational Advance

Poster

Zone 4 - #255

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 312

11:00 AM - 11:30 AM

Since the discovery of the CRISPR-Cas9, researchers now have a tool for precise gene targeting in any living organism. However, there remain concerns about whether such DNA editing methods are ethical, specific and safe, especially if editing is carried out in somatic cells. Recent work has shown that another Cas family protein, Cas13, can target and degrade specific RNA transcripts, thus effectively silencing target gene expression. The targeting of RNA strands has many advantages over DNA, as any changes are not permanent and its effect is transient. Our project aims to extend the application of CRISPR-Cas13 guided RNA targeting system for editing specific RNA bases on RNA strand (RESCUE system). Cas13 is linked to the catalytic domain of APOBEC1, an enzyme that can carry out RNA base modification. Our RESCUE system can diversify the current repertoire of RNA editing methods available.

NWU-China**No title****Region**

Asia - China

No abstract

Track

Environment

Poster

Zone 2 - #100

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 310

5:15 PM - 5:45 PM

NYMU-Taipei**Hair to Stay - a Drug Screening System for Androgenetic Alopecia (AGA)****Region**

Asia - Taiwan

Track

New Application

Poster

Zone 2 - #98

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 312

2:45 PM - 3:15 PM

Hair is one of the first noticeable aspects of our beauty and it reflects our identity. This year, the NYMU iGEM team aims to introduce a quick and convenient drug-screening platform to determine the effectiveness of hair loss product without animal or human testing. The cause of AGA is believed to be highly related to dihydrotestosterone (DHT), a derivative of testosterone that can possibly trigger the production of DKK-1 protein. DKK-1 protein can possibly inhibit the growth of root sheath cells in hair follicles and eventually lead to hair loss. The system that our team designed demonstrates a convenient platform to measure the amount of secreted DKK-1 protein, which provides a novel method for the screening of AGA drugs.

NYU Abu Dhabi

Pathogene: A portable, low-cost, microfluidic lab-on-a-chip based device for rapid detection of multiple foodborne pathogens

Region

Asia - United Arab Emirates

Track

Diagnostics

Poster

Zone 5 - #308

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 304

5:15 PM - 5:45 PM

Despite regulations in place to ensure the distribution of safe food, foodborne diseases (FBDs) remain a global concern. To address the worldwide challenge of FBDs, we have devised a customizable device for the simultaneous detection of multiple food-borne pathogens (FBPs). The device detects specific DNA sequences associated with four FBPs: *Campylobacter*, *Listeria monocytogenes*, *Salmonella*, and *Vibrio cholerae* using the isothermal amplification techniques: recombinase polymerase amplification (RPA) and loop-mediated isothermal amplification (LAMP). The use of isothermal techniques allows the device to be more portable and cost-effective compared to conventional PCR systems, while the use of microfluidics allows for multiplexing and rapid high-throughput screening. The parameters of the device such as the number of pathogens, and amplification and detection methods can be customized as required. This novel lab-on-a-chip based device is rapid, portable, affordable, sensitive, specific, and customizable, making it ideal for resource-limited settings and point-of-care testing.

OLS Canmore Canada

The PET Peeve Project: Bio-tagging PET Plastic for Efficient Sorting and Recycling

Region

North America - Canada

Track

High School

Poster

Zone 4 - #218

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 306

11:00 AM - 11:30 AM

The accumulation of plastic pollution has spurred a global crisis. Looking for a solution, the OLS SynBio team discovered that the issue is not the recycling of plastic, but instead the inefficient sorting of plastics. The project uses synthetic biology to create a novel fusion protein that can specifically bio-tag polyethylene terephthalate (PET) plastic, so it can be sorted and recycled correctly. The project involves two proteins, PET hydrolase (PETase) and a hydrophobin called BsIA, that are produced via a bacterial chassis called *Bacillus subtilis*. The PETase enzyme binds to PET and is fused to a red fluorescent protein called mCherry, visually indicating when the adhesion occurs. The hydrophobin is 'water-fearing' and will help to bind the PETase to PET plastic. So far, transformations of *Bacillus subtilis* using the construct have been successful, and real-world applications of the project look promising.

OUC-China

miniToe Family- A Controllable Toolkit Based on Csy4

Region

Asia - China

Track

Foundational Advance

Poster

Zone 1 - #86

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 311

12:00 PM - 12:30 PM

This year, we design a toolkit focused on post-transcriptional regulation, which is composed of a RNA endoribonuclease (Csy4) and a RNA module named miniToe. Csy4 (Csy6f), a member of CRISPR family, recognizes a specific 22nt hairpin. The RNA module was constructed by inserting the 22nt Csy4 recognition site between a RBS and cis-repressive RNA element, which can be specifically cleaved upon Csy4 expression, so the RBS is usually masked. Cleaved at the specific recognition site, it can release the masked RBS, thus endowing the programming of gene expression in the translation level with higher feasibility. We want to use one system to achieve diverse expression of target gene. So we further design four Csy4 mutants and five miniToe mutants. The whole system including five Csy4s and six miniToes is called miniToe family. By combining each Csy4 and hairpin, we can achieve different expression level of the target proteins in a polycistron.

Oxford

miBiome: Treatment of IBD with Genetically Engineered Probiotics

Region

Europe - United Kingdom

Track

Therapeutics

Poster

Zone 5 - #312

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 302

12:00 PM - 12:30 PM

Inflammatory Bowel Disease (IBD) is characterised by chronic inflammation of the intestine. The condition is associated with an imbalance in immune cell populations, notably Th17 and Treg. Existing immunosuppressive therapies, when successful, often elicit systemic side effects and require frequent readministration. Our solution is to develop a probiotic strain that restores the Th17/Treg cell balance via secretion of IL-10 in response to nitric oxide in the intestinal lumen. Overshoot is prevented by an adenine riboswitch-sRNA construct which responds to extracellular adenosine, an indicator of the Treg cell population. Integration of separate stimuli in a dual feedback loop enables a more dynamic, robust response to the immune state of the body. Various features have been incorporated to maximise biological safety, including an inducible kill switch system. We believe our design offers a non-invasive, self-tuning therapeutic for IBD, with potential to replace conventional immunosuppressants in the treatment of gastrointestinal autoimmune disorders.

Paris Bettencourt

STAR CORES: Protein scaffolds for star-shaped antimicrobial peptides

Region

Europe - France

Track

Therapeutics

Poster

Zone 1 - #19

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 306

5:15 PM - 5:45 PM

Antibiotic overuse in livestock industry is one of the major drivers to the antibiotic resistance evolution; motivating calls to reduce, replace, and re-think the antibiotic usage in animals. Antimicrobial peptides (AMPs) are a promising alternative to conventional antibiotics. Recently, a class of chemically-synthesized, star-shaped AMPs has been shown to exhibit broad-spectrum antimicrobial activity while maintaining biocompatibility with mammalian cells. In this project, we combinatorially fused a set of known AMPs to structurally diverse, self-assembling protein cores to produce star-shaped complexes. Over 200 fusions were designed and expressed in a cell-free system, then screened for activity, biocompatibility, and membrane selectivity. In addition, we selected 4 AMPs for rational mutagenesis (~12000 variants), and a subset of fusions for molecular dynamic modeling, to identify features of surface charge and star geometry that impact AMP performance. Overall, we aim to create a novel class of selective, non-toxic AMPs which are biologically-produced.

Pasteur Paris

NeuronArch: the novel connecting and protecting biofilm based system for prostheses

Region

Europe - France

Track

New Application

Poster

Zone 2 - #167

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 311

2:15 PM - 2:45 PM

In the future, a long due consideration and an easier access to healthcare will be given to people with disabilities. Presently, some prostheses allow amputees to perform simple actions but without a direct connection between the nerves and the prosthesis. Furthermore, a major health risk is the development of pathogenic communities of microorganisms in structures called biofilms. Strong treatments with antibiotics, or even surgical reinterventions are then required. They represent a heavy burden for both the patient and the healthcare system. We imagined NeuronArch as a novel application that subverts potential pathogenic biofilms using an engineered one. This interface produces substances called neurotrophins (NGF), for directed and controlled growth of nerves. Using a conductive membrane, it will also allow passing of information and enhancement of the electrical properties. Altogether, these improvements would enable patients to regain natural perceptions and prevent the formation of *Staphylococcus aureus* biofilms by blocking quorum sensing.

Peking

Synthetic organelle: A phase-separation-based multifunctional toolbox

Region

Asia - China

Track

Foundational Advance

Poster

Zone 2 - #144

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 304

9:30 AM - 10:00 AM

Membrane-less organelles are involved in many essential biological processes. In order to orchestrate various cellular regulation using a single platform and to make the response dynamics more flexible, we put forward the idea to construct a 'synthetic membrane-less organelle' as a multifunctional toolbox in yeast. In this case, certain components are self-organized to form liquid droplets through phase separation, which require multivalence and interaction as prerequisites. Based on this principle, we fused interactional modules into homo-oligometric tags (HOTags) to form droplets in the yeast. Various interactional modules provide diverse control methods while different promoters alter the features and kinetics of our systems. Beyond quantitative analysis of the foundational system, we verified the feasibility of several potential functions theoretically and experimentally, including reaction crucible, sequestration, organization hub, sensor, etc. In the future, by replacing functional modules with other parts, this system would conduct functions not included in the current project.

Pittsburgh

Chronological Event Recording of Stimuli using CRISPR/Cas9-mediated Base Editing,Ä®

Region

North America - United States

Track

Information Processing

Poster

Zone 4 - #227

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 306

9:00 AM - 9:30 AM

The ability to measure and record molecular signals in a cell is critical. Current systems are limited in that they can only take a 'snapshot' of the environment, preventing scientists from understanding event order. Previously systems have utilized a CRISPR/Cas9 base editor complex (BE), which can record information in DNA by producing permanent single nucleotide changes; however, recording capability was limited to logging an average concentration of stimuli over a period of time. Our system builds upon these foundations by designing a method of true chronological event recording. By introducing recording plasmids with repeating units of DNA and multiple gRNA to direct our base editor construct, we can achieve true temporal resolution of stimuli. Furthermore, we simplified the readout, so inexpensive laboratory equipment can be used. This technique will provide an understanding of the order in which molecules and proteins appear in systems, illuminating the hidden, casual relationships.

Pittsburgh CSL

Energy on Demand from Symbiotic Microbial Fuel Cells

Region

North America - United States

Track

High School

Poster

Zone 1 - #76

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 306

11:30 AM - 12:00 PM

The burning of fossil fuels generates greenhouse gases that damage the atmosphere and impacts the global environment. Energy from sustainable sources such as wind and solar is difficult to store for times when no wind is blowing or no sun is shining. The purpose of this project is to show a possible symbiotic relationship between *Shewanella oneidensis* and *E.coli* to generate energy. This allows the use of energy in a eco friendly way. In order to build a sustainable energy source for energy on demand we created a system using living organisms. *E.coli* was engineered to synthesize lactate which will then be used to feed a *Shewanella* biofilm. *Shewanella oneidensis* is a bacterium notable for its ability to reduce metal ions, live in environments with or without oxygen and when incorporated into a microbial fuel cell produced voltage. Results of co-culture experiments to test the symbiotic relationship will be presented.

Purdue

A Novel Paper-Based Diagnostic Assay For The Detection of *Candida Albicans*

Region

North America - United States

Track

Diagnostics

Poster

Zone 5 - #318

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 309

2:45 PM - 3:15 PM

The common yeast infection, vulvovaginal candidiasis, affects 75% of women throughout their lifetime. This disease is caused by the fungal pathogen *Candida albicans*, which is also a major cause of systemic candidiasis, a rarer but deadly disease with up to a 49% lethality rate. Existing diagnostics for both infection types are lacking in accessibility, speed, or accuracy – far from the ideal test. This project focuses on creating such a test by detecting farnesol and tyrosol, biomarkers indicative of *C. albicans*, by binding them to the split proteins pqsR and tyrosinase. Upon binding, a split horseradish peroxidase catalyzes and produces a blue color on a paper test strip by oxidizing the substrate tetramethylbenzidine. This test will produce a colorimetric output for a simple-to-understand diagnosis without any infrastructure. It also may provide an easy and cheap way to diagnose candidiasis worldwide, reducing antifungal abuse.

Queens Canada

In The Glow: Luminescent Biosensors for Hormone Detection and Diagnosis

Region

North America - Canada

Track

Diagnostics

Poster

Zone 5 - #282

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 309

12:00 PM - 12:30 PM

This year's project has focused on the production of protein biosensors for detection, diagnosis, and monitoring of salivary hormones. We have taken two approaches to our design process. Firstly, we constructed a reagent-less, and continuous glucocorticoid sensor which utilizes changes in Fluorescence Resonance Energy Transfer to detect hormones. Secondly, we have begun developing a novel, and easy to use biosensor which utilizes ligand-dependent intein splicing to produce a luminescent signal. The resulting signal could then be quantified, providing a dose-dependent measurement of analytes. In addition to our laboratory work, we have constructed a complimentary diagnostic pacifier featuring a built in luminometer, allowing for the potential to passively collect, and analyze saliva in a portable and non-invasive fashion. In practice, a child would use the pacifier as normal, and the baby's salivary hormones would be collected, analyzed, and wirelessly transmitted to the parent or a healthcare professional through a smartphone application.

RDFZ-China

Xscape

Region

Asia - China

Track

High School

Poster

Zone 3 - #201

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 302

12:00 PM - 12:30 PM

Biosafety has always been a major challenge. Leakage of recombinant DNA to the environment may cause undesirable environmental consequences. Aiming to solve this urgent issue, we constructed three devices: two for industrial fermentors, and one for drug delivery bacteria. The first device for use in fermentors utilized thermal-sensitive and quorum system sensors, PhIF and sRNA as logic gate components, and DNase as actuator, forming a NOR gate; the second used a cold-regulated device and a LuxR-repressed promoter as sensors, forming an AND gate. Both devices will self-induce DNA degradation if recombinant bacteria are accidentally leaked into environment. Moreover, with multiple thermal-sensitive devices and gas vesicles, we could perform noninvasive monitoring of the bacteria, drug release by heating tissue at the nidus, and initiation of DNA degradation by applying a higher temperature. For human practice, we mainly focused on current biosafety issues, including biohackers, sales of hazardous materials and local laws.

REC-CHENNAI FLUOROSCREEN

Region

Asia - India

Track

Foundational Advance

Poster

Zone 5 - #295

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 311

11:30 AM - 12:00 PM

With the ever-growing demand for designing proteins with better sensitivity, selectivity, stability, and affinity, oligo-based site-directed mutagenesis has become instrumental and indispensable in Genetic Engineering. The conventional method is considered cumbersome, for it relies on replica-plating to screen the mutants based on the reversal in resistance and sensitivity to two antibiotics: Tetracycline and Ampicillin respectively. It also necessitates sub-cloning the mutated gene in an expression vector to ultimately express the mutant-protein. Our orthogonal system facilitates fluorescence-based screening of mutants, using a novel 'Red-Green' Dual-Fluorescent GFP-mutant. While point-mutating the gene-of-interest, introducing a single point-mutation in the coding sequence of this GFP-mutant codes for its 'Green-Only' isoform. The loss of red fluorescence in the transformed colonies is indicative of successful mutagenesis. Apart from simplifying the screening method, this system facilitates the mutagenesis of the target-gene and expression of the mutated-gene using a single plasmid, thus eliminating the need for sub-cloning.

Rheda Bielefeld

Interpoll-Scanning the air for pollen

Region

Europe - Germany

Track

High School

Poster

Zone 3 - #196

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 208

5:15 PM - 5:45 PM

A great percentage of Earth's population is allergic to specific substances. Approximately 20 million people living in Germany are allergic to different plants, animals and much more, but about half of them are allergic to pollen. We want to help these people suffering from an allergy to pollen by advising them which dose of medicine is necessary for every day. Although there is already useful medicine, we are convinced that we can optimize the use of such medicine and reduce the exposure to unnecessary drugs which have negative side effects like lowering the personal performance capacity, becoming tired and many others. Therefore we use a DNA-based method using pectinase and cellulase to open the pollen and isolates their DNA. This DNA will be used for a PCR with specific primers against the birch allergen 'Bet'. By hereby identifying pollen we aim to measure the current pollen exposure in the air.

RHIT

PEBBLE - Modifying *Escherichia coli* to Degrade and Metabolize Polyethylene Terephthalate Plastic into Usable Products**Region**

North America - United States

Track

Environment

Poster

Zone 4 - #231

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 309

4:45 PM - 5:15 PM

A recently discovered bacteria, *Ideonella sakaiensis*, degrades polyethylene terephthalate (PET) plastic into ethylene glycol and terephthalic acid using the enzymes PETase and MHETase. As genetic engineering methods have not been well-developed for this organism, we are engineering this pathway into *Escherichia coli*, a model organism. Other researchers have mutated PETase's active site to increase its substrate turnover. We are cloning the DNA sequences of these mutated enzymes into an *E. coli* plasmid and developing a second plasmid to overexpress the native *E. coli* enzymes for ethylene glycol metabolism. With both plasmids, the transformed bacteria should be able to survive solely off the PET carbon. The only byproduct would be terephthalic acid, a precipitate which can be recycled into new plastic. Computer simulations of the pathway gave us predictive degradation rates at optimum conditions. Implementation of these bacteria in the future could address the concern of plastic build-up in our world.

Rice

PORTAL: A Portable Transcription-Translation System to Improve Cross-Species Genetic Circuit Reliability**Region**

North America - United States

Track

Foundational Advance

Poster

Zone 1 - #30

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 208

11:30 AM - 12:00 PM

The unique properties of non-model bacteria can expand the applications of synthetic biology. However, currently there are few reliable tools for engineering non-model bacteria. A central obstacle to the development of such tools is the dependence of circuit expression on host machinery. To address this problem, we developed PORTAL, a system which uses T7 transcription and orthogonal ribosomes to insulate the circuit from host processes. We characterized PORTAL in four *E. coli* strains, *Shewanella oneidensis*, and *Pseudomonas putida*, comparing PORTAL-driven and host-driven expression of a reporter. To design orthogonal ribosomes, we created software that analyzes binding energies of 16S rRNA and determines the optimal orthogonality-promoting anti-Shine-Dalgarno mutations. We created a model that simulates the performance of PORTAL and shows that the system is minimally sensitive to metabolic differences. PORTAL presents a tunable 'virtual machine' to facilitate insulated synthetic gene circuit expression in non-model bacteria.

RMHS Maryland

Conversations: Developing a Two-Way Quorum-Sensing Feedback Loop and Characterizing Dose-Dependent Sensitivity to Realistic Autoinducer Concentrations

Region

North America - United States

Track

High School

Poster

Zone 3 - #197

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 306

4:45 PM - 5:15 PM

Quorum sensing, a form of bacterial cell-to-cell communication reflecting cell population fluctuations, can be adapted to facilitate multi-population collaboration. Our project combines two different QS systems to create a novel feedback loop in an E.coli co-culture, where each population synthesizes a different fluorescent protein in response to the other population's autoinducer production. Population A is a LuxS knockout that produces AI-1 and RFP in response to AI-2, while Population B secretes a constant level of AI-2 and expresses GFP in response to AI-1. In co-culture, each population induced fluorescence in the other, indicating a successful two-way quorum sensing system. In the process, we also generated novel characterization data for two Biobricks, demonstrating for the first time that BBa_K575024 exhibits minimal leaky expression and is dose-dependent over a range of realistic AI-1 concentrations (5-1000 nM). We also provide the first evidence that BBa_K575026 is induced by AI-1.

Rotterdam HR

Selective carbon monoxide detection using the CO binding receptor protein CooA in E. coli.

Region

Europe - Netherlands

Track

Open

Poster

Zone 1 - #33

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 312

2:45 PM - 3:15 PM

Modified bacteria that are present in our product contain the CooA receptor gene which codes for the synthesis of a receptor protein named CooA. This CooA receptor can bind with the carbon monoxide derived from the polluted environment. The binding of the CooA receptor with carbon monoxide results in a change of the protein structure. Due to the changed structure, the CooA protein will be able to bind to a CooA sensitive promoter on the bacterial DNA. The binding of the CooA receptor with the promoter enables the synthesis of the enzyme urease. Accordingly, the formed urease converts the urea which is present in the medium into CO₂. The released CO₂ gas in the medium will be collected. When a certain threshold is reached in the amount of produced gas an increase in the resistance between two electrodes will occur. Finally, the detected change in resistance will activate the alarm.

Ruia-Mumbai

Catechewing Coli: The Paan Stain Redemption

Region

Asia - India

Track

Environment

Poster

Zone 2 - #107

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 208

2:15 PM - 2:45 PM

Indiscriminate spitting of red-colored catechu (Paan-) based products is a common practice in India. Paan stains tarnish public places and historical monuments in the country. Although a considerable amount of resources are invested in cleaning these stubborn red-stains, existing methods are ineffective in removing them. Our team designed a dual-component ecologically contained system that will remove these stains more efficiently. The first module employs a four-enzyme system that breaks down the stains into non-toxic byproducts in a targeted manner. The second module interfaces with this degradation system to trigger the destruction of the system's DNA from the environment as a safety measure after the stain-fighting enzymes have been produced. Given the enormity of this social issue, we take a holistic approach to actively engage our community and learn from industry experts, users, cleaners, and policy makers how to effectively remove existing stains as well as prevent new ones.

Saint Joseph

RAFI - Revolutionary Approach To Fish Infections

Region

Europe - Turkey

Track

High School

Poster

Zone 5 - #294

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 302

3:15 PM - 3:45 PM

For years, fish industry has been one of the most important economic resources. However, humans were not the only ones consuming this resource; some aquatic bacteria such as *Vibrio anguillarum* and many other bacteria species have evolved to prey on fish. This has caused huge economic losses in various countries' fish industries. Humans responded to this problem by applying antibiotics, to which bacteria easily developed resistance. Another solution applied was vaccinations but they were ineffective for fish larvae. That's why we need to find an effective solution that can adapt to its ever changing environment. For this we aim to use bacteriophages as a specialized lytic agent to eliminate fish pathogen. Due to resistant nature of bacteria we will support our bacteriophages with an antimicrobial peptide in a recombinant therapy where we will observe any potential synergy against *Vibrio anguillarum*. We will execute our experiments in in-vitro environments.

SBS SH 112144

The lysis of Cyanobacteria in freshwater ecosystem using Cyanophage lysozyme and its commercial implications

Region

Asia - China

Track

High School

Poster

Zone 3 - #203

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 304

2:15 PM - 2:45 PM

The rampant growth of cyanobacteria in freshwater ecosystem has become more than an environmental issue. Their incredible ability to multiply and voracious consumption of oxygen often make them a disturbing factor to natural systems. Although effective ways to gather and salvage cyanobacteria have been developed, there are barely any success in decomposing these bacteria. Through background research, our team identified a cyanophage lysozyme, cp-OS lysozyme 1. Along with other chemicals such as BugBuster, this lysozyme in small reaction systems could lyse the cyanobacteria effectively. Through molecular cloning, protein expression, and the subsequent purification, we were able to acquire the recombinant protein from *E. coli* cells, and we evaluated its enzymatic activity under different pH and temperatures. We also designed a prototype device in which immobilized lysozyme can be used to lyse cyanobacteria repeatedly. Our research lays foundation for the utilization of cyanobacteria components in agricultural, bioenergetic, and even medical fields.

SCAU-China

Desertification combating strategy: bacterial cellulose biosynthesis in desert surviving cyanobacteria

Region

Asia - China

Track

New Application

Poster

Zone 5 - #288

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 311

3:15 PM - 3:45 PM

Desertification is becoming a serious global problem. Great efforts have been put into the desertification control by introducing various methods. Here, we take advantage of using genetic engineering and synthetic biology as powerful tools to propose a new strategy for the desertification control. We use *Acetobacter xylinus* which is a model bacterium for producing cellulose. Its cellulose can be used for water conserving both soil and moisture. On the other hand, *Micrococcus vaginatus* is a dry land living cyanobacteria which is an ideal bioreactor for producing bacterial cellulose. We cloned seven key genes that are critically required for bacterial cellulose synthesis from *Acetobacter xylinus* and expressed them in cyanobacteria. Additionally, we employed computer modeling and prediction to optimize the production of cellulose. Finally, we successfully achieved the cellulose production from the transgenic cyanobacteria and its cultivation on sands. Together, we have developed a new and low-cost method for desertification control.

SCU-China

CRISProgrammer

Region

Asia - China

Track

Foundational Advance

Poster

Zone 4 - #256

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 208

11:00 AM - 11:30 AM

Inspired by the modularization, call-and-return and do-not-reinvent-the-wheel philosophy in computer programming, we came up with the idea of using the dCas9 to manipulate the expression of proteins and to implement complex logic in *E. coli*. Ideally, we would like to generate a versatile 'Library strain' containing the CDS of commonly used proteins. Individuals would simply transform a much smaller 'Minimid' which contains specific sgRNAs targeting the sequence of desired proteins into the Library strain, then the dCas9-sgRNA complex can control the expression. To show the practicality of the design, we tested the system in *E. coli* by using a series of simple logic circuits based on dCas9-sgRNA complex, with fluorescent proteins as reporters. We also thought about the further application of our design in the synthesis of indigo and try to modularize two enzymes that participated. This project will contribute to the construction of engineered bacteria and green manufacturing.

SCUT ChinaB

Plastic Killer - Engineered *Corynebacterium glutamicum* that degrade plastics

Region

Asia - China

Track

Environment

Poster

Zone 5 - #290

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 207

11:30 AM - 12:00 PM

In recent years, the problem of plastic pollution has attracted more and more attention because of its huge amount and ubiquity. Meanwhile, traditional PET treatment methods have problems such as high cost, insufficient degradation, and secondary pollution. Therefore, we have constructed an engineering strain that can degrade PET and convert it into a carbon source. We are going to use *Corynebacterium glutamicum* in our project which is a food-grade microorganism that is commonly used in the industrial production of foods and amino acids. Our bacteria will firstly degrade PET to p-Phthalic acid(TPA) and Ethylene glycol(EG). Secondly, they will catalyze the TPA to protocatechuatePCA and finally to PDC, which can participate in TCA cycle to provide energy for cell growth and development. All in all, our engineered bacteria have the advantage of effectively degrading PET at a lower cost without secondary pollution.

SCUT-ChinaA

Enhancing limonene biosynthesis by a high efficiency enzyme self-assembly system

Region

Asia - China

Track

Environment

Poster

Zone 2 - #110

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 312

2:15 PM - 2:45 PM

Terpenoid flavor and fragrance compounds (TFFCs) show extensive application in nutraceutical, pharmaceutical and food industries that have rapid grow market demands. The use of GRAS microorganisms to convert natural raw materials into aroma compounds can be described as natural products, which have been considered as one of the most promising strategies. However, fermentive TFFCs produced by engineered microbes mostly only obtain intermediates or low yields of end-product currently. This study proposes a non-conditional yeast *Yarrowia lipolytica* as a chassis for TFFCs production, in which limonene was chose as target product. By employing synthetic biology technology including gibson assembly, CRISPR/Cas9 and protein scaffold, we develop a high-performance enzyme self-assembling system (HESS) to rewiring the pathway into limonene accumulation. Furthermore, the MVA pathway will be enhanced by overexpression of two rate-limiting enzymes (HMG1 and ERG12) for increasing the production. This project will provide an alternative metabolic engineering strategy for biosynthesis of TFFCs.

SDSZ China

Advanced enzymolysis technique for chitosan production

Region

Asia - China

Track

High School

Poster

Zone 2 - #127

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 306

12:00 PM - 12:30 PM

Chitin is a kind of natural macromolecular substance that can be found abundant in the exoskeleton of arthropods. It could be converted to chitosan, -1, 4- polymer of 2-glucosamine, through deacetylation. Chitosan is significantly soluble and bioactive, widely used in medicine, food industry, and water treatment. However, the current technology that treats chitin with concentrated alkali has led to deficient, unstable chitosan production, and pollution. After learning that Chitin Deacetylase (CDA) could hydrolyze the acetamino group on chitin, we aimed to find out a crystal- chitin-active-enzymes due to the only industrial-available source of chitin. In our research, we chose several CDA and chitinase sequences, synthesized and complemented them with respective domains, and cultivated them in plasmid pET-28a. After inserting plasmids into competent cells and searching for optimal induction condition for expression, we would finally find out maximum viability and model the research for factory production.

SDU-CHINA

MetaboLight: Light-controlled Redirection of Metabolic Flux

Region

Asia - China

Track

New Application

Poster

Zone 5 - #275

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 207

9:30 AM - 10:00 AM

In engineering *Escherichia coli* cell factories, conflicts exist between engineered and endogenous pathways for their competition for metabolite precursors. E.g., the production of polyhydroxybutyrate (PHB) inevitably consumes Acetyl-CoA in the TCA cycle for cell growth. Given cell mass is a key factor of yield, precise switching from growth phase to production phase is significant. Previous studies utilized chemical inducers which are subject to irreversibility & toxic effects. In this project, we addressed these problems by introducing light in *E. coli* transcriptional control. A switch redirecting metabolic flux from growth to PHB production was built using a green light responsive CcaS/CcaR two-component system and a Type I-E CRISPR-Cas System. Upon green light illumination, the gene cluster *phbCAD* is transcribed to initiate PHB synthesis. A crRNA is transcribed simultaneously and binds a deactivated *cas3* (mimicking *dcas9*) to block the expression of *glfA*, an essential gene in TCA cycle and cell growth.

SFLS Shenzhen

Early detection of breast cancer using miRNA-155 and miRNA-10b

Region

Asia - China

Track

High School

Poster

Zone 5 - #298

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 312

4:45 PM - 5:15 PM

The global incidence of breast cancer has been rising since the late 1970s. According to the data of breast cancer incidence released by the National Cancer Center and the Center for Disease Control in 2009, the incidence of breast cancer in the registered areas ranks the first in women with malignant tumor. Our project is to use miRNA--miRNA155 and miRNA10b--in human serum as biomarkers to detect early forms of breast cancer. Toehold switches are used for the detection and the product can be suited to any other early cancer detections if the trigger part is changed to bind with other miRNA sequences. When both kinds of miRNAs are binded,our artificial designed biological system will produce green fluorescent protein.Based on it,we can detect fluorescence and calculate microRNA expression level.We're trying to make our project become a convenient and cheap disease-detecting method in people's daily life.

ShanghaiTech

Fast & Fidelity - a circuit system achieving high input-output concurrence

Region

Asia - China

Track

Foundational Advance

Poster

Zone 3 - #209

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 208

2:15 PM - 2:45 PM

Input, controller, and output have been the standard procedure of engineered regulatory biocircuit. However, the precise input-to-output control may fail at times mainly due to (i) delayed responses from input signals to output signals, and (ii) unexpected interactions between the host and exogenous circuits. For example, previous iGEM projects primarily focused on the single time response of systems, which underestimated the fact that continuously changing inputs may cause the disorder of output signals. Therefore, a system needs to be constructed for rapidly responding to the changing input signals and eliminating the superposition between outputs from different input signals. In this context, we design a high-fidelity control system with a feedback loop and orthogonal ribosome, which allows the outputs to respond precisely to the changing input signals. We envision that our control system will offer the synthetic biology community a novel solution to manipulate uncertain input.

SHPH-Shanghai

A new biological method to degrade biofilm.

Region

Asia - China

Track

High School

Poster

Zone 2 - #146

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 312

5:15 PM - 5:45 PM

Our team finds that lactic acid produced by *Lactobacillus delbruckii* ND02 is an acid with considerable effect of biofilm degradation. In order to support *Lactobacillus delbruckii* for acid secretion, lysozyme is used to hydrolyze polysaccharides in the biofilm to smaller fragments of mono and disaccharides. Sequence that codes for lysozyme is combined with sequence of *Lactobacillus breri* that codes for S-layer protein signal peptide, which promotes the secretion of lysozyme. The combined sequence is then transferred to the acid producing *Lactobacillus delbruckii* for expression. With nutrients provided by hydrolyzed polysaccharides, *Lactobacillus delbruckii* secretes lactic acid that further degrades the biofilm. As the pH of the system gradually decreases, the ability of *Lactobacillus delbruckii* adhering to biofilm increases. In addition, hydrogen peroxide is secreted for sterilization when the pH drops below 3. This produces a positive feedback loop for biofilm degradation and its effect is expected to be significant.

SHSBNU China

Biofilm x Laccase

Region

Asia - China

Track

High School

Poster

Zone 1 - #57

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 309

5:15 PM - 5:45 PM

The textile industry creates environmental problems due to the release of highly polluting effluents containing substances from different stages of dyeing that are resistant to light, water, and various chemicals. These dyes would do harm to human health and ecological system. The biological degradation of dyes is an economical and environmentally friendly alternative. Thus, the aim of team SHSBNU_China is to create a biofilm for discoloration of synthetic reactive dyes. The team would use biofilm of *E. coli* and engineered it to contain the laccase CotA from *B. subtilis*, which is a polyphenol oxidase that can catalyze the degradation of dyes. In the form of living biofilm, the bio-degradation will be more resistant to stress from environment or different effluents.

SHSID China

Everglow

Region

Asia - China

Track

High School

Poster

Zone 1 - #10

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 302

2:15 PM - 2:45 PM

With electricity consumption increasing across the globe, the conservation of energy has become a topic of major concern. Our team has devised an innovative solution to reduce electricity usage by attempting to create genetically modified bioluminescent plants. By altering particles on the microscopic level, we hope to create plants that can glow and thus replace electricity in the future. To these ends, our team conducted experiments to transfer the lux operon, a cluster of genes (LuxCDABEG) that control bioluminescence in the bacterial species *Aliivibrio fischeri*, to plant species like *Nicotiana tabacum*. We also attempted to insert an extra copy of LuxG to enhance the effects of bioluminescence. The results are promising and point to the possibility of creating a greener alternative to current lighting. Furthermore, we will design a new plasmid that can detect potential stress factors like ethanol and report the signal with stronger bioluminescence.

SHSU China

ExoBlood

Region

Asia - China

Track

High School

Poster

Zone 3 - #204

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 302

2:45 PM - 3:15 PM

We will engineer human cell line to produce exosomes that work as cellular hemoglobin based oxygen carriers. They can be used in blood transfusion and stroke treatment. We will first try to secrete human hemoglobin subunits and other required proteins for oxygen transport. Then we will focus on loading the protein cargo into the exosome, which we have chosen for the reason of immune-compatibility and easy production. The exosomes will be loaded endogenously with hemoglobin using membrane anchored proteins (CD63) or using exosome-forming pathways inside the cell (WW tag and Ndfip1). By doing this, we will produce an efficient method for future iGEM teams to create protein-loaded exosomes that can be used in therapeutics and develop a potential blood replacement.

SIAT-SCIE

COPE: CRISPR/Cas9-OMV-signal Peptide Encapsulation technique mediated targeting of oncogene in *Fusobacteria Nucleatum*

Region

Asia - China

Track

High School

Poster

Zone 3 - #192

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 309

4:45 PM - 5:15 PM

Outer Membrane Vesicles(OMVs) are a ubiquitous type of vehicles that continuously bud off from gram-negative bacteria's outer membrane, serving as a communicative tool between bacteria. As natural kins to the bacterial membrane, they can preserve the integrity and bioactivity of sensitive Cas9 proteins and single guide RNA (sg-RNA) within, when used as a delivery tool. Our project aims to construct a system that uses OMVs as vectors for transporting the Cas9 protein and sgRNA into the host cells to achieve efficient muting of the virulent gene of interest in its genome. We expressed Cas9 and sgRNA together with a signal peptide enabling them to reach the bacteria's periplasm to be encapsulated by OMVs. We expect this technique would reveal more flexible approaches in both in vitro and in vivo genetic engineering, thus enlarging the armamentarium of Synthetic Biology.

SJTU-BioX-Shanghai

ECHO: E.coli for Colon Health Observation

Region

Asia - China

Track

Diagnostics

Poster

Zone 4 - #234

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 304

11:00 AM - 11:30 AM

Colorectal cancer being a severe illness worldwide, its mortality rises along with diagnosis delay. As a result, an accurate method for early diagnosis is in desperate need. Therefore, this year our team comes up with an engineered E.coli used for early, non-invasive detection of colorectal cancer. Due to the combination with ultrasound technique, we name it, ECHO. When our device arrives at the colorectal area after capsule degradation, it stabilizes on cancerated tissue through antigen-peptide binding, meanwhile expressing gas vesicles in vivo, enabling the rapid detection and location of the cancer foci using ultrasound. Besides usage on detection, ECHO also synthesizes azurin used to eliminate cancer cells after being triggered by environmental factors in cancerated area. At last, after ultrasound detection and medicine synthesis, arabinose will be consumed to trigger self-destruction pathway. To sum up, our device introduces an applicable and innovative non-invasive technique in early diagnosis of colorectal cancer.

SJTU-software

Metlab: a metabolic network alignment tool

Region

Asia - China

Track

Software

Poster

Zone 3 - #187

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 311

4:45 PM - 5:15 PM

Our project, Metlab, is a metabolic network alignment tool. User can input a pathway designed by themselves, then our software can align the pathway to the networks in the database, and show the aligned part of the networks. With the help of our software, user can discover the natural pathways similar with the pathway they design.

SKLMT-China

Planet protect plan

Region

Asia - China

Track

Environment

Poster

Zone 1 - #41

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 310

9:00 AM - 9:30 AM

Pseudomonas fluorescence Pf-5 is kind of biocontrol bacteria which can be used in the environmental protection. Compared with *E.coli*, the developed organisms, the toolkit for *Pseudomonas fluorescence* seems hasn't been exploited well. This year, SKLMT-China wants to construct a library of artificial constitutive promoters as a useful tool for the model-based fine-tuning of gene expression in *Pseudomonas fluorescence*. The strength of different promoters will be characterized by a reporter gene, firefly luciferase. Given that *P. fluorescence* pf-5 has a poor ability to degrade nicotine in the natural environment, we hope to engineer this bacteria with a nicotine degradation gene cluster (about 30Kb) from *P.putida* S16 by red/ET recombination technology. In this way, the nicotine degradation pathway in *P. fluorescence* pf-5 could be improved so it can degrade nicotine more efficiently. Combined with the promoter library, pf-5's nicotine degradation efficiency can be easily controlled.

SMMU-China

CaRTIN: Reversion of Failing Heart with a Controlled Gene-therapy via Cardiomyocyte RyR2 Targeting Intra-Nanobody

Region

Asia - China

Track

Therapeutics

Poster

Zone 2 - #118

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 302

9:00 AM - 9:30 AM

Chronic PKA phosphorylation of RyR2 has been shown to lead to cardiac dysfunction. We designed a targeting device, CaRTIN (Cardiomyocyte RyR2 Targeting Intra-Nanobody), to implement RyR2-specific inhibition of phosphorylation. Here, one of the isolated RyR2 nanobodies, AR185, inhibiting RyR2 phosphorylation in an in vitro assay was then chosen for further investigation. We investigated the potential of adeno-associated virus (AAV)-9-mediated cardiac expression of AR185 to combat post-ischemic heart failure. Adeno-associated viral gene delivery elevated AR185 protein expression in rat heart, and this administration normalized the contractile dysfunction of the failing myocardium in vivo and in vitro. Moreover, CaRTIN therapy to failing cardiomyocytes reduced sarcoplasmic reticulum (SR) Ca²⁺ leak, restoring the diminished intracellular Ca²⁺ transients and Ca²⁺ load and reversed the phosphorylation of RyR2. To achieve controlled intra-nanobody release, a BNP promoter based platform was also accessed. Our results established a role of CaRTIN as a promising therapeutic approach for heart failure.

SMS Shenzhen

The prevention and treatment of dental caries

Region

Asia - China

Track

High School

Poster

Zone 1 - #47

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 208

9:30 AM - 10:00 AM

This year, SMS_Shenzhen team will focus on using synthetic biologic method to prevent dental plaque. Dental plaque can be led by *Streptococcus mutans*, a bacteria lives in human's mouth. Clinging to the teeth in thin layers called biofilm, *S. mutans* digests sucrose and produces acids that can eat into enamel and cause cavities. Specifically, dextran is the main component of the biofilm. We find two enzymes, the first one is named 'Dextranase', which can hydrolyze the dextran in the biofilm; and the second one is named 'FruA', which can decompose the resource that *S. mutans* uses to produce biofilm. The gene of these two enzymes are cloned into *E. coli* and *Lactobacillus*. In our experiment, we would use *E. coli* to produce these two enzymes for relative measurement like enzyme activity. Then, for commercial design, we would produce *leber* with our *Lactobacillus* which can secrete these two enzymes.

Sorbonne U Paris

Suga[R]evolution

Region

Europe - France

Track

Foundational Advance

Poster

Zone 4 - #214

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 208

3:15 PM - 3:45 PM

Sugar is the main source of energy for the cell factories used in synthetic biology. However, its massive production has dramatic impacts on the environment. Therefore, in order to bring a solution to this serious environmental issue, we want to engineer a green microalgae, *Chlamydomonas reinhardtii*, to allow an ecofriendly sugar production within marine waters, limiting the competition with arable lands. Moreover, to be able to spread the use of microalgae as a chassis, more genetic tools to engineer it are still required. To do so, we will enrich the recently developed Modular Cloning (MoClo) toolkit for *C. reinhardtii* with a synthetic retrotransposon to generate in vivo continuous directed evolution. It will be the first time that such genetic tool is applied to non-baring plasmid cells such as microalgae. This approach enables the generation of new proteins with tailor-made functional properties as well as the optimization of biological systems.

SSHS-Shenzhen

Beetle Rival ---An RNAi-based approach for *Phyllotreta striolata* control

Region

Asia - China

Track

High School

Poster

Zone 1 - #24

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 208

9:00 AM - 9:30 AM

Phyllotreta striolata is one of the most destructive insects worldwide. However, the present insect control strategies have certain limitations, for example, chemical insecticide applications will cause dietary pollution and environmental destruction. Here, we aim to develop an RNAi-based approach for controlling *P. striolata*. This approach is to topically apply exogenous siRNAs/shRNAs onto vegetables, ingestion of the sprayed siRNAs or shRNAs by *P. striolata* will induce the RNAi mechanism in the insect and lead to its death. In our project, siRNAs/shRNAs were designed based on the mRNA sequences of their target genes. The effect of both siRNAs and shRNAs in mediating RNAi in *P. striolata* were examined. Experimental results show that both siRNAs and shRNA could successfully silence their target genes, which was demonstrated by the survival rate decrease after siRNA or shRNA treatment. Our project provides an environmentally friendly approach for insect control.

SSTi-SZGD

HYALURONIC ACID MICRO FACTORY : A BACTERIUM PRODUCES LOW MOLECULAR WEIGHT HYALURONIC ACID

Region

Asia - China

Track

Manufacturing

Poster

Zone 4 - #247

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 309

10:00 AM - 10:30 AM

The production of hyaluronic acid (HA) has been changed from traditional animal tissue formulation to microbial fermentation. However, there is no report that tissue cells or microorganisms can directly produce low molecular weight HA. In order to prepare low molecular weight HA, physical and chemical methods are needed. However, there are many drawbacks in physical and chemical methods, such as poor product stability, low efficiency, complex reaction conditions and possible environmental pollution. This year our project constructed a recombinant strain *Bacillus subtilis* 168E which could directly produce different molecular weight HA products by regulating the activities of LHAase. The HasA gene and identified precursor genes was transferred into *Bacillus subtilis*. Since HA of high molecular weight was produced at this time, we transferred the LHAase gene into *Bacillus subtilis* 168 which is from leech resources coding hyaluronidase. Therefore the HA could be enzymatic hydrolyzed to different molecular weight.

St Andrews

A system for detection of bacterial cell lysis and the presence of biofilms

Region

Europe - United Kingdom

Track

Diagnostics

Poster

Zone 4 - #225

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 302

4:45 PM - 5:15 PM

A split mNeongreen fluorophore system was employed such that one half of the protein was retained within a certain population of *Escherichia coli*, while a different population exported the other component. Upon lysis of the former group, the two protein domains associated to form the complete molecule, which fluoresced detectably. Regarding the detection of biofilms, several methods were tested. An mCherry fluorophore was fused to binding proteins for each of the following components of biofilms: the polysaccharides alginate and Psl (major components of the biofilms of *Pseudomonas aeruginosa*), cellulose, and double stranded RNA. Studies were carried out to determine which of these most accurately predicted the presence or absence of biofilms as compared with the results of traditional detection methods.

Stanford

A transcription-inducing bacterial detection platform for DNA, small molecules, and proteins

Region

North America - United States

Track

New Application

Poster

Zone 2 - #149

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 304

5:15 PM - 5:45 PM

Two-hybrid systems are a well-established tool for screening protein-protein interactions in yeast and bacteria; however, there is little precedent of using these systems for detection. By swapping bait and target proteins for single-chain antibodies and dCas9, we have adapted a bacterial two-hybrid system as a modular *E. coli*-based detection platform for small molecules, proteins, and DNA. While most whole-cell detection methods indicate the target molecule's presence by activating a visible reporter, our system initiates transcription of a downstream gene. This allows us to activate gene expression in response to a specific signal, effectively turning any DNA sequence, small molecule, or protein into a potential transcription factor. This holds tremendous promise as a safety mechanism for engineered bacterial strains: if an undesirable mutation or molecular product is detected within a cell, our system can kill the cell by activating an apoptotic gene, or express a fluorescent protein for live-cell sorting.

Stanford-Brown-RISD

Functionalizing mycotecture

Region

North America - United States

Track

Manufacturing

Poster

Zone 1 - #38

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 306

11:00 AM - 11:30 AM

A turtle carries its own habitat. While it is reliable, it costs energy. NASA makes the same trade-off when it transports habitats and other structures needed to lunar and planetary surfaces increasing upmass, and affecting other mission goals. But what if it didn't have to be transported from earth? What if it could be grown on planet? The Stanford-Brown-RISD iGEM team proposes to explore the use of fungal mycelium, the vegetative structure of fungi, as a light-weight, durable material that could be grown on planet using spores to create habitats and other necessary items. The team will focus on developing a design for a habitat from mycelium as a proof of concept, and using synthetic biology to enhance the filtration and adhesion capabilities of the mycelium. The team will further explore the implications and uses of these biodegradable, self-growing structures made of fungi on Earth.

Stockholm

Biotic Blue: Fighting antibiotic pollutants in the Baltic Sea

Region

Europe - Sweden

Track

Environment

Poster

Zone 5 - #273

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 304

12:00 PM - 12:30 PM

Antibiotics are among the most impactful pollutants of water resources. Their presence negatively affects the environment due to ecotoxicity and potential contribution to antibiotic resistance. Sulfamethoxazole (SMX) is among the most prevalent and persistent antibiotics in the Baltic Sea. We want to tackle this problem by harnessing the oxidative power of a laccase originating from *Trametes versicolor*. This enzyme has the capacity to oxidize a wide range of aromatic compounds. We aim to express this laccase in *Pichia pastoris* and engineer its ability to inactivate SMX using advanced in silico rational design methods. Enzyme activity, SMX removal and toxicity assays were performed for analysis. In our final product, the laccase will be immobilised on magnetic beads, creating a reusable recovery system powered with magnetism. It can be implemented at wastewater treatment facilities or at entering points of the sewage system in hospitals, elderly homes and houses.

Stony Brook

The Sucrose Factory

Region

North America - United States

Track

Energy

Poster

Zone 2 - #163

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 302

3:15 PM - 3:45 PM

In 2017, humans released ~32.5 gigatons of CO₂ into the atmosphere. Even if anthropogenic carbon emissions ended today, the CO₂ in our atmosphere would persist for thousands of years, causing ocean acidification and global warming. Current carbon sink technology is not economically feasible and would cost trillions of dollars at modest estimates. We believe the solution lies in cyanobacteria - photosynthetic prokaryotes - as they were the first organisms to sink carbon dioxide billions of years ago and are some of the most efficient autotrophs. Our approach is to induce sucrose secretion for the industrial production of biofuels and bioplastics, while simultaneously sinking CO₂. Additionally, to address the lack of promoters available for cyanobacteria synthetic biology research, our team developed a variety of constitutive, light-inducible, and nutrient-repressible promoter BioBricks for our strain of *Synechococcus elongatus*. We hope these promoters will be used to produce other high value carbon sinking products.

Stuttgart

The Anti Germ Coating - TAGC

Region

Europe - Germany

Track

Manufacturing

Poster

Zone 5 - #303

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 304

3:15 PM - 3:45 PM

To stop the spreading of germs in public places is an issue everyone can agree on its usefulness. Our team aims to produce an antimicrobial surface coating which tackles this problem. This coating, called 'The Anti Germ Coating', TAGC, consists of a chitosan matrix, coupled with rhamnolipid and nisin. All of these substances have shown antimicrobial properties in previous studies. During the iGEM competition we produced two BioBricks until this day, one for nisin-production and one for chitosan production. A third BioBrick, which should enable rhamnolipid production is currently under construction. Two approaches of coupling are used to generate our coating. The first method uses a surface-accessible tyrosine to couple a modified nisin to chitosan enzymatically. Chemical linkage of rhamnolipid is achieved by using divinyl adipate, which acts as a cross-linker. Antimicrobial properties of the coating are currently investigated. First results seem to be very promising.

SUIS Shanghai

Better Together: Engineering Bacteria for Symbiotic Relationships with Micro Algae.

Region

Asia - China

Track

High School

Poster

Zone 5 - #320

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 310

2:45 PM - 3:15 PM

Although numerous strains of microalgae have already been identified as being useful for biotechnology purposes, to make commercial up-scaling of algal production cost effective, research into novel approaches to enhance microalgae growth, and their products is needed. Microalgae and bacteria have existed together from the early days of evolution. This co-evolution provides an interesting avenue for industrial biotechnology exploration. Synthetic biology presents us with an opportunity to rationally design and construct microbial communities with well-defined objectives. The co-cultivation of engineered bacteria and micro-algae provides the possibility for enhancing associations between these populations. We aim to engineer a strain of E.coli which will help increase the biomass of microalgae through nutrient-exchange-based mutualism. Our engineered bacterium was designed to express the gene cluster for the biosynthesis of Vibrioferriin, a type of siderophore. Our construct will allow for the increased bioavailability of iron for many species of microalgae once co-cultured.

SUSTech Shenzhen

A 'Time-saving Machine' for Genetic Screening in Two-Cell System

Region

Asia - China

Track

Foundational Advance

Poster

Zone 5 - #263

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 207

12:00 PM - 12:30 PM

With rapid development of Molecular and Cellular Biology, we know more about what's in a cell but still know little about how cells interact among populations. Cell-Cell Interactions form a complicated signaling network which is far beyond our imagination. SUSTech 2018 Team developed a 'time-saving machine' to study cell signaling networks based on genetically engineered Two-Cell system, a Secreting and Responding cell. Wnt signaling pathway was our proof-of-principle. Secreting cells secret Wnt signal and were modified by CRISPR-Cas9 knockout system for genetic screening on Wnt secretion. Responding cells were constructed by inserting a strong TCF promoter with GFP fluorescence for visualization of Wnt signal level. Two types of cells were then encapsulated by our microfluidic system producing thousands of Two-Cell droplets at a time. Unlike traditional coculture method, this is time-saving. In future, our systems may have wider applications in synthetic biology, drug screening and immunological recognitions.

SYSU-CHINA

Braking Bad--Towards a safer CAR-T therapy

Region

Asia - China

Track

Therapeutics

Poster

Zone 1 - #1

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 306

4:15 PM - 4:45 PM

CAR-T therapy is one of the most promising treatment for cancer, with multiple ongoing clinical trials worldwide and 2 therapies approved by the FDA. However, without proper control after administration of CAR-T cells, severe adverse effects may bring fatal risks to the patients, especially during the clinical trial stages. While suicide switches serve as common methods for controlling adverse effects, they completely halt the expensive treatment, and repeating the treatment process could be a burden for the patients, both physically and financially. To provide a safer yet affordable CAR-T therapy, we developed a reversible safe switch controlled by small molecules called CAR BRAKE. By expressing U24 protein of the human herpesvirus 6A under the control of tet-ON promoter, we can downregulate CAR molecules on the cell surface through endosomal recycling inhibition. This could potentially be used as a universal add-on for all CAR-Ts and TCR-Ts to ensure safety.

SYSU-Software

CO-RAD: Collaborative optimization platform with recommendation, analysis and design

Region

Asia - China

Track

Software

Poster

Zone 1 - #29

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 304

5:15 PM - 5:45 PM

Designing genetic circuits and protocols by teamwork is pervasive for synthetic biologists, but it's still hard to cooperate with partners using traditional collaborative software for the complexity and hierarchy in synbio design. Here, we develop an open-access software CO-RAD to facilitate the collaboration, recommendation and analysis for the synthetic biologists. CO-RAD allows users to edit circuits and protocols online while collaborating with other users in real-time. For assisting users in optimizing their circuits, we strengthen CO-RAD's ability of recommendation and analysis. After designing circuits in embedded design platform easily, users will get similar circuits from our interactive database by collaborative filtering algorithm. Users can also acquire various projects information efficiently through our search engine. Based on directed evolution algorithm, our software can simulate performance of circuits and provide suggestion of optimization. Moreover, some deep level information of circuit sequence can be showed in our software concisely.

SZU-China

Cockroach terminator

Region

Asia - China

Track

Manufacturing

Poster

Zone 1 - #54

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 306

2:15 PM - 2:45 PM

This year we designed a fungal cockroach terminator system based on *Metarhizium anisopliae*. It can infect cockroaches in a very high efficiency and eventually lead to death. Our system consists of three parts. First, we use a hydrophobic protein called HsbA. It can help our fungus attach better to the cockroaches. Second, we transferred Bbchit which encodes the chitinase that can penetrate the surface of the cockroaches. After our transgenic *Metarhizium anisopliae* enter the hemolymph of cockroach. The third gene we transferred called MCL1 will combine with the specific antigen on the surface of *Metarhizium anisopliae*, which makes our system 'invisible' and can avoid the detection of the immune system. This allows our transgenic *Metarhizium anisopliae* to reproduce themselves greatly and eventually lead to cockroach's death. For better application we designed a device to contain our emulsifiable powder which we will definitely show you in giant jamboree.

Tacoma RAINmakers

Ticket or Quit It: Protecting Families from Arsenic Contamination

Region

North America - United States

Track

High School

Poster

Zone 1 - #44

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 207

12:00 PM - 12:30 PM

In Tacoma, Washington, arsenic pollution from the ASARCO copper smelter continues to devastate the surrounding communities' soil and water. Even small amounts of arsenic pose a threat to long-term community health, including cancer and developmental issues in children. The city and state have spent more than \$62,000,000 over 18 years testing around 450 yards in the region, with efforts still underway. Our iGEM team seeks to change that paradigm by engineering an affordable and easy-to-use biosensor that utilizes chromoproteins made in the presence of bioavailable arsenic. Our biosensor is user-friendly by design and will not require hazardous chemical reagents. The Tacoma RAINMakers' goal is to improve community understanding of this local environmental issue and provide a low-cost tool that can be used by the citizens of Tacoma and communities worldwide to detect heavy metals.

Tartu TUIT

Eco-friendly sunscreen: MAAs+yeast extract

Region

Europe - Estonia

Track

Environment

Poster

Zone 2 - #92

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 311

9:30 AM - 10:00 AM

Nowadays a great number of commercially produced sunscreens contain chemical compounds with a broad-spectrum ultraviolet coverage, such as oxybenzone and octinoxate, which are extremely toxic to the environment. Every year around 14,000 tons of sunscreen is washed into the oceans and seas, resulting in a dramatic increase of the toxicity level, causing a variety of pathologies to corals. Tartu TUIT iGEM team will engineer *S. cerevisiae* to produce yeast extract enriched with biological sunscreen compounds Shinorine and Porphyrin-334, both of which belong to Mycosporine-like Amino Acids (MAA). In order to produce MAAs, we will introduce 4 genes from cyanobacteria *Nostoc commune* KU002 (MysA, MysB, MysC, MysD) or *Actinosynnema mirum* DSM 43827 (amir_4259, amir_4258, amir_4257, amir_4256) into yeast *Saccharomyces cerevisiae*. Our final product, which combines positive properties of both biological sunscreen compounds and yeast extract, could be further used in cosmetic products like creams, lotions, etc.

TAS Taipei

Say No to Glow: Reducing the carcinogenic effects of ALDH2 deficiency

Region

Asia - Taiwan

Track

High School

Poster

Zone 1 - #36

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 309

4:15 PM - 4:45 PM

Turning red after consuming alcohol may seem like a mere social inconvenience. Yet, this flushing response is caused by an accumulation of acetaldehyde, a carcinogenic intermediate of alcohol metabolism. Acetaldehyde is broken down into harmless acetate by aldehyde dehydrogenase 2 (ALDH2). ALDH2 deficiency, the result of a point mutation in the ALDH2 gene, produces a much less efficient ALDH2 enzyme, leading to an accumulation of acetaldehyde and the subsequent flushing response. While about 8% of the global population is ALDH2 deficient, in our home, Taiwan, approximately 47% of the population carries this genetic mutation--the highest percentage in the world! Studies show that ALDH2 deficiency greatly increases the risk of developing esophageal and head and neck cancer. Thus, our project aims to produce recombinant ALDH2 to decrease levels of acetaldehyde in the upper digestive tract region. We envision delivery of ALDH2 as a purified protein or in consumer-friendly probiotics.

Tec-Chihuahua

Production of antimicrobial peptides in *Escherichia coli* for *Paenibacillus* larvae and *Melissococcus plutonius* inhibition

Region

Latin America - Mexico

Track

Food & Nutrition

Poster

Zone 2 - #102

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 207

9:00 AM - 9:30 AM

American and European Foulbrood are diseases that affect bee (*Apis mellifera*) larvae worldwide. In the last two years, 53 countries suffered from these diseases, 6 of them are among the top 10 honey producers. The causal agents of these ailments are gram-positive bacteria: *Paenibacillus* larvae and *Melissococcus plutonius* respectively. Nowadays, two techniques for the treatment of Foulbrood are used: antibiotics and incineration of hives. The former promotes the development of antibiotic resistance in bacteria while the latter results unprofitable for beekeepers. Therefore, we propose the production of bee antimicrobial peptides (AMPs) in *Escherichia coli* to treat *P. larvae* and *M. plutonius* infections. Defensin 1, abaecin, defensin 2, and apidaecin are each expressed in a different BL21 (DE3) culture. PelB leader peptide and a 6X His-tag foster adequate expression and further purification. Through mathematical modeling, the diffusivity of PLGA-nanoencapsulated apidaecin is evaluated for future in vivo delivery in the bee system.

Tec-Monterrey

E.Coding

Region

Latin America - Mexico

Track

Foundational Advance

Poster

Zone 2 - #133

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 207

11:30 AM - 12:00 PM

CRISPR-Cas technology has the capability of storing information. This year, iGEM team Tec-Monterrey aims to use the CRISPR-Cas system to store specific DNA sequences in the genome of *E. coli* in order to save information about the environment surrounding the bacteria. To make this possible, Cas1-Cas2 proteins, which create the protospacer acquisition in the CRISPR system, are used to insert a synthetic DNA sequence in the CRISPR array within the genome of the bacteria. This synthetic sequence is produced by a second system, called SCRIBE. The final step of our project is reading out the inserted DNA sequence. Using specific primers for polymerase chain reaction (PCR) are used to amplify a section of the CRISPR array where the sequence is inserted. Taking together both systems, our project intends to act as a biological tape recorder capable of sensing external stimuli in the environment and storing their presence in the genome.

TecCEM

Novel Treatment: Tissue regeneration in burns by recombinant proteins with nanodelivering on a MiniSkin Simulator

Region

Latin America - Mexico

Track

Therapeutics

Poster

Zone 5 - #315

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 309

4:45 PM - 5:15 PM

The percentage of the Mexican population that can afford a treatment for second degree burn injuries is low since they demand a large spend when treated. Representing the third cause of infant mortality in Mexico, it stands for an urgent issue to assess. This project approaches such problematique with the design of a multi-glycopeptide scaffold and the recombinant growth factor Leptin B to induce fibroblast proliferation. Nanoencapsulation was employed to ensure proper delivery and distribution. Growth measurements were evaluated through cell image analysis and lactate dehydrogenase activity as an indirect indicator, obtained from the culture medium in the MiniSkin Simulator, which is a hardware to test molecules in a 3D culture. This system could enhance tissue regeneration, minimizing infection risks and treatment lapses for affected patients with second degree burns.

TecMonterrey GDL

Lactobachill: a smart psychobiotic with anxiolytic and antidepressant properties

Region

Latin America - Mexico

Track

Therapeutics

Poster

Zone 2 - #90

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 306

9:30 AM - 10:00 AM

Around 300 million people suffer from depression and anxiety worldwide. Although there are several therapeutic strategies available, treatments targeting the gut-brain axis are gaining importance due to the strong relationship between alterations in the microbiota, systemic inflammation, and psychiatric disorders. Therefore, we aimed to develop a novel approach for the treatment and prevention of depression and anxiety. For this, we will genetically engineer a strain of *Lactobacillus rhamnosus* to detect increases in the levels of stress in the body. This psychobiotic, which we have termed 'Lactobachill', will secrete soluble receptors (i.e., sgp130 and a mutated variant of sgp80) that could selectively inhibit the aberrant trans-signaling pathway of the pro-inflammatory cytokine IL-6. We will also characterize the efficiency of secretion of these receptors, which will be coupled to bacterial signal peptides from Sec-dependent pathways. We envision that Lactobachill could be used as an adjunct to current treatments against anxiety and depression.

Thessaloniki

Galene: A genetic toolbox for controlled gene expression

Region

Europe - Greece

Track

Foundational Advance

Poster

Zone 2 - #165

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 311

9:30 AM - 10:00 AM

Biological systems are unpredictable, noisy and difficult to maintain stable even under standardized conditions, thus making controlled gene expression difficult. Combined with the fickleness and stochasticity associated with genetic circuitry, fluctuations in the production rate of a desired protein are inevitable. Through model-driven design, we engineer systems which guarantee constant gene expression, decoupled from gene/plasmid copy number, that can be induced to meet the desired expression level. We implement a Type I incoherent feedforward loop in *E. coli* cells to stabilize promoters using TAL Effectors, CRISPRi and cis-acting sRNA repressors that regulate a downstream attenuator. Furthermore, to render our system versatile, we introduce a theophylline riboswitch that allows on-the-fly control of stabilized protein production. We provide a foundational advance tool that enables fine tuning of complex metabolic pathways, functionality improvement of logic gates and suppression of fluctuations in gene expression.

Tianjin

Life Tik Tok

Region

Asia - China

Track

Foundational Advance

Poster

Zone 4 - #259

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 306

3:15 PM - 3:45 PM

Organisms are adapted to the relentless cycles of day and night thanks to circadian clocks which regulate biological activities with ~24-hour rhythms. This year, we reconstruct KaiABC clock system in the bio-rhythm expression of yeast. This will not only perfect the experimental data of the template xenotransplantation, but also provide more reliable materials in regulating and exploring the oscillation. Correlated with the yeast two-hybrid technique, reporter genes help detect the results of our construction. To work as a powerful heterologous regulator, we investigate the regulatory mechanism of the clock through the systematic alteration of chromosome topology. And a novel application we envisioned was that *S. cerevisiae* can produce different products alternately under the periodic regulation day and night.

TJU China

Booming CRISPRers

Region

Asia - China

Track

New Application

Poster

Zone 1 - #3

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 310

9:30 AM - 10:00 AM

This year, the CRISPR-Cas family is the protagonist in our story series. The old member, dCas9, is the enhancer for the heavy-metal detection based on *E. coli*, while the newbie, Cas12a, is a worker for the high-throughput cancer-related SNP detection chip. We have also built a 'highway' for tracking and delivering the Cas9/sgRNA complex in mammalian cells, and we try to apply it to manipulate the mitochondrial genome.

Tokyo Tech

Finding Flavi - Establishment of dengue virus serotype prediction and detection systems

Region

Asia - Japan

Track

New Application

Poster

Zone 2 - #158

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 312

2:15 PM - 2:45 PM

Dengue virus, which is in the flavivirus family, is a worldwide spread virus and has huge impact on society, however, not many developing countries are recognizing its danger. Dengue virus is unique in terms of its four different serotypes. Multiple infection can easily cause severe dengue, appearing hemorrhage and organ damage. It is important to grasp which serotype the patient is infected, however, there is not enough data about each serotype in a year. To tackle the situation, we succeeded in the development of the serotype prediction system using stochastic process analysis. This system can predict the patient's serotype by simulating the past data. We also developed the simple and fast testing kit that can detect serotype with fluorescence, so that we can check the patient easily and get enough data to estimate the patients' serotypes more accurate. In the future, this system can contribute to other flavivirus detection system.

Tongji China

Ocandy

Region

Asia - China

Track

Therapeutics

Poster

Zone 1 - #25

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 309

5:15 PM - 5:45 PM

Neoantigens, which are the abnormal proteins produced by mutations in cancer cells that activate the immune system have already become the hotspots of concern to researchers. Neoantigen is Individualized and is a promising concept to be used in cancer treatment. Type III secretion system (T3SS) acts as a promising tool for protein delivery directly into the target cells. We establish a method which can deliver neoantigens into immune system using the Type III secretion system of *Pseudomonas aeruginosa*. We select the colorectal cancer as our target and use the bioinformatic method to filter our item antigens. Then we use the T3SS to deliver the item antigens into immune system through orally intake of engineered attenuated bacteria. Since for the T3SS, there are almost no restrictions on the delivery of short peptide antigens, this method has the flexibility to be adapted to, if there are effective neoantigens, any specific cancer patient.

Tongji-Software

Alpha Ant

Region

Asia - China

Track

Software

Poster

Zone 1 - #88

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 304

4:45 PM - 5:15 PM

Advancements in metabolic engineering have enabled us to engineer enzymes and construct novel pathways for various applications including drug discovery and value-added biochemical production. However, it is hard to design and construct pathways with high efficiency and fidelity while balancing the metabolic burden of the microorganism. Thus, our project is to develop powerful and convenient web tool for synthetic biologists to design proper metabolic pathways while taking into account several criteria such as thermodynamic feasibility, material competition of heterologous reactions, atom conservation, toxicity of intermediates. We obtain data from several databases, including KEGG, BRENDA, MetaCyc and equilibrator. The core algorithm we use is depth-first search. Other than that, we have some additional functions for users, including organism recommendation and FBA. Alpha Ant means its capacity to find the most efficient metabolic pathway is just like the ant colony's intelligence of finding the most efficient path to a food source once it has been discovered by scouts.

Toronto

Exploring biomass flotation as a viable separation technique for application in bioremediation processes

Region

North America - Canada

Track

New Application

Poster

Zone 3 - #191

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 310

2:15 PM - 2:45 PM

Our project focuses on demonstrating flotation of *Escherichia coli* using gas vesicle proteins (GvPs) as a novel cellular separation technique for bioremediation processes. Previous iGEM teams have demonstrated gas vesicle production and flotation in mammalian and yeast cells using GvPs from various bacterial species. Shapiro et al., (2018) engineered a GvP-producing plasmid using *arg1* from *Aphanizomenon flos-aquae* and *Bacillus megaterium* to synthesize these echogenic structures and observed that high expression enabled *E. coli* to float. Our goal is to replicate and improve their flotation results by modifying *arg1* to achieve consistent flotation using a specific induction protocol. We propose that using this technique may be a cost-effective separation technique for various bioremediation processes. Upon sorption or uptake of pollutants or valuable materials, this technique could allow for simpler extraction of pollutant-harboring or heavy metal-bound bacteria. We have developed a bioreactor model to investigate this claim.

Toulouse-INSa-UPS

Cerberus : Creating Endless Possibilities with Cellulose

Region

Europe - France

Track

Manufacturing

Poster

Zone 2 - #155

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 208

4:15 PM - 4:45 PM

Cellulose is broadly used in medicine, textile and stationery. However, functionalising cellulose could lead to exciting innovative material developments such as conductive paper or self-disinfecting bandages. Here, we designed a versatile linker protein to enable the fixation of a wide range of organic and inorganic molecules on cellulose. Since the design is based on the fusion of three fixating protein heads, we named it Cerberus, like the mythological dog. The first head is a protein domain of the type 3 Carbohydrate Binding Module family to bind cellulose. The second is a streptavidin domain, with high affinity for biotinylated compounds. The last head features an unnatural amino acid, azidophenylalanine, allowing click chemistry to form covalent bonds. Each head has been assessed and cellulose with new functions has been produced. This work combines synthetic biology, chemistry and molecular modelling and paves the way to a revolution in our use of cellulose-sourced materials.

TPHS San Diego

Chitinolytic Activity of *Serratia Marcescens* Chitinase in Response to Various Species of Pathological Fungi

Region

North America - United States

Track

High School

Poster

Zone 1 - #31

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 207

4:45 PM - 5:15 PM

Fungi producing harmful mycotoxins flourish on various crops. Such fungal infections significantly reduce sustainability and food production in developing countries, where mycotoxin exposure from lack of advanced food storage are responsible for severe economic losses and 40% of diseases. Our team developed a modified enzyme chitinase capable of breaking down chitin cell walls. Specifically, *Serratia Marcescens* Chitinase works against multiple families of fungi. By GSTChiA Chitinase genes with a signal sequence from *araC*, we successfully generated an *Escherichia coli* line that secretes chitinase against *Rhizoctonia solani*, *Alternaria raphani*, and many other pathogenic fungi. Expression of GSTChiA was further quantified through analysis of chitin compounds. This project will provide an easily accessible method capable of combating major pathogens, saving crop yield and revenue.

Tsinghua

NEON Coli - Wide-dynamic-range, fine-tuned quorum sensing positive feedback circuit

Region

Asia - China

Track

Information Processing

Poster

Zone 1 - #87

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 304

9:00 AM - 9:30 AM

A major goal of synthetic biology is to design functional analog gene circuits that are capable of signal integration and processing. Our project presents an improved wide-dynamic-range positive feedback circuit based on bacterial quorum sensing system. Preexisting positive feedback circuits suffer from leakage problems, and to solve this we add a CRISPRi system to keep the positive feedback loop in check. This design allows us to execute fine control on signal transduction and protein expression, in our test system the expression of sfGFP. In order to make our project more presentable, we use this circuit to design a fluorescent bacteriograph that is able to change the picture, like a bacterial neon light. However this is not the extent of the circuit's usefulness, as it may lead to new applications in synthetic biological computations, and projects that require fine control of gene expression.

Tsinghua-A

Allergy test master: the histamine receptor based whole - yeast sensor

Region

Asia - China

Track

Diagnostics

Poster

Zone 1 - #75

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 304

4:15 PM - 4:45 PM

Histamine increases significantly in blood when allergy happens. So, we engineered the pheromone pathway in yeast to test histamine release in blood sample under one specific allergen per time. The pheromone receptor *ste2* in original pathway is replaced by human Histamine receptor H3 or H4. In order to reinforce the coupling between H3/H4 and yeast G-protein, C-terminal of α subunit of G-protein is modified by replacing several amino acids from the homologous protein in human. EGFP is set behind promoter *Fus1* as the reporter gene. Many previous works support our modifications. Then the models of histamine and EGFP intensity relationship and the diagnosis credence can help to give the final result. Our special-designed integrated box can finish the blood collection, reaction and data sending process. Then the result will be calculated by our server and sent back to the smart phone. Thus, our project is available in families.

TU Darmstadt

Combimers

Region

Europe - Germany

Track

Manufacturing

Poster

Zone 5 - #292

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 208

5:15 PM - 5:45 PM

Dependence on petrochemicals derived from oil and gas poses a major problem in the plastics industry and polymer production. Establishing biological precursors for high quality polymers is a hurdle we want to tackle. Poly(lactic-co-glycolic-acid), PLGA, is a copolymer used in a variety of biological applications due to its attractive properties: tailored biodegradation rate, biocompatibility, and a wide range of surface modifications for specialized utilization. The Food and Drug Administration (FDA) approves of PLGA derivatives for clinical applications as surgical tools or nanoparticles in innovative drug delivery systems. Faster degradable copolymers, like poly(lactide-co-glycolide-co-caprolactone), PLGC, have similar properties and are attractive for pharmacokinetics of nanocapsule engineering. We set ourselves the goal to manufacture PLGA and PLGC in a sustainable, eco-friendly way. The required monomers will be produced by engineering of the Krebs cycle and other biological pathways in *Saccharomyces cerevisiae* and *Escherichia coli*.

TU-Eindhoven

GelCatraz: Where E. Coli goes to stay! A Novel platform for Living Materials.

Region

Europe - Netherlands

Track

New Application

Poster

Zone 2 - #138

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 304

4:15 PM - 4:45 PM

Living biomaterials are expected to revolutionize the field of medicine. This new class of devices, which incorporates biomaterials and harnesses the synthetic powers of living cells, would enable numerous applications ranging from replacement organs to personalized point-of-care medicine production. A major obstacle for the use of Living Biomaterials outside the lab is bacterial leakage, presenting both a technical issue and a safety risk. Our project aims to address this issue. We have engineered a strain of E. Coli to anchor itself into a novel dextran hydrogel by expressing an adhesive protein derived from arctic ice-binding bacteria. This platform would enable innumerable applications. As a proof of concept, we have designed a patch for chronic wounds in which anchored E. coli would secrete antimicrobial peptides to fight infections and reduce the need for systemic antibiotics and daily change of wound dressing – a painful procedure for many patients.

TU Delft

Advanced Detection of Performance Enhancement (ADOPE): Detecting Gene Doping with Innovative Targeted Next Generation Sequencing

Region

Europe - Netherlands

Track

New Application

Poster

Zone 5 - #266

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 208

4:15 PM - 4:45 PM

TU Delft iGEM 2018 aims to prevent the abuse of synthetic biology in sports by developing a genetic doping detection methodology. Gene doping has been on the list of prohibited substances in sports since 2003, yet no method has been implemented to enforce this ban. Our project, Advanced Detection Of Performance Enhancement (ADOPE), aims to provide the proof-of-concept for an efficient, secure and versatile detection method. We have modelled the detection window; implemented a suitable sample preparation method from blood; developed a valid pre-screen based on gold nanoparticle technology and developed a unique and cutting edge targeted sequencing platform based on a novel dxCas9-Transposase fusion protein and nanopore sequencing technology. Finally, we have developed an algorithm that is able to group our sequencing outputs and indicates whether the athlete used gene doping. Continuous feedback from stakeholders has focussed and improved our project, making our method all the more complete.

Tuebingen

BoNT C - Licence to enter

Region

Europe - Germany

Track

Foundational Advance

Poster

Zone 1 - #4

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 302

4:15 PM - 4:45 PM

In modern medicine treatment options involve many substances modified from natural sources, occasionally even toxins. We modify botulinum toxin in a way that leads to its detoxification. Thus, it can be coupled with a variety of other substances while not losing its specific shuttle mechanism for neuronal cells. In detail, we develop a library of different detoxified botulinum toxin derivatives which can accommodate other proteins, small molecules, and fluorochromes by specific linkers. To investigate the influence of the point mutations leading to detoxification in the active site, we conduct MD simulations. Since our shuttle mechanism could potentially be used in patients, we remove the most prevalent immune epitopes by a theoretical bioinformatics approach. Ultimately, our system is supposed to be utilized for therapy strategies and specific neuronal targeting in basic research. With our project we want to encourage future teams to think outside the box while keeping safety in mind.

Tufts

Hypothetical System for Sensing miRNA with High Specificity and Signal Amplification

Region

North America - United States

Track

Diagnostics

Poster

Zone 2 - #123

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 208

10:00 AM - 10:30 AM

miRNA is a small DNA regulatory molecule found in the bloodstream. More recently, its significance as a biomarker for various diseases and conditions from bone microfracture to various cancers has been discovered. These conditions are specifically correlated to certain sequences of miRNA, which is found in low concentrations (6-16CT PCR thresholds). To detect the miRNA with high specificity and amplification, our team proposed a system in which a complimentary toehold RNA would be created upstream of the RNA sequence for cas13a, a modified version of cas9 which would cut RNA randomly, triggering a fluorescent signal amplification when in the presence of RNase detection kits.

TUST China

Tetracycline Detecting and Degradation ('T D&D')

Region

Asia - China

Track

Environment

Poster

Zone 4 - #230

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 311

4:45 PM - 5:15 PM

Tetracycline is a kind of antibiotic substance separated from the culture solution of *Streptomyces aureofaciens*, which belong to the common broad-spectrum antibiotic and have a great effect on many types of microorganism, this family including chlortetracycline oxytetracycline and tetracycline. Last century, tetracycline is widely used in animal husbandry and aquaculture because of its competitive prices between with other antibiotics. As a result of this phenomenon, the pollution of tetracycline in water and soil is increasingly serious. This year, we want to construct a tetracycline detecting and degradation devices, "T D&D" system, to achieve our anticipation that sensitive detection and rapid degradation in the special devices through our constructive chassis. In our project, we would find a better ratio between detecting device and degradation device to the optimal result.

UAlberta

Developing an Antifungal Porphyrin-based Intervention System (APIS) to treat Nosema infections in honey bees

Region

North America - Canada

Track

Food & Nutrition

Poster

Zone 5 - #285

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 312

4:15 PM - 4:45 PM

Nosema ceranae is a microsporidian parasite which infects the European honey bee, *Apis mellifera*. *Nosema* infections cause energetic stress in bees and decreases their immune response. The detrimental effects of *Nosema* can lead to lower hive productivity, and ultimately colony failure. To counteract this infection, Team UAlberta designed an Antifungal Porphyrin-based Intervention System (APIS) to treat *Nosema* infections in honey bees. APIS uses a modified heme biosynthesis pathway in *Escherichia coli* to overproduce protoporphyrin IX (PPIX), the eighth intermediate in the pathway. When ingested, PPIX-like molecules have been shown to decrease *N. ceranae* spore load in infected bees. Re-introducing the heme pathway in *E. coli* controlled by an inducible promoter overproduces PPIX using existing cell machinery. APIS allows bypassing of mechanisms regulating the endogenous pathway. Our system allows for directly introducing the bacteria into bees, as well as the mass production of PPIX in bioreactors.

UC Davis

Cenozoic

Region

North America - United States

Track

Environment

Poster

Zone 3 - #171

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 310

3:15 PM - 3:45 PM

Our project aims to develop mammalian-based biosensors for use in the context of environmental toxicology. Specifically, our biosensors have been designed to co-opt the mammalian cell's intrinsic stress response pathways and use these to trigger the production of a fluorescent reporter. We hypothesize that a device reporting on the activation of cell stress pathways will provide more physiologically and health-relevant information about the potential toxins present in an environment than bioassays which seek to simply measure the compound presence and/or abundance. That is, our bioassay asks not whether a compound is there, but rather whether compounds exist that may pose a health hazard. Our biosensors use mammalian-derived promoters of genes known to be activated in response to stress-inducing environmental pollutants. These promoters are coupled to a reporter gene (eGFP) and used in in vitro assays to report on the presence of compounds that elicit cell stress.

UC San Diego

Using unsupervised machine learning and synthetic biology to implement a novel, quantitative liquid biopsy test

Region

North America - United States

Track

Diagnostics

Poster

Zone 4 - #258

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 304

12:00 PM - 12:30 PM

In order to address key bottlenecks in liquid biopsy and noninvasive cancer detection techniques, our team focused on using epigenetic determinants for diagnostic purposes. Presented here is a novel workflow for diagnosing cancer by using promoter methylation as an indicator of interest. Key promoter regions of interest are first identified via unsupervised machine learning applied to the Cancer Genome Atlas via our in silico predictive tool. After this, our specially-designed assay can detect the presence of these hypermethylated regions of interest and provide a quantitative, fluorescent readout in order to generate clinical insight. Special advances in material science and microfluidics are then used to enhance the sensitivity and specificity of our assay. The workflow is then completed via integration into a smartphone application that provides the necessary data and helps streamline doctor-patient communication. Our proof of concept was centered around hepatocellular carcinoma.

UCAS-China

Rose Forest

Region

Asia - China

Track

Open

Poster

Zone 2 - #111

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 312

3:15 PM - 3:45 PM

A hundred years ago, a nightingale built a red rose for true love out of music by moonlight. Today, our *E. coli* uses light and music to create a colorful and fragrant rose forest for scientists and artists. Using three sensors to sense light of different wavelengths and intensity, and a RNAP system as resource allocator, our *E. coli* produces different proportions of three-primary colors responding to light and music, realizing the painting of full-color roses. By changing the output into scent genes, our roses can even emit various sorts of pleasant odors. Besides, we plan to make a collection kit to collect important genes related to light control and the color output of *E. coli*, which will be more convenient for future researchers. Integrating idealistic human feelings with logical genetic circuits, we aim to bring forth a new perception of combining art and science.

UChicago

An iGEM-Optimized CEN Plasmid for *E. coli* and *Pichia pastoris*

Region

North America - United States

Track

New Application

Poster

Zone 2 - #91

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 310

9:00 AM - 9:30 AM

Komatsuna pastoris, otherwise known as *Pichia pastoris*, serves as an important industrial chassis organism for its ease of cultivation while also making post transcriptional modifications to eukaryotic proteins. Expensive and complex techniques, such as in vivo recombination, however remain a major bottleneck to developing transgenic *P. pastoris* lines. Centromeric plasmids developed for *Saccharomyces cerevisiae* overcome this bottleneck by providing the flexibility of plasmids with the stability of endogenous chromosomes. Here, we adapt the pSB1C3 iGEM backbone with a *P. pastoris* selection marker and various portions of the *P. pastoris* centromeric sequences to develop centromeric plasmids. We demonstrate by sectoring assay that these plasmids provide chromosome-like stability while maintaining the ease of use of an iGEM plasmid. This plasmid has major implications in the manufacturing of biologics.

UChile Biotec

Tenzyme Vilu - Aptazymes for biosensing marine toxins.

Region

Latin America - Chile

Track

Environment

Poster

Zone 2 - #104

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 309

11:00 AM - 11:30 AM

Last year during BiMaToX project we developed a novel biosensor based in aptazymes in order to detect paralytic toxins (saxitoxin) produced during harmful algal blooms (HAB). Tenzyme Vilu project will expand this goal to design a platform to obtain functional aptazymes for biosensing other marine toxins. For this, we have fully characterized adenosine monophosphate (AMP) aptazyme to further investigate aptazymes molecules as a diagnostic platform for other marine toxins. In order to improve the affinity of the aptazymes with its respective ligand, we have tested alternative sequences by using a rational design to avoid false negative or positive detections that can eventually arise when analysing raw samples. Then, by using our approach we developed novel aptazymes for sensing different HAB toxins, such as paralytic, diarrhetic and amnesic shellfish toxins. Finally, a cell-free cellulose matrix device with different lyophilized aptazyme will be tested to evaluate the presence of different marine toxins.

UCL

SETA - Silk Engineered Technology & Applications

Region

Europe - United Kingdom

Track

Manufacturing

Poster

Zone 2 - #136

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 208

12:00 PM - 12:30 PM

Revolutions in synthetic biology are driven by effective and universal standardisations, which the biomaterial industry has not had... yet. Inspired by the idea of engineering modularity, we investigated an innovative technology that allows for more efficient and high-throughput manufacturing of environmentally-friendly biomaterials. We devised a plug-and-play framework using intein splicing to aid in both the polymerisation and functionalisation of biomaterials with a range of applications. Due to its durability, biodegradability, and kevlar-like strength, we opted for spider silk as a model to test our proposed system. While developing our platform, we conceived a BioBrick-compatible standard with improved flexibility that enables the integration of conventional cloning methods into iGEM's workflow. Our split-intein system provides the manufacturing industry a modular and accessible polymerisation approach that can foster the next generation of biomaterials.

Abstracts

UCLouvain

No title

Region

Europe - Belgium

No abstract

Track

Therapeutics

Poster

Zone 3 - #211

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 207

2:15 PM - 2:45 PM

UConn

Biological Alkane Synthesis through Shuttled Electron Transport

Region

North America - United States

Track

Manufacturing

Poster

Zone 2 - #125

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 306

3:15 PM - 3:45 PM

BASSET aims to engineer *E. coli* to produce biofuel (short-chained alkanes) in a microbial electrosynthesis (MES) system. For this year, BASSET produces alkanes from fatty acyl-ACPs. This aim is achieved by heterologous expression of Pmt1231 (from *Prochlorococcus marinus*) and Acr (from *Clostridium acetobutylicum*), overexpression of the endogenous FadK and a mutant TesA. The engineered organism is tailored for future use in a MES. In the MES, *E. coli* will accept electrons from an external source (for example, off-peak excess of solar energy). This energy will power the biosynthesis pathway by producing reducing equivalents such as NADH or NADPH in the cell.

UCopenhagen

PharMARSy: A novel system combining protein production and purification - keeping astronauts on mars healthy

Region

Europe - Denmark

Track

New Application

Poster

Zone 5 - #279

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 306

4:15 PM - 4:45 PM

Long-term space travel and colonization of Mars will require on-site production of pharmaceutical proteins to treat diseases, but current methods require expensive and bulky equipment. PharMARSy will develop a novel portable system that combines protein production and purification in a single step. To achieve this, we will hijack the bacterial type-3-secretion system (T3SS) that injects signal-tagged proteins through cell membranes. By constructing a device with two chambers separated by a membrane we direct our T3SS-bearing bacteria to inject target-proteins through the membrane and into a collection chamber. This method will separate the pure recombinant protein from the producing organism, facilitating purification. We will establish proof-of-concept using membranes in the form of liposomes, lipid-bilayers, onion cells and egg yolk. Furthermore, the two-chambered device will be 3D-printed. Our project will be developed further by integrating feedback from experts in space exploration, pharmaceuticals and bio-safety.

UCSC

Portable Progesterone Production in Yeast (PoPPY)

Region

North America - United States

Track

Manufacturing

Poster

Zone 5 - #313

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 309

9:00 AM - 9:30 AM

Women around the world lack adequate access to safe and affordable methods of contraception. The University of California, Santa Cruz (UCSC) iGEM team will create a safe, sustainable, and cheap progesterone-based contraceptive for all women, regardless of location or status. We will engineer the yeast *Yarrowia lipolytica* (Yali) to synthesize progesterone. Yali naturally produces a progesterone precursor, ergosterol. We will add five genes to the yeast genome to induce steroid hormone production by completing the progesterone biosynthesis pathway. We will insert these genes into Yali via three parallel experiments: Gibson cloning followed by homologous recombination, yeast-mediated cloning in *Saccharomyces cerevisiae* followed by Cre-lox recombination into Yali, and yeast-mediated cloning followed by Cre-lox into Yali. Following these experiments, we will monitor progesterone production to determine a safe, effective contraceptive dosage. On proper growth media, our self-replicating yeast biofactory will produce progesterone and provide a sustainable source of contraception.

UESTC-China

Straw-Degrading Energy E.coli

Region

Asia - China

Track

Energy

Poster

Zone 5 - #309

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 311

11:30 AM - 12:00 PM

With the development of agriculture, the yield of straw is huge, and it grows rapidly around the world every year. However, due to the complex structure of straw, current physical and chemical methods not only consume a lot of energy, but also create potential air pollution problems, while existing biological methods still require pretreatment by chemicals. Therefore, how to use straw effectively has become a problem we need to consider. Fortunately, we have found a bifunctional enzyme, xyn10D-fae1A from a paper, which directly decomposes straw and converts it into useful chemical raw materials – cellulose, lignin, ferulic acid and xylose. In addition, considering the energy shortage, we also convert cellulose to butanol and hydrogen to make more efficient use of cellulose.

UESTC-Software

BioMaster: An integrated bio-brick database

Region

Asia - China

Track

Software

Poster

Zone 3 - #176

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 311

4:15 PM - 4:45 PM

BioMaster is an integrated bio-brick database with the function of promoter prediction. We improved and standardized the information of bio-bricks in iGEM Registry by integrating information in databases like Uniprot, Epd, GO, etc. So BioMaster provides more comprehensive information about bio-bricks, including their functions, sites, interactions and references. With these, bio-bricks could be used and designed in a more reasonable way. Meanwhile, BioMaster offers more user-friendly searching methods. In addition, we provided a promoter prediction tool based on machine learning, in which promoter sequences can be found in unlabeled gene sequences. Via this tool, a promoter database predicted from E. coli genome was constructed, it contains a quantity of promoter sequences and information about the gene to which the sequences belong. We believe that this brand-new bio-brick database, BioMaster, can provide more conveniences for synthetic biologists.

UFlorida

Engineering Probiotic *Escherichia Coli* Nissle 1917 for Butyrate Production

Region

North America - United States

Track

Food & Nutrition

Poster

Zone 4 - #257

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 312

4:45 PM - 5:15 PM

Escherichia coli 1917 is a clinically approved therapy for various forms of inflammatory bowel disease. In order to apply synthetic biology approaches to potentially augment the probiotic and therapeutic potential of this bacterial strain, we decided to introduce a heterologous butyrate producing pathway into the bacteria. We decided to delete several genome genes involved in producing metabolites that drain carbon and reducing equivalents from theoretical butyrate production in a redox - balanced manner. Then, we synthesized two gblocks in order to assemble them together to form a biobrick encoding 5 enzymes involved in butyrate production. We also tested the function of past iGEM teams that have unsuccessfully attempted to produce butyrate. Our approach to metabolic engineering of *E. Coli* Nissle 1917 involved both genome editing and biobrick assembly, both of which are necessary to turn this strain into a therapeutic butyrate cell factory in the gut.

UGA

Development of Gal4/UAS Reporter Systems for use in Plants

Region

North America - United States

Track

Food & Nutrition

Poster

Zone 5 - #310

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 310

12:00 PM - 12:30 PM

The development of inducible expression systems in plants is imperative to the field of synthetic biology. The University of Georgia's 2018 iGEM team is expanding the iGEM registry's profile of plant promoters and reporters. Here we report a modified Gal4/UAS system. The Gal4/UAS system is an inducible promoter system native to yeast that utilizes the Gal4 transcription factor to activate genes downstream of a minimal promoter enhanced by an upstream activator sequence (UAS). We have created a 6X UAS repeat combined with a minimal 35S promoter to provide enhanced expression of reporter genes such as GFP, AmilC, and the apoptotic initiator from bell peppers, BS3, in the model organism, *Nicotiana Benthamiana*. The introduction of these expression systems to the iGEM registry will enable future iGEM teams to produce targeted expression in plants with ease using a binary vector system.

UI Indonesia

Finding Diphthy: Utilization of LuxAB-eYFP Resonance Energy Transfer System to Detect Diphtheria Toxin

Region

Asia - Indonesia

Track

Diagnostics

Poster

Zone 2 - #134

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 309

11:30 AM - 12:00 PM

Diphtheria is an infection caused by *Corynebacterium diphtheriae*, marked by pseudomembrane in posterior pharynx, potentially leading to respiratory tract occlusion and death. Recently, there has been diphtheria outbreak affecting major provinces in Indonesia. We realize the urgency of fast, reliable, and cheap early detection method for diphtheria infection to overcome this issue. Therefore, we plan to combine *Escherichia coli* Tar chemotaxis receptor with human heparin-binding EGF-like growth factor (HB-EGF) receptor so the bacteria can detect diphtheria toxin. In addition, we will combine CheA and CheY in *E. coli* chemotaxis pathway with LuxAB and eYFP, respectively. When in contact, LuxAB and eYFP will create resonance energy transfer system. Without diphtheria toxin, CheA will interact with CheY and thus LuxAB-eYFP energy resonance will happen, resulting in yellow color. With toxin presence, CheA will not interact with CheY and energy resonance will not happen, resulting in blue color (i.e. LuxAB native color).

UiOslo Norway

Canditect - Fast detection of vulvovaginal *Candida albicans* using CRISPR/dCas9

Region

Europe - Norway

Track

Diagnostics

Poster

Zone 1 - #43

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 208

9:00 AM - 9:30 AM

During their lifetime 75% of women will experience a *Candida albicans* infection, one of the most common vulvovaginal yeast infections. Currently there are no fast methods to detect whether an infection is caused by *C. albicans*. As a result, women purchase over-the-counter antimycotics without knowing the cause of their infection. This contributes to the rise of antimycotic resistance, making treatment of future infections more difficult. Based on previous projects, UiOslo_Norway aims to develop a fast detection kit for *C. albicans* infections, using CRISPR/dCas9. Upon a suspected infection, a vaginal sample will be treated with glucanase to selectively lyse yeast cells walls, exposing the fungal DNA. Afterwards, modified dCas9 enzymes fused with split α -lactamase are added. Using specifically designed guideRNAs, the dCas9 complexes bind adjacently on *C. albicans* specific DNA sequences. This activates the α -lactamase to cleave its substrate nitrocefin, producing a colored product indicating the presence of *C. albicans* DNA.

UIOWA

Investigating biosensors for the industrial production of 3-hydroxypropionic acid

Region

North America - United States

Track

Manufacturing

Poster

Zone 1 - #35

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 306

11:30 AM - 12:00 PM

Many industrial manufacturing processes revolve around the molecule 3-hydroxypropionic acid (3HP). This organic molecule can be used in a variety of industrial products, from biofuels to bioplastic production. While much research is focusing on maximizing the production of this important molecule, our team belongs to a smaller subset focused on finding ways to sense and measure its production. In a recent study, genes from the bacteria *Pseudomonas putida* were incorporated into *Escherichia coli* and demonstrated that re-purposed regulatory proteins from *P. putida* could be used as a biosensor for 3HP (Hanko et al. 2017). A separate study identified similar 3HP responsive genes in *Pseudomonas denitrificans* (Zhou et al. 2015). Our research team has transformed a promoter-regulator system that recognizes 3HP into *Bacillus subtilis*. *B. subtilis* is a hardy bacterium that has great potential as a 3HP producer for industrial processes and metabolic engineering experiments.

UIUC Illinois

Symbiosis of *Lactococcus lactis* and *Saccharomyces cerevisiae*

Region

North America - United States

Track

Energy

Poster

Zone 3 - #207

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 311

11:00 AM - 11:30 AM

We are exploring symbiotic co-culture of *Lactococcus lactis*, a lactic acid bacteria (LAB), and *Saccharomyces cerevisiae*, brewer's yeast, as a means to naturally produce lactic acid. This precursor is valuable for the synthesis of poly-lactic acid, a widely used biodegradable plastic. In many food and beverage industries, LAB is a common contaminant of yeast. This suggests that yeast and LAB form a complex microbiome where both species act in symbiosis. Studying the symbiotic relationship between yeast and LAB could increase carbon flux to the production of lactic acid. Co-culture dynamics have not been thoroughly studied, as a result, we obtained bacterial and yeast fluorescence reporter strains and performed a systematic analysis of co-culture dynamics, including optimization of media characteristics and ratios of initial cell numbers. We concluded the ideal co-culture media is a mixture of 1X YPD and 1X M17 media supplemented with 2% glucose.

ULaval

Adrenayeast: Eco-Innovative Biosynthesis of Adrenaline in *Saccharomyces cerevisiae*

Region

North America - Canada

Track

Manufacturing

Poster

Zone 5 - #268

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 311

4:15 PM - 4:45 PM

Adrenaline is an essential medication used to treat several conditions, including life-threatening anaphylactic reactions. However, the current chemical manufacturing processes struggle to keep up with the demand for adrenaline, often leading to shortages of potentially life-saving medicine. Our project aims to increase the molecule's availability by providing an eco-innovative alternative with milder operational conditions. We designed a two-plasmid system which harbors synthetic human cDNAs encoding the adrenaline enzymatic pathway. We explored how the insertion of this plasmid system into a *Saccharomyces cerevisiae* strain engineered to overproduce L-tyrosine can be used for the biosynthesis of adrenaline. As the enzymatic pathway also produces metabolic intermediates of biomedical interest, we intend to create three strains of *Saccharomyces cerevisiae* producing dopamine, noradrenaline or adrenaline, based on plasmid combination. Along with an optimized protocol to harvest purified products, we present our exploration of the social and ethical impacts of using this process to mass-produce adrenaline.

ULaVerne Collab

A Bio-Solution to Plastic Pollution!

Region

North America - United States

Track

Environment

Poster

Zone 3 - #177

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 208

12:00 PM - 12:30 PM

Every year, 8 million tons of plastic enter the ocean and can devastate the ocean's ecosystem. Many of these plastics are broken down into very small pieces called microfibers which are more harmful because they can be consumed by many organisms and negatively affect their health. Although the exact path from land to ocean is still unclear, we aim to remove the plastics from the wastewater level where plastic particles are known to accumulate. To eliminate these plastic particles from wastewater, we tested modified PETase enzyme that contains a unique catalytic site. To model our system, we aim to use a zero-energy requiring RAM pump design to hold our microbes and properly circulate the plastics and degrade them so plastic-free water can be released from the treatment plants and into the environment without any harm coming to the aquatic ecosystems.

UMaryland

PETNET: A scalable solution for plastic bioremediation

Region

North America - United States

Track

Environment

Poster

Zone 1 - #40

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 302

4:45 PM - 5:15 PM

Explosive worldwide increase in plastic production has led to extensive pollution from polyethylene terephthalate (PET) despite ambitious recycling efforts. PETNET uses several advances to address this issue. The recently discovered PETase from *Ideonella sakaiensis* is attached to a cellulose binding domain to increase PET degrading potential. The degrading efficiency of this protein is amplified with the integrated hardware featuring a cellulose-lined, modular flow reactor. The enzymatic activity of PETase is accelerated when immobilized near flowing PET substrate via interaction of linked CBD with the reactor's cellulose scaffold, allowing for feasible real-time PET degradation. Quantitation of PET degradation is accomplished with an evolved protocatechuate biosensor sensitive to micromolar concentrations of PET degradation byproduct. This approach circumvents the need for expensive instrumentation for the downstream detection of PET degradation. PETNET is a comprehensive approach to PET degradation that will offer a scalable platform for society to address the overwhelming accumulation of plastic.

UMass Dartmouth

No title

Region

North America - United States

No abstract

Track

Foundational Advance

Poster

Zone 1 - #63

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 207

11:00 AM - 11:30 AM

UNebraska-Lincoln

Improving Early Detection of the Emerald Ash Borer

Region

North America - United States

Track

Environment

Poster

Zone 3 - #200

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 208

2:45 PM - 3:15 PM

The emerald ash borer, *Agrilus planipennis*, is an invasive species native to Asia that first appeared in the United States in 2002. It has since spread to four Canadian provinces and thirty-five U.S. states, including Nebraska. The infestation is currently monitored with detection traps baited with the green leaf volatile (Z)-3-hexenol, which has been documented as an unreliable lure. The more effective bait, Phoebe oil and its most bioactive constituent 7-epi-sesquithujene, are commercially unavailable. Our team seeks to meet this challenge by building a bacterial cell factory to synthesize 7-epi-sesquithujene. We first introduced the mevalonate-dependent pathway into *E. coli* to enable the accumulation of the key biosynthetic precursor, farnesyl pyrophosphate. The maize terpene synthase gene *tps4-B73* was then expressed in the engineered host. Accumulation of the target molecule by the constructed strain was confirmed by gas chromatography-mass spectrometry analysis. Future research will focus on product quantification and purification.

Unesp Brazil

Hope: a framework to engineer living therapeutics

Region

Latin America - Brazil

Track

Therapeutics

Poster

Zone 5 - #264

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 302

11:30 AM - 12:00 PM

Treatment of metabolic disorders often relies on pills and uncomfortable injections. Genetically engineered probiotics have the power to revolutionize drug delivery in a non-invasive way, by acting as living therapeutics in the human gut. To take this novel approach to its fullest potential, we designed a robust framework to engineer living therapeutics. Our framework provides an interchangeable and adaptable system to secrete and deliver a therapeutic polypeptide in response to an environmental signal, and a light-responsive biocontainment module based on the CRISPR/Cas9 machinery. Moreover, we designed and constructed a low-cost bioreactor system to simulate the human gut microbiome and validate our engineered probiotic. As proof of concept, we engineered a probiotic to treat type 1 diabetes that secretes insulin in response to glucose. Our framework aims to offer an easy, modular, robust and open-source solution to engineer and validate designer probiotics, bringing new hope to patients suffering from metabolic disorders.

UNSW Australia

Covalent attachment of enzymes to a self-assembling protein scaffold for substrate channelling

Region

Asia - Australia

Track

Foundational Advance

Poster

Zone 1 - #73

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 306

2:15 PM - 2:45 PM

Metabolic engineering aims to produce complex high-value compounds for industry from simpler and cheaper substrates by enhancing rates of reaction. The rates of metabolic reactions can be greatly enhanced by substrate channelling, which spatially brings together the enzymes of a multi-step reaction, increasing the effective concentration of metabolic intermediates. We have designed a novel protein scaffold that specifically and covalently co-localises enzymes in a modular system. Our 'Assemblase' system consists of a heterohexameric complex of a highly thermostable and chemical resistant archaeal protein, prefoldin, which has been engineered to recruit enzymes using covalent protein-protein interactions. The design is being tested with a two step enzyme pathway to produce the horticultural plant hormone, indole 3-acetic acid, from tryptophan. We propose that the Assemblase system could be used for accelerating the production of pharmaceuticals and industrial chemicals, bioremediation and as a foundational research tool.

UofGuelph

E. coli- and S. cerevisiae-Mediated Breakdown and Prevention of Beerstone via FRC, OXC and OxIT

Region

North America - Canada

Track

Food & Nutrition

Poster

Zone 2 - #161

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 312

9:30 AM - 10:00 AM

Beerstone is calcium oxalate buildup that forms as a byproduct inside beer brewing equipment. Beerstone's high insolubility results in the need for highly corrosive chemicals such as nitric and phosphoric acids, combined with intense physical scrubbing for its removal. Oxalobacter formigenes is a human gut bacterium which solely metabolizes oxalate using enzymes Formyl-Coenzyme A Transferase (FRC) and Oxalyl-Coenzyme A Decarboxylase (OXC). Oxalate is taken into the cell by an oxalate-formate antiporter (OxIT), and following its metabolism, formate is exported from the cell by OxIT. We have investigated engineering E. coli and S. cerevisiae with these genes in order to characterize their activity and feasibility for use in an industrial setting. Tests included heterologous production of FRC and OXC in E. coli to characterize their activity against calcium oxalate, and modifying S. cerevisiae to utilize calcium oxalate using OxIT, FRC and OXC during the brewing process to prevent beerstone buildup.

UPF CRG Barcelona

Probiotics to fight metastasis: Engineering *E. coli* to regulate fatty acid metabolism

Region

Europe - Spain

Track

Therapeutics

Poster

Zone 4 - #223

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 309

10:00 AM - 10:30 AM

Prevention of metastasis remains a challenge for modern medicine. Recent experimental evidences indicate that metastasis development correlates directly on dietary long chain fatty acids (LCFA) intake, such as palmitic acid (PA). Hence, targeting fatty acid availability in the intestine could prevent cancer cells from spreading. Here a safe, effective and affordable solution is proposed by the design of a probiotic with increased LCFA uptake, GARGANTUA. We approached this by modulating the beta-oxidation family genes in *E. coli*. Moreover, we developed the first LCFA intracellular biosensor that does not interfere with its metabolism. This will provide a tool able to characterize LCFA uptake. We also developed a framework for the genomic integration of the uptake machinery, as a way to increase safety and robustness of our device. GARGANTUA provides a proof of concept for an alternative approach for metastasis prevention with potential applications in metabolic disease treatment.

Uppsala

Worm Busters - Fighting the hidden resistance

Region

Europe - Sweden

Track

New Application

Poster

Zone 2 - #148

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 208

4:45 PM - 5:15 PM

This year iGEM Uppsala has applied modern methods in novel ways to solve problems in a field largely untouched by synthetic biology. The purpose of the project is to use applied diagnostics to prevent overutilization of anthelmintics in horses by engineering a 'smart' bacterium. These bacteria would be able to report the presence of specific nematode parasites in a quantitative manner, allowing deworming treatments to be individualized for each horse depending on the level of infection. This would minimize the risk of future anthelmintic resistance, helping to stem the impending problem. Using synthetic biology to solve problems in veterinary diagnostics has presented many unique challenges to our team. These challenges have been overcome by development of new applications of existing techniques such as phage display, transcriptome sequencing using nanopore technology, and chromoprotein expression.

US AFRL CarrolIHS

Engineering E.coli to detect and destroy biofilms

Region

North America - United States

Track

High School

Poster

Zone 3 - #199

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 302

11:00 AM - 11:30 AM

With growing environmental concerns, industries are increasingly relying on biofuels. Biodiesel storage tanks are susceptible to water infiltration that often results in biofilm formation containing bacteria and fungi. Biofilms may clog pipes, degrade fuel, or corrode storage tanks. We set out to engineer a 'seek, aim, and destroy' system for the remediation of microbial biofilms. *Pseudomonas aeruginosa*, commonly found in fuel biofilms, releases the quorum sensing molecule C4-HSL. Our engineered *E. coli* cells express CheZ protein in response to a concentration gradient of C4-HSL to activate the flagella motors and propel the cells towards the biofilm. In addition, the engineered *E. coli* expresses chitinase on its surface and secretes cinnamaldehyde. Chitinase breaks down chitin in the fungal cell walls, increasing the ability of cinnamaldehyde to destroy the fungi. Cinnamaldehyde also eliminates bacteria, thus remediating the biofilm. (DISTRIBUTION A: Approved for public release; distribution unlimited. 88ABW-2018-3904. 01 August 2018.)

USAFA

Ops Normal: a novel protein sequestration sequence to prevent a phenotypic switch in *Candida albicans*

Region

North America - United States

Track

Therapeutics

Poster

Zone 4 - #245

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 208

2:45 PM - 3:15 PM

Candida albicans is a fungus that, despite being considered part of normal human flora, has the potential to cause life-threatening systemic infections, with candida infections being the fourth leading cause of hospital acquired systemic infections and resulting in mortality rates of up to 50%. *Candida albicans* becomes pathogenic after a phenotype switch from white-to-opaque or opaque-to-white, depending on the infection site. Here, we cloned the 5' UTR of the master white-opaque phenotypic regulator *WOR1* into a vector to act as a protein sequestration sequence. To confirm successful cloning of the 5' UTR and expression of our vector, we used *E. coli* as our model organism. Once integrated into the *Candida albicans* genome, our genetically engineered part should sequester transcriptional regulating proteins away from the *WOR1* gene and alter the phenotypic switching tied to the pathogenicity of *Candida albicans*.

USMA-West Point

Developing bacterial mammalian olfactory system-based chemical biosensors

Region

North America - United States

Track

Manufacturing

Poster

Zone 3 - #206

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 312

11:00 AM - 11:30 AM

Artificial bio-sensors based on the mammalian olfactory system are potentially powerful chemical analytical systems for many industrial, medical and security applications. The ability to express mammalian proteins make bacteria a potentially powerful platform for developing artificial chemical biosensors. Bacteria, however, lack several of the intracellular signaling proteins required to alter cell membrane field potential changes in response to odorant binding. To overcome this challenge, we have developed a plasmid containing a synthetic bacterial operon that enables the expression of multiple genes under the control of the upstream regulatory promoter for the AraC gene. In this proof-of-principle system, synthetic operon will be expressed in E.coli with a separate plasmid that co-expresses a human odorant receptor protein. These studies will provide the foundation for future work to develop synthetic operons can be used to heterologously express the multiple proteins required to develop bacterial chemical biosensors based on the mammalian olfactory system.

USP-Brazil

QS-Comms

Region

Latin America - Brazil

Track

Foundational Advance

Poster

Zone 3 - #194

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 310

5:15 PM - 5:45 PM

Quorum sensing is a mechanism for communication within and between bacterial populations, and it presents interesting possibilities for biotechnology in controlling populational behavior, ranging from task division in bioprocesses to biofilm disruption in infections. However, to generate complex patterns in a predictable manner, orthogonality between different quorum sensing pathways is essential, so the toolkit of quorum sensing parts needs to be thoroughly characterized, expanded and optimized so that this technology may see its full potential. Thus, our project aims to characterize activity and quantify the genetic crosstalk between a variety of quorum sensing systems that showed promising activity in prior works, while also using this information to predict, model and ultimately aid possible design applications and solutions for microbial communication. This way we will build on a growing bank of data of quorum sensing parts that will help future projects work with this technology.

USP-EEL-Brazil

Lacquase: Biodegradation of estrogens from water

Region

Latin America - Brazil

Track

Environment

Poster

Zone 1 - #39

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 207

12:00 PM - 12:30 PM

The detection of endocrine disruptor chemicals (EDCs) in water bodies is increasing. These compounds, also known as estrogens, are highly toxic to fish and may cause long-term harmful effects in humans and other animals. The lack of effective treatment of effluents to remove these micro pollutants has led to the contamination of water reservoirs and pollution of the environment. Our team's proposal was the development of a method for the removal of these estrogens from water. To achieve this goal, we cloned and expressed genetically engineered laccases from filamentous fungi in *E. coli* strains. Laccases are copper-containing enzymes that act in the oxidation of a various range of phenolic substrates, including EDCs. We plan to explore laccases as model environmental friendly biocatalyzers applied in the biodegradation of estrogenic compounds in water and effluent treatment stations, which can greatly improve water quality.

UST Beijing

Natural RE-lease

Region

Asia - China

Track

Food & Nutrition

Poster

Zone 5 - #276

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 311

3:15 PM - 3:45 PM

Our long-term goal is to improve the health-promoting effects of ginsenosides. We believe that sterols in the ginsenosides are responsible for their main benefits. Therefore in the past projects we engineered synthetic squalene cyclase for in situ production of ginseno-sterols in human cells; and produced synthetic β -glucosidase in *E. coli* for removal of sugar from ginsenosides. In the current strategy, in the wake of "No release" policy of iGEM community, we are able to by-pass synthetic biology methods to achieve our goal by applying in vitro chemical reactions.

USTC

Make TW Beneficial

Region

Asia - China

Track

Manufacturing

Poster

Zone 3 - #181

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 311

5:15 PM - 5:45 PM

In China, tobacco industry is under government's control. To prevent some people from illegally making cigarettes with TWs (tobacco wastes), especially small pieces of tobacco, TWs are all recycled to dispose. The usual way of TW's disposal is to burn, which produces pollution like CO, and nicotine in TW will spread in the air, causing huge waste. Faced with the phenomenon that nicotine in TW is difficult to use, we propose our project to make nicotine in TW beneficial by degrading nicotine to valuable chemicals. We use 3 enzymes: NicA2, PNAO, SAPD to convert nicotine to 3-succinoyl-pyridine, a valuable medicine. And then, we design a nicotine biosensor, combined with LuxR-AHL-lux pR system to activate expression of the degradation enzymes. Furthermore, to lower the harm of Secondhand Smoke, we devise our hardware using bacterial cellulose to absorb nicotine in air for recycling. We believe our project will make TW beneficial!

USTC-Software

Biohub 3.0

Region

Asia - China

Track

Software

Poster

Zone 2 - #115

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 304

4:15 PM - 4:45 PM

Biohub 3.0 is a powerful Synthetic biology platform devoting for efficient working and sharing. Inspired by some weblog sites, it introduces a communication platform for Synthetic biology researchers to share ideas and experimental programs. When coming up with an idea, one can immediately build a specific basic experimental process and share it with Biohub. Experimental programs can be stored and demonstrated in the cloud. Researchers can focus on the content and won't be distracted by the annoying format. More than a community, the platform is also a well-designed kit for Synthetic biology, providing a powerful search engine for researchers. Massively useful information in daily research is covered. Biohub can be a reliable and powerful software for Synthetic biology researchers all over the world.

UT-Knoxville

Engineering E. coli for Dichloroacetate and Dichloromethane Degradation

Region

North America - United States

Track

Environment

Poster

Zone 2 - #124

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 309

11:30 AM - 12:00 PM

Chemical pollution resulting from large-scale industrial practices can result in volatile organic compound (VOC) accumulation in water supplies. One VOC of interest, dichloroacetate (DCA), is a chlorinated carcinogenic contaminant at clinically high levels. Similarly, dichloromethane (DCM), is used for various industrial applications but its accumulation in water systems poses a threat to aquatic organisms and is considered a carcinogenic to humans. The goal of the UT Knoxville iGEM Team is to design biological systems in E. coli capable of degrading DCA and DCM in order to remove them from the water supply and metabolize them within the cell. Through the addition of Haloacid Dehalogenase (HADase) genes capable of breaking down DCA as well as the development of a DCM biosensor, we are generating biological organisms in order to facilitate our access to clean drinking.

Utrecht

DeTaXion: a synthetic biology-based biosensor to detect environmental pollutants

Region

Europe - Netherlands

Track

Environment

Poster

Zone 4 - #251

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 207

2:45 PM - 3:15 PM

Water is one of our most precious resources. Unfortunately, increased use of chemicals such as pharmaceuticals threatens this ecosystem. These contaminants are often difficult to detect. We therefore developed Detaxion, a biosensor to rapidly identify chemical contaminants in water. Detaxion is based on the E. coli chemotaxis system. We engineered the CheY and CheZ chemotaxis proteins to form a bioluminescence resonance energy transfer (BRET) pair. Upon binding of chemicals to the TAR chemotaxis receptor, BRET fluorescence emission changes in a quantifiable manner. We additionally used receptor ligand binding domain swapping to expand the range of detectable chemicals. Finally, we modified receptor methylation sites to extend the detection range. Our results thus far show successful fluorescence energy transfer. Moreover, we used a capillary-based assay to confirm BRET measurements. Taken together, Detaxion constitutes a synthetic biology-based approach to detect chemical waste in water, to safeguard this vital resource.

Valencia UPV

Printeria

Region

Europe - Spain

Track

New Application

Poster

Zone 5 - #306

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 304

11:00 AM - 11:30 AM

Access to Synthetic Biology by the interested layperson is currently hampered by several barriers, including a required background knowledge and availability of expensive and often bulky technological equipment. Printeria, a fully-equipped bioengineering device able to automate the process of printing genetic circuits in bacteria but made as simple and easy to operate as a domestic desktop printer, breaks down these barriers. It uses a digital microfluidic system creating little droplets that can be mixed and moved across predefined electrode paths on a PCB surface. Printeria combines this novel system with Golden Gate Technology, low-cost sensors and electronics, and a user-friendly software application. This way, the user is capable of assembling domesticated DNA parts in a one-step reaction and can control all biotechnological steps, from the assembly of parts and transformation to cell culture, with high accuracy. Printeria opens the door to a world of applications affordable for the general public.

Vilnius-Lithuania

SynDrop - Synthetic Droplets for Membrane Protein Research

Region

Europe - Lithuania

Track

Foundational Advance

Poster

Zone 1 - #65

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 208

10:00 AM - 10:30 AM

Membrane proteins (MPs) are an essential part of major cellular processes and key targets for drug development. Since distinct obstacles, including cell-toxicity and irreversible aggregation in hydrophilic environment impede MP research, we employ microfluidics and bottom-up forward engineering approach to revolutionize it. Octanol-assisted liposome assembly is implemented for synthesis of monodisperse cell-sized liposomes. We encapsulate modified MP assembly machinery alongside cell-free protein synthesis system within liposomes with excellent efficiency. This system serves as overarching framework for effective synthesis, folding, and competent insertion into the membrane of active prone-to-aggregate membrane proteins. We offer a full-synthetic microfactory that, coupled with directed evolution, solves contemporary problems in MP engineering. Additionally, synthetic liposomes enable building artificial logic gates and signaling pathways to study metabolic cascades and protein interaction completely noise-free. Utilizing liposomes as simplified synthetic models of living cells, SynDrop will facilitate scientists to step into fully controlled synthetic era of membrane protein research.

Vilnius-Lithuania-OG

CAT-Seq: Catalytic Activity Sequencing

Region

Europe - Lithuania

Track

Foundational Advance

Poster

Zone 5 - #272

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 312

11:30 AM - 12:00 PM

Biological part characterization is the core requirement for engineering complex, yet predictable biosystems. The immense complexity of nature makes this a challenging task. Currently, there is a considerable lack of well-defined, standardized parts and an insufficient grasp of their sequence-function relationship. Notably, state of the art screening methods have insufficient throughput to effectively navigate the extensive biomolecule sequence space. To address this issue we have developed a novel approach to part characterization based on microfluidics and modified nucleotides: Catalytic Activity Sequencing (CAT-Seq). CAT-Seq enables the simultaneous activity measurements of billions of biomolecule variants in parallel. Unique biomolecules are each synthesized in separate water droplets and their activity is recorded and stored into their individual DNA sequences. This information can then be readily retrieved by next-generation sequencing. CAT-Seq can rapidly assess sequence-function relationships, characterize regulatory parts, their interactions, and provide much-needed data for predictively designing novel biological systems.

Virginia

Quorus: Engineering a Microbial Symphony

Region

North America - United States

Track

Manufacturing

Poster

Zone 4 - #220

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 207

10:00 AM - 10:30 AM

Quorum sensing (QS) is a mechanism where bacteria detect the presence of nearby cells and coordinate their behavior among the population. Utilizing the QS genes of the Lsr operon and T7 RNA Polymerase, we are developing a biologically orthogonal quorum response sensitive to the universal autoinducer AI-2. This system introduces an alternative method of gene induction and biomanufacturing to iGEM, re-engineering microbial coordination of population phenotypes. Further, we have designed a synthetic feedback loop in tandem with the Lsr operon to increase the mean and homogeneity of quorum activation in a colony to levels comparable to industrial inducers like IPTG. This provides a system of self-regulating induction that can produce target proteins cheaper and more efficiently than current industrial methods. The resulting engineered microbe has increased biofilm production compared to the wild type, which has applications such as microbial cellulose biomanufacturing and hyper-virulent control organisms for testing certain microbial antibiotics.

VIT Vellore

Toggle pH: Engineered micro workers for ocean pH homeostasis

Region

Asia - India

Track

Environment

Poster

Zone 5 - #289

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 309

9:00 AM - 9:30 AM

Increase in industrialization has led to an overall increase in Carbon Footprint, the major component of which is Carbon Dioxide, leading to global warming. Among other ill effects of industrialization, the one that has garnered a lot of attention is what we call Ocean Acidification also known as 'the other CO2 problem'. Increasing acidity is directly linked to having potentially harmful consequences for marine organisms, such as depressing metabolic rates and immune responses in some organisms, and causing the worst cases of coral bleaching. In order to tackle these problems our engineered microbe jumps in. This engineered *E. coli* will interact with its surrounding environment to utilize protons whose levels regulate activation of certain pH-sensitive promoters. Along with promoters, specific repressor protein-operator binding regulates gene expression so that the transporter proteins are expressed which shuffle bicarbonates, carbonates and protons in and out of cells that bring about pH homeostasis.

Warwick

Safe Water

Region

Europe - United Kingdom

Track

Environment

Poster

Zone 3 - #182

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 312

9:00 AM - 9:30 AM

Safe water is a global issue. Our team provides solutions to biological, organic and inorganic problems facing polluted water. Biological: The *Legionella* genus of Bacteria causes disease in humans. We utilise a never before seen regulation system to identify and respond to pathogenic RNA. Organic: Toxic oestrogen concentrations induce sex reversal in fish; the inability for breeding due to lack of males results in population decline. We have artificially tweaked and transferred a recently discovered enzyme pathway into *E. coli* which reduces oestrogen toxicity. Inorganic: Lead contamination is responsible for serious health problems. We have designed a system through which lead can be isolated and removed via gas vesicles in *Bacillus*.

Washington

Stronger Together: An efficient, generalizable approach to design biosensors for small molecules

Region

North America - United States

Track

Foundational Advance

Poster

Zone 1 - #23

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 304

10:00 AM - 10:30 AM

Chemically induced dimerization (CID), in which two proteins dimerize only in the presence of a small molecule, has been widely used to control cell signaling, regulatory, and metabolic pathways, and used as logic gates for biological computation in living mammalian cells. However, few naturally occurring CID systems and their derivatives are currently available. Creating a CID system with desired affinity and specificity for any given small molecule remains an unsolved problem for computational design and other protein engineering approaches. To address this challenge, we have used a novel strategy to select CID binders from a vastly diverse combinatorial nanobody library. We have created new CID systems that can sense cholecalciferol and artemisinin. We are validating CID biosensors by a yeast three-hybrid system and built structural models to understand the small molecule-induced dimerization. Our work is a proof-of-concept that can be generalized to create CID systems for many applications.

WashU StLouis

DETECTING WHEAT RUST FUNGUS SPORES USING E. COLI AND S. CEREVISIAE

Region

North America - United States

Track

Food & Nutrition

Poster

Zone 2 - #151

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 310

11:00 AM - 11:30 AM

Virulent races of *Puccinia graminis* f. sp. *tritici* (Pgt), or wheat stem rust, have caused devastating effects on cereal grains worldwide, impacting global food security. We are engineering *Escherichia coli* DH5 α and *Saccharomyces cerevisiae* EBY100 to detect Pgt and improve response times to virulent strains. To detect Pgt, we are creating a device that will germinate spores from the *Puccinia* genus. The germinated spores produce ribitol, a sugar unique to Pgt. Our engineered DH5 α will produce a fluorescent signal in the presence of ribitol, thus detecting Pgt. To detect specific virulent races of Pgt, we will modify yeast to contain the stem rust resistance gene *Sr35* from *Triticum monococcum*. *Sr35* recognizes its corresponding effector *AvrSr35*, secreted by Pgt, as part of the plant's innate immune system. Using bimolecular fluorescence complementation, our yeast will detect *AvrSr35*, a first step in being able to indicate the virulence of the germinated Pgt spores.

Waterloo

E. co-light: Dynamic Optogenetic Control of Co-cultures

Region

North America - Canada

Track

New Application

Poster

Zone 1 - #68

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 304

12:00 PM - 12:30 PM

Microorganisms exist in complex and diverse communities. This enables a variety of important interactions including co-metabolism and nutrient cycling. Yet, it can be difficult to culture species together in a laboratory setting. Mixed populations are difficult to maintain primarily due to competition: a difference in growth rates often results in one population outcompeting another. Our team aims to dynamically control *E. coli* growth by using optogenetics (light-induced gene expression) to regulate the production of MetE, an enzyme essential for bacterial growth. This kind of control could help us overcome a major barrier to maintaining co-cultures: competition between microorganisms. This would open several doors in biotech and research. For instance, metabolic engineering of microbial communities may improve the production of pharmaceuticals, biofuels, and other important materials. Moreover, controllable co-cultures would allow researchers to explore complex interactions between microbes and investigate questions that could not previously be answered due to co-culturing limitations.

Westminster UK

Facilitating styrene biodegradation through modification of the tod operon

Region

Europe - United Kingdom

Track

Environment

Poster

Zone 1 - #66

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 310

2:45 PM - 3:15 PM

While waste plastics are a major environmental concern, polystyrene is one of the least recycled and is amongst the most polluting plastics. We investigated the impact of polystyrene and evaluated chemical methods of reducing its expanded volume using citrus waste chemicals followed by thermal depolymerisation. Methylbenzene (toluene) is metabolised in *Pseudomonas putida* F1 through the Tod operon, a class of genes which facilitate the transport and metabolism of toluene. Our goal is to use the tod operon to facilitate the biodegradation of styrene monomers. One critical enzyme, the 3-methylcatechol 2,3-dioxygenase (todE) was reported to encounter inactivation by 3-vinylcatechol intermediate of styrene biodegradation thus, our aim is to up-regulate todE in our composite biobricks while computationally modelling it. If successful, these genetic modifications could be applied back to *P. putida* F1 for more efficient growth on waste styrene on an industrial scale, with the possibility of useful intermediate collection.

WHU-China

Noah's Ark I - Polyphosphate planet

Region

Asia - China

Track

Environment

Poster

Zone 5 - #314

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 208

11:30 AM - 12:00 PM

This year we aim to establish a brand new system of environmental remediation and maintenance in water. Owing to leakage or improper discharge, there are high levels of many chemicals in the water body causing water pollution like eutrophication. To deal with this, we established a set of pathways, used the symbiotic system of algae and our engineered bacteria and finally built an device as platform that can carry them—The Noah's Ark. The Ark can make use of solar energy and continuously collect specific element or chemical agents from water to achieve the water restoration, as well as reusing the purified chemicals as resources as an experiment, we used the Ark to recover phosphorus this year. Thus, the first product of a whole series was launched Noah's Ark I—Polyphosphate planet.

William and Mary

Construction of a decoding circuit to process dynamic frequency-encoded information

Region

North America - United States

Track

Information Processing

Poster

Zone 5 - #280

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 306

9:30 AM - 10:00 AM

One of the most ubiquitous forms of information processing in cellular systems is one in which information is encoded in the time-domain dynamics of signals. Although there exist synthetic circuits capable of encoding information in the time-domain of gene expression, the field lacks circuits that can decode time-domain information. As a result, synthetic circuits are incapable of processing time-domain information, rendering them unable to interface effectively with dynamically encoded cellular signals. To address this problem we created a decoder circuit that uses an incoherent feed-forward loop to convert frequency-encoded information into amplitude-encoded information. Through modeling and experimentation we demonstrate that our IFFL decoder allows synthetic circuits to more accurately process information encoded in the frequency of an oscillatory signal. Our decoder therefore provides a means for teams to design and build synthetic circuits that can better interface with endogenous signaling pathways to access the broad possibilities of time-domain information processing.

WLC-Milwaukee

Ec-Sense

Region

North America - United States

Track

Environment

Poster

Zone 4 - #213

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 310

9:30 AM - 10:00 AM

Fresh water is an increasingly valuable resource in our world where the needs of a burgeoning population are complicated by rapid urbanization. Water contamination and a lack of water security affects millions of people worldwide every year, especially in at risk communities, resulting in illness and transmission of deadly parasites. Unfortunately, ensuring water safety is expensive and time consuming with few testing options available. The WLC-Milwaukee iGEM team has been continuing past work to develop a simple, accurate, and fast test kit for *E. coli* providing consumers the tools they need to ensure water safety. We have been working with proteins from Lambda phage known to bind the outer membrane protein, LamB, of *E. coli* conjugated to HRP. This protein-enzyme conjugate binds *E. coli* and when a colorimetric substrate is used, an easy to read visual signal indicates the presence of *E. coli* and fecal coliform contamination.

Worldshaper-Wuhan

Long noncoding RNA IL7-AS promotes cell migration in renal cell carcinoma

Region

Asia - China

Track

High School

Poster

Zone 5 - #283

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 208

4:15 PM - 4:45 PM

Renal cell carcinoma (RCC) is the most common type of kidney cancer in adults. Patients with RCC typically respond poorly to conventional treatment with chemotherapy and radiotherapy. A better understanding of the molecular mechanisms underlying RCC progression, including metastasis, is required to improve RCC treatment. LncRNAs have been shown to have crucial roles in carcinogenesis and metastasis. LncRNA IL7-AS is a newly discovered lncRNA, which has been suggested to be associated with innate immunity. We first examined the expression pattern of IL7-AS in tumor tissues compared with normal tissues via mining various available public data sets, which has suggested IL7-AS may play an important role in carcinomas, especially in renal cell carcinoma. Our project will clone the different splices of IL7-AS and investigate the role of IL7-AS in renal cell carcinoma. Our studies may reveal that IL7-AS is a potential diagnostic biomarker and therapeutic target for renal cell carcinoma.

Worldshaper-XSHS

Microbial Sensor for Nicotine Capture

Region

Asia - China

Track

High School

Poster

Zone 1 - #67

Saturday

Session I & J

12:45 PM - 2:15 PM

Presentation

Saturday

Room 311

11:00 AM - 11:30 AM

Tobacco consumption is one of the leading preventable causes of death and disease in the world. Nicotine, a major toxic component of tobacco, can cross biological membranes and the blood-brain barrier easily. During cigarette manufacturing, large quantities of tobacco waste with high concentrations of nicotine are produced, and the disposal of these wastes is a serious ecological problem. Microbial organisms play important roles in the tobacco manufacturing process by altering the content of nicotine. Some strains of *Pseudomonas* exhibits high nicotine-degrading activity, which has a gene cluster encoded enzymes involved in the catabolism of nicotine. In this project, we are aiming to explore a better way to nicotine detection and degradation. The *Escherichia coli* strains was constructed to easily detect the concentration of nicotine using synthetic biological methods. Meanwhile, over-expressing the key enzyme genes for nicotine bioremediation is also in progress.

WPI Worcester

ICEberg (ISPs Combatting EPSs)

Region

North America - United States

Track

Food & Nutrition

Poster

Zone 5 - #300

Thursday

Session A & B

12:45 PM - 2:15 PM

Presentation

Thursday

Room 312

9:00 AM - 9:30 AM

Approximately 48 million people contract a foodborne illness in the United States each year. Many of these outbreaks are linked to field crops contaminated with pathogenic bacteria. Inspired by the 2018 romaine lettuce *E. coli* outbreak in the United States and the work of the 2015 WPI iGEM team, we investigated methods to prevent biofilms of human pathogens on crops. We analyzed the antimicrobial properties of antifreeze proteins, also called ice structuring proteins (ISPs), and curcumin, a component of turmeric. The biofilms were measured by the amount extracellular polymeric substances (EPSs) they produced using crystal violet binding assays. On lettuce leaves, biofilms were quantified by their colony forming units. We also constructed a gene gun, based off the 2016 Cambridge iGEM team's design, to transform lettuce leaves to express antifreeze proteins. In the future, we envision transgenic crops that produce antimicrobial proteins to protect themselves against colonization of human pathogens.

XJTLU-CHINA

EXOport: A CNS-targeting mRNA-packaging exosome device

Region

Asia - China

Track

Therapeutics

Poster

Zone 3 - #189

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 302

12:00 PM - 12:30 PM

In recent decades, scientists have advanced various drug delivery modalities to overcome the blood-brain barrier (BBB), which excludes most neurotherapeutics from entering the central nervous system (CNS), in order to treat CNS disorders. The emerging brain virotherapy using AAV vectors was reported to be immunogenic and costly in manufacturing. In addition, it is rather perilous that therapeutic viruses have to be administered into cerebrospinal fluid. Hence, this year, our team aims to engineer HEK293T cells to produce engineered exosomes, which are extracellular vesicles naturally capable of traversing BBB, hereby providing a low-risk platform for CNS mRNA therapy. The engineering includes: 1. boosting the production of exosomes; 2. facilitating therapeutic RNA to be packaged into exosomes; 3. increasing targeting specificity to neurons with low leakage during the transport of RNA cargo 4. prolonging the expression of therapeutic RNAs in the neurons

XJTU-China

DEcose: A Biosensor-based Directed Evolution Method in Promoting D-psicose Productivity

Region

Asia - China

Track

Manufacturing

Poster

Zone 3 - #202

Saturday

Session K & L

6:45 PM - 8:15 PM

Presentation

Saturday

Room 208

4:45 PM - 5:15 PM

D-psicose, the C-3 epimer of fructose, is a natural rare sugar that is low in energy, which exerts several potential health benefits, including preventing diabetes development. Bioproduction of D-psicose shows promise but suffers severely from low enzyme activity. Directed evolution (DE) is an effective strategy for optimizing various enzymes. However, high throughput is never achieved when screening manually or using conventional methods such as HPLC to monitor metabolite concentration. To overcome such difficulties, we have constructed the Sensing, Coupling, Selecting and Iterating framework of DE with quantitative regulatory mechanisms underlying each step. D-psicose productivity is first converted into mRNA expression level, then couples with genes conveying survival advantages by tunable hairpin cassette. The procedure iterates itself in evolving more effective enzymes. This framework for DE could hopefully be applied to improve the functionality of other biomolecules, as long as a suitable biosensor for the final product exists.

XMU-China

Cell-free Systems for Disease Detection and Treatment

Region

Asia - China

Track

New Application

Poster

Zone 2 - #105

Friday

Session E & F

12:45 PM - 2:15 PM

Presentation

Friday

Room 310

12:00 PM - 12:30 PM

This year team XMU-China developed cell-free systems to detect and treat diseases. Protein detection is unique and significant in biology fields, especially for the detection of protein biomarkers which produced by diseased cells. In order to overcome the deficiencies of traditional detection methods, we have developed an Aptamer Based Cell-free Detection system (ABCD system) of protein. The core of the ABCD system is the specific binding of the aptamer and its target protein. After protein detection, we use outer-membrane vesicles (OMVs) to treat the diseased cells. We designed a system that has realized the efficient, customizable production of OMVs, which serves to encapsulate specific siRNA for disease treatment. To guarantee the practicability detection and treatment system, we also improved KaiABC system and TDPs system to regulate the expression rate of OMVs and store fragile chemicals or biological materials.

Yale

Engineering a synthetic bacterial co-culture to degrade and metabolize PET plastics

Region

North America - United States

Track

Environment

Poster

Zone 1 - #81

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 207

4:15 PM - 4:45 PM

Polyethylene terephthalate (PET) is a polymer used to make plastic products ranging from synthetic fibers to water bottles. Large amounts of PET end up accumulating in the environment as pollution. A bacterium named *Ideonella sakaiensis* was found to degrade PET by using two enzymes, PETase and MHETase, to break PET into two monomers: ethylene glycol (EG) and terephthalic acid (TPA). However, *I. sakaiensis*' inability to breakdown PET on a practical time scale undermines its usefulness in eliminating PET pollution. Our project aimed to tackle PET pollution by engineering a synthetic *Escherichia coli* and *Aceintobacter baylyi* co-culture to degrade and metabolize PET. Since both *E. coli* and *A. baylyi* are more characterized than *I. sakaiensis* and also capable of high-throughput mutagenesis, PET degradation and metabolism pathways in an engineered synthetic *E. coli* and *A. baylyi* co-culture potentially could be optimized to be more efficient than those natively found in *I. sakaiensis*.

ZJU-China

A Detector - A Framework of Multi-enzyme Assembly

Region

Asia - China

Track

New Application

Poster

Zone 5 - #311

Thursday

Session C & D

6:45 PM - 8:15 PM

Presentation

Thursday

Room 310

2:45 PM - 3:15 PM

Injuries—resulting from traffic collisions, drowning, falls or burns - and violence - from acts of war—kill more than 5 million people worldwide annually and cause harm to millions more. A waste of prehospital time led to high mortality. In response to these situations, ZJU-China developed A Detector for point-of-care testing (POCT), a manufacturing platform for other biosensors. Developers can assemble customized enzymes with Tag/Catcher labels in the expected order and immobilize them on a biocompatible matrix of curli fibers. In traumatic shock detecting, a triple-enzyme complex is constructed and performs as a logic gate to integrate two clinical parameters on molecular level. The result is exported through redox reaction on electrodes. Besides, in silicon machine learning is used to build a bridge between real clinical data and currents in our design. In brief, we propose an innovative new application by introducing A Detector, a Tag-Enzyme-Catcher assembly for fast response.

ZJUT-China

LiGEM-DARG: Light-controlled Genetic Engineering Machine for Degrading Antibiotic Resistance Genes

Region

Asia - China

Track

Environment

Poster

Zone 5 - #307

Friday

Session G & H

6:45 PM - 8:15 PM

Presentation

Friday

Room 310

4:15 PM - 4:45 PM

Due to antibiotic resistance genes (ARGs), microbial infections are increasingly difficult to be treated with antibiotics. The spread of ARGs has become a global challenge. Eliminating ARGs of microbes (e.g. from fermentation industry or laboratories) can reduce the amount of ARGs in the environment. To this end, we developed a light-controlled genetic engineering machine for degrading ARGs, which is comprised of the following modules: 1) To cleave an ARG, Cas9 was expressed under the control of arabinose promoter and guided by the sgRNA which targets at the ARG. 2) To control the expression of Cas9 through light, the efficiency of the light-controlled part was measured with eGFP as reporter. 3) To reduce leaky transcription of sgRNA, the arabinose-controlled repressor LacI was constructed and evaluated with eGFP. 4) A module for cell lysis was constructed to disrupt cells after eliminating the ARG. Together, we provided a novel strategy for controlling ARGs.

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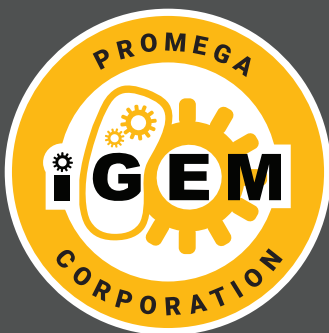
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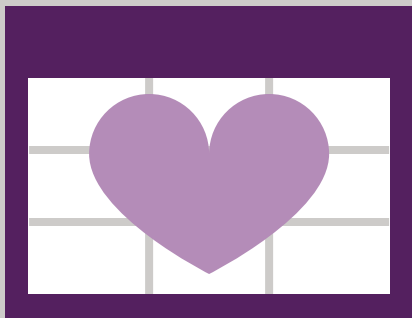
Now that you've finished your project, you're probably ready to do it all over again next year, right?

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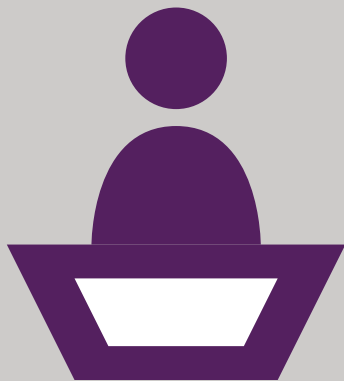
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KEYNOTE SPEAKERS



Ingrid Swanson Pultz
CSO of PVP Biologics



Jason Kelly
CEO of Ginkgo Bioworks



George Church
Wyss Institute



Auditorium
Sunday 1:30 PM - 3:30 PM

INSTRUCTOR SOCIAL

Social event for the instructors and advisors!
Light refreshments will be served.



Hynes Convention Center, Third Floor
Saturday 8:00 PM - 10:00 PM

CELEBRATION SOCIAL

Dance floor, arcade games, pool tables,
bowling lanes, and lounge areas, cash bar (21+)



145 Ipswich St, Boston, MA 02215
Sunday 7:00 PM - 12:00 AM



Your involvement in iGEM is just beginning. Exciting opportunities await!

**Be a part of the iGEM Network
after.igem.org**

After iGEM is designed to give you ways to continue participating in iGEM, synthetic biology, and in the community. Join the iGEM Network and learn about connecting with fellow iGEMers, interacting with your peers, and representing iGEM across the globe.

Join us at these events at the Jamboree to learn more!

Networking Bingo



Room 210
Thursday 5:45 PM - 6:45 PM

Mentorship Workshop



Room 306
Thursday 5:45 PM - 6:45 PM

Peers and Public:
Science Communication within and
beyond the iGEM Competition



Room 312
Friday 5:45 PM - 6:45 PM

Ambassador Program Workshop:
A tiny-huge world



Room 312
Saturday 5:45 PM - 6:45 PM

After iGEM Summit



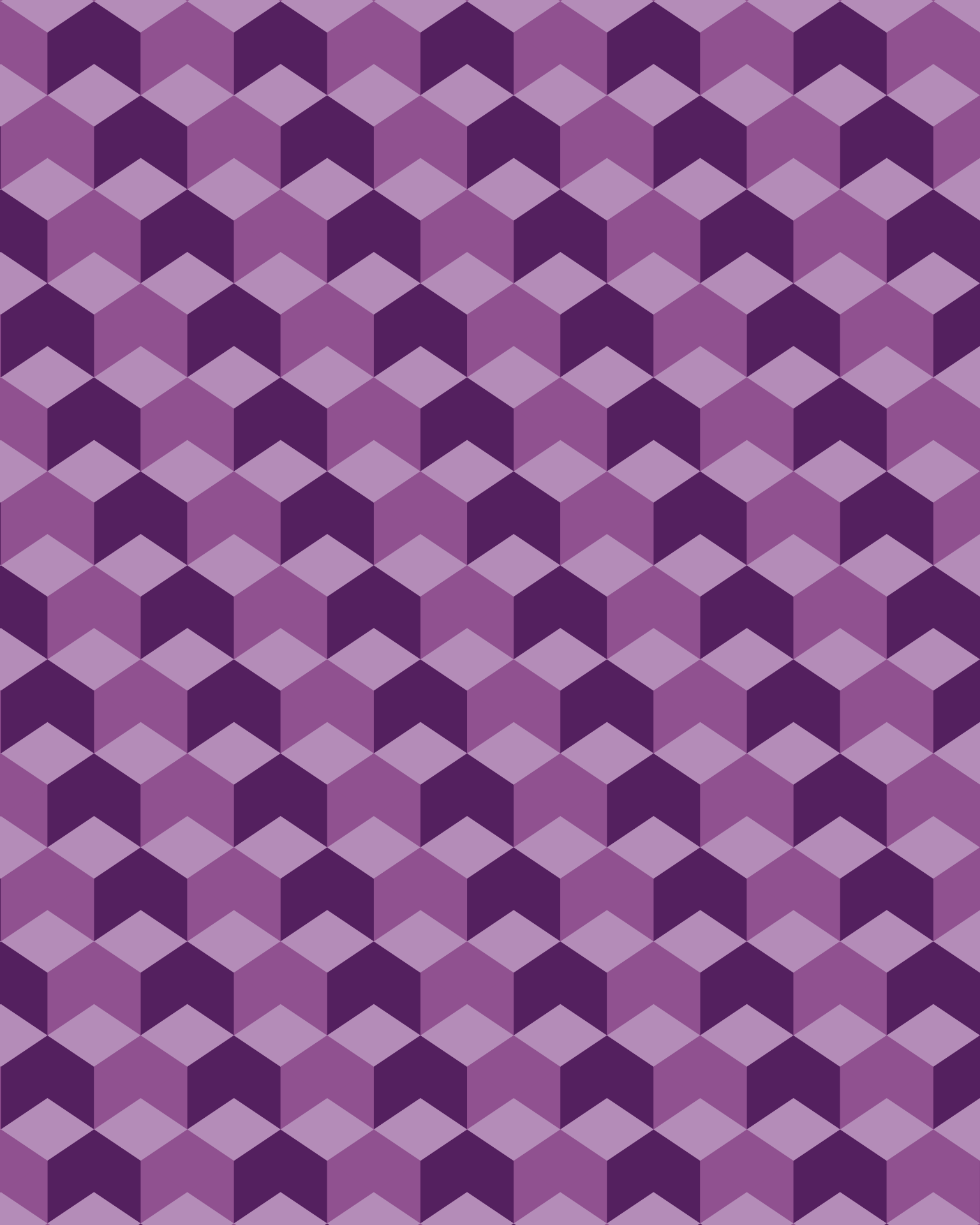
Ballroom B
Monday 9:00 AM - 3:00 PM
2018.igem.org/Giant_Jamboree/Schedule/Monday

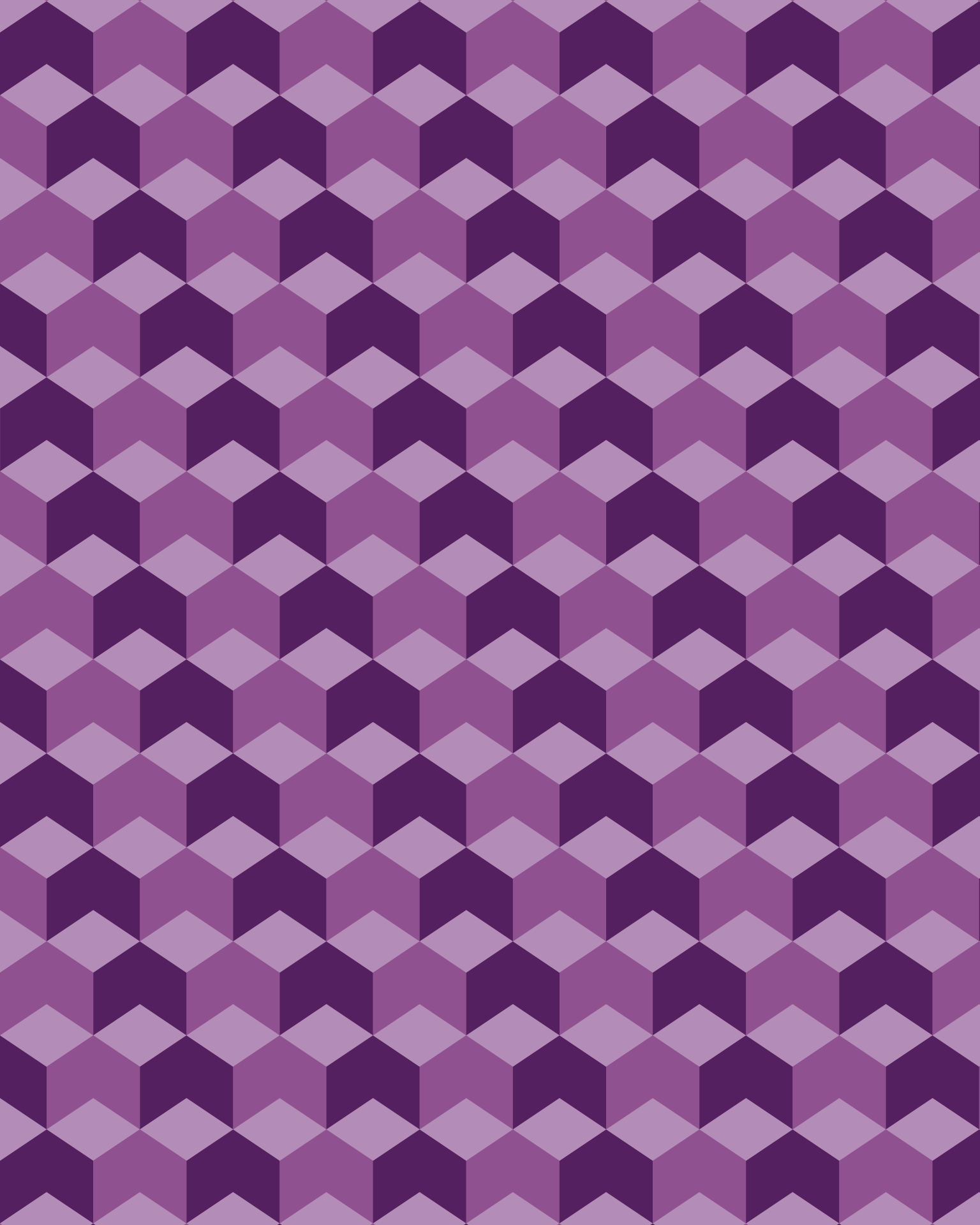
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